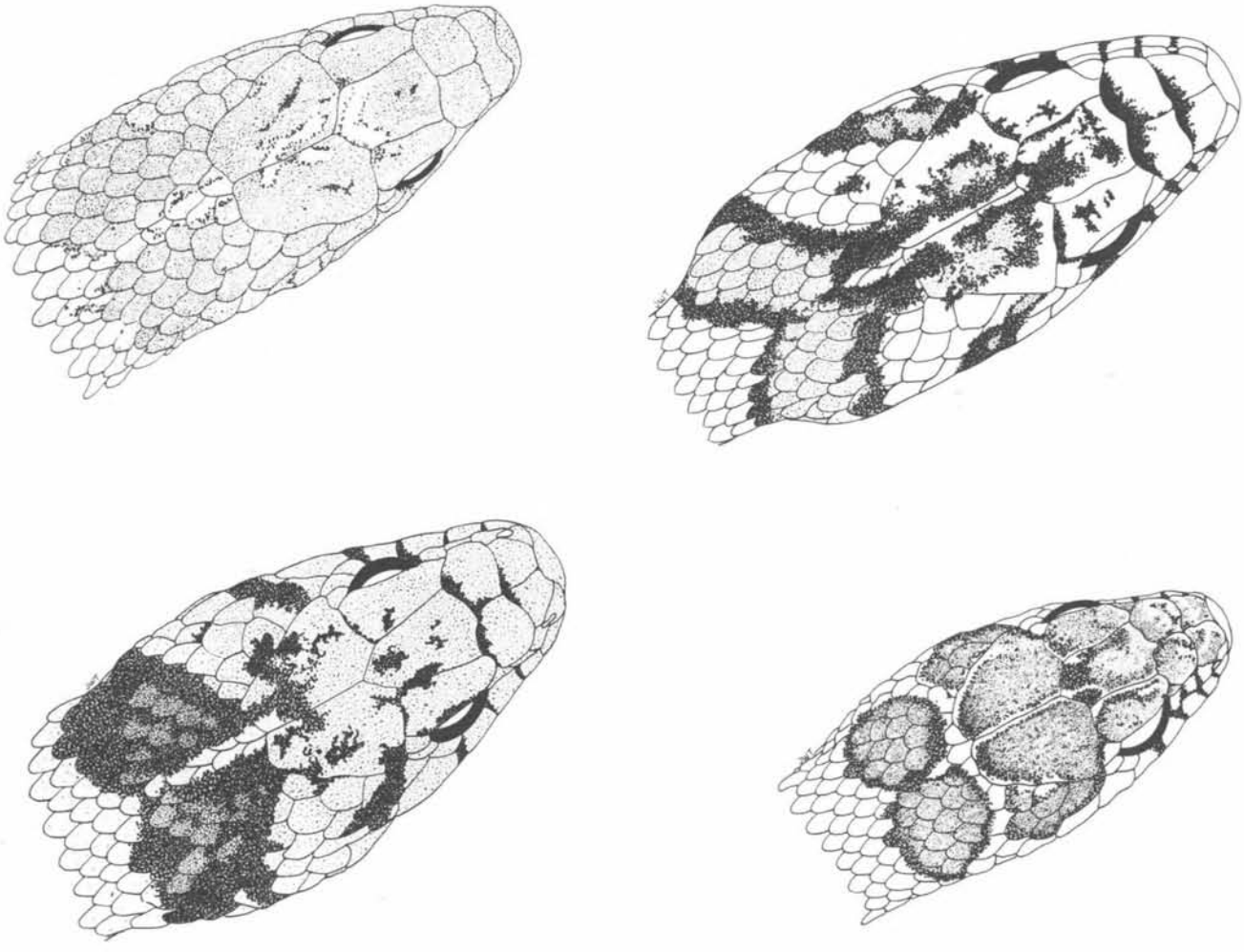
VOLUME 25 NUMBER 4 — DECEMBER 1994

Herpetological Review



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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the ***Journal of Herpetology*** (4 issues annually), ***Herpetological Review*** (4 issues annually), and occasional issues of ***Facsimile Reprints in Herpetology***. Members may purchase other Society publications at reduced rates.

ANNUAL DUES 1994

Student member	$25.00*	Sustaining member	$60.00*
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About the Cover.—The cover illustrations were executed by Jeffrey W. Tamplin, Department of Zoology & Physiology, Louisiana State University, Baton Rouge. Clockwise, from upper left: *Thamnophis exsul* (USNM 166423, holotype: Coahuila); *Thamnophis sumichrasti* (USNM 7079a: Veracruz); *Thamnophis scalaris* (MVZ 144489: Veracruz); *Thamnophis mendax* (LSUMZ 35340: Tamaulipas). Readers interested in the systematics of this group of Mexican garter snakes are referred to the following publication: D. A. Rossman. 1992. Taxonomic status and relationships of the Tamaulipan montane garter snake, *Thamnophis mendax* Walker, 1955. Proc. Louisiana Acad. Sci. 55:1–14.

1995 Annual Meeting
Society for the Study of Amphibians and Reptiles
38th Annual Meeting

8–13 August 1995

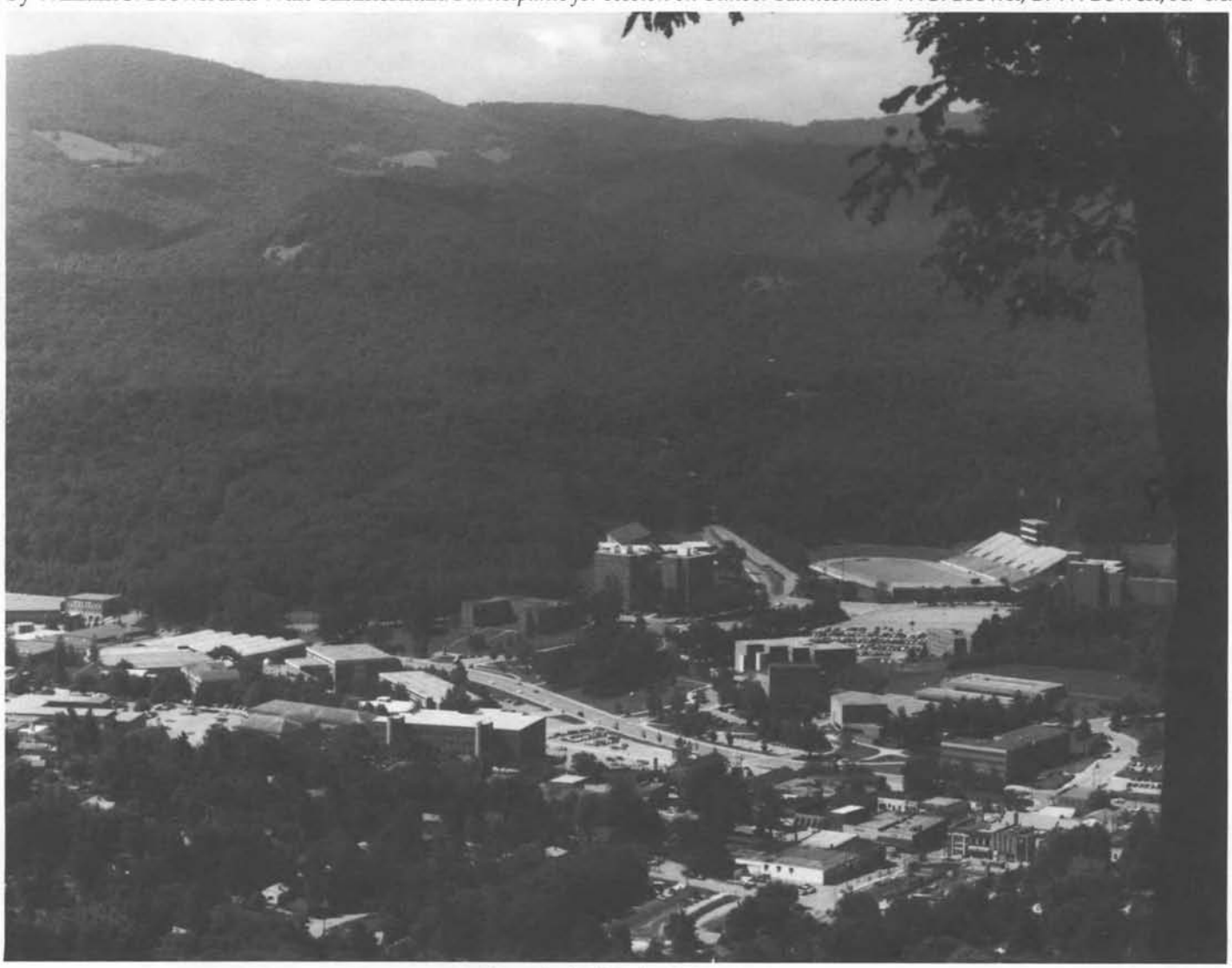
Appalachian State University, Boone, North Carolina

The members of the Biology Department and Office of Conferences and Institutes at Appalachian State University take great pleasure in inviting y'all to come and visit us next August. We have one of the nicest settings you can imagine and all the modern facilities necessary to ensure that your meeting in Boone will be a resounding success. Escape the heat and humidity (or at least one of these) and come up the mountain.

Meeting Announcement: The formal announcement brochure will be mailed to North American members of SSAR by the middle of January 1995. Overseas members and non-members can receive the brochure by contacting Wayne Van Devender (see page 135 for address and contact numbers). This booklet will include final descriptions of all activities, call for papers, pre-registration forms, and full information on accommodations.

Keynote Address: The Keynote Address will be given by Dr. Judy Stamps of the University of California, Davis ("TERRITORIAL BEHAVIOR: TESTING THE ASSUMPTIONS").

Symposium: "EASTERN RATTLESNAKES: BIOLOGY AND CONSERVATION OF *CROTALUS HORRIDUS* AND *CROTALUS ADAMANTEUS*" organized by William S. Brown and Walt Timmerman. *Participants for session on Timber Rattlesnake:* W. S. Brown, B. W. Bowen, A. -M.



Clark, L. M. Bushar, H. K. Reinert, D. E. Keyler, B. L. Oldfield, R. Stechert, A. Breisch, S. H. Harwig, S. Smith, W. H. Martin, E. Possardt, T. Tyning, R. T. Zappalorti, D. Wynn, A. H. Savitzky, B. A. Savitzky, G. Rocco, J. B. Sealy, A. Soha, J. T. Taylor, A. C. Smith, Jr., K. Michell, R. R. Rupert, Jr., D. F. Fraser, J. Congdon. *Participants for session on Eastern Diamondback Rattlesnake:* W. Timmerman, W. Auffenberg, W. H. Martin, D. B. Means, G. Dalrymple, P. Kain, S. Telford, J. W. Gibbons, R. Mount, L. Jones.

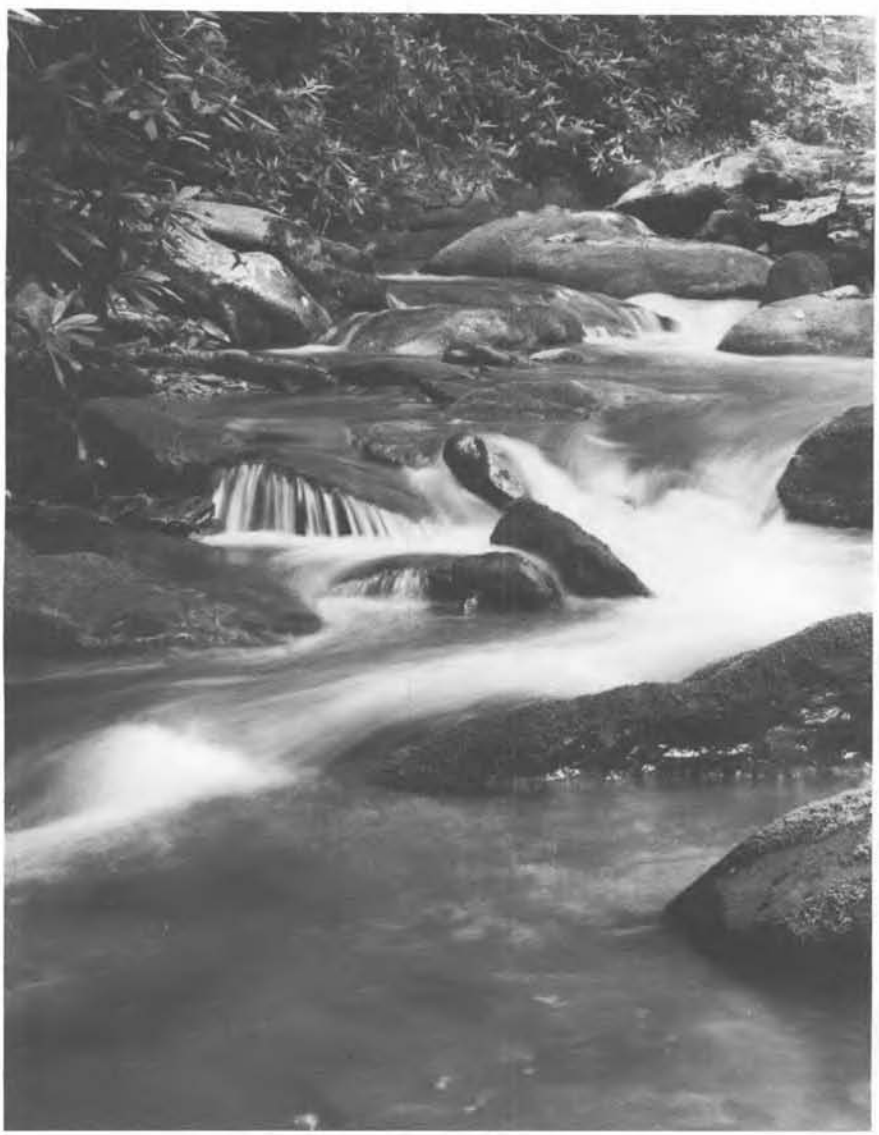
Special Regional Societies Conference: "Regional Herpetological Societies: Programs and Projects," organized by Martin J. Rosenberg.

Workshop: "Herp Photography" by David Dennis and Eric Juterbock.

Contributed Papers & Poster Presentations: There will be several concurrent sessions each day. All sessions will be held at the Broyhill Inn at Appalachian State University. Previous experience indicates that these rooms will cover our needs for spaces, both large and small. Rooms are close together, so people (but not a lot of noise) can move freely from room to room. Presentations of either type must include an informative abstract and will be accepted on a first come, first served basis.

Student Paper Award: Seibert Prizes will be awarded to the two best student papers ($250 first prize, $150 second prize).

Student Travel Grants: Ten awards of $200 each will be given. For details see SSAR Business in this issue (page 136).



Winkler's Creek near the ASU campus.

Multimedia Presentations: "Herps of the West" and "Amphibians of the Appalachians," by David Dennis and Eric Juterbock; "Herpetological Namesakes," by Kraig Adler and David Dennis.

Social Programs: Welcome social, Wednesday night, 9 August. Barbecue dinner, Thursday, 10 August ($20 per person). Graduate student social, Friday, 11 August. Multimedia presentations, Friday, 11 August. Annual SSAR auction, Saturday, 12 August. SSAR President's Travelogue Slide Shows, time to be announced.

Field Trips: Trips to Grandfather Mountain, Linville Gorge Wilderness Area, and more are planned, as well as night trips for salamander watching. Several spouse tours are also anticipated. See the upcoming announcement brochure for the latest arrangements and options.

Exhibits: Numerous merchants and artists will be on hand. Usual exhibits include books, reprints, artwork, t-shirts, field equipment, regional herp societies, photography, etc. A photographic display of all members of the *Plethodon glutinosus* complex is under consideration. Poster sessions and audiovisual shows are also open to the public.

Live Exhibits: Herps of the region, sponsored by the North Carolina Herpetological Society and Appalachian State University. As usual, a diverse array of animals will be available for viewing and photography.

Accommodations: Boone, North Carolina is a popular summer resort area. Reservations should be made well in advance. Lodging at Broyhill Inn (meeting site) will be $40 (single occupancy) or $46 (double occupancy) per day. Dormitory rooms for 200 people are available for approximately $15 (single occupancy) or $10 (double occupancy) per day plus $8 for linen. Approximately 100 additional rooms are reserved at several local motels for $49–$70 per day.

Travel and Parking: The recommended airport in the region is in Charlotte, North Carolina, which is about 110 miles and two hours driving time from Boone. If you have interests in visiting other parts of North Carolina or simply wish to have some mobility, it will be best to arrange a rental car at the airport. Most larger firms have offices in Charlotte. To accommodate other travelers Appalachian State University will provide limited shuttle service to Charlotte for a nominal fee of $20 each way. Scheduling will be restricted due to limited motor pool resources, and some passengers may have substantial waits at the airport. Parking will not be regulated on the Appalachian State University campus during this period, and abundant, free parking will be available. Shuttle transportation will be available from dormitories and motels to the Broyhill Inn.

Family Programs: A number of family activities will be offered, including tours of Boone and surrounding areas, regional craft fairs, etc.

Collecting Permits: Scientific collecting permits are required for taking and holding more than five reptiles and ten amphibians. Requests and/or questions should be sent to *Randall C. Wilson, Nongame Section Manager, Division of Wildlife Management, North Carolina Wildlife Resources Commission, 512 N. Salisbury Street, Raleigh, North Carolina, 27604-1188, USA (tel. 919-733-3391).*

Meals: University cafeterias will not be functioning during our meeting. Boone has the usual group of fast food restaurants and a number of places with more atmosphere. The Broyhill Inn (meeting site) has an excellent restaurant.

Registration: A booth at Broyhill Inn will be staffed at convenient hours to handle your registration and answer questions.

Pre-registration: All persons attending the meeting must pay the registration fees. These fees pay for printing, mailing, administration, social events, coffee breaks, etc. We can accept payments only in U.S. dollars and checks drawn on U.S. banks. Registration fees, if received *before 15 April 1995*, are: $75 for students, $110 for regular members, and $50 for spouses. After 15 May, registration fees will be $115, $145, and $50, respectively.

Climate: The campus of Appalachian State University lies at just above 3300 ft (1005 m) in elevation. In August you can expect cool nights (down to about 50°F) and at least a few rainy days during the meetings. Daytime temperatures rarely exceed 85°F. Most buildings are not, and do not need to be, air-conditioned.

Questions: Further details, call for papers, pre-registration and abstract forms will be mailed to all US, Mexican, and Canadian members of SSAR by January 1995. Overseas members may request these materials by mail. Address any questions about the program or field trips, or request materials from ***Dr. Robert Wayne Van Devender, Department of Biology, Appalachian State University, Boone, North Carolina 28608, USA (tel. 704-262-2665, fax 704-262-2127, e-mail vandevenderr@appstate.edu).*** Address questions about meeting sites, rooms, registration, etc., to ***Richard Hudson, Office of Conferences and Institutes, University Hall (tel. 704-262-3045; fax 704-262-4992; e-mail hudsonre@appstate.edu).***



Several field trips are planned in conjunction with the meeting, including one to nearby Grandfather Mountain, home of *Plethodon yonahlossee* (shown here), *P. welleri*, *P. jordani*, and *Desmognathus wrighti*. Grandfather Mountain and Yonahlossee Road at its base are forever enshrined in herpetological lore through Emmett R. Dunn's field work there in the 1920s and the eloquent preface to his book on the family Plethodontidae (1926). In 1931, a Cincinnati teenager, Worth Hamilton Weller, lost his life in a fall off Grandfather Mountain, after a successful search for the new species of salamander that was later named for him.

SSAR BUSINESS

SSAR 1994 Annual Meeting in Athens

Nearly 500 herpetologists converged on Athens, Georgia between 28 July and 1 August 1994 as SSAR held its 37th annual meeting, concurrently with the annual meeting of the Herpetologists' League. Almost all of the meeting events took place at the Georgia Center, on the campus of the host institution, the University of Georgia; Josh Laerm and Whit Gibbons were the Local Committee co-chairs.

The traditional, though unofficial, beginning of the meeting was the annual meeting of the SSAR Board of Directors, who met on Wednesday, 27 July 1994, between 1000 and 1740 hours (excluding a total of 90 minutes for a luxurious lunch in the Georgia Center dining room). At the time we were called to order, attendees included all officers: Bob Aldridge, Tom Fritts, Lynne Houck, Eric Juterbock, Al Savitzky, and Karen Toepfer; directors Robin Andrews, Paul Moler, and Bern Tryon; editors representing all of the SSAR publications: Kraig Adler, Joe Collins, Steve Corn, Bob Hansen, Bob Powell, Rich Seigel, and Tom Tyning; several coordinators or committee chairs: Randy Krohmer, George Pisani, and Eric Rundquist; immediate past treasurer Doug Taylor; and, several members including Bill Brown, Jim Christiansen, Jim Murphy, John Wright, and Wayne Van Devender. Others appeared during the day to make reports or observe the goings on. A summary of business conducted was presented at the Business Meeting (see below).

Presentations

Even before the official opening of the meeting, we had academic business to attend to. Wednesday evening, from 2000 to 2200 hours saw a packed house for a Point-Counterpoint Forum: Issues in Conservation, moderated by Bob Jaeger. Henry Wilbur and Brad Shaffer discussed the reality and significance of the apparent amphibian decline. The meeting was officially called to order at 0830 on Thursday, 28 July 1994 to begin the plenary session. After the welcomes and opening announcements, we were treated to the Keynote Address/Distinguished Herpetologist Lecture, "The Evolution of Reptilian Viviparity Revisited" by Richard Shine.

Scholarly presentations were made in 27 contributed paper sessions, two poster sessions (of two days each), three symposia and one colloquium between 1330 hours on the 28th and 1600 hours on the 1st. Over 250 authors contributed approximately 150 papers and over 100 authors presented nearly 50 posters. The three symposia (Field and Behavioral Endocrinology, Reptile and Amphibian Life History Interfaces, West Indian Herpetology) involved 65 authors and 50 papers; The Turtle Phylogeography Colloquium, 12 authors of 12 papers.

Social Program

To judge from the density of scholarly activity during the five days, one might not expect much time to be sociable. Our UGA/SREL hosts, however, managed to squeeze in a plethora of events designed to entertain and enlighten us, as well as occasionally entice us into spending money. A huge exhibit of literature, art, tee-shirts, and herpetological equipment was located in the center of all Georgia Center activities, and a massive exhibit of live amphibians and reptiles (organized by Wayne Van Devender and the SREL crew) was located just upstairs; both for the duration of the meeting. A herptile art exhibit was located in the nearby Ecology Building for most of the meeting as well.

Social events were frequent, and offered more fine edibles and liquid refreshments than we were able to consume (though not for lack of trying!). There was an Ice Breaker Social on Thursday evening, a Graduate Student Social on Friday evening, a barbecue at the State Botanical Garden on Saturday night, and, of course, the traditional SSAR Auction, with Joe Collins as Auctioneer, was held on Sunday night, the 31st. It was at this event that Auctioneer Collins announced the winning bids for the SSAR Student Travel Awards Silent Auction. This silent auction had been going on for several days. It was organized by students Dawn Wilson and John Krenz to collect money to be used to fund travel grants to students attending the annual meeting.

The annual multimedia extravaganza was held on Friday evening, and the long string of trouble-free airings ended as a handful of minor equipment problems caused the program to get off to a slow start. Still, a huge crowd enjoyed the presentations of "Herpetology of the West" and "Amphibians of the Appalachians" by Dave Dennis and Eric Juterbock. They were treated to the premiere of a new program by Kraig Adler and Dave Dennis: "Herpetological Namesakes." This latter program, which used examples from around the world and all major groups of herptiles, first presented a photo of an animal, then a photo of its namesake, and finally a caption which told the story. It was especially appreciated by the audience. A SRO crowd was on hand Monday to be overwhelmed by the Third Annual President's Travelogue, held in the Ecology Building auditorium. Ric Shine (Australian snakes), Jan Caldwell (Brazilian frogs), and Rob Stuebing (herps of Sarawak) combined beautiful images of their favorite animals with insightful commentary.

Business Meeting

President Lynne Houck called to order the Annual Business Meeting at 1530 hours on Monday, 1 August 1994, in the Mahler Auditorium of the Georgia Center. After welcoming those present and making a few introductory remarks, President Houck announced the winners of the Kennedy and Seibert Awards (see announcements later in this issue). Twelve students competed for the Kennedy Award this year and 26 for the Seibert Award.

Secretary Juterbock reported on the business conducted at the Board Meeting on Wednesday. Said meeting was neither exceptionally long nor particularly contentious; virtually all business other than the budget involved receiving reports of the editors and committee chairs. Our publications are all in fine shape and growing; the number of submissions to *Journal of Herpetology* and *Herpetological Review* continues to increase. The latter plans to add color covers in the near future. The *Catalogue* still could use accounts by senior researchers and on North American taxa. Kraig Adler announced that four *Facsimiles* are due in 1995: Fitzinger's "Neue Classification der Reptilien" (1826), Gray and Gunther's "Lizards of Australia and New Zealand" (1845–1875), Stejneger's "Herpetology of Japan and Adjacent Territory" (1907), and Wilhelm Peters's "Herpetological Contributions." Two *Contributions* are due in 1995: Anderson's "Lizards of Iran" and Powell and Henderson's "West Indian Herpetology: a Symposium in Honor of Albert Schwartz." *Herpetological Circulars* will publish Beltz's "Original Citations for North American (North of Mexico) Amphibians and Reptiles." Steve Corn announced that our new series, *Herpetological Conservation*, has an editorial board and has solicited manuscripts; he hopes to have the first volume printed during 1995.

Ken Dodd reported for the Conservation Committee and read a number of resolutions (see below), which were all adopted. The Grants-in-Herpetology Committee announced that it wishes to increase the size of awards, and encouraged members to contribute to the GIH endowment. The slate of nominees for the 1994 election was read; there were no additional nominations from the floor, and the slate was accepted by acclamation.

Immediate past treasurer Doug Taylor reported that SSAR was in excellent financial shape due to the budgetary officers staying within budget and tremendous sales of publications. Treasurer Karen Toepfer reported that the 1994 picture was just as good. She announced that we were both increasing the number of our programs and adding to current programs and publications; thus we were increasing all dues categories except for students.

Wayne Van Devender, Local Committee Chair for the 1995 meeting in Boone, North Carolina, invited us all to join him in salamander heaven (see announcement elsewhere in this issue). Field trips, a Grandfather Mountain event, a Rattlesnake symposium and a Keynote Address by Judy Stamps, "Lizard Territoriality: Testing the Assumptions" are only a few of the highlights of this meeting. He encouraged everyone to pre-register early.

George Pisani read the remaining resolutions, which were all accepted by the membership, and no new business was introduced. So, after President Houck transferred the SSAR Presidential Gavel to President-elect Al Savitzky, he adjourned the meeting at 1635 hours.

1994 Joint Resolutions

Society for the Study of Amphibians and Reptiles and The Herpetologists' League

Protection of Indian Sea Turtles (Joint)

WHEREAS India has historically supported the largest worldwide nesting site of the olive ridley sea turtle (*Lepidochelys olivacea*) at Gahirmatha Beach (Bhitarkanika Sanctuary) in Orissa; and,

WHEREAS Gahirmatha Beach represents one of only four remaining mass-nesting beaches for this species in the entire world and is the only such site in the Indian and Western Pacific Oceans; and,

WHEREAS actions of the Orissa State Government to develop a major shrimp fishery at the Port of Talchua threaten migratory breeding populations of this species at Gahirmatha Beach; and,

WHEREAS the incidental capture of sea turtles by shrimp fishing fleets has been demonstrated to be especially destructive to sea turtle populations, and various other human activities, especially egg poaching, have for many years adversely affected sea turtles; and,

WHEREAS for the forseeable future the Madras hatcheries for the olive ridley serve to mitigate some of the damage caused to populations by egg poachers; and,

WHEREAS the sea turtles of the world are an international resource that in the course of their lives travel in and out of sovereign waters of many nations and into international waters; and,

WHEREAS these nations, most recently México, have developed and are vigorously enforcing conservation programs for this and other sea turtle species to maintain this sustainable economic resource in accordance with guidelines of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES);

NOW IN VIDEO!



AUFFENBERG ON MONITORS

SSAR is pleased to announce its first video production, a recording of the lecture by Professor Walter Auffenberg (University of Florida) presented at the society's 1993 Annual Meeting in Bloomington, Indiana. In this 60-minute video, which is extensively illustrated with color slides, graphs, and other figures, Auffenberg describes and contrasts the behavioral ecology and feeding strategies of three markedly different species of monitors—the Komodo Monitor of eastern Indonesia, Gray's Monitor of the Philippines, and the Bengal Monitor of South Asia. Each species has been the subject of a major book by Auffenberg, and that on the Bengal Monitor was just published by the University Press of Florida. The video includes several film sequences of Komodo Monitors in the wild.

Videotapes may be purchased from DUANE BUSICK VIDEO PRODUCTIONS, 4400 ETTER ROAD, BLOOMINGTON, INDIANA 47408, USA, for US$20 each in the USA, $25 outside the USA (prices include all shipping and handling as well as airmail postage overseas). Payment may be made by personal checks or money orders, *in advance*; sorry, no credit cards or CODs. This is a VHS format tape (NTSC standard, appropriate for USA VCR machines); those who need PAL or SECAM versions may convert from NTSC copies or inquire of Busick Video for additional charges for PAL or SECAM versions (telephone area 812, 336-8329).

THEREFORE, be it
RESOLVED that the Society for the Study of Amphibians and Reptiles (SSAR) and The Herpetologists' League (HL), international professional scientific societies devoted to the study of amphibians and reptiles, strongly encourage the Government of

India to give serious consideration to relocating the proposed Talchua shrimp fishery to existing facilities at Paradeep and/or Dhamara; and, be it further

RESOLVED that these societies strongly encourage India's government to require and enforce the use of Turtle Excluder Devices by all shrimp trawlers; and, be it further

RESOLVED that these societies strongly encourage India's government to work with the Government of Orissa to preserve the Gahirmatha Beach nesting site and develop eco-tourism to it to bolster the Orissan economy; and, be it further

RESOLVED that these societies strongly encourage India's government to continue the sea turtle hatchery management programs at Madras; and, be it finally

RESOLVED that these societies strongly encourage India's government to develop and enforce vigorously laws to halt egg poaching at sea turtle nesting sites.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles and The Herpetologists' League, 25 April 1994.

The California Desert Protection Act
(H.R. 518, S. 21 and variants thereof)

WHEREAS the Congress of the United States is considering the passage of legislation to designate up to 8 million acres of public land as parks and wilderness in the southern deserts of California, and

WHEREAS the designation would add 1.1 million acres to Death Valley National Monument and upgrade it to a national park, and

WHEREAS over 1 million acres would add 300,000 acres to Joshua Tree National Monument and upgrade it to a national park, and

WHEREAS over 1 million acres will be designated as the East Mojave National Park or the Mojave National Preserve, and

WHEREAS the designation of such lands would provide additional and important protection for desert plants and wildlife, including desert tortoises, bighorn sheep, and other species of significance, and

WHEREAS the designation of such lands provides a complementary level of protection to other lands identified as critical habitat for the recovery of the federally threatened Mojave metapopulation of the desert tortoise, and

WHEREAS the designation of such lands would preserve fragile desert ecosystems for the benefit of future generations of Americans, and

WHEREAS the lands encompassed are of high biological and cultural significance,

THEREFORE, be it
RESOLVED that The Herpetologists' League and the Society for the Study of Amphibians and Reptiles at their joint annual meeting at the University of Georgia, 29 July to 1 August 1994, endorse the swift passage of an inclusive and effective version of the California Desert Protection Act.

Establishment of Incidental Take Levels for Sea Turtles

WHEREAS many thousands of endangered and threatened sea turtles have washed ashore along the Gulf and Atlantic coasts of the United States as a result of incidental take by certain commercial fisheries, and

WHEREAS an unacceptable number of sea turtles continue to be killed by commercial fishing activities throughout waters of U.S. jurisdiction, and

WHEREAS the same temporal pattern of mortality has continued for decades thereby decimating the large-juvenile and adult populations, and

WHEREAS the responses of the Department of Commerce, the responsible agency for protecting these animals on the endangered species list, have been based mainly on the modification of a single fishing technology (turtle excluder devices or TEDs in shrimp nets); and the Department of Commerce has apparently considered the remaining mortality acceptable incidental "take" under the Endangered Species Act, and

WHEREAS unless new actions are taken, the chances for improvement in the status of threatened and endangered populations will continue to decline,

THEREFORE, be it
RESOLVED that the Herpetologists' League and the Society for the Study of Amphibians and Reptiles at their joint annual meeting at the University of Georgia, 29 July to 1 August 1994, hereby request that the Secretary of Commerce:

(1) contract for an advisory group of the National Academy of Sciences (with such individuals as used for the study required by Section 1008 of the Endangered Species Act Amendments of 1988) to establish the maximum allowable incidental "take" within a reasonable time limit (one to two week period) in a fishery zone by commercial fisheries and the consequences of exceeding that quota, and

(2) that the Secretary of Commerce follow the guidelines properly to carry out his/her responsibilities under the Endangered Species Act to protect these species by all means necessary, including (a) temporary closing of fishery zones, (b) restrictions on dumping bi-catch which attracts sea turtles, (c) initiation of new studies of sea turtle physiology and pathology, (d) modifications of handling procedures following incidental catch, (e) and the establishment of non-fishing zones as control areas for ecological and behavioral studies that would afford some protection to remaining stocks of sea turtles.

Reauthorization of the Endangered Species Act

WHEREAS the diversity of native species of animals and plants is being reduced by human activities, and

WHEREAS the reduction in biological diversity is a consequence of habitat loss and degradation and from the introduction of non-native species, and

WHEREAS biological diversity and natural ecosystems are important components of our natural heritage, and

WHEREAS the purpose of the Endangered Species Act is to prevent the loss of biological diversity and the natural ecosystems on which plants and animals depend, and

WHEREAS the Endangered Species Act is up for reauthorization and funding by the U.S. Congress,

THEREFORE, be it
RESOLVED that The Herpetologists' League and the Society for the Study of Amphibians and Reptiles at their joint annual meeting at the University of Georgia, 29 July to 1 August 1994, urge the Congress of the United States to support passage of a strong version of the Endangered Species Act such as that presently embodied in H.R. 2043 and S. 921.

Increased Federal Funding for National Wildlife Refuges in Florida

WHEREAS the protection of natural habitat is essential to the conservation of native species, and

WHEREAS the U.S. Fish and Wildlife Service has identified two regions of Florida, the Lake Wales Ridge of central Florida and the Atlantic coast beaches of east-central Florida, as providing essential habitat for a broad diversity of threatened and endangered species, and

WHEREAS the first of these, designated as the Lake Wales Ridge National Wildlife Refuge, is critical to the survival of numerous plants and animals, including at least three species of reptiles that exist nowhere outside of Florida, and

WHEREAS the second of these, designated as the Archie Carr National Wildlife Refuge, serves as a nesting beach for three species of sea turtles, including the densest aggregation of nesting loggerhead turtles in the Western Hemisphere, and

WHEREAS both of these sites occur in regions that are subject to some of the greatest rates of human-mediated habitat destruction anywhere in the United States,

THEREFORE, be it
RESOLVED that the Herpetologists' League and the Society for the Study of Amphibians and Reptiles at their joint annual meeting at the University of Georgia on 29 July to 1 August 1994, commend the U.S. Congress for allocating initial funding for the acquisition of land in both refuges.

However, in recognition that the funds thus far allocated represent only a small fraction of the needed resources, we therefore urge substantially increased federal funding for the acquisition, in conjunction with designated state and local funds, of biologically critical and highly endangered lands within both refuges, and, be it further

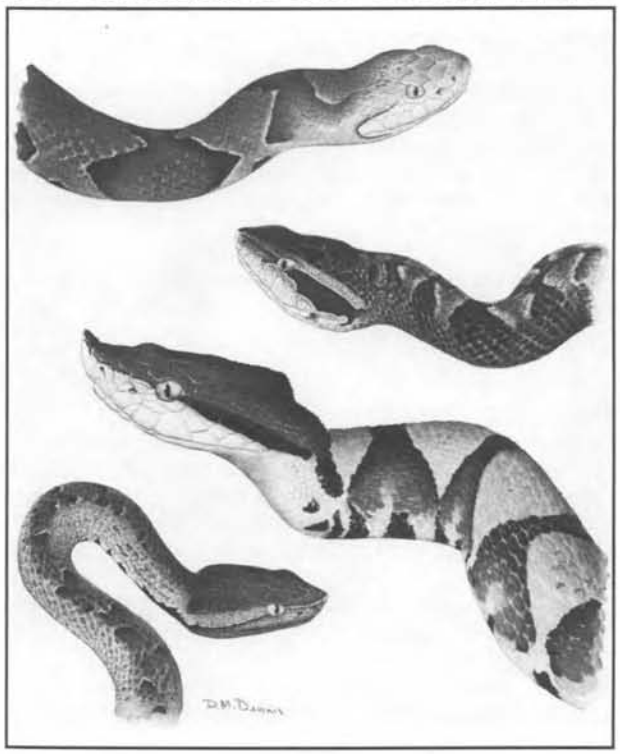
RESOLVED that copies of this resolution shall be provided to the Secretary of the Interior, Director of the U.S. Fish and Wildlife Service, Chairs of the House and Senate Appropriations Committees, Senators Bob Graham and Connie Mack of Florida, and other appropriate persons.

PCR and Scientific Research on Endangered Species

WHEREAS biological information on endangered species is a necessary prerequisite to any effective conservation program, and

WHEREAS United States biologists are required by law to obtain research permits from the U.S. Fish and Wildlife Service Office of Management Authority (OMA) to conduct conservation-related research on endangered species, and

"SNAKES OF THE *AGKISTRODON* COMPLEX"



SIGNED LIMITED-EDITION COLOR PRINT

SSAR is pleased to offer signed-and-numbered copies of the frontispiece to its book, "Snakes of the *Agkistrodon* Complex" by H. K. Gloyd and Roger Conant (published 1990). This full-color print is reproduced from a watercolor by the well-known wildlife artist, David M. Dennis. Each copy is individually signed by Dr. Conant and Mr. Dennis and is numbered in an edition strictly limited to 117 copies. Each print measures 8.75 x 11.5 inches (22 x 29.5 cm) and is printed on acid-free paper suitable for framing.

ORDERING: Send orders to Dr. Robert D. Aldridge, SSAR Publications Secretary, Department of Biology, St. Louis University, 3507 Laclede Avenue, St. Louis, Missouri 63103, USA (*telephone*: area code 314, 658-3900 or 658-3916; *fax*: 314, 658-3117).

PRICE: $25, including shipping.

WHEREAS recent experience has shown that permits for standard scientific procedures can take months or years to obtain from OMA, and such delays often constitute a substantial obstacle to conservation-oriented research, and

WHEREAS OMA often imposes extensive conditions on endangered species permits, and such conditions can constitute a substantial obstacle to conservation-oriented research, and

WHEREAS OMA often imposes extensive conditions on collaborative research conducted by foreign nationals on their native soil, and

WHEREAS OMA recently has claimed jurisdiction over synthetic DNA generated by polymerase chain reaction (PCR) methodology, despite the fact that synthetic DNA can be obtained nondestructively and contains no part of the original (endangered species) DNA, and

WHEREAS at the last two meetings of the Convention on International Trade in Endangered Species (CITES), a proposal was forwarded to exempt small tissue samples from CITES regulations, in recognition of the importance of conservation-oriented research, and that both times this proposal was opposed by the U.S. representative (OMA), and

WHEREAS as the biodiversity crisis gains momentum, there is no time to waste on non-essential restrictions on conservation-oriented research.

THEREFORE, be it
RESOLVED that 1) The Herpetologists' League (HL) and the Society for the Study of Amphibians and Reptiles (SSAR) at their joint annual meeting at the University of Georgia, 29 July to 1 August 1994, call upon the Secretary of the Interior, the Director of the U.S. Fish and Wildlife Service, and the Chief of the Office of Management Authority to work with scientists under the spirit of the Endangered Species Act, rather than adopt an interpretation of regulatory control which works to the detriment of conservation goals.

2) The HL and SSAR call upon the U.S. Office of Management Authority to recognize the importance of biological research in conservation, and to facilitate conservation-oriented research by making permits available to biologists in a timely and efficient manner.

3) The HL and SSAR call upon the U.S. Office of Management Authority to issue permits without extensive and unnecessary conditions, and without attempting to modify or second-guess the scientific methodology.

4) The HL and SSAR call upon the U.S. Office of Management Authority to allow free exchange of synthetic DNA for biological research, in recognition of the fact that synthetic DNA has no commercial value but has extensive scientific and conservation value.

5) The HL and SSAR call upon the U.S. Office of Management Authority to support the proposal to exempt small tissue samples (< 1 gram), small blood samples (< 1 ml) and DNA isolates from CITES regulations, in recognition of the fact that these scientific specimens have no commercial value but have extensive scientific and conservation value.

6) The HL and SSAR call upon the U.S. Office of Management Authority to exercise extreme restraint in imposing conditions on endangered species research outside the United States, in recognition of the fact that such actions diminish the spirit of cooperation necessary for international conservation, and in recognition of the fact that domestic permit agencies are the appropriate regulatory body for research conducted within the territorial boundaries of sovereign nations.

Listing Box Turtles on Appendix II of CITES

WHEREAS box turtles (genus *Terrapene*) are important ecological and aesthetic components of the terrestrial ecosystems of North America where they historically reached high population densities, and

WHEREAS box turtles are long-lived species whose adults maintain high survivorship despite substantial mortality of juveniles and young, and

WHEREAS the large-scale removal of breeding adults of such long-lived species exacerbates already existing problems such as loss of habitat, highway mortality, and habitat fragmentation, and

WHEREAS box turtle populations in many parts of North America are declining despite local or state protection, and

WHEREAS the international export of box turtles to Europe and Japan has exploded within recent years to the extent that more than 70,000 individuals were exported during the last three years alone, and

WHEREAS the uncontrolled exploitation of such long-lived species will eventually lead to the extirpation of many populations for a purpose which is unconscionable under present concerns for ecosystem biodiversity, and

WHEREAS box turtles (genus *Terrapene*) have been proposed by the U.S. Fish and Wildlife Service to be added to Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) at the forthcoming meeting in Fort Lauderdale in November,

THEREFORE, be it
RESOLVED that the Herpetologists' League (HL) and the Society for the Study of Amphibians and Reptiles (SSAR), at their joint annual meeting at the University of Georgia 29 July to 1 August 1994, support the listing of the genus under provisions of Appendix II; and, be it further

RESOLVED that HL and SSAR urge the U.S. Fish and Wildlife Service to vigorously pursue data relating to the international trade of all native chelonians to ensure that other species are not likewise jeopardized by unregulated trade; and, be it further

RESOLVED that HL and SSAR urge the U.S. Fish and Wildlife Service and other federal and state resource agencies to support research designed to assess and monitor chelonian populations on a long-term basis.

Honoring Jack McCoy

WHEREAS Jack McCoy was an exceptionally valued friend and mentor to many in the herpetological community; and,

WHEREAS Jack McCoy devoted much time and effort to advancing the goals and stature of both the Herpetologists' League and the Society for the Study of Amphibians and Reptiles; and,

WHEREAS Jack McCoy's untimely sudden death on 7 July 1993 has left a palpable void both in the field of herpetology and in the lives of friends and associates;

THEREFORE, be it
RESOLVED that these societies hereby express their most heartfelt sense of loss of a friend and colleague.

Adopted unanimously by The Herpetologists' League and the Society for the Study of Amphibians and Reptiles at their joint annual meeting at the University of Georgia, 29 July to 1 August 1994.

Thanking The Local Committee

WHEREAS The University of Georgia at Athens has provided an excellent setting, fine food and accommodations for this joint meeting of the Society for the Study of Amphibians and Reptiles and The Herpetologists' League; and,

WHEREAS the Savannah River Ecology Laboratory has a long and distinguished tradition of research in ecology and herpetology; and,

WHEREAS the choices of seminar rooms has done much to further a feeling of closeness between members of these societies; and,

WHEREAS Joshua Laerm is to be commended for his observance of these societies' tradition of consumption of cereal-malt beverages.

THEREFORE, be it
RESOLVED that the Society for the Study of Amphibians and Reptiles and The Herpetologists' League extend their most sincere thanks to the Local Committee: Whit Gibbons, Norma Reed, Joshua Laerm, Janice Sands, Amy Edwards, Bobby Bowen, Elizabeth McGhee, Joe Morgan, Martina Conrad, David Brooks, Christine LaPorte, Kurt Buhlmann, Tony Mills, Dawn Wilson, Wayne Van Devender, John Krenz, and also to Vinny Burke, Mark Mills, John Lee, Michael Schwartz, and the other SREL and UGA students whose combined efforts have made this meeting a successful intellectual and social event; and, be it further

RESOLVED that these societies offer sincere apologies to Joshua Laerm for the obviously diminished imbibational capacity of the membership at the Social.

Adopted unanimously by The Herpetologists' League and the Society for the Study of Amphibians and Reptiles at their joint annual meeting at the University of Georgia, 29 July to 1 August 1994.

1994 SSAR Resolution

Honoring Outgoing SSAR Officers and Editors

WHEREAS the following individuals have given freely of their time, skills, insight, and knowledge to the Society for the Study of Amphibians and Reptiles in this past year; and,

WHEREAS they have been therefore instrumental in advancing the Society's goals and furthering its growth as an international scientific society; and,

WHEREAS SSAR is dependent upon the generosity of these persons and those who have gone before them, and is greatly indebted to them for their fine efforts in its behalf;

THEREFORE, be it
RESOLVED that the Society for the Study of Amphibians and Reptiles urges these persons not to ride off into the sunset, but rather to continue to be available, with or without official titles, as resources to guide those who follow; and, be it further

RESOLVED that the Society offers its most sincere thanks to the following persons who have served in these capacities:

WILLIAM E. COOPER— Chair, Nominating Committee
CHARLES COSTA— Elector
THOMAS H. FRITTS— President
RONALD GOELLNER— Chair, Zoo Liaison Committee
LOUIS J. GUILLETTE— Director
STEPHEN H. HAMMACK— Director
MICHAEL W. KLEMENS— Section Editor, *Catalogue of American Amphibians and Reptiles*
PAUL MOLER— Chair, Conservation Committee
EDWARD O. MOLL— Immediate Past-President and Chair, Long-Range Planning Committee
CRAIG E. NELSON— Chair, 1993 Local Committee
GEORGES PASTEUR— Editorial Board, *Journal of Herpetology*
ERIC M. RUNDQUIST— Chair, Regional Societies Liaison Committee
NORMAN J. SCOTT— Chair, Henri Seibert Awards Committee
DOUGLAS H. TAYLOR— Treasurer

Adopted unanimously by the Society for the Study of Amphibians and Reptiles, 1 August 1994 at its Annual Business Meeting.

Kennedy Student Award Committee Annual Report – 1994

The Kennedy Award Committee has completed its work for Volume 27 of the *Journal of Herpetology*. The Committee has selected "Maternal Brood Care by *Dendrobates pumilio*: A Frog that Feeds its Young" by Douglas G. Brust. Mr. Brust carried out this work as a doctoral candidate in the Section of Ecology and Evolutionary Biology of Cornell University. His present address is the College of Physicians and Surgeons at Columbia University, Box 509, 630 West 168th Street, New York, New York 10032, USA. F. Harvey Pough provided research direction as major professor.

Twelve manuscripts were in competition this year. The Committee noted the high quality of the submitted papers.

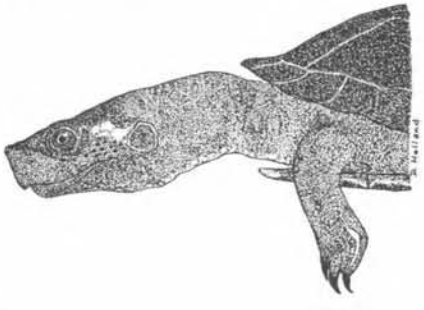
KEN R. MARION, Chair
Kennedy Student Award Committee.

Seibert Award Winners for 1994 Announced

The third annual Seibert Awards were presented at the 37th Annual Meeting of the SSAR in Athens, 28 July–1 August 1994. These awards are named in honor of Henri C. Seibert, an early and tireless supporter of SSAR (having served as an officer for over 20 years). The awards recognized outstanding student presentations at the annual meeting.

The winners: Joseph H. K. Pechmann (Duke University and Savannah River Ecology Laboratory), First Prize ($250); Frank R. Hensley (University of Florida at Gainesville and Savannah River Ecology Laboratory), Second Prize ($150). Honorable Mention: Paul T. Andreadis (University of Tennessee at Knoxville); Bradley T. Braun (Lehigh University); S. B. Reichling (University of Memphis); Kevin C. Zipple (Cornell University).

The judges were Neil Ford, John Iverson, Fredric Janzen, Randall Krohmer, Charles R. Peterson, and Susan Walls.



SSAR Student Travel Awards Fundraiser Call For Donations

At the 1994 SSAR/HL meetings in Athens, Georgia, the newly formed SSAR Student Travel Awards Committee organized a frameable art silent auction to raise funds for students attending and presenting papers at an annual meeting. Because of the great success of the first silent auction (over $2000 raised), the Travel Awards Committee is pleased to announce the second frameable art silent auction to be held at the 1995 SSAR meeting in Boone, North Carolina. Many people attending the Athens meeting expressed an interest in donating an item to the silent auction. Items acceptable as a donation include: photos of your favorite study animal (or herpetologists!), line drawings, prints, paintings, or anything else that can be put into a frame, if not framed already. If you are interested in donating an item please contact *Dawn S. Wilson, Biology Dept., University of South Florida, Tampa, Florida 33620, USA; tel. (813) 974-9175; FAX (813) 974-3263; E-mail: WILSON@CHUMA.CAS.USF.EDU.*

SSAR Student Travel Award Donors

The SSAR Student Travel Awards Committee wishes to thank the following people for their donations to the 1994 SSAR frameable art silent auction held in Athens, Georgia: Kraig Adler, Ronald Altig, Patty Barber, Jonathan Campbell, David Cannatella, Martin Capron, David Chiszar, David Dennis, Dale Jackson, William Lamar, Ernie Liner, Linda Maxson, Roy McDiarmid, Margo McKnight, Don Moll, Henry Mushinsky, Alan Savitzky, David Scott, Richard Seigel, Adam Summers, Peg Summers, and Steve Werman.

SSAR Student Travel Awards Call For Applications

Ten SSAR Student Travel Awards of $200 each are available to undergraduate and graduate student members of the SSAR to help defray the cost of travel to the upcoming meeting in Boone, North Carolina. An applicant must be a student and a member of SSAR, must not have previously received a travel award from SSAR, and must be the first author of a paper or poster to be presented. An applicant must include in the application package:

1) a letter signed by his or her major advisor or department chair stating that he or she is currently an undergraduate or graduate student and that he or she is not completely funded for travel from another source;

2) an official copy of the poster or paper abstract to be presented;

3) a self-addressed, stamped envelope.

If the research is co-authored, the applicant must also include a letter from his/her advisor stating that the work was primarily the product of the applicant. All qualified applicants will be pooled and awardees will be drawn at random. Students from the local meeting site and current members of the SSAR Travel Awards Committee are excluded from applying for a travel award. APPLICATIONS MUST BE POSTMARKED BY 15 MAY 1995. Award recipients will be notified by early June 1995 and award checks will be dispersed at the meeting. Send applications to: *Dawn S. Wilson, Department of Biology, University of South Florida, Tampa, Florida 33620, USA. For further information Wilson may be contacted at: Tel. (813) 974-9175, FAX (813) 974-3263; e-mail WILSON@CHUMA.CAS.USF.EDU.*

New Section Editors Named For *HR*

Owing to the increased number of "techniques" manuscripts submitted to *Herpetological Review*, a new section editorship has been established. Authors of techniques manuscripts should submit these directly to the new section editor: *Stephen D. Busack, Section Editor—Techniques, National Fish & Wildlife Forensics Laboratory, 1490 East Main Street, Ashland, Oregon 97520, USA.*

Additionally, the section editor for Natural History Notes (Amphibia), Randy Jennings, has resigned due to other commitments. The Editor and SSAR thank him for his efforts and wish him well. Natural History Notes concerning amphibians should be sent to the new section editor: *Charles W. Painter, Section Editor—Natural History Notes, Endangered Species Program, New Mexico Department of Game and Fish, P.O. Box 25112, Santa Fe, New Mexico 87504, USA.*

NEWSNOTES

The Canadian Association Of Herpetologists Invites New Members

The Canadian Association of Herpetologists is a scientific organization of professionals, students, and interested amateurs whose goals are to foster herpetological research and to aid communication between reseachers in Canada. Membership in CAH is open to all those whose work is concerned with the biology of amphibians and reptiles, particularly those who are located in Canada, who are working with Canadian populations, or who are interested in herpetology in Canada. The Association will celebrate its tenth anniversary in 1995. Its annual meeting is held in conjunction with an annual meeting of one of the three large North American herpetological societies, ASIH, HL, and/or SSAR and, in the tradition of the Association, business is held *after* the pleasure of an informal evening banquet. The Association is a part sponsor of the Canadian Declining Amphibian Populations Task Force and reports on its proceedings and progress through its publication, the *CAH Bulletin*.

HERPETOLOGY IN ARIZONA



Status, distribution, and conservation of Arizona herpetofauna

Seasonal (up to 9 months) and Limited (up to 3 years) appointments available

Salary range: $18,288-$27,810/year
Limited appointments include benefits

Send request for information to:
Jeff Howland
Nongame Branch
Arizona Game and Fish Department
2221 W. Greenway Road
Phoenix, Arizona 85023

The *CAH Bulletin* is produced twice each year and publishes articles, news, and reviews of interest to herpetologists in Canada. The *Bulletin* also publishes thesis abstracts of M.Sc.'s and Ph.D.'s completing research in Canadian herpetology. Reports submitted for publication may be in the form of short announcements or letters, or may be written as longer articles. Articles may be published in English or French. The *Bulletin* especially requests news about current research activities and recent publications, travel plans, new students, grants, awards, fellowships, new books, or book reviews, trivia, or concerns. Correspondence and submissions, preferably stored on a 3.5-inch floppy disc or sent by e-mail, should be addressed to the editor: *David M. Green, Redpath Museum, McGill University, 859 Sherbrooke St. W., Montreal, Quebec H3A 2K6 (Fax: 514-398-3185 • email: czdg@musica.mcgill.ca).*

Annual membership dues in CAH (in Canadian funds) are $10.00 (regular) or $5.00 (student, with proof of status) payable to the Canadian Association of Herpetologists. Membership requests should be sent to: *Dr. Patrick T. Gregory, Department of Biology, University of Victoria, Victoria, B.C., V8V 2Y2 Canada.*

Declining Amphibian Populations Task Force Update

The DAPTF office has been moved, from Corvallis, Oregon USA, to the United Kingdom (new address below). The new Chair is Ron Heyer and the new Executive Director is Tim Halliday. To contact the DAPTF or to be placed on the mailing list for their newsletter, *FROGLOG*, write to: *DAPTF, Department of Biology, The Open University, Walton Hall, Milton Keynes, MK7 6AA, United Kingdom.*

Southwestern Research Station Positions And Grants For 1995

VOLUNTEERS—Approximately 20 volunteer positions are open in 1995 at the American Museum of Natural History's Southwestern Research Station in Portal, Arizona. The volunteer program is run annually and offers students in biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging are provided to volunteers in exchange for twenty-four hours per week of routine chores, with the remaining time available for research activities.

The program is open to both undergraduate and graduate students; the latter may pursue their own research projects. Faculty knowing of promising students should alert them to this opportunity for professional experience toward, development of, and evaluation of their career goals.

Volunteers are needed between March 15 and November 1. Appointments are for part of this period, with a minimum appointment of six weeks. Applicants for spring positions (March–May) should submit applications by February 15, summer volunteers (June–August) by April 1, and fall volunteers (September–November) may apply any time.

For applications, write: *Dr. Wade C. Sherbrooke, Director, Southwestern Research Station, American Museum of Natural History, Portal, AZ 85632 USA; telephone 602-558-2396.*

SOUTHWESTERN RESEARCH STATION STUDENT SUPPORT FUND—The American Museum of Natural History awards several grants each year of approximately $400–$800 to graduate students or postdoctoral students pursuing research at its Southwestern Research Station in the Chiricahua Mountains, Portal, Arizona.

Information and application forms for this program and other Museum grant programs can be obtained by writing: Office of Grants and Fellowships, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024-5192. Application due date: Feb. 15, 1995. Address questions concerning the Station to: *Dr. Wade C. Sherbrooke, Director, Southwestern Research Station, Portal, Arizona 85632 USA; telephone 602-558-2396.*

SEASONAL OFFICE ASSISTANT—Assist in operations of biological research station office and nature shop: taking reservations, answering phones, greeting guests, supervising volunteers, etc. Begin March 15, 1995, through September 1995. Five-day week; salary $190/wk, plus room (shared) and board. Applicant must be punctual, organized, enjoy people, and be interested in living in a remote setting (Chiricahua Mountains) and working with biological researchers. Biological training an asset. Call and send résumé to: *Dr. Wade C. Sherbrooke, Director, Southwestern Research Station, American Museum of Natural History, Portal, Arizona 85632, USA. Telephone and fax: 602-558-2396.*

MEETINGS

British Herpetological Society Meetings For 1995

The British Herpetological Society has released a preliminary timetable for meetings during 1995. Further details concerning time and venue for most of these meetings will be published in the BHS *Bulletin* as soon as they become available. Additional information concerning meetings or membership may be obtained by corresponding with: *The Secretary, British Herpetological Society, c/o Zoological Society of London, Regent's Park, London NW1 4RY, U.K.*

1. Herpetofauna Recorders' Meeting (4 February).
2. Herpetological Speakers Workshop, Birmingham (18 February).
3. Annual General Meeting, Birkbeck (18 March). Speakers include Lee Brady: "Leeches, malaria & cyclones: studying chameleons in Madagascar;" Ian Bride: "The welfare aspect to the retail pet trade in reptiles and amphibians;" and Mark Fisher: "Conservation through commercialisation."
4. Captive Breeding (Veterinary) Meeting (25 March).
5. Joint Conservation/Education Meeting (8–9 April).
6. Leapers & Creepers/visit to Beam Brook (Surrey) (mid-May).
7. Captive Breeding Meeting: Chelonia. Paul Eversfield (27 May).
8. Captive Breeding Meeting: Breeding reptiles commercially for the trade (29 July).
9. October General Meeting, Birkbeck College (14 October). Speakers include Stephen Divers: "Mortality and disease of imported royal pythons;" Rob Quest: "Reptile imports;" and Mary Swan: "Results from the National Amphibian Survey."
10. Captive Breeding Meeting: Breeding monitor lizards (7 or 28 October).
11. Research Meeting, Birkbeck (2 December).

LEGISLATION & CONSERVATION ALERT

U.S.A.: Department of the Interior: The U.S. Fish and Wildlife Service has proposed that the Barton Springs salamander (*Eurycea sosorum*) be listed as Endangered. The Barton Springs salamander is entirely aquatic and lives in a complex of karst springs that are owned by the City of Austin, Texas. Although several of the springs are used for recreational swimming, this activity seems to be compatible with the persistence of the salamanders. However, the major concern to *E. sosorum*, the Barton Springs habitat, and the entire Edwards Aquifer is water contamination through chemical spills, urban runoff, and development (Endangered Species Tech. Bull. Vol. XIX, No. 3, 1994).

México: The Government of México has produced a list of endangered, threatened, and rare flora and fauna (Diario Oficial de la Federacion, Tomo CDLXXXVIII No. 10, 16 May 1994). The list contains 477 species and subspecies of reptiles and 139 species and subspecies of amphibians. For further information, interested persons should contact *Dr. Oscar Flores Villela, Museo de Zoologia, Universidad Nacional Autonoma de México, Apartado Postal 70-399, México D.F. 04510 México.*

KURT A. BUHLMANN
SSAR Conservation Committee.

LETTERS TO THE EDITOR

Dear Editor:

Back in October of 1990 John Zyla and I published a little note on wood turtles from the Atlantic Coastal Plain along Maryland's western shore (The Maryland Naturalist 33[1–2]:37–41). The text was four paragraphs long, included a photograph and one map, and listed twelve records for *Clemmys insculpta* from Anne Arundel and Prince Georges Counties. It stated simply that *C. insculpta* occurred locally on the Coastal Plain along the western side of the Chesapeake Bay, and that the presence of a newly hatched individual provided evidence of recent reproduction. Robert Miller subsequently took considerable exception to that short paper and published a lengthy critique in this journal (1993. Herpetol. Rev. 24:90–93). When I first read Miller's critique of our note I thought that he was discussing a different paper. He seems to have gotten much more from our article than we put into it, and after reading it again, I still do not know what raised Miller's ire to the level expressed in his discussion. However, since he has introduced some misconceptions into the literature, stated or implied numerous things that adversely reflect on us or other local naturalists, and attacked the Natural History Society of Maryland, which publishes *The Maryland Naturalist*, I feel compelled to offer some rebuttal.

Miller's criticism of our note centers around the use of what he considers to be "undocumented" records to establish the presence of this turtle in an area of Maryland where only a few scattered reports previously existed. In doing this he discusses just about every wood turtle that has ever been reported from east-central Maryland. While this is interesting, absolutely none of it is new information, and very little, if any, has anything to do with the argument that he attempts to make. Miller even cites additional records that, by his own admission, could have been used to support our records. However, all this aside, the major points that come from his discussion are that he apparently doubts the records that we reported (without contacting the persons who gave the reports to us, all of whom were identified in our paper), doubts several records published by Dr. Carl Ernst, and feels intuitively that this turtle can not occur where we report it.

Frankly, I am not sure why Miller finds it so surprising that wood turtles might encroach onto the Maryland Coastal Plain, because that's exactly what they do everywhere else. Carl Ernst (pers. comm.) is aware of several records for this species on the Virginia Coastal Plain in Alexandria and Fairfax Counties, one as far down as Fort Belvoir near the Potomac River. In New Jersey there are numerous records along the Piedmont/Coastal Plain boundary and Robert Zappalorti (pers. comm.) knows of several sites where they have penetrated onto the Coastal Plain in Gloucester and Burlington Counties, and has under study a location where this species actually occurs on the fringe of the Pine Barrens in Ocean County. The Ocean County record represents over fifteen marked turtles, including juveniles. Roger Conant mentioned to me that he also knows of New Jersey Coastal Plain records. Although there are only two known Delaware localities, one is right at the edge of the Piedmont/Coastal Plain boundary at Brandywine Creek State Park, and the other is clearly on the Coastal Plain just east of Newark (Jim White, pers. comm.). Considering this, I would be more surprised to find that *C. insculpta* did not occur on the Maryland Coastal Plain.

Miller takes us to task for not explaining what our records mean. John Zyla and I did not discuss this because we don't know what they mean, and neither does Miller. In his first paragraph, Miller assumes that we consider all the records from the Maryland Coastal Plain to represent natural occurrences. This is incorrect and is not supported by anything in our note. However, such a large number of turtles from that area, including young individuals and hatchlings, suggests to me that they should be acknowledged as elements of the local biota, whether they arrived on their own or were introduced. Miller's lengthy discussion is apparently intended to provide an answer to his question by determining if the turtles represent natural occurrences or recent introductions, or show that there is no basis for their existence by demonstrating that either we and the other naturalists who told us about these turtles misidentified the animals in question or were otherwise in error. After carefully reading his opinion several times, I must conclude that he succeeds in shedding no more light on this than we did. What Miller has done is take a great deal of space to show that there is very little historic evidence of the presence of wood turtles in this area. John Zyla and I knew that when we started; that's precisely why we wrote our note.

Miller devotes half a page to our mention of an historic record from Maryland's eastern shore that was reported by John Norman and discussed by Clyde Reed, a professional botanist with diverse interests in natural history. Miller attempts to prove that Reed's opinion of the zoogeographic significance of Norman's turtle was unreasonable, and attacks Reed's other early herp papers to support his argument. Miller is correct in his assertion that most herpetologists tend to ignore that record. However, local researchers in other disciplines (ichthyology, invertebrate zoology, botany) have continued to be intrigued by it. The central and lower Delmarva includes several good examples of "Piedmont species" (the mottled sculpin, black-nosed dace, and shield darter for example), that show disjunct populations apparently representing Pleistocene relicts. For some of these this is the only place in the species' range where they occur on the Atlantic Coastal Plain. These fishes, incidentally, consistently occur in streams inhabited by wood turtles in Maryland and adjacent Pennsylvania. Considering this, I feel that it would be shortsighted to disregard Norman's specimen without knowing much more about the distribution of various species on the Delmarva. It may also be worth mentioning that the past decade or so has seen the discovery of a number of interesting species on the

Delmarva, some of which are large and/or showy (barking treefrog, curly grass fern, Atamasco lily, pond spice, Hirst's panic grass, etc.), as well as significant additions to the "known" distribution of others (tiger salamander, bog turtle, red-belly water snake). Clearly, we do not know nearly as much about the distribution of plants and animals on the Delmarva as Miller thinks we do.

Twenty thousand years ago most of the wood turtle's present range was beneath glacial ice, and much of the rest was tundra or boreal forest. I consider it unlikely that wood turtles were present in the northeast at that time. Instead, they, like just about everything else from this region, were probably forced southward (there are fossil records from Georgia and Tennessee). The Piedmont fishes now occupying disjunct habitats on Maryland's lower eastern shore moved down the ancestral Susquehanna paleochannel onto the Delmarva, and possibly the adjacent outer Coastal Plain (now the Continental Shelf). Although there is no fossil record to support it, I consider it possible that the wood turtle did the same thing. When the Laurentide ice sheet began to recede about 18,000 ybp those displaced populations would have again moved north and eventually came to occupy their present ranges. The movement of these species through the Delmarva, which could have happened several times as the glaciers waxed and waned, would have happened well before rising sea levels fueled by melting of the Laurentide ice created the modern Chesapeake Bay, which happened as recently as 5,000 ybp. The Piedmont fishes still occupy scattered, disjunct populations as relicts of these previous range adjustments. Like these fishes, a relict population of wood turtles could have done the same and may have survived until recently. This cannot be resolved at the present time, but the idea should not be disregarded quite yet.

I also take issue with Miller's statement that "Reptile distributions in Maryland were well known long before Reed's 1958 article...." McCauley's publication, which Miller cites in support of his remark, is just about all there was before Conant published the first edition of his field guide in 1957. McCauley, whose work I respect greatly, had only eleven verified records for this turtle, virtually none of which was from the eastern half of its range in Maryland. Conant's book, which did so much to clarify distributions, appeared just before Reed's publication, and may not even have been available when his paper went to the printer. In 1958 I was actively involved in local field work. I, and everyone else on the scene at that time, was struggling to understand the distribution of various species in this area, and no one had a clear understanding of what was going on. Miller's statements about Dr. Reed and his many "egregious errors," are unfair and show a remarkable lack of understanding of the difficulties under which amateur herpetologists worked 35 years ago. I suggest that Miller attempt to demonstrate a bit of sensitivity when he moves to criticize those who worked in his field before he was born.

I am not sure what Miller means when he says that *C. insculpta* is a "montane" turtle, but whatever he intended to convey, the statement is absurd. A brief look at any published range map for this species shows that it clearly ranges widely into lowland areas on the Piedmont east of the Appalachians, and westward into the Central Lowlands around the Great Lakes where it occupies the Drift Plains and Hill Prairies of Wisconsin and eastern Minnesota. Further, his contention that its "range encompasses very little of the piedmont, regardless of how liberally one accepts locality records" is equally ridiculous. Numerous records on the Piedmont Physiographic Province are documented in the published herp surveys for Maryland, Pennsylvania, and Virginia, and biologists, naturalists, and herpetologists in this area are quite familiar with this turtle. It is typically found along floodplains and streams throughout the Maryland Piedmont. Miller may not be aware of these reports, but there are dozens of them, dating back decades.

Miller does review the literature that documents the repeated observation of this species on and around Plummers Island, near the edge of the Piedmont/Coastal Plain boundary just above metropolitan Washington, D.C. This obviously is not a turtle that is of "debatable occurrence" in that area. Another interesting record is provided by a sizable population of wood turtles in northeastern Harford County that has been under study by Bob Chance (pers. comm.) for over a decade. Chance's population, which is doing well, is actually on the Coastal Plain, but very close to the edge of the Piedmont. In my opinion, the presence of the bonafide Piedmont wood turtle records given in Herb Harris's Maryland Distributional Survey (eighteen records, more than all other physiographic provinces combined) and the literature cited by Miller, and at least these two areas way over near the eastern edge of the Piedmont where repeated occurrences have been documented (three areas if you are inclined to accept the turtles reported by Zyla and me), identifies the wood turtle as a legitimate member of Maryland's Piedmont herpetofauna.

Having discussed various local finds with Miller on numerous occasions, I am well aware that he is hesitant to accept reports not supported by voucher specimens. However, over the years I have observed a lot of wood turtles in Maryland (my field notes record eleven individuals on the Piedmont alone), and discussion with other knowledgeable persons (amateur herpetologists, amateur and professional naturalists, foresters, wildlife and fisheries biologists, science teachers, park rangers, etc.) shows that many others have made similar observations. Although Miller would not accept these reports as "records" they are none the less useful in determining where this species occurs and where it may not. By eliminating this information from his data base, Miller limits himself to the handful of existing preserved specimens. A Maryland range map drawn by Miller would be well documented, but I believe that one drawn by me would better reflect the local distribution of this turtle.

Miller tends to gather incomplete bits of information and use them to support his contentions as if they were significant. For instance, he "disregards" the Elvaton record because Clyde Prince did not publish on it, and it is not mentioned in the Prince notebooks that were deposited at Towson State University after Clyde's untimely death. Unfortunately, Miller neglected to mention that Clyde Prince never published much of anything. He also kept very sporadic notes, all of which are not at TSU. I still have several of his notebooks that were given to me by Barbara Prince. Clyde was a close personal friend and we talked about reptiles often. He was excited by the Elvaton turtle, discussed it with me in detail, and even called me long distance to tell me that it had been given to him. He did consider it significant, and I resent Miller's inference that he did not. I doubt that he ever spoke to Clyde. I was aware of Clyde's record for over a decade without making much of it. For the same reason, I never considered the DOR found by me near Annapolis in 1971 to be more than mildly interesting until John Zyla and I pooled our information and realized that there were too many records from the area to write off as "releases" or "escapes."

The Prince turtle brings me to another point that I consider important. Miller says emphatically that "no reliance can be placed" on that record. Elsewhere in his critique he states that records from Carl Ernst's published range map "cannot be allowed." Just because Miller writes something down and it gets published does not make it gospel. The readers of your journal would probably be better served if authors who state opinions would use words that imply opinion, such as "I believe," "I feel," "in my opinion," or "I suggest that." Unless the international herpetological community has elected Miller as their spokesperson, it is not for him to disallow any record. When he publishes his opus on the Maryland fauna, he may decide to disregard them. However, the decision to accept or reject a record should be made by each of us, individually.

Toward the end of his diatribe Miller gets around to the issue of "documentation." This is a real sore point that he and I have discussed many times. He clearly feels that records are unreliable unless they are based on preserved material in a recognized collection. I feel that this is a reasonable position when a species is likely to be misidentified. However, with a species like the wood turtle, which any good naturalist with Conant and Collins' field guide can identify reliably, I am willing to accept a sight record. In this time of concern for animal rights, increasing information about the fragile nature of *Clemmys* populations, and tightening non-game species regulations, I consider the collection of wood turtles to be unacceptable. The simple fact here is that John Zyla and I presented records for twelve specimens, some of which we had seen personally, some that were seen by competent local naturalists, and three of which were still alive in captivity. Miller has decided that these records are unreliable. John and I disagree. I would also like to state that the records reported to us by others were accepted only after John Zyla and I were convinced that the persons in question knew what they were talking about. We did reject several reports that we considered questionable.

I found it very interesting that Miller not only cited Austin Clark's paper on wood turtles from the Plummers Island vicinity, but gave it considerable credibility. It's interesting because Clark's paper is virtually identical to ours. Clark presented information on twelve wood turtles from an area near the eastern edge of the Piedmont, where they had been rarely reported previously. Of his records, most were what Miller would consider unsubstantiated reports from local naturalists, three are preserved at the USNM (three of ours were still alive in captivity at nature centers), and one was documented by a photograph that Clark saw but did not publish (we published a photograph of one of the turtles listed by us). I assume that Miller accepts Clark's paper while rejecting ours because the intervening years have resulted in sporadic reports of additional turtles from that area, and it is within what he considers to be the normal range of *C. insculpta*. Apparently, Miller isn't willing to wait to see if our data stand the test of time equally well. Incidentally, since our note appeared I have received reports of several additional wood turtles from this portion of the Maryland Coastal Plain.

Miller strongly criticizes our use of two Coastal Plain localities shown by Carl Ernst on the map included with his Catalogue account for *Clemmys insculpta*. We discussed those records with Dr. Ernst and have no hesitancy in accepting them, contrary to Miller's determination that "they cannot be allowed." Our plotting of those dots was not as haphazard as Miller implies. We scanned Carl's original map into a competent GIS system then enlarged it to overlay previously digitized state maps with county boundaries. Since we found a pretty good fit between Carl's map and several of those in the system, I believe that the dots are about where Carl put them. If Miller's implication is that Carl Ernst did not have good records when he prepared his map, or that he somehow mis-mapped them, I'm sorry, but we disagree. As for Miller's charge that in plotting Ernst's localities we are guilty of "inventing a county record," who cares? We are attempting to understand the distribution of an animal and, since that has nothing to do with geopolitical boundaries, I consider haggling over county records to be a total waste of effort.

The part of Miller's discussion that I find perhaps most objectionable is his criticism of the journal in which the note in question was published, *The Maryland Naturalist*. I do edit that journal, and can state unequivocally that every paper published there is peer reviewed, and that the few that I have published there were scrutinized more closely than any others. Miller knows all about this editorial policy because just before he wrote his critique of our note he submitted a manuscript that was subsequently withdrawn because he would not accept several reasonable recommendations that were made by reviewers. Since Miller understands this editorial policy and has first hand experience with our peer review process, his statements represent more than a misconception on his part. The Natural History Society of Maryland is a volunteer organization with a sixty-three year history. Throughout that time it has worked to support herpetology and natural history in Maryland with a considerable degree of professionalism and success. Miller's comments about that organization are unfair.

Toward the end of his critique, Miller makes a very informative statement when he writes, "I find it impossible to accept that a turtle as large and conspicuous as *Clemmys insculpta* could be as common (i.e., naturally occurring) in the suburbs of Baltimore, Washington, and Annapolis as Norden and Zyla indicate, yet somehow go unnoticed until recently." Basically, he is saying that he *can not* accept the records that we reported, and *would not* believe them no matter how many there were. This is hardly an objective approach to interpreting new data, and *Herpetological Review* does a disservice to herpetology by validating it. If we are ever to really understand the detailed local distribution of reptiles, we need more herpetologists with the ability to consider each and every record with an unbiased view, not researchers who approach data with preconceived certainty that it must somehow be false.

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ARTICLES

Second Update On The List Of Amphibians And Reptiles Known From Honduras

A decade has transpired since Wilson (1983) provided a listing of the amphibians and reptiles known at the time from the Central American country of Honduras. In the interim, research has continued apace, resulting in the addition of a sizeable number of taxa to the herpetofauna, either from range extensions or described as new to science. In addition, for this listing, we have added the marine turtles that visit the shores of Honduras, as well as the reptiles known to occur on the Swan Islands and the Honduran portion of the Miskito Keys. As of this writing, then, the total number of Honduran amphibian and reptilian species is 277, up from the 208 species included on the 1983 list. The increase of 69 taxa involved the addition of 73 species and the deletion of four (these include: *Bolitoglossa schmidti*, a synonym of *B. dofleini*, McCranie and Wilson, ms.; *Bufo cavifrons*, based on misidentified *B. valliceps*, McCranie and Wilson, ms.; *Eleutherodactylus gollmeri*, shown not to occur in Honduras by Savage 1987 [the specimens listed under this name by Meyer and Wilson 1971, represent three species]; and *Urotheca euryzonus*, shown not to occur in Honduras by Savage and Crother 1989, and Wilson, McCranie, and Espinal, ms.). The 73 species added to the 1983 list include one caecilian (status clarified by Nussbaum 1988), seven salamanders (six new to science, one range extension), 28 anurans (14 new to science, 13 range extensions, and one clarification of status [*Eleutherodactylus rostralis* by Savage 1987]), seven turtles (including six marine species not included in the 1983 list and one inclusion based on a

questionable record [*Rhinoclemmys areolata*]), 19 lizards (five new to science, five resident on the Swan Islands or Miskito Keys, seven range extensions [that for *Laemanctus serratus* is suspect, inasmuch as it is likely based on specimens collected by an animal dealer], and two reidentifications), and 11 snakes (one new to science, one resident in the Swan Islands, and nine range extensions). In total, the taxa added to the herpetofauna of Honduras include two due to clarification of their status, one based on a questionable record, six marine species, six resident on the Swan Islands or Miskito Keys, two reidentifications, 30 range extensions, and 26 new to science. Addition of the 56 taxa in the last two categories has occasioned a 27% increase in the size of the herpetofauna from that listed by Wilson (1983). We have not included the taxon *Corallus annulatus*, reported by Henderson (1993), inasmuch as the provenance of the specimens is very much in doubt, due to their collection for commercial dealers.

As with the previous paper (Wilson 1983), the species are listed in alphabetical order under each order. In addition, each name is followed by a parenthetically-enclosed number referring to a numbered reference in the Literature Cited section in which that species was reported as occurring in Honduras.

ORDER GYMNOPHIONA (3 species)

Dermophis mexicanus (29)
Gymnopis multiplicata (29)
Gymnopis syntrema (31)

ORDER CAUDATA (17 species)

Bolitoglossa carri (21)
Bolitoglossa celaque (21)
Bolitoglossa conanti (21)
Bolitoglossa dofleini (29)
Bolitoglossa dunni (29; see reference 21)
Bolitoglossa mexicana (29)
Bolitoglossa occidentalis (29)
Bolitoglossa rufescens (29)
Bolitoglossa striatula (29)
Bolitoglossa sp. 1 (Cortés: McCranie and Wilson, ms.)
Bolitoglossa sp. 2 (Yoro: McCranie and Wilson, ms.)
Nototriton barbouri (29, as *Chiropterotriton barbouri*)
Nototriton nasalis (29, as *Chiropterotriton nasalis*)
Oedipina cyclocauda (29)
Oedipina gephyra (26)
Oedipina ignea (46)
Oedipina stuarti (29)

ORDER ANURA (69 species)

Agalychnis callidryas (29)
Agalychnis moreleti (29)
Agalychnis saltator (14)
Anotheca spinosa (14)
Atelophrymiscus chrysophorus (24)
Bufo coccifer (29)
Bufo haematiticus (3)
Bufo luetkeni (29)
Bufo marinus (29)
Bufo valliceps (29)
Cochranella albomaculata (33, as *Centrolenella albomaculata*)
Duellmanohyla salvavida (19, as *Hyla salvavida*)
Duellmanohyla soralia (45, as *Hyla soralia*)
Eleutherodactylus anciano (39)
Eleutherodactylus aurilegulus (39)
Eleutherodactylus biporcatus (29)
Eleutherodactylus bransfordi (36)
Eleutherodactylus chac (37)
Eleutherodactylus chrysozetetes (16)
Eleutherodactylus cruzi (16)
Eleutherodactylus fitzingeri (14)
Eleutherodactylus laticeps (29; see reference 37)
Eleutherodactylus merendonensis (29)
Eleutherodactylus milesi (29)
Eleutherodactylus mimus (29)
Eleutherodactylus noblei (29)
Eleutherodactylus rhodopis (37)
Eleutherodactylus ridens (29)
Eleutherodactylus rostralis (37)
Eleutherodactylus rugulosus (29)
Gastrophryne elegans (29)
Hyalinobatrachium fleischmanni (29, as *Centrolenella fleischmanni*)
Hyalinobatrachium pulveratum (14)
Hyla bromeliacia (29, as *Hyla bromeliacea*)
Hyla catracha (35)
Hyla ebraccata (4)
Hyla insolita (27)
Hyla loquax (29)
Hyla microcephala (29)
Hyla picta (29)
Hyla salvaje (48)
Hypopachus barberi (50)
Hypopachus variolosus (29)
Leptodactylus labialis (29)
Leptodactylus melanonotus (29)
Leptodactylus pentadactylus (29)
Leptodactylus silvanimbus (23)
Phrynohyas venulosa (29)
Physalaemus pustulosus (29)
Plectrohyla chrysopleura (47)
Plectrohyla dasypus (17)
Plectrohyla glandulosa (49)
Plectrohyla guatemalensis (29)
Plectrohyla hartwegi (7)
Plectrohyla matudai (18)
Plectrohyla teuchestes (7)
Ptychohyla hypomykter (22)
Ptychohyla salvadorensis (29, as *Hyla salvadorensis*)
Ptychohyla spinipollex (29; see reference 22)
Rana berlandieri (29, as *Rana pipiens*)
Rana maculata (29, as *Rana macroglossa*)
Rana vaillanti (29, as *Rana palmipes*)
Rana warszewitschi (29, as *Rana warschewitschi*)
Rhinophrynus dorsalis (29)
Scinax staufferi (29, as *Hyla staufferi*)
Smilisca baudini (29)
Smilisca phaeota (29)
Smilisca sordida (42)
Triprion petasatus (50)

ORDER TESTUDINES (16 species)

Caretta caretta (12)
Chelonia agassizi (12)
Chelonia mydas (12)
Chelydra serpentina (30)
Dermatemys mawei (30)
Dermochelys coriacea (12)
Eretmochelys imbricata (12)
Kinosternon leucostomum (30)
Kinosternon scorpioides (30)
Lepidochelys olivacea (12)
Rhinoclemmys annulata (30)
Rhinoclemmys areolata (8; also see reference 34)
Rhinoclemmys funerea (30)
Rhinoclemmys pulcherrima (30)

Staurotypus triporcatus (30)
Trachemys scripta (30, as *Chrysemys ornata*)

ORDER CROCODILIA (2 species)

Caiman crocodilus (30)
Crocodylus acutus (30)

ORDER SAURIA (69 species)

Abronia salvadorensis (50, as *Abronia montecristoi*; see reference 2)
Ameiva ameiva (40)
Ameiva festiva (30)
Ameiva undulata (30)
Anolis allisoni (30)
Aristelliger georgeensis (1)
Aristelliger praesignis (40)
Basiliscus plumifrons (30)
Basiliscus vittatus (30)
Celestus bivittatus (50)
Celestus montanus (30)
Celestus sp. (Yoro: McCranie and Wilson, ms.)
Cnemidophorus deppei (30)
Cnemidophorus lemniscatus (30)
Cnemidophorus motaguae (30)
Coleonyx mitratus (30)
Corytophanes cristatus (30)
Ctenosaura bakeri (30, as *Enyaliosaurus bakeri*; see reference 6)
Ctenosaura oedirhina (6)
Ctenosaura palearis (30, as *Enyaliosaurus palearis*)
Ctenosaura quinquecarinata (30, as *Enyaliosaurus quinquecarinatus*)
Ctenosaura similis (30)
Eumeces managuae (5)
Eumeces sumichrasti (30)
Gonatodes albogularis (30)
Gymnophthalmus speciosus (30)
Iguana iguana (30)
Laemanctus longipes (30)
Laemanctus serratus (13)
Leiocephalus carinatus (40)
Lepidophyma flavimaculatum (30)
Mabuya unimarginata (30, as *Mabuya mabouya*)
Mesaspis moreleti (30, as *Barisia moreleti*)
Norops amplisquamosus (25)
Norops biporcatus (30, as *Anolis biporcatus*)
Norops capito (30, as *Anolis capito*)
Norops crassulus (30, as *Anolis crassulus*)
Norops cupreus (30, as *Anolis cupreus*)
Norops humilis (30, as *Anolis humilis*)
Norops johnmeyeri (44, as *Anolis johnmeyeri*)
Norops laeviventris (30, as *Anolis laeviventris*)
Norops lemurinus (30, as *Anolis lemurinus*)
Norops limifrons (30, as *Anolis limifrons*; see reference 46)
Norops loveridgei (30, as *Anolis loveridgei*)
Norops oxylophus (14)
Norops pentaprion (30, as *Anolis pentaprion*)
Norops petersi (18)
Norops pijolense (28)
Norops purpurgularis (15)
Norops rodriguezi (46)
Norops sagrei (30, as *Anolis sagrei*)
Norops sericeus (30, as *Anolis sericeus*)
Norops sminthus (30, as *Anolis sminthus*)
Norops tropidonotus (30, as *Anolis tropidonotus*)
Norops uniformis (46)
Phyllodactylus palmeus (30)
Phyllodactylus tuberculosus (30)
Polychrus gutturosus (30)
Sceloporus malachiticus (30)
Sceloporus squamosus (30)
Sceloporus variabilis (30)
Sphaerodactylus dunni (30)
Sphaerodactylus glaucus (9)
Sphaerodactylus millepunctatus (30, as *Sphaerodactylus continentalis*)
Sphaerodactylus notatus (40)
Sphaerodactylus rosaurae (30)
Sphenomorphus cherriei (30, as *Scincella cherriei*)
Sphenomorphus incertus (46)
Thecadactylus rapicauda (30)

ORDER SERPENTES (101 species)

Adelphicos quadrivirgatus (51)
Agkistrodon bilineatus (51)
Alsophis cantherigerus (40)
Amastridium veliferum (51)
Atropoides nummifer (51, as *Bothrops nummifera*)
Boa constrictor (51)
Bothriechis bicolor (51, as *Bothrops bicolor*)
Bothriechis marchi (51, as *Bothrops marchi*)
Bothriechis schlegeli (51, as *Bothrops schlegeli*)
Bothrops asper (51, as *Bothrops atrox*)
Cerrophidion godmani (51, as *Bothrops godmani*)
Chironius grandisquamis (51)
Clelia clelia (51)
Coniophanes bipunctatus (51)
Coniophanes fissidens (51)
Coniophanes imperialis (51)
Coniophanes piceivittis (51)
Conophis lineatus (51)
Crisantophis nevermanni (51)
Crotalus durissus (51)
Dendrophidion nuchale (51, as *Dendrophidion clarki*)
Dendrophidion percarinatum (51)
Dipsas bicolor (51)
Dryadophis dorsalis (51)
Dryadophis melanolomus (51)
Drymarchon corais (51)
Drymobius cloroticus (51)
Drymobius margaritiferus (51)
Drymobius melanotropis (51)
Elaphe flavirufa (51)
Enulius flavitorques (51)
Erythrolamprus mimus (51)
Ficimia publia (51)
Geophis fulvoguttatus (20)
Geophis hoffmanni (51)
Hydromorphus concolor (51)
Imantodes cenchoa (51)
Imantodes gemmistratus (51)
Imantodes inornatus (51)
Lampropeltis triangulum (51)
Leptodeira annulata (51)
Leptodeira nigrofasciata (51)
Leptodeira septentrionalis (51)
Leptodrymus pulcherrimus (51)
Leptophis ahaetulla (51)
Leptophis mexicanus (51)
Leptophis modestus (51)
Leptophis nebulosus (51)
Leptotyphlops goudoti (51)
Loxocemus bicolor (51)
Masticophis mentovarius (51)
Micrurus alleni (14)
Micrurus browni (20)
Micrurus diastema (51)

Micrurus nigrocinctus (51)
Micrurus ruatanus (51)
Ninia sp. (51, as *Ninia atrata*; McCranie and Wilson, ms.)
Ninia diademata (51)
Ninia sebae (51)
Nothopsis rugosus (32)
Oxybelis aeneus (51)
Oxybelis brevirostris (51)
Oxybelis fulgidus (51)
Oxyrhopus petola (51)
Pelamis platurus (51)
Porthidium nasutum (51, as *Bothrops nasuta*)
Porthidium ophryomegas (51, as *Bothrops ophryomegas*)
Pseustes poecilonotus (51)
Rhadinaea godmani (51)
Rhadinaea kinkelini (51)
Rhadinaea montecristi (51)
Rhadinaea tolpanorum (11)
Rhinobothryum bovalli (51)
Scaphiodontophis annulatus (51)
Scolecophis atrocinctus (51)
Senticolis triaspis (51, as *Elaphe triaspis)*
Sibon anthracops (51)
Sibon carri (51)
Sibon dimidiata (51)
Sibon fischeri (51)
Sibon nebulata (51)
Sibon sartorii (51)
Spilotes pullatus (51)
Stenorrhina degenhardti (51)
Stenorrhina freminvillei (51)
Storeria dekayi (51)
Tantilla lempira (51)
Tantilla melanocephala (51)
Tantilla schistosa (51)
Tantilla taeniata (51)
Tantillita lintoni (51)
Thamnophis fulvus (51)
Thamnophis marcianus (51)
Thamnophis proximus (51)
Tretanorhinus nigroluteus (51)
Trimorphodon biscutatus (51)
Typhlops costaricensis (43)
Typhlops tenuis (51, as *Tylops tenuis*, in error)
Ungaliophis continentalis (51)
Urotheca elapoides (51, as *Pliocercus elapoides*)
Xenodon rabdocephalus (51)

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Rotenone Hazards To Amphibians And Reptiles

Declining amphibian populations throughout the world have been the focus of much recent attention (Barinaga 1990; Brown 1990; Pechmann et al. 1991). One reason suggested for this apparent decline is poisoning by pesticides and pollutants (Blaustein and Wake 1990; Bury and Whelan 1984; Honegger 1978). In a recent review of the status and needs for assessing effects of pesticides on amphibians and reptiles, Hall and Henry (1992) pointed out that evaluating risk of chemical hazards for amphibians and reptiles is complicated by their taxonomic, ecological, physiological, and geographic diversities. Interestingly, tadpoles (*Rana* spp.) and adult lizards (*Anolis carolinensis*) currently are the only species for which pre-registration testing of chemicals for acute lethal toxicity has been considered. Similarly, no information is available for the majority of environmental chemicals as hazards to amphibians or reptiles. Further, the standard toxicological tests for homeothermic vertebrates and for fish may not be useful for or protective of the herpetofauna.

Rotenone, also known as derris or cubé root, is a natural chemical compound extracted from the stems and roots of particular tropical plants (bean family Leguminosae). The principal use of rotenone is as an insecticide or piscicide. For centuries, natives in the tropics have used rotenone for stunning and killing fish. Rotenone now is a commonly used pesticide in North America and has been used in fish management since 1934. Because of its effectiveness as a fish toxicant, rotenone is widely used to sample fish populations or to improve fisheries by removing or reducing populations of undesired or nuisance fish species (Lennon et al. 1970; Schnick 1974; Sigler and Sigler 1990; Sousa et al. 1988). However, recent reviews of the amphibian and reptile toxicological literature (Devillers and Exbrayat 1992; Hall and Henry 1992) did not address the potential hazards of rotenone, while a Canadian technical report (Power et al. 1989) provided only a tabular review of acute toxicity and one field study which dealt primarily with benthic invertebrates (Burress 1982). Therefore, the objective of this paper is to evaluate the toxicity of rotenone to amphibian and reptile populations through review of the available literature, and to provide information which may be useful to resource managers in evaluating the risk of rotenone applications to the aquatic herpetofauna.

Although practically insoluble in water (0.2 mg/L), rotenone is quite lipid-soluble (log P 4.26). Rotenone also is an unstable compound that is non-persistent and essentially does not bioaccumulate. Degradation is affected by temperature, light, oxygen, and pH. Other factors affecting the degradation rate, and therefore reducing toxicity, include presence of organic debris, turbidity, lake shape and depth, dilution by inlets and runoff, and the dosage used (Sousa et al. 1988). The half-life of a Noxfish formulation of rotenone (5% w/w) is 10.3 days in cold water (32°–41°F) and 0.94 days in warm water (73°–81°F). Decomposition follows a first-order decay curve (Gilderhus et al. 1988).

Rotenone is applied as a wettable paste/powder or as an emulsifiable spray concentrate containing approximately 5% rotenone. Common application methods include using drip stations or sprayers and pumping through hoses into the propeller wash of power boats. In some cases, aerial applications are used. Treatments with 5% rotenone usually range from 0.5 ppm to 5.0 ppm, with a typical treatment rate of 2 ppm (Sousa et al. 1988).

Toxicological/biochemical studies with fish indicate that major sites of bioconcentration of rotenone residues are liver, bile, gills, brain, and heart. Biliary excretion is the major elimination route for rotenone and rotenoid residues (Gingerich 1986; Gingerich and Rach 1985; Rach and Gingerich 1986). In the liver of fish, rotenone is oxidized to less toxic forms primarily by a

microsomal monooxygenase enzyme system, cytochrome P450. Interestingly, polycyclic aromatic hydrocarbons (PAH's) are capable of inducing certain hepatic microsomal monooxygenases (MO). Because of widespread use/presence of PAH's in the aquatic environment, hepatic MO's of fish in polluted waters may be altered and the toxicity of xenobiotics (such as rotenone) affected by their activities. Piperonyl butoxide, a common synergist in rotenone formulations (e.g., Nusyn-Noxfish), has been shown to inhibit the hepatic microsomal oxidation of rotenone while concomitantly causing enzyme induction (see Erickson et al. 1992). Similarly, polychlorinated biphenyl (PCB) residues in fish may increase their sensitivity to rotenone treatment (Bills et al. 1981). And PCB's are known to act as a synergist for carbamate insecticides (Plapp 1972) and other environmental contaminants (Bills et al. 1977). In addition, Fabacher and Chambers (1972) suggested that rotenone resistant mosquitofish were the result of increased levels of mixed-function oxidase enzymes. Reports for fish clearly indicate that tissue distribution and rates of uptake, detoxification and elimination influence sensitivity of fish to rotenone and suggest the potential effects of other environmental chemical contaminants as additive or possibly synergistic.

The site of toxic action of rotenone is the electron transport system in the mitochondria where reoxidation of reduced nicotinamide adenine dinucleotide by NADH-dehydrogenase is blocked (Horgan et al. 1968; Lindahl and Oberg 1961). Therefore, death is caused by oxygen deprivation. Rotenone may be neutralized by potassium permanganate or chlorine, or toxicity may be reversed by placing affected fish in a solution of methylene blue (Sousa et al. 1988).

Rotenone is known to be relatively harmless to plants and mammals, but very toxic to insects, other invertebrates, and fish. Fish are particularly susceptible to rotenone because of partitioning across the gills and inability of fish to avoid exposure. Being lipid-soluble, rotenone will be absorbed into both skin and respiratory membranes, but skin may provide more of a barrier due to differences in diffusion distances. Although basically a broad spectrum fish toxicant, rotenone is reported to have selectively killed a few species of fish (Sigler and Sigler 1990; Sousa et al. 1988). As reported by Marking and Bills (1976), the 24-hour acute toxicity (LC50) of rotenone for fish varied from 0.0165 mg/L for walleye (*Stizostedion vitreum*) to 0.665 mg/L Noxfish for black bullhead (*Ictalurus melas*). Further, a general trend was apparent in that salmonids were most sensitive, centrarchids were of intermediate sensitivity, and ictalurids were least sensitive.

Because various formulations of rotenone differ in actual percentage rotenone contained, care should be taken in interpretation of toxicity data from studies involving different formulations. In addition to unformulated technical rotenone, several commercial formulations have been utilized, including the following: Noxfish, an emulsifiable concentrate containing 5% rotenone; Pro-Noxfish, a synergized emulsifiable concentrate containing 2.5% rotenone and 2.5% sulfoxide synergist; Dri-Noxfish, a dispersible powder containing 20% rotenone; Chem-Fish Special, an emulsifiable concentrate containing 5% rotenone; and Nusyn-Noxfish, a emulsifiable concentrate containing 2.5% rotenone synergized with 2.5% piperonyl butoxide. In toxicity reports for amphibians, several studies utilized unformulated technical rotenone while others included commercial formulations of rotenone as Noxfish, Pro-Noxfish and Dri-Noxfish (see Table 1 and Burress 1982). For purposes of this review to compensate for different formulations used and to allow for better comparisons among studies, a calculated value as a standard has been included in Table 1 as a supplement to the original LC50 values reported in the scientific literature. This standardized value was calculated by multiplying the percent of rotenone contained in a given formulation by the LC50 reported for that formulation. In addition, temperature, pH, alkalinity, flow rate, turbidity, and physical conditions are all factors which might affect the toxicity of rotenone (Schnick 1974); such values are included in Table 1 as available.

Relative to amphibians, a fisheries management report (California Department of Fish and Game 1985) stated that treatment with 2 mg/L rotenone formulation (Noxfish) with LC50 values ranging from 5.8 mg/L (96-hour) to 24.0 mg/L (24-hour) would not seriously affect adult frogs and other amphibians. However, the report further stated that tadpoles of frogs and metamorphosing salamanders would be killed with LC50 values of approximately 0.1 mg/L Noxfish. Sousa et al. (1988) also suggested that tadpoles and juvenile salamanders would probably be killed, but adult amphibians would not be seriously affected by rotenone applications.

With the exception of the data for adult frogs as presented by Farringer (1972), the 24-h LC50 of rotenone for various amphibians ranges from 0.1–0.580 mg/L (Table 1). Farringer (1972) reported much higher LC50 values (> 3.2 mg/L in all tests for Noxfish and Dri-Noxfish) than any other investigator, suggesting that adult frogs are considerably less sensitive to rotenone than amphibian larvae. Comparison of the 24-hour LC50 values for larval amphibians (Table 1) with those for fish (0.0165–0.665 mg/L for Noxfish, Marking and Bills 1976) strongly suggests the possibility that rotenone applications will result in considerable non-target amphibian mortality if an effective fish kill occurs.

Hamilton (1941) exposed tadpoles of *Rana pipiens* in various stages of metamorphosis to rotenone concentrations ranging from 0.01 to 0.5 mg/L. Tadpoles that had not begun metamorphosis exhibited the typical symptoms of suffocation by rising to the surface and gasping for air. Those tadpoles undergoing tail resorption basically remained at the surface of the rotenone solution to obtain air and exhibited sluggish muscular movements after several hours. Lethal concentration was 0.1 mg/L (Table 1), but time of death varied with the stage of metamorphosis. Tadpoles still undergoing gill respiration were killed within 8 h, while metamorphosed animals survived for 24 h. In a field study of the effects of Pro-Noxfish on nontarget organisms in ponds, substantial mortality of *R. pipiens* tadpoles was reported at a treatment of 5 µL/L (Burress 1982).

The response of metamorphosing salamanders (*Ambystoma tigrinum*) to rotenone was similar to that reported for tadpoles (Hamilton 1941). A lethal concentration of 0.1 mg/L for metamorphs was reported and concentrations as low as 0.0166 mg/L were toxic, but not necessarily fatal, for salamanders that had not resorbed their gills. Sublethal concentrations may be important causes of mortality since laboratory tests utilize death as an endpoint and do not monitor behavioral anomalies which may increase mortality in wild populations (Hall and Henry 1992). Apparently amphibian larvae with gills are most sensitive to rotenone.

Two other salamanders, *Amphiuma* and *Siren*, also may be susceptible to rotenone. Both of these large neotenic salamanders are obligately aquatic and inhabit freshwater ponds, ditches, streams, swamps, and lakes (Conant and Collins 1991). Effects of rotenone treatments on these salamanders may be pronounced due to their high rates of cutaneous respiration (Duellman and Trueb 1986) and their inability to leave the aquatic habitat.

At the 0.5 to 2 mg/L concentrations used in fisheries management, rotenone is reported to be nontoxic to mammals, birds, and reptiles (Sousa et al. 1987). However, no studies have been conducted to document the effects of rotenone treatment on reptiles. Carr (1952) stated that soft-shelled turtles (*Apalone* spp.) were susceptible to suffocation by concentrations of rotenone used in standard fisheries practices. Dundee and Rossman (1989) also suggested that softshell turtles are affected by rotenone. But authors of both books did not include discussion of potential rotenone toxicity for any other turtle species.

TABLE 1. Toxicity of rotenone to amphibians in laboratory tests.

Species	Stage	Temp °C	pH	Hardness (mg/L $CaCO_3$)	LC50 (mg/L) 24 h		LC50 (mg/L) 96 h		Formulation	Reference
Rana pipiens	juvenile/ adult	—	—	—	2.0?	[0.01]*	—		0.5% Rotenone in glycol	Haag 1931
R. pipiens	tadpole	—	—	—	0.1	[0.005]	—		5% Rotenone (powdered derris in water)	Hamilton 1941
Ambystoma tigrinum	larvae	—	—	—	0.1	[0.005]	—		5% Rotenone	Hamilton 1941
R. pipiens	adult	12	7.2-7.6	40-48	4.8 (3.7-6.3)**	[0.24]	4.8 (3.7-6.3)	[0.24]	Noxfish (5% w/w in distilled water)	Farringer 1972
		12	7.6-8.0	160-180	24.0 (21.1-27.2)	[1.20]	5.8 (3.6-9.8)	[0.29]	Noxfish	Farringer 1972
R. pipiens	adult	12	7.2-7.6	40-48	7.3 (6.3-10.3)	[1.46]	4.6 (4.3-4.9)	[0.92]	Dri-Noxfish (20% powder in distilled water)	Farringer 1972
		12	7.6-8.0	160-180	7.9 (6.2-9.8)	[1.58]	3.2 (2.3-4.3)	[0.64]	Dri-Noxfish	Farringer 1972
Bufo bufo japonicus	tadpole	—	—	—	0.33***		—		Rotenone	Hashimoto and Nishiuchi 1981
R. spheno-cephala	tadpole	16±1	6.6	20	0.580 (0.494-0.680)	[0.03]	0.500 (0.423-0.591)	[0.025]	Noxfish (in acetone)	Chandler and Marking 1982
Xenopus laevis	tadpole	17.2±5	7.39±0.22	40.4-49.5†	—		>0.040††		Rotenone (in DMF)	Holcombe et al. 1987

*calculated values in brackets are standardized for % rotenone content and represent mg/L rotenone rather than mg/L of the formulation as reported in the literature.
**values in parentheses are 95% confidence intervals.
***LC50 at 48 h.
†Alkalinity.
††The 48- or 96-h LC50's were actually higher than this value which represented the highest concentration tested.

Because rotenone is a respiratory poison, tolerance generally varies inversely with oxygen requirements (Engstrom-Heg et al. 1978). Many aquatic turtles are capable of remaining submerged for long periods of time without pulmonary respiration due to specialized aquatic respiration mechanisms (Dunson 1960; Girgis 1961; Root 1949). Specifically, *Apalone spinifera* and *Kinosternon minor* utilize buccopharyngeal respiration (Belkin 1968; Dunson 1960) which involves pumping water in and out of the pharynx region where numerous villiform papillae of the buccal mucosa are highly vascularized (Girgis 1961). The skin and cloaca in turtles may also be modified for underwater respiration (Dunson 1960; Girgis 1961; Root 1949). Other turtles, including *Trachemys scripta* and *K. odoratum*, are capable of aquatic respiration, but to a lesser extent (Belkin 1968; Jackson and Schmidt-Nielsen 1966; Root 1949). Use of aquatic respiration (buccopharyngeal, skin, and/or cloacal) is likely the proximate cause for rotenone susceptibility in turtles. Although no published data exist documenting turtle mortality, their aquatic preference, in conjunction with delay in leaving the water once poisoning commences, may render them incapable of avoidance behavior. Species which are less dependent on aquatic respiration and leave the water upon treatment may be affected to a lesser degree.

Freshwater aquatic snakes do not utilize aquatic respiration and dermal absorption of rotenone is unlikely, but secondary poisoning by ingestion of affected fish or frogs is a possibility. Aquatic snakes such as water snakes (*Nerodia*), crayfish snakes (*Regina*), mud and rainbow snakes (*Farancia*), cottonmouths (*Agkistrodon piscivorus*), and the black swamp snake (*Seminatrix pygaea*) potentially would be most affected by rotenone applications. Haque (1971) reported mortality of one aquatic snake (no identification given) 48 h after rotenone treatment (1–2 ppm of Chem-Fish Special, 5% rotenone), but noted another snake swimming in the pond. Avoidance of the water by frogs also was reported. However, no conclusive evidence of the effects of rotenone on these animals was presented.

An additional consideration in evaluating non-target mortality following rotenone treatment is the proportion of animals surfacing and, therefore, becoming visible. Proportions of fish populations surfacing or remaining on the bottom varies with

species, water temperature, time, water depth, and presence of rooted aquatic plants (Bartoo 1977; Parker 1970). Amphibian larvae, aquatic turtles, and snakes may remain on the bottom of treated bodies of water, thereby concealing mortality.

Non-target mortality may be greatly reduced by certain management practices. Hockin et al. (1985) successfully managed rotenone treatment of fish compounds by providing several untreated areas as a refuge for small fish and larval stages of frogs, toads, and newts; access to untreated compounds was by passage through Netlon fence divisions. Additional protection for tadpoles abundant in one specific compound was provided by placement underwater along the fence division of a sheet of hessian sacking soaked in a saturated potassium permanganate solution. No mortality of non-target amphibians was reported.

The summary of a 1976 questionnaire sent to various states concerning the use of rotenone at concentrations above 1 ppm revealed that 83% of respondents (N = 174) noted no observed effect or effects unknown on non-target organisms, 4% reported some dead tadpoles, 1% reported some dead sirens, and <1% reported some dead salamanders. However, caution in interpretation of results was suggested, as the cause of death may not have necessarily been related to rotenone applications (Schnick 1977).

Review of the literature indicates that various factors may affect the toxicity of rotenone to amphibians and reptiles. Response to rotenone is species-specific, although animals utilizing a high degree of aquatic respiration are probably most susceptible. As shown for fish, tissue distribution and rates of uptake, detoxification and elimination are the apparent mechanisms responsible for differences in susceptibility to rotenone. In addition, exposure to various environmental contaminants (e.g., PCB's) may alter susceptibility to rotenone. Physical parameters affecting rotenone toxicity include temperature, pH, alkalinity, flow rate, turbidity, rotenone formulation, and dosage. Further, variable application rates, particularly those in excess of 2 ppm, may compromise the safety of non-target amphibians and reptiles. In light of these diverse environmental, physical and physiological factors which influence the toxicity of rotenone, additional investigations of effects on amphibians and reptiles are needed if these species are to be adequately protected in areas of rotenone use. The most urgent need is for additional acute toxicity testing for aquatic amphibian and reptile species, particularly aquatic turtles. Management of rotenone applications to lessen non-target mortality and adequate knowledge of the local distribution of amphibians and reptiles in treated habitats would greatly reduce the potential hazards to these aquatic animals.

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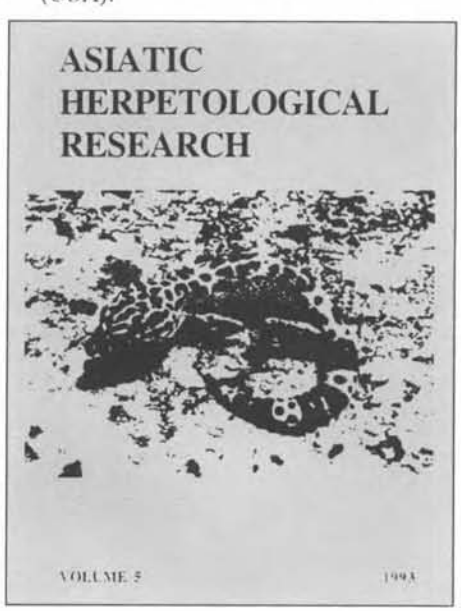
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Hemidactylus brooki (Gray) Lacks Abdominal Fat Bodies And Fat Pads

The presence of abdominal fat bodies is reported in a number of species of lizards from temperate and tropical parts of the world (Derickson 1976; Duvall et al. 1982; Fox 1977; Sarkar and Shivanandappa 1989). In temperate lizards, the fat bodies appear to serve as nutrient reserves during winter (Derickson 1976; Fox 1977). An inverse relation between fat body mass and gonadal cycles has been reported in some species of lizards from temperate as well as tropical regions. However, for a few species of tropical lizards, there is no clear relationship between the two (Derickson, 1976; Flemings 1993; Greenberg and Gist, 1985; Magnusson 1987; Vitt 1983). Among gekkonid lizards, Church (1962) reported the absence of fat bodies in three Javanese species, *Cosymbotus platyurus*, *Hemidactylus frenatus*, and *Peropus mutilatus*. The Mediterranean gecko, *Hemidactylus turcicus*, possesses a single, small, triangular-shaped fat body extending forward from the anterior margin of the pelvic girdle (Selcer 1992). Furthermore, it has additional lipid storage sites in the form of discrete subcutaneous fat pads extending from the axilla to the hindlimbs, being more prominent posteriorly.

In this communication, we report the absence of abdominal fat bodies and subcutaneous fat pads in the south Indian gekkonid, *Hemidactylus brooki*. This species inhabits human dwellings and is a multi-clutched, monoautochronic lizard having an extended breeding season from November to June. About 25–35 lizards were collected every month from October 1992 to September 1993. A total of 350 adult lizards (151 males, 199 females), collected in Dharwad city (15°17′N, 75°3′E), were dissected and examined. Snout-vent lengths of these lizards ranged from 40 mm (minimum size at sexual maturity) to 65 mm.

Church (1962) attributed the absence of fat bodies in the three gekkonid species he studied to relatively uniform climatic conditions and constant food supply; therefore, perhaps these species are continuous breeders. On the other hand, in *H. turcicus*, a multi-clutched seasonal breeder, the fat deposits are depleted completely in females during production of the first clutch and are not replenished until after reproduction has ceased. Similar observations are made in other genera of seasonally breeding multi-clutched lizards (Etheridge et al. 1986; Hahn and Tinkle 1965; Shanbhag and Prasad 1992). Food availability is considered to be an ultimate factor determining whether or not lipids are stored (Derickson 1976). The adaptive value of stored lipids in most lizards is that reproduction may occur during periods of unpredictable or fluctuating resource availability. The situation in *H. brooki* is unlike that of other gekkonid species studied thus far. For instance, although it is a seasonal breeder it does not store lipids in the form of fat bodies or fat pads. Presumably, this reflects the presence of a relatively constant food supply.

Acknowledgment.—This work was partly supported by Grant No. F.3. 17/94 (SAP-II) of UGC, New Delhi, under the Special Assistance Programme.

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POINTS OF VIEW

Human Nature And Peer Review: An Argument For Anonymity

I read with interest Wilson and McCranie's (1993) critique of the anonymous peer review system. Clearly, their experience with the peer review system is considerable, given their extensive publication histories and editorial experience. I have reviewed six manuscripts for three herpetology journals and one general science journal and have published seven peer-reviewed articles during the six years I have been actively engaged in research. Although admittedly less experienced than Wilson and McCranie, I hope my views will bring the perspective of a less established researcher into the discussion on the merits of anonymity.

After acknowledging that peer review is a necessary component of the publication process, Wilson and McCranie outlined several pros and cons of anonymity in the peer review system. They cite several herpetological editors who favor preservation of the anonymous system and outline the pro-anonymity arguments as follows:

1. The anonymous system protects less established persons against retribution by established colleagues.
2. Anonymity encourages free expression.
3. Anonymity levels the "playing field" by forcing authors to thoughtfully consider the comments of a reviewer without knowledge of reviewer's status.

Ultimately, Wilson and McCranie dismiss these arguments, and suggest the anonymous peer review system should be replaced with an onymous system because:

1. The anonymous system is cumbersome and time consuming.
2. Vindictive reviewers are sheltered.
3. Science should be conducted openly and to behave otherwise amounts to academic dishonesty.
4. Anonymity provides a vehicle for persons seeking to keep others from publishing competing results.
5. The anonymous system is a form of cowardice.
6. The anonymous system discourages a cooperative atmosphere.

The arguments outlined above, both pro and con, undoubtedly have some basis in truth. Each of us can probably recall a conversation during which someone claimed their work was enhanced or unfairly assaulted within the framework of the anonymous review system. Some of us have even been exposed to individuals boasting about how they used the anonymous system to exact retribution.

All systems are prone to abuses, and Wilson and McCranie are right to point out the need for periodic evaluation of the status quo. They have diligently outlined several problems with anonymous review and, at a minimum, their critique reiterates the need to be ever watchful for abuses in the system. However, I believe their critique underestimates the effect onymity would have on the objective nature of our field.

In a recent commentary on Wilson and McCranie's suggestions, Pisani (1994) wrote that editors and scientists are "human first and scientists/editors second." Pisani's point illustrates the inherent conflict that we all face between subjective human nature and the objective nature of science. It has been my experience that anonymity dulls subjectivity and enhances objectivity. For example, I am personally acquainted with four of the six authors whose papers I peer reviewed. During the reviews, I made every effort to divorce our personal relationship from my evaluation of their work. Knowing that I would remain anonymous to the authors greatly enhanced my ability to approach objectivity (consciously and presumably subconsciously). In an onymous system, I believe it would been immeasurably more difficult to detach the relationships I had with the authors from my evaluation of their work.

As a reviewee, only one of the 20+ peer reviews I have received was signed. The review was positive and, like it or not, I feel beholden to that individual. Given the small number of people involved in most scientific specialties (e.g., snake physiology, turtle nesting) and the probability that persons familiar with the subject matter will act as reviewers, onymous peer review appears likely to favor human nature over the objective nature of science.

Wilson and McCranie limit their discussion to the effects of anonymous peer review on the scientific community. However, most scientists have patrons (e.g., granting agencies, private foundations, industry, taxpayers) and research results often impact those patrons. Because our results don't only impact us, it is important that persons outside our community have confidence in the integrity of our system of checks and balances. For example, I recently published a dietary analysis of sea turtles in New York waters (Burke et al. 1993). The results of my analysis will presumably be the basis for decisions regarding habitat protection in New York. The publication of my study following rigorous peer review by persons unknown to me can only strengthen its credibility and therefore its value to my patron, the New York State Department of Environmental Conservation.

To summarize, anonymous peer review was primarily set up to insure that research results are critiqued as objectively as possible. An offshoot of this system is patron and public confidence in the integrity of the field employing anonymous peer review. It is my opinion that these two points counterbalance and perhaps outweigh the objections to anonymity raised by Wilson and McCranie.

Acknowledgments.—I thank S. Patterson, K. Buhlmann, and J. W. Gibbons, each of whom represents varying degrees of experience with the peer review system, for their comments on the manuscript. Manuscript preparation was aided by contract DE-AC09-76SROO819 between the U.S. Department of Energy and the Savannah River Ecology Laboratory.

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HERPETOLOGICAL HUSBANDRY

Stimulation Of Ingestion In Solenoglyphous Snakes

Many studies have shown that various vipers and pitvipers prefer envenomated over nonenvenomated rodents in experimentally arranged choice situations (Burghardt 1970; Chiszar et al. 1983; Duvall et al. 1980). Recent projects have indicated that this effect depends upon puncture wounds inflicted by snake fangs and an action of venom on rodent internal tissues and not upon the extemal presence of venom and snake saliva on the prey's hair (Chiszar et al. 1992; Lavin-Murcio et al. 1993). Based on this accumulation of data, it was hypothesized at Rio Grande Zoo (RGZ) that poor-feeding solenoglyphs might be induced to ingest rodent carcasses that have been envenomated by conspecifics who are not reluctant to strike or swallow. The hypothesis was tested first with a captive-born, 13-month old urutu *(Bothrops alternatus)* that had accepted *Mus musculus* five times in four weeks after birth, but then refused all food for the next 12 months. An adult conspecific envenomated a mouse, which was then placed into the juvenile's cage. The prey was ingested during the night, and this experiment was successfully repeated one and two weeks later. The same approach was taken with a juvenile ocellate mountain viper (*Vipera wagneri*) that had a poor feeding history during five months at the zoo. This animal ingested a conspecifically envenomated mouse within 3 h and this experiment was successfully repeated one week later.

At the University of Colorado, the same attempt was made with four poor-feeding adult prairie rattlesnakes (*Crotalus v. viridis*), and all accepted conspecifically envenomated mice within 2–12 h. Two of these snakes had never fed in captivity (six months) and two ate sporadically (no more than six times per year with prey being offered every 14 days, a schedule on which two dozen other *C. v. viridis* accept prey at almost every opportunity). Three of the four snakes ate conspecifically envenomated mice again 14 days after the first such feeding; the fourth snake refused the second prey.

At the University of Northern Colorado, conspecifically envenomated *M. musculus* were offered to two western diamondback rattlesnakes (*Crotalus atrox*). One was an adult that had refused food (wild and domestic, live and dead *M. musculus*) consistently for 15 months, and the other was a juvenile that had refused prey four times over six months. Both ingested conspecifically envenomated mice within 2 h. Two poor-feeding banded rock rattlesnakes (*Crotalus lepidus klauberi*) also accepted conspecifically envenomated prey within 4 h. For the juvenile *C. atrox* and both *C. l. klauberi*, the same mice which had been refused for 12 h were accepted after being envenomated by conspecifics. Finally, two adult dusky pigmy rattlesnakes (*Sistrurus miliarius barbouri*) were poor feeders, never having accepted prey since their arrival in Colorado five months prior. Since no good-feeding conspecifics were available to envenomate prey, venom was expressed from the *S. m. barbouri* and 10 microliters of crude venom was injected into each of two mice (4.3 g each), which were then placed into the cages of the respective snakes. One of these *S. m. barbouri* ate within 10 h, the other did not.

It is noteworthy that the urutu at RGZ and the adult western diamondback at University of Northern Colorado have subsequently begun to strike and ingest untreated *M. musculus*. The urutu, after accepting untreated mice twice, again refused. The same mouse was offered the next day after being envenomated by a conspecific, and the snake then ingested the mouse. This has happened four times.

Several hypotheses could be adduced to explain the willingness of poor feeders to take conspecifically envenomated prey (e.g., Chiszar et al. 1992; Thomas and Pough 1979). For the present, however, we intend only to recommend this RGZ effect as a husbandry strategy for solenoglyphous snakes that refuse to feed in captivity. It would be of interest to determine whether poor-feeding elapid snakes will also accept envenomated prey. Finally, we encourage researchers to study the use of reconstituted lyophilized venom in stimulating ingestion, as this might provide a useful and safe procedure in cases where conspecific snakes are unavailable to envenomate prey for poor-feeding singletons.

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Instructions for contributors to Geographic Distribution appear in volume 25, number 1.

CAUDATA

AMBYSTOMA TIGRINUM (Tiger Salamander). USA: GEORGIA: Chattahoochee Co: ca. 200 m W of Box Springs Road and 5.2 km N of Shamanski Road. (89°39'08"N, 32°28'05"W). 17 February 1994. John B. Jensen. Verified by Craig Guyer. Auburn University (AUM 33684). Many egg masses and larvae observed; several larvae collected and preserved. New county record.

Submitted by **JOHN B. JENSEN**, Florida Natural Areas Inventory, 1416 Cape Lane, Niceville, Florida 32578, USA.

HEMIDACTYLIUM SCUTATUM (Four-toed Salamander). USA: GEORGIA: Floyd Co: Stretch Road, Berry College campus, 1.77 km WNW jct. Rt. 27 and main entrance to college (34°17'44"N, 85°12'01"W). 15 February 1992. S. L. DeFauw and P. J. English. Verified by Gerald K. Williamson and Robert A. Moulis. Savannah Science Museum (SSM 12551). Adult DOR; new county record. Martof (1956, Amphibians and Reptiles of Georgia, Univ. Georgia Press, Athens. 94 pp.) surmised a patchy distribution throughout the state.

Submitted by **SHERRI L. DEFAUW**, McPherson College, McPherson, Kansas 67460, USA, and **PATRICK J. ENGLISH**, 306 Oak Park Drive, McPherson, Kansas 67460, USA.

ANURA

BUFO MICROSCAPHUS MICROSCAPHUS (Arizona Toad). USA: ARIZONA: Coconino Co: Clear Creek at Hamilton Crossing, SW1/4, SW1/4 Sec. 29, T15N, R13E. 26 June 1994. S. DeMarais. Photo on file at Arizona Game and Fish Department, Nongame Branch Fisheries Program (Photo DBD001). Verified by Brian K. Sullivan, Arizona State University. Extends the known range 10 km NE from East Clear Creek at Mack's Crossing (Sullivan 1993, Great Basin Nat. 53:402–406), indicating that this species may occur significantly farther downstream in Clear Creek north of the Mogollon Rim.

Submitted by **SCOTT DeMARAIS** and **DANA WATERS**, Arizona Game and Fish Department, Nongame Brance, 2221 West Greenway Road, Phoenix, Arizona 85023, USA.

BUFO WOODHOUSII WOODHOUSII (Woodhouse's Toad). USA: TEXAS: Sherman Co: Coldwater Creek crossing (N side) at Farm Road 119, ca. 22.5 km S jct. with U.S. Rt. 54 (36°16'15"N, 101°49'23"W), 1059 m elev. 19 May 1994. J. D. Johnson and T. J. LaDuc. Verified by R. G. Webb. University of Texas at El Paso (UTEP 15652–53). First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M Univ. Press, College Station. 434 pp.).

Submitted by **JERRY D. JOHNSON**, Biology Department, El Paso Community College, El Paso, Texas 79998-0500 and Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas 79968-0519, USA, and **TRAVIS J. LaDUC**, Laboratory for Environmental Biology, The University of Texas at El Paso, El Paso, Texas 79968-0519, USA.

CENTROLENE ANDINUM (NCN). VENEZUELA: ZULIA: Distrito Perijá, Serranía de Perijá, Trayecto de La Escalera a La Cascada, 1400 m elev. Colección de Vertebrados de la Universidad de Los Andes, Mérida (CVULA IV-3933, adult female); and a juvenile (CVULA IV-3934) referred to this species from Sierra de Perijá, Campamento El Desastre, 2050 m. Nancy Sierra. Verified by John D. Lynch. New state records; these discoveries significantly extend the species range ca. 210 air km NW from the type locality, making this the northernmost record for this frog. CVULA VI-3934 is also a maximum elevation record for the species, previously known only from elevations between 840–1050 m in the Mérida Andes (La Marca 1992, Cuadernos Geográficos 9:19).

Submitted by **ENRIQUE LA MARCA**, Instituto de Geografia y Conservación de Recursos Naturales, Universidad de Los Andes, Apartado 116, Mérida 5101-A, Venezuela.

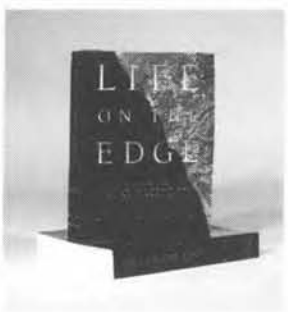
ELEUTHERODACTYLUS PERUVIANUS (NCN). BOLIVIA: SANTA CRUZ: Amboró National Park (18°40'S, 63°35'W). 21 December 1988 and 22 September 1990. Paolo Bettella and Nelson Vaca. Verified by William E. Duellman. MNK (Museo Noel Kempff, Santa Cruz de la Sierra, Bolivia) 189, 191, 236, 358–61, 365, 374. First record for the country. Most literature reports of *Eleutherodactylus fenestratus* from this region may actually correspond to *E. peruvianus* (De la Riva 1990, Boll. Mus. reg. Sci. nat. Torino 8:261–319; De la Riva 1993, Rev. Esp. Herpetol. 7:97–105). Most common species of the genus in the area. Advertisement calls have been also heard in two localities in the Departamento Cochabamba: Bulo-Bulo (17°16'S, 64°20'W) and Valle de Sajta (17°00'S, 64°50'W). These records extend the distribution about 800 km southeastward (air line) from the closest known locality in Pampas del Heath, Madre de Dios, Peru (12°35'S, 68°40'W) (Icochea 1993, Mem. X Cong. Nac. Biol., Perú, pp. 351–354). Bolivian populations lack the yellow or orange spots on the posterior surface of thighs characteristic of Peruvian and Ecuadorian specimens.

Submitted by **IGNACIO DE LA RIVA**, Natural History Museum, The University of Kansas, Lawrence, Kansas 66045-2454, USA.

ELEUTHERODACTYLUS PLANIROSTRIS PLANIROSTRIS (Greenhouse Frog). USA: LOUISIANA: Plaquemines Parish: 4.0 km NE Belle Chasse on Tulane University Herbert Center grounds. 2 September 1994. Harold A. Dundee. Verified by Robert A. Thomas. TU 23352. This specimen, a spotted phase phenotype, was captured on the loading platform of the building housing Tulane University's Museum of Natural History Herpetological Collection. On 3 October 1994, while moving some rotting wooden boxes that had been stored on the loading plaform, six additional spotted specimens were captured and several others escaped. These latter captures are now TU 23358-23363. How the species arrived there is unknown; no horticultural plants are located on the entire 500 acre plot of the Hebert Center, which is mostly heavily forested or grassed, but other developments about 2 km distant do have horticultural plantings. All specimens captured or seen are essentially adult size, but although plenty of prey items are constantly seen on the platform, I cannot visualize that a clutch of eggs could have been laid and successfully survived atop bare cement, even though covered by a box; variation in size suggests several different arrival times. The species is now widely distributed in the nearby city of New Orleans and its suburbs on the opposite side of the Mississippi River; these latter records are the first from west of the Mississippi River. A colony at my home, started with a few individuals in 1982 but not being seen again until about 1988, became very abundant in 1991 when rainfall in the area was more than double the usual ca. 63 inches, then waned to where I saw only a couple per year in 1992 and 1993. But late in 1994 they have been appearing in modest numbers despite a very dry year until late summer. I strongly suspect that the species will turn up in many communities along the Gulf Coast via importation with horticultural plants from Florida nurseries, but the agility of these frogs can enable them to spread rapidly once established.

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Submitted by **HAROLD A. DUNDEE**, Tulane University Museum of Natural History, Belle Chasse, Louisiana 70037-3098, USA.

EPIPEDOBATES PETERSI (NCN). BRAZIL: ACRE: Jurua River, left bank, municipality of Cruzeiro do Sul, Sobral (72°49'W, 8°22'S). 9 March 1992. Claude Gascon. Verified by James P. Bogart. Instituto Nacional de Pesquisas da Amazônia (INPA 4407–09, 4429, 4437, 4491, 4525, 4557, 4615, 4631, 4637, 4687, 4731, 4738–39, 4776–77, 4779–80). First record for Brazil. This species was known only from a few localities in the Amazon drainage of Peru (Rodriguez and Myers 1993, American Mus. Novitates 3068:1–15).

Submitted by **CLAUDE GASCON**, Ecologia/INPA, CP 478, 69011-970 Manaus, Amazonas, Brazil.

HYLA CINEREA (Green Treefrog). USA: ALABAMA: Calhoun County: small pond near Jacksonville, 4.8 km S of junction of Ala. Rt. 204 and Ala. Rt. 21, and ca. 1.6 km E of Ala. Rt. 21, Sec. 35, T14S, R8E. 28 June 1994. E. Sowhren, M. Boudreaux, P. Rodgers. Jacksonville State University Collection (JSUC A001). Verified by G. R. Cline. New county record; fills gap in distribution, suggesting a bridge between the sporadic populations occurring in the Appalachian Plateau and the Ridge and Valley provinces (Mount 1975, The Reptiles and Amphibians of Alabama. Auburn Univ. Exp. Sta., Alabama. 347 pp.; Conant and Collins 1991, Field Guide to Reptiles and Amphibians of Eastern and Central North America, Third ed. Houghton Mifflin Co., Boston, Massachusetts. 450 pp.). This suggests that the species may also be found in these provinces in northwestern Georgia.

Submitted by **ERIC C. SOEHREN**, **MELISSA C. BOUDREAUX**, and **C. PAUL ROGERS**, Department of Biology, Jacksonville State University, Jacksonville, Alabama 36265, USA.

HYLA FEMORALIS (Pine Woods Treefrog). USA: LOUISIANA: East Baton Rouge Par: Lee Price Road, 2.5 km W of La. Rt. 37, Baywood. 11 July 1994. J. Boundy and S. Shively. LSUMZ 56721–56722. East Feliciana Par: La. Rt. 959, 2.5 km W of LA 63. 11 July 1994. J. Boundy and S. Shively. LSUMZ 56726. All verified by David A. Good. Extend range ca. 25 km W of locality in SE St. Helena Parish (Dundee and Rossman 1989, Amphibians and Reptiles of Louisiana. Louisiana State Univ. Press, Baton Rouge. 300 pp.). All were males calling in young pine plantations.

Submitted by **JEFF BOUNDY**, Museum of Natural Science, Louisiana State University, Baton Rouge, Louisiana 70803, USA, and **STEVE SHIVELY**, Natural Heritage Program, Louisiana Department of Wildlife & Fisheries, P. O. Box 98000, Baton Rouge, Louisiana 70898, USA.

HYLA GRATIOSA (Barking Treefrog). USA: GEORGIA: Floyd Co: Stretch Road, Berry College campus, 2.08 km WNW jct. Rt. 27 and main entrance to college (34°18'01"N, 85°12'12"W). 2 May 1993. S. L. DeFauw and A. A. Kinsey. Verified by Gerald K. Williamson and Robert A. Moulis. Savannah Science Museum (SSM 12554). DOR adult. New county record; extends the range ca. 74.7 km NE of nearest known locality in Calhoun County, Alabama (Mount 1975, The Reptiles and Amphibians of Alabama. Auburn Univ. Exp. Sta., Alabama. 347 pp.). Martof (1956, Amphibians and Reptiles of Georgia, Univ. Georgia Press, Athens. 94 pp.) noted occurrences in the Cumberland Plateau.

Submitted by **SHERRI L. DEFAUW**, McPherson College, McPherson, Kansas 67460, USA, and **ANDREW A. KINSEY**, Department of Biology, Berry College, Mount Berry Station, Georgia 30149, USA.

HYLA PLATYDACTYLA (NCN). VENEZUELA: ZULIA: Distrito Perijá, Serranía de Perijá, Campamento El Temor, 1825m elev. Nancy Sierra. Verified by John D. Lynch. Colección de Vertebrados de la Universidad de Los Andes, Mérida, CVULA IV-3936. First state record (La Marca 1987, 37a. Conv. Anual AsoVAC, noviembre

1987:267; La Marca 1987, Herpetol. Rev. 18(3):57; Viloria y Calchi 1993, Biollania 9:37–69); represents the northernmost locality for the species and extends known range ca. 240 air km NW of closest known locality in the Mérida Andes and ca. 260 air km N of nearest record in the state of Táchira.

Submitted by **ENRIQUE LA MARCA**, Instituto de Geografia y Conservación de Recursos Naturales, Universidad de Los Andes, Apartado 116, Mérida 5101-A, Venezuela.

PHYLLOBATES LUGUBRIS (Dart-Poison Frog). PANAMA: PROVINCIA DE PANAMA: Distrito de Capira, Cirí Grande (8°57'18"N, 80°03'38"W), 160–180m elev. 12 February 1993. C. A. Jaramillo, M. Arrunátegui, Q. Fuenmayor, F. Sánchez. Verified by A. Stanley Rand. Círculo Herpetológico de Panamá (CH-3904). Previous known localities for this species in Panamá were within the Provincia de Bocas del Toro (Savage 1968, Copeia 1968:745–776). Myers and Daly (1983, Sci. Amer. 248(2):120–133) extended this range eastward by presenting an approximate distribution of *P. lugubris* on a map; however, they did not provide information on specific localities. New province record; extends range of this species further east, outside the area shown by Myers and Daly (1983).

Submitted by **ROBERTO IBAÑEZ D.**, Smithsonian Tropical Research Institute, Apartado 2072, Balboa, Republica de Panamá, **CESAR A. JARAMILLO**, Círculo Herpetológico de Panamá, Apartado 10762, Estafeta Universitaria, Panamá, Republica de Panamá, and **FRANK A. SOLIS**, Departamento de Zoología, Escuela de Biología, Universidad de Panamá, Republica de Panamá.

PHYLLOPEZUS POLLICARIS PRZEWALSKYI (Ututo Macho). ARGENTINA: SALTA: Departamento de Anta, Ranch Campo Grande (24°36'S, 63°18'W), 85 km N and 12 km E from J. V. Gonzalez. 1–4 February 1993. E. O. Lavilla, G. J. Scrocchi and F. B. Cruz. Verified by G. J. Scrocchi. Instituto de Herpetologia, Fundación Miguel Lillo (EL 1370-FML-S 03027, EL 1475-FML-S 03041, EL 1491/92-FML-S 03042). First province record; cited before in Argentina from Misiones, Corrientes, Chaco and Santiago del Estero (Cei 1993, Mus. Reg. di Scienze Nat. Torino. Monog. XIV. 949 pp.)

Submitted by **FÉLIX B. CRUZ, GUSTAVO J. SCROCCHI**, and **ESTEBAN O. LAVILLA**, Instituto de Herpetologia, Fundación Miguel Lillo, Miguel Lillo 251, (4000) Tucuman, Argentina.

PSEUDACRIS CRUCIFER (Spring Peeper). USA: ILLINOIS: Shelby Co: 5 km S Towerhill and 3 km W Towerhill/Herrick blacktop road (39°20'44"N, 88°59'48"W). 20 March 1994. Allan Wilson. Southern Illinois University Department of Zoology Collection (SIUC H-4636). Montgomery Co: 1.4 km W Middle Fork Shoal Creek bridge on Rt. 16 and 1.2 km S (39°9'33"N, 89°30'54"W). 6 March 1994. Chris Schmedeke and Allan Wilson. Both verified by Ronald A. Brandon. SIUC H-4587–88. New county records (Smith 1961, Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **ALLAN K. WILSON**, Rural Route 2, Box 147, Ramsey, Illinois 62080, USA.

PSEUDACRIS OCULARIS (Little Grass Frog). USA: FLORIDA: Okaloosa Co: Niceville, roadside ditch along Bayshore Drive ca. 0.5 km west of Palm Boulevard, SW 1/4 Sec. 17, T1S, R22W. 13 July 1994. J. B. Jensen. Verified by Paul Moler. Florida Museum of Natural History (UF 91658). New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 3, The Amphibians. Windward Publ., Miami). Extends known range ca. 15 km W (Moler 1982, Herpetol. Rev. 13:131).

Submitted by **JOHN B. JENSEN**, Florida Natural Areas Inventory, 1416 Cape Lane, Niceville, Florida 32578, USA.

PSEUDACRIS TRISERIATA TRISERIATA (Western Chorus Frog). USA: ILLINOIS: Montgomery Co: 1.4 km W Middle Fork Shoal Creek bridge on Rt. 16 and 1.2 km S (39°9'33"N, 89°30'54"W). 6 March 1994. Chris Schmedeke and Allan Wilson. Verified by Ronald A. Brandon. Southern Illinois University Department of Zoology Collection (SIUC H-4589 and H-4590). New county record (Smith 1961, Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **ALLAN K. WILSON**, Rural Route 2, Box 147, Ramsey, Illinois 62080, USA.

RANA CAPITO SEVOSA (Dusky Gopher Frog). USA: FLORIDA: Walton Co: SE 1/4 SE 1/4 Sec. 4, T2N, R21W. 23 February 1994. John B. Jensen. Verified by Paul E. Moler. UF Photograph 89755. One adult male found AOR. New county record. Frog apparently heading to a nearby pond in which the author previously discovered 57 Dusky Gopher Frog egg masses on 14 February 1994. Individual was photographed and released due to threatened status in state. Five additional breeding ponds have since been located in the county.

Submitted by **JOHN B. JENSEN**, Florida Natural Areas Inventory, P. O. Box 1150, Niceville, Florida, 32588-1150, USA.

RANA CATESBEIANA (Bullfrog). USA: COLORADO: El Paso Co: pond at W end of golf course, Air Force Academy, 9.6 K N Colorado Springs. 17 June 1994. David O. Norris, Edmund J. Clark, and Tucker Kellogg. Verified by Hobart M. Smith. UCM 56889. First county record (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife. 131 pp.); westernmost range in Colorado E of the divide. Second straight year of sightings; metamorphosing tadpoles captured with seine net at perimeter of pond.

Submitted by **DAVID O. NORRIS, EDMUND J. CLARK**, and **TUCKER KELLOGG**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

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SCAPHIOPUS HOLBROOKII HOLBROOKII (Eastern Spadefoot). USA: GEORGIA: Floyd Co: Berry College main campus, 0.8 km WNW jct. Rt. 27 and main entrance to college (34°17'32"N, 85°11'24"W). 21 August 1992. S. L. DeFauw and P. J. English. Verified by Gerald K. Williamson and Robert A. Moulis. Savannah Science Museum (SSM 12552–53). Both specimens were collected from a temporary pastureland pool following a hard rain (8.9 cm accumulation in a 12 hour period). New county record; verifies presumed distribution in the Ridge and Valley physiographic province of northwestern Georgia (Martof 1956, Amphibians and Reptiles of Georgia. Univ. Georgia Press, Athens. 94 pp.).

Submitted by **SHERRI L. DEFAUW**, McPherson College, McPherson, Kansas 67460, USA,, and **PATRICK J. ENGLISH**, 306 Oak Park Drive, McPherson, Kansas 67469, USA.

SCHARTHYLA OSTINODACTYLA (NCN). BRAZIL: AMAZONAS: Jurua River, right bank, municipality of Eirunepé, Sacado, (70°51'W, 6°46'S). 16 September 1991. Claude Gascon. Verified by James P. Bogart. Instituto Nacional de Pesquisas da Amazônia (INPA 2572, 2637, 2641, 2652, 2800, 2844–5, 2848, 2884–6). First record for Brazil; species was only known from a few localities in Peru (Duellman and Sá 1988, Trop. Zool. 1:117–136). Other localities in Amazonas where this species was collected are: Jurua River, left bank, municipality of Eirunepé, Condor (70°51'W, 6°45'S), 14 September 1991, (INPA 2549); Jurua River, right bank, municipality of Eirunepé, Penedo, (70°45'W, 6°50'S), 22 August 1991, (INPA 2321, 2347–48, 2354–6, 2402, 2408); Jurua River, left bank, municipality of Eirunepé, Nova Empreza, (70°44'W, 6°48'S), 24 August 1991, (INPA 2340, 2370, 2434, 2504); Jurua River, left bank, municipality of Itamarati, Barro Vermelho, (68°46'W, 6°28'S), 28 October 1991, (INPA 3386); Jurua River, right bank, municipality of Itamarati, Jainu, (68°46'W, 6°29'S), 17 October 1991, (INPA 3080, 3160, 3162, 3212–15, 3226, 3238–39, 3439, 3444, 3452, 3481); Jurua River, left bank, municipality of Itamarati, Altammira (68°54'W, 6°35'S), 22 November 1991, (INPA 5212); Jurua River, left bank, municipality of Jurua, Vira-Volta, (66°14'W, 3°17'S), 5 June 1992, (INPA 5752); in Acre: Jurua River, right bank, municipality of Cruzeiro do Sul, Nova Vida, (72°49'W, 8°22'S), 17 March 1992, (INPA 4653, 4667, 4675, 4721, 4753, 4755).

Submitted by **CLAUDE GASCON**, Ecologia/INPA, CP 478, 69011-970 Manaus, Amazonas, Brazil.

TESTUDINES

APALONE SPINIFERA (Spiny Softshell). USA: COLORADO: Denver Co: 15 m S recently drained Garland Park pond and 100 m N of Cherry Creek. 12 June 1994. R. M. Engeman. Verified by Richard E. Mauldin. Live adult (carapace length 33 cm). Denver Wildlife Research Center Archives color slide accession 94/3. New county record; nearest record is ca. 30 km N on South Platte River in Weld County (Hammerson 1982, Amphibians and Reptiles in Colorado, Colorado Div. Wildlife. 131 pp.), of which Cherry Creek is a tributary.

Submitted by **RICHARD M. ENGEMAN**, Denver Wildlife Research Center, P. O. Box 25266, Bldg. 16, Denver Federal Center, Denver, Colorado 80225-0266, USA.

CHELYDRA SERPENTINA SERPENTINA (Common Snapping Turtle). USA: NEBRASKA: Cheyenne Co: Buffalo Bend. 22 May 1994. David and Adam Chiszar, Richard L. Holland, Carolyn Ristau, and H. M. Smith. Verified by Lauren Livo. UCM Color Slides 80–81. First county record (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA; **RICHARD L. HOLLAND**, Boulder High School, 1604 Arapahoe Avenue, Boulder, Colorado 80302, USA; **CAROLYN RISTAU** and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

CHELYDRA SERPENTINA SERPENTINA (Common Snapping Turtle). USA: NEBRASKA: Kimball Co: Lodgepole Creek, 1.6 km

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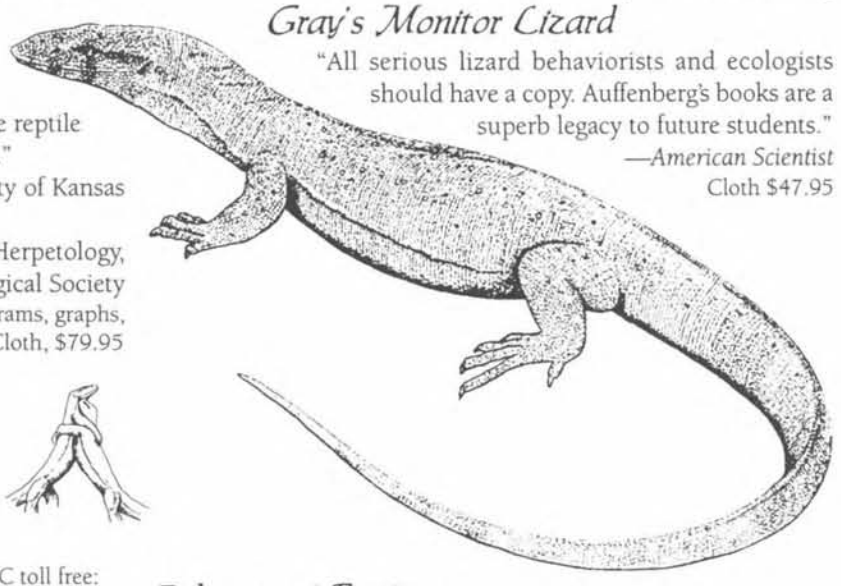
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N Kimball. 16 July 1993. Brian R. Roh. Verified by John D. Lynch. University of Nebraska State Museum (UNSM 15112). New county record from the extreme southwestern panhandle of Nebraska (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **BRIAN R. ROH**, Department of Biology, University of Nebraska, Lincoln, Nebraska 68588-0118, USA.

CHRYSEMYS PICTA BELLII (Western Painted Turtle). USA: COLORADO: Phillips Co: Settling Ponds, 1.6 km E Haxtun. 11 July 1994. Richard L. Holland and H. M. Smith. Verified by Lauren Livo. UCM 56891 and Laboratorio de Biogeografia, Universidad de Los Andes, Mérida, Venezuela (ULABC 3907). First county record (Hammerson 1986, Amphibians and Reptiles in Colorado, Colorado Division of Wildlife. 131 pp.).

Submitted by **RICHARD L. HOLLAND**, Science Department, Boulder High School, 1604 Arapahoe Avenue, Boulder, Colorado 80302, USA; **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA; **CAROLYN RISTAU** and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

CHRYSEMYS PICTA BELLII (Western Painted Turtle). USA: NEBRASKA: Cheyenne Co: Buffalo Bend. 22 May 1994. Richard L. Holland, David and Adam Chiszar, Carolyn Ristau, and H. M. Smith. Verified by Lauren Livo. UCM Color Slides 82–83. First county record (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **RICHARD L. HOLLAND**, Science Department, Boulder High School, 1604 Arapahoe Avenue, Boulder, Colorado 80302, USA; **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA; **CAROLYN RISTAU** and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

MACROCLEMYS TEMMINCKII (Alligator Snapping Turtle). USA: MISSISSIPPI: Sharkey Co: Big Sunflower River at Red Rock Boat Ramp, Delta National Forest, Rt. 16, 20.8 road km SE of Rolling Fork, Sec. 12, T12N, R6W. 19 October 1993. K. J. Killgore, et al. Northeast Louisiana University Color Slide 70483; Big Sunflower River, 3.2 river km S of Rt. 14 Bridge, Sec. 23, T13N, R6W. 27 October 1993. S. G. George, et al. NLU Color Slide 70484; Sunflower Co: Quiver River, 1.3 river km N of Hannah's bridge, Sec. 33, T22N, R3W. 6 October 1993. J. J. Hoover and S. L. Harrel. NLU Color Slide 70485; Big Sunflower River at Rt. 49W bridge, 3.2 road km S of Indianola, Sec. 8, T19N, R5W. 5 December 1993. S. G. George and J. J. Hoover. NLU Color Slide 70486. All specimens were verified by Neil H. Douglas and represent new county records.

Submitted by **STEVEN G. GEORGE, JAN JEFFERY HOOVER**, and **K. JACK KILLGORE**, U.S. Army Engineer Waterways Experiment Station, ER-A, 3909 Halls Ferry Road, Vicksburg, Mississippi 39180-6199, USA.

TERRAPENE ORNATA ORNATA (Ornate Box Turtle). USA: COLORADO: Sedgwick Co: Road 15, 2 mi S Road 14. 12 July 1994. Richard L. Holland. Verified by David Chiszar. UCM Color Slides 84–85. First county record and northernmost record in state (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife. 131 pp.).

Submitted by **RICHARD L. HOLLAND**, Science Department, Boulder High School, 1604 Arapahoe Avenue, Boulder, Colorado 80302, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

LACERTILIA

AMEIVA AUBERI OBSOLETA (Exuma Islands Ameiva). BAHAMAS: GREAT BAHAMA BANK: Exuma Islands, Exuma Cays Land and Sea Park, Shroud Cay. July 1993. R. Franz, C. K. Dodd, Jr. Verified by David L. Auth. UF 89622. New island record (Franz et al. 1993, Caribbean Journ. Sci. 29[3–4]:165–173).



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Submitted by **RICHARD FRANZ**, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA, and **C. KENNETH DODD, JR.**, National Biological Survey, 412 N. E. 16th Avenue, Room 250, Gainesville, Florida 32601, USA.

ANOLIS CAROLINENSIS (Green Anole). USA: LOUISIANA: West Carrol Parish: residence on Gould Street, Lake Providence, 4 December 1993. C. Toney and G. Toney. Verified by Neil H. Douglas. Northeast Louisiana University Museum of Zoology (NLU 70478). New parish record; fills gap in the northeastern portion of the state. (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana St. Univ. Press, Baton Rouge. 300 pp.).

Submitted by **STEVEN G. GEORGE**, U. S. Army Engineer Waterways Experiment Station, ER-A, 3909 Halls Ferry Rd. Vicksburg, Mississippi 39180-6199, USA.

ANOLIS SAGREI ORDINATUS (Bahamian Brown Anole). BAHAMAS: GREAT BAHAMA BANK: Exuma Islands, Exuma Cays Land and Sea Park, Elbow Cay. UF 89611; Hawksbill No. 1 (island between Hawksbill and Little Hawksbill cays). UF 89618; Little Cistern Cay. UF 89612; O'Briens Cay. UF 89620–21. All July 1993. R. Franz, C. K. Dodd, Jr. All verified by David L. Auth. New island records (Franz et al. 1993, Caribbean Journ. Sci. 29[3–4]:165–173).

Submitted by **RICHARD FRANZ**, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA, and **C. KENNETH DODD, JR.**, National Biological Survey, 412 N. E. 16th Avenue, Room 250, Gainesville, Florida 32601, USA.

BASILISCUS BASILISCUS BARBOURI (NCN). VENEZUELA: ESTADO MERIDA: Distrito Campo Elías, Ejido, La Quebrada, sector Saladito, inmediaciones del Instituto Universitario Tecnológico de Ejido, 1200m elev. 13 September 1993. Tulio Enrique Salazar Ruíz. Verified by Pascual J. Soriano M. Colección de Anfibios y Reptiles, Núcleo de Biogeiografía de Montaña, Instituto de Geografia y Conservación de Recursos Naturales de la Universidad de Los Andes (ULABG 3426). The subspecies was first reported for the Venezuelan Andes, without indication of museum numbers, from "Estado Mérida: Río Chama," and "Estado Táchira: Palmira, Rio Tarbes (Torbes?)," by Donoso-Barros (1968, Carib. Journ. Sci. 8: 113). ULABG voucher specimen is the first documented record for the Venezuelan Andes, extending the range ca. 400 km SE of the type locality. It is a female bearing pale throat markings that differ from those exhibited by Sierra de Perijá female specimens reported by La Marca [1987, Herpetol. Rev. 18(3):57; 1987, 37a. Conv. Anual AsoVAC, noviembre 1987:267] as *Basiliscus basiliscus* by Donoso-Barros (1968, Carib. Journ. Sci. 8:113) or as *Basiliscus basiliscus barbouri* by Viloria and Calchi (1993, Biollania 9:42). Throat markings should be investigated as a potential diagnostic character for the subspecies, since most keys, like those of Peters and Donoso-Barros (1970, U.S.Natl. Mus. Bull. 297) and Gorzula (1978, Serie Boletín Técnico M. A. R. N. R., DG 11 A/BT/01/78), rely solely on male crest differences.

Submitted by **ENRIQUE LA MARCA**, Instituto de Geografia y Conservación de Recursos Naturales, Universidad de Los Andes, Apartado 116, Mérida 5101-A, Venezuela, and **JUAN JOSÉ GARCÍA MILANO**, Laboratorio de Invertebrados de Los Andes, Urbanización Humboldt, Bloque 5, Edificio 02, Apartamento 0102, Mérida 5101, Venezuela.

CYRTOPODION KOTSCHYI (Kotschy's Gecko). GREECE: MUNICIPALITY (NOMOS) OF ETOLIAS-AKARNANIAS: Province (Eparchia) of Navpaktias, 5 km S Platanos (38°35'N, 21°48'E), ca. 600 m elev. 1 May 1994. H. Bringsøe. Verified by W. Böhme. Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (ZFMK 57501). In mainland Greece north of the Peloponnese, *C. kotschyi* is known to have a coastal distribution, whereas it is more widespread on the peninsula of the Peloponnese [Beutler 1981, pp. 53–74 *In* Böhme (ed.), Handbuch der Reptilien und Amphibien Europas, Band 1, Echsen 1, Akad. Verlagsges., Wiesbaden; Bringsøe 1985, Ann. Musei Goulandris 7:271–318]. This record fills a gap in the hitherto known limit of distribution towards the Greek inland north of the Gulf of Corinth and is situated between the recorded localities of Agrinion and Amphissa as illustrated by Beutler (1981, *op. cit.*).

Submitted by **HENRIK BRINGSØE**, Esthersvej 7, DK-4600 Køge, Denmark.

EUMECES OBSOLETUS (Great Plains Skink). USA: COLORADO: Sedgwick Co: S side Platte River, 30 m E Rt. 59. 12 July 1994. Richard L. Holland and Hobart M. Smith. Verified by David Chiszar. UCM 56898. First county record and northernmost record in state (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife. 131 pp.).

Submitted by **RICHARD L. HOLLAND**, Science Department, Boulder High School, 1604 Arapahoe Avenue, Boulder, Colorado 80302, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

GERRHONOTUS INFERNALIS (Texas Alligator Lizard). MEXICO: HIDALGO: municipality of Meztitlán, Rancho Shalteno, about 2.5 km SW Zoquizoquipan (20°38'N, 98°43'W), 1980 m elev. 13 October 1984. Fernando Mendoza Quijano and Roberto Zapata Morales. Verified by Oscar Flores-Villela. Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de Mexico (UNAM MZFC-4875). First record for the state of Hidalgo and a range extension southeastward of ca. 260 airline km from records reported by Good (1994, Herpetol. Monogr. 8:180–202) in San Luis Potosí (at Alvarez and in the Alvarez Mts. at Km. 42 on the Potosí-Río Verde Railroad). Although it generally has been considered a subspecies of *G. liocephalus*, Good (1994) demonstrated the species status of *G. infernalis*. Good found no evidence that *G. infernalis* and *G. ophiurus* (another former subspecies of *G. liocephalus*) are sympatric, but *G. ophiurus* occurs at El Chilaco, Hidalgo (1260 m elev.), 10 km NW of Rancho Shalteno. Hence the two species may be sympatric or parapatric, or there may be an enclave of *G. infernalis* within the range of *G. ophiurus*.

Submitted by **FERNANDO MENDOZA QUIJANO**, Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de Mexico, A.P. 70-399, Distrito Federal 04510, México, and **DAVID A. GOOD**, Museum of Natural Science, 119 Foster Hall, Louisiana State University, Baton Rouge, Louisiana 70803, USA.

HEMIDACTYLUS GARNOTII (Indo-Pacific Gecko). BAHAMAS: LITTLE BAHAMA BANK: Abaco, Man O' War Cay. August 1992. Nancy Albury. Verified by David L. Auth. UF 87191–94. First record for the Bahamas (introduced) (Schwartz and Henderson 1991, Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. Univ. Florida Press, Gainesville. 720 pp.).

Submitted by **SANDRA D. BUCKNER**, P. O. Box N-8893, Nassau, Bahamas, and **RICHARD FRANZ**, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA.

HEMIDACTYLUS MABOUIA (Tropical House Gecko). BAHAMAS: GREAT BAHAMAS BANK: New Providence Island, Nassau, at Retirement Road. 23 September 1992. UF 87202; Nassau, at Buen Retiro. 7 December 1992. UF 87201, 87204; Nassau, at Ludens on Dowdeswell Street. 23 December 1992. UF 87203, 87205. D. Knowles, S. D. Buckner. All verified by David L. Auth. Second record for the Bahamas; first record for New Providence (Franz et al. 1993, Caribbean Journ. Sci. 29[3–4]:165–173).

Submitted by **SANDRA D. BUCKNER**, P. O. Box N-8893, Nassau, Bahamas, and **RICHARD FRANZ**, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA.

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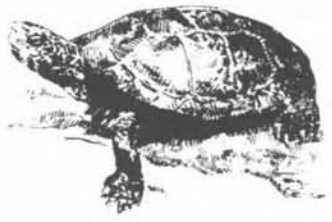
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HEMIDACTYLUS MABOUIA (Tropical House Gecko): USA: FLORIDA: Glades Co: Palmdale, Palmdale Campgrounds. 3 June 1994. W. E. Meshaka, Jr. Verified by R. D. Bartlett. USNM 244446. Adult male collected on building at night. Other exotic species were observed (*Anolis sagrei*) or collected (*H. garnotii*, *Osteopilus septentrionalis*). New county record detects inland colony disjunct from and probably transported from extreme southern Florida where it is widespread (Lawson et al. 1991, Herpetol. Rev. 22:11–12; Butterfield et al. 1993, Herpetol. Rev. 24:111–112; Meshaka et al. 1994, Herpetol. Rev. 25:80–81).

Submitted by **WALTER E. MESHAKA, JR.**, Archbold Biological Station, P. O. Box 2957, Lake Placid, Florida 33852, USA, **BRIAN P. BUTTERFIELD** and **J. BRIAN HAUGE**, Department of Zoology and Wildlife Sciences, 331 Funchess Hall, Auburn University, Auburn, Alabama 26489-5414, USA.

LEIOCEPHALUS CARINATUS VIRESCENS (Exuma Islands Curlytail Lizard). BAHAMAS: GREAT BAHAMA BANK: Exuma Islands, Exuma Cays Land and Sea Park, Shroud Cay. July 1993. R. Franz, C. K. Dodd, Jr. Verified by David L. Auth. UF 89622. New island record (Franz et al. 1993, Caribbean Journ. Sci. 29[3–4]:165–173).

Submitted by **RICHARD FRANZ**, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA, and **C. KENNETH DODD, JR.**, National Biological Survey, 412 N. E. 16th Avenue, Room 250, Gainesville, Florida 32601, USA.

OPHISAURUS ATTENUATUS LONGICAUDUS (Eastern Slender Glass Lizard). USA: FLORIDA: Baker Co: 21 km E Lake City (30°14'N, 82°23'W). 27 April 1989. K. M. Enge. Verified by David L. Auth. UF 72750. New county record representing first peninsular record N of Alachua County (Ashton and Ashton 1991, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians. Windward Publ., Miami. 191 pp.). Captured by drift fencing in longleaf pine flatwoods at Olustee Battlefield State Historic Site.

Submitted by **KEVIN M. ENGE**, Florida Game and Fresh Water Fish Commission, Route 7, Box 3055, Quincy, Florida 32351, USA.

OPHISAURUS COMPRESSUS (Island Glass Lizard). USA: FLORIDA: Baker Co: 21 km E Lake City (30°14'N, 82°23'W). 24 April 1989. K. M. Enge. Verified by David L. Auth. UF 72749. New county record; partially fills hiatus between Columbia County and the Atlantic Coast (Ashton and Ashton 1991, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians. Windward Publ., Miami. 191 pp.). Captured by drift fencing in longleaf pine flatwoods at Olustee Battlefield State Historic Site.

Submitted by **KEVIN M. ENGE**, Florida Game and Fresh Water Fish Commission, Route 7, Box 3055, Quincy, Florida 32351, USA.

PHRYNOSOMA CORNUTUM (Texas Horned Lizard). USA: FLORIDA: Escambia Co: Sabine Drive, 0.3 km–1.3 km N and NE of Fort Pickens Road, Santa Rosa Island, T3S, R29W. 30 May 1993 and 8 May 1994. John B. Jensen and Jodie B. Bell. Verified by Craig Guyer. Auburn University, Alabama (30 May 1993, AUM 33692; 8 May 1994, AUM 33693, 33694, 33695). New county record. One individual was collected DOR 30 May 1993. Subsequently, three additional specimens, also DOR, were collected 8 May 1994. This introduced species apparently has a well established population in the vicinity of the given location.

Submitted by **JOHN B. JENSEN**, Florida Natural Areas Inventory, 1416 Cape Lane, Niceville, Florida, 32578, USA.

PRISTIDACTYLUS ACHALENSIS (Pampa de Achala Copper Lizard). ARGENTINA: CORDOBA: Department Rio Cuarto, 19 km NW Alpa Corral (32°2'S, 64°42'W) on rocky place on summit ("pampa de altura") of Sierra de Comechingones (Cerro de Oro

site). 28 February 1994. Luciano Javier Avila. Verified by Ricardo A. Martori. Herpetological collection of Zoologia de Vertebrados, Departamento de Cienceas Naturales, Universidad Nacional de Rio Cuarto, Argentina [ZV-UNRC 2977 (male) and 2976 (female)]. Extends range ca. 100 km from population on Cerro Champaquí, Department Calamuchita. (Cei 1986, Mon. IV, Mus. Reg. Sci. Nat. Turín. 527 pp.).

Submitted by **LUCIANO JAVIER AVILA**, Departamento de Ciencias Naturales, Universidad Nacional de Rio Cuarto, Est. Post. Nro. 9, C. P. 5800, Rio Cuarto (Córdoba), Argentina

SPHAERODACTYLUS NIGROPUNCTATUS GIBBUS (Exuma Islands Black-spotted Ground Gecko). BAHAMAS: GREAT BAHAMA BANK: Exuma Islands, Exuma Cays Land and Sea Park, Little Cistern Cay (UF 89616), Little Hawksbill Cay (UF 89617), Shroud Cay (UF 89623). July 1993. F. Franz, C. K. Dodd, Jr. All verified by David L. Auth. New island records (Franz et al. 1993, Caribbean Journ. Sci. 29[3–4]:165–173).

Submitted by **RICHARD FRANZ**, Florida Museum of Natural History, University of Florida, Gainesville, Florida, 32611, USA, and **C. KENNETH DODD, JR.**, National Biological Survey, 412 N. E. 16th Avenue, Room 250, Gainesville, Florida 32601, USA.

SPHAERODACTYLUS NOTATUS AMAURUS (Great Bahama Bank Reef Gecko). BAHAMAS: GREAT BAHAMA BANK: Exuma Islands, Exuma Cays Land and Sea Park, Little Cistern Cay. UF 89614–15; O'Briens Cay. UF 89626; Shroud Cay. UF 89624. All July 1993. R. Franz, C. K. Dodd, Jr. All verified by David L. Auth. New island records (Franz et al. 1993, Caribbean Journ. Sci. 29[3–4]:165–173).

Submitted by **RICHARD FRANZ**, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA, and **C. KENNETH DODD, JR.**, National Biological Survey, 412 N. E. 16th Avenue, Room 250, Gainesville, Florida 32601, USA.

SERPENTES

BOTHROPS MOOJENI (Brazilian Lancehead). BRAZIL: MATO GROSSO: 2 km N Porto Jofre on Rodovia Transpantaneira. 16 September 1993. Wolfgang Wüster and Stephen Pierini. Verified by Miguel Trefaut Rodrigues. Instituto Butantan (IB 55112). First record from inside Pantanal, ca. 120 km S of nearest record from Poconé (Campbell and Lamar 1989, Venomous Reptiles of Latin America. Comstock, Ithaca, New York. 425 pp.). This confirms these authors' prediction of its presence within the Pantanal. The specimen was found dead on the road in a zone of permanently dry higher ground with cerrado vegetation. The species is probably absent from the floodplain that constitutes most of the Pantanal. Fieldwork funded by European Community.

Submitted by **WOLFGANG WÜSTER**, Department of Zoology, University of Aberdeen, Tillydrone Avenue, Aberdeen AB9 2TN, Scotland, United Kingdom, **STEPHEN PIERINI**, 93 Putnoe Lane, Bedford, MK41 9AH, England, United Kingdom, and **GIUSEPPE PUORTO**, Laboratório de Herpetologia, Instituto Butantan, Avenida Vital Brasil 1500, CEP 05503-900 São Paulo—SP, Brazil.

[Editor's note: The above record originally appeared, with printing errors, in Herpetol. Rev. 25(2):76. It is reprinted here in its entirety.]

COLUBER CONSTRICTOR FLAVIVENTRIS (Eastern Yellowbelly Racer). USA: NEBRASKA: Hitchcock Co: 0.8 km E 23.3 km S Culbertson. 23 July 1993. Brian R. Roh. Verified by John D. Lynch. University of Nebraska State Museum (UNSM 15124). County record (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **BRIAN R. ROH**, Department of Biology, University of Nebraska, Lincoln, Nebraska 68588-0118, USA.

CROTALUS ADAMANTEUS (Eastern Diamondback Rattlesnake). USA: SOUTH CAROLINA: Allendale Co: E side of Rt. 3, 4.95 km S jct. S.C. Rt. 301. 13 December 1989. Jess Way. Verified from photos by James L. Knight. South Carolina State Museum (SCSM Photo 94.33). Gibbons and Semlitsch (1991, Guide to the Reptiles and Amphibians of the Savannah River Site. Univ. Georgia Press, Athens. 131 pp.) note that *C. adamanteus* has not been reported within 80 km of the southern border of the Savannah River Site (SRS). This specimen extends the range of this snake to within ca. 12 air km of the SRS southern boundary and is believed to be the first report of this species in Allendale County.

Submitted by **CHUCK SMITH**, 4942 Platt Springs Road, Box 7, West Columbia, South Carolina 2916, USA.

CROTALUS HORRIDUS (Timber Rattlesnake). USA: FLORIDA: Walton Co: DOR S side Lake Jackson marsh, SW 1/4 Sec. 27, T6N, R21W. 9 July 1994. J. B. Jensen, B. W. Mansell and P. E. Moler. Verified by David Auth. Florida Museum of Natural History (UF 91594). County record and first Florida record west of Apalachicola River (Allen 1949, Copeia 1949:73–74; Ashton and Ashton 1981, Handbook of Reptiles and Amphibians of Florida. Part 1, The Snakes. Windward Publ., Miami, Florida. 176 pp.). Species has been observed in Covington County, Alabama, ca. 36 km NW of this site (Jensen, pers. observ.) and represents the closest previously known locality.

Submitted by **JOHN B. JENSEN**, Florida Natural Areas Inventory, 1416 Cape Lane, Niceville, Florida 32578, USA; **BARRY W. MANSELL**, 2826 Rosselle Street, Jacksonville, Florida 32205, USA; and **PAUL E. MOLER**, Florida Game and Fresh Water Fish Commission, 4005 South Main Street, Gainesville, Florida 32601, USA.

DIADOPHIS PUNCTATUS ARNYI (Prairie Ringneck Snake). USA: TEXAS: Sherman Co: Coldwater Creek crossing (N side) at Farm Road 119, ca. 22.5 km S jct. with U.S. Rt. 54 (36°16'15"N, 101°49'23"W), 1059 m elev. 19 May 1994. J. D. Johnson and T. J. LaDuc. Verified by R. G. Webb. University of Texas at El Paso (UTEP 15640). First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M Univ. Press, College Station. 434 pp.).

Submitted by **JERRY D. JOHNSON**, Biology Department, El Paso Community College, El Paso, Texas 79998-0500 and Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas 79968-0519, USA.

ELAPHE GUTTATA (Corn Snake). BAHAMAS: LITTLE BAHAMA BANK: Grand Bahama Island, (two adults) specific data unknown (specimens at the Bahamian Dept. of Agriculture); (juvenile) 2.6 mi east of Eight-Mile Rock at "The Fishing Hole." 22 June 1993. R. Neck. Verified by David L. Auth. UF 89403. First records for the Bahamas; introduced (Schwartz and Henderson 1991, Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. Univ. Florida Press, Gainesville. 720 pp.).

Submitted by **SANDRA D. BUCKNER**, P. O. Box N-8893, Nassau, Bahama, and **RICHARD FRANZ**, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA.

ELAPHE OBSOLETA (Rat Snake). BAHAMAS: LITTLE BAHAMA BANK: Abacos, Marsh Harbour, government dock. November 1992. Simeon Pinder. Verified by David L. Auth. UF 87206 (small juvenile). First record for the Bahamas; introduced (Schwartz and Henderson 1991, Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. Univ. Florida Press, Gainesville. 720 pp.).

Submitted by **SANDRA D. BUCKNER**, P. O. Box N-8893, Nassau, Bahama, and **RICHARD FRANZ**, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA.

LAMPROPELTIS TRIANGULUM (Milk Snake). USA: WYOMING: Campbell Co: Sec 1, R71W, T49N, 4 km S of Wyodak (Wyodak is located 8.5 km E of Gillette). 28 September 1992. Rusty Bird. Presented to Gordon W. Schuett. Verified by Fred Kraus. UMMZ 203656. A female neonate (SVL = 23.2 cm; TL = 4.2 cm; mass = 7.2 g) found moving on the ground surface in rocky terrain near habitat consisting of grass and sage brush at 1825 h. Died several days after capture. New county record; first documented specimen from northeast Wyoming (Baxter and Stone 1980, Amphibians and Reptiles of Wyoming. 2nd ed. Wyoming Game and Fish Department, Cheyenne. 137 pp.; Williams 1988, Systematics and Natural History of the American Milk Snake, *Lampropeltis triangulum*. 2nd ed. Milwaukee Pub. Mus., Wisconsin. 176 pp.; C. J. McCoy, pers. comm.). Albany Co: SR 34, 54.4 km E of Bosler and 1.02 km E of the Sybille Canyon Research and Visitor Center. 6 May 1992. Paul Buttenhoff. Presented to Gordon W. Schuett. Verified by Fred Kraus. UMMZ 203657. Adult female found AOR at 1036 h at air temperature of 25–27°C, sky overcast with light rain. Died in captivity. New county record (see above references). These two records bring to 11 the documented specimens of *L. triangulum* from Wyoming.

Submitted by **GORDON W. SCHUETT**, Department of Life Sciences, Arizona State University West, P. O. Box 37100, Phoenix, Arizona 85069-7100, USA.

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LEPTOTYPHLOPS HUMILIS (Western Blind Snake). USA: ARIZONA: Coconino Co: Little Colorado River (LCR) Gorge: River Mile 5, S side of the river. 6 May 1991. J. A. Cole. Verified by Charles J. Cole. AMNH 139734. Record suggests that this species occurs reasonably continuously from the LCR corridor to the Mainstem Colorado River and continues along the Colorado River to its known historical range. Has not been identified to subspecies.

Submitted by **JEFFREY A. COLE**, Navajo Department of Fish & Wildlife, P. O. Box 1480, Window Rock, Arizona 86515, USA.

NERODIA SIPEDON SIPEDON (Northern Water Snake). USA: COLORADO: Logan Co: Dune State Wildlife Area. 21 May 1994. Richard L. Holland. Verified by Lauren Livo. UCM 56887. First county record; northeasternmost record in state (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife. 131 pp.).

Submitted by **RICHARD L. HOLLAND**, Science Department, Boulder High School, 1604 Arapahoe Avenue, Boulder, Colorado 80302, USA; **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA; and **CAROLYN RISTAU** and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

PITUOPHIS MELANOLEUCUS (Gopher Snake). USA: WASHINGTON: Skamania Co: adjacent to Columbia River, 0.2 km SW of Spring Creek National Fish Hatchery, NE 1/4 Sec. 28, T3N, R10E. 3 June 1994. W. P. Leonard and E. Phenix. Verified by Greg Schneider. UMMZ 206415. New county record; extends range ca. 18 km W along N side of Columbia River (Nussbaum et al. 1983, Amphibians and Reptiles of the Pacific Northwest. Univ. of Idaho Press, Moscow. 332 pp.)

Submitted by **WILLIAM P. LEONARD**, Washington Department of Natural Resources—Natural Heritage Program, P. O. Box 47046 Olympia, Washington 98504-7046, USA, and **ERIK PHENIX**, 2800 Limited Lane, Apt. Q3, Olympia, Washington 98502, USA.

REGINA SEPTEMVITTATA (Queen Snake). USA: SOUTH CAROLINA: Barnwell Co: Tinker Creek at Rt. 161 bridge, 1.9 km W jct. Rts. 161 and 125 (9.0 km NE Williston). 17 May 1994. Rudolf G. Arndt and students. Verified by Alvin L. Braswell. North Carolina State Museum of Natural Sciences (NCSM 37136). New county record; extends range ca. 70 km E of the nearest shown edge of its range on the Edgefield-Aiken County boundary (Thompson 1982, A Guide to the Amphibians, Reptiles and Mammals of South Carolina. Privately published, Columbia. 134 pp.), which agrees with Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, 3rd ed., Houghton Mifflin Co., Boston, Massachusetts. 450 pp.). This snake gave birth to nine young on 15 August 1994 (NCSM 37137–145).

Submitted by **RUDOLF G. ARNDT**, Faculty of Natural Sciences and Mathematics, The Richard Stockton College of New Jersey, Pomona, New Jersey 08240, USA.

RHADINAEA FLAVILATA (Pine Woods Snake). USA: FLORIDA: Gulf Co: N Port St. Joe, 1.5 km E U.S. Rt. 98 on S side County Road 382, Sec. 36, T7S, R11W. 26 February 1992. K. M. Enge. Verified by David L. Auth. UF 91091. First record for county and fourth record from the Florida panhandle W of Jefferson County (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 1. The Snakes. Windward Publ., Miami, Florida. 176 pp.; Palis 1992, Herpetol. Rev. 23:92; Irwin 1993, Herpetol. Rev. 24:110). Male discovered under trash in disturbed mesic flatwoods.

Submitted by **KEVIN M. ENGE**, Florida Game and Freshwater Fish Commission, Route 7, Box 3055, Quincy, Florida 32351, USA.

SONORA SEMIANNULATA (Ground Snake). USA: TEXAS: Sherman Co: Coldwater Creek crossing (N side) at Farm Road 119, ca. 22.5 km S jct. with U.S. Rt. 54 (36°16'15"N, 101°49'23"W), 1059 m elev. 19 May 1994. J. D. Johnson and T. J. LaDuc. Verified by R. G. Webb. University of Texas at El Paso (UTEP 15642). First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M Univ. Press, College Station. 434 pp.).

Submitted by **TRAVIS J. LaDUC**, Laboratory for Environmental Biology, The University of Texas at El Paso, El Paso, Texas 79968-0519, USA, and **JERRY D. JOHNSON**, Biology Department, El Paso Community College, El Paso, Texas 79998-0500 and Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas 79968-0519, USA.

TANTILLA NIGRICEPS (Plains Blackhead Snake). USA: COLORADO: Crowley Co: J Road, 4.9 km E Rt. 71. 18 June 1994. David Chiszar. Verified by Richard L. Holland. UCM 56890. First county record (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife. 131 pp.).

Submitted by **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

TANTILLA NIGRICEPS (Plains Blackhead Snake). USA: TEXAS: Sherman Co: Coldwater Creek crossing (N side) at Farm Road 119, ca. 22.5 km S jct. with U.S. Rt. 54 (36°16'15"N, 101°49'23"W), 1059 m. 19 May 1994. T. J. LaDuc and J. D. Johnson. Verified by R. G. Webb. University of Texas at El Paso (UTEP 15639). First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M Univ. Press, College Station, Texas. 434 pp.).

Submitted by **TRAVIS J. LaDUC**, Laboratory for Environmental Biology, The University of Texas at El Paso, El Paso, Texas 79968-0519, USA, and **JERRY D. JOHNSON**, Biology Department, El Paso Community College, El Paso, Texas 79998-0500 and Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas 79968-0519, USA.

THAMNOPHIS RADIX (Plains Garter Snake). USA: ILLINOIS: Jersey Co: NW1/4 Sec. 20, T6N, R11W, Ill. Rt. 100 at Elsah Road. 16 May 1994. J. Tucker. Verified by C. Phillips. Illinois Natural History Survey (INHS 11262). Adult DOR. County record; extends documented range 100.8 km S of Scott County record and 52.6 km WNW of isolated record for Madison County (Smith 1961, Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **JOHN K. TUCKER**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

VIRGINIA VALERIAE (Smooth Earth Snake). USA: TENNESSEE: Wilson Co: Cedars of Lebanon State Forest, in woods adjacent Cedar Forest Road, ca. 3 km N Simmons Bluff Road jct. 21 April 1990. B. T. Miller, M. Donovan, D. Donovan. Middle Tennessee State University (MTSU 27S, 28S, 29S). Cannon Co: pasture off Sinks-Miller Road, ca. 1 km W Burt-Burgen Road. B. T. Miller, J. L. Miller. MTSU 85S. Verified by Robert Powell. New county records; extend the known distribution into the eastern rim of the width of the suspected hiatus separating *V. v. valeriae* and *V. v. elegans*. (Powell et al. 1992, Cat. Amer. Amph. Rept. 552.1–552.6).

Submitted by **BRIAN T. MILLER** and **JOYCE L. MILLER**. Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

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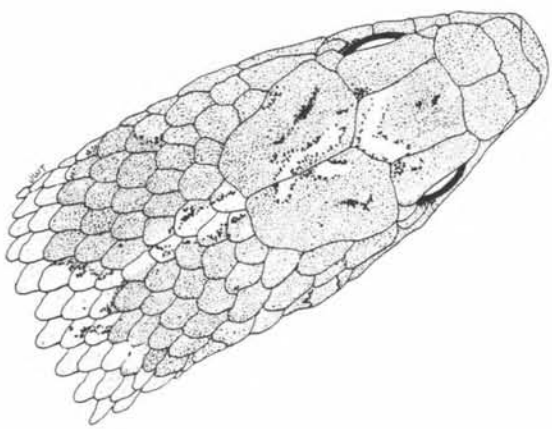
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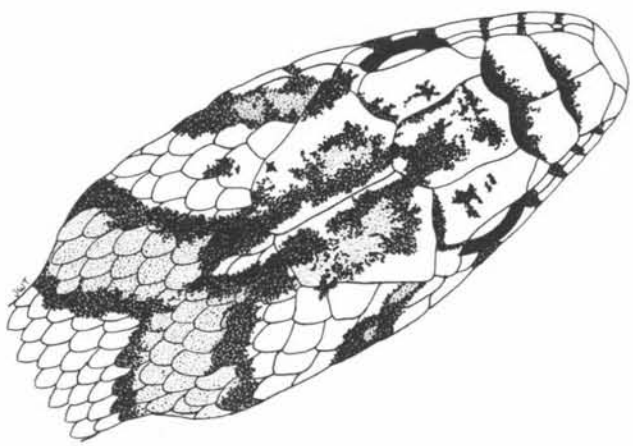
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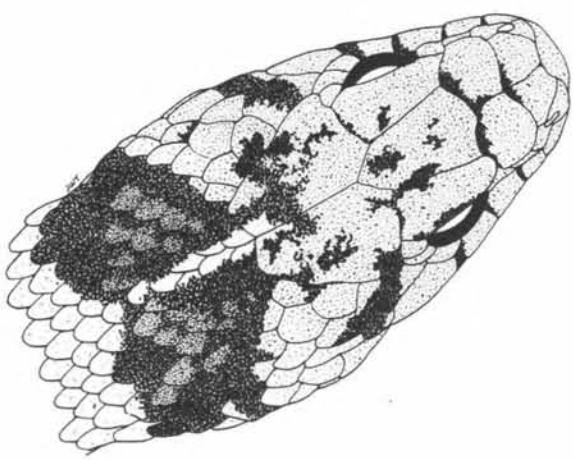
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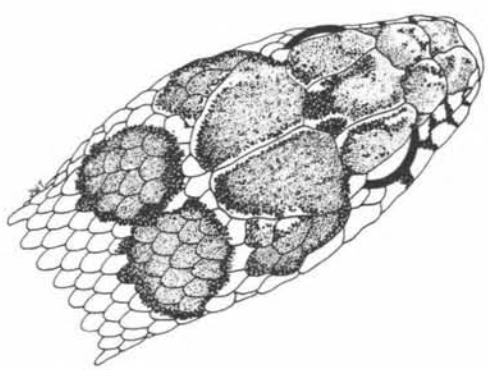
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About the Cover.—The cover illustrations were executed by Jeffrey W. Tamplin, Department of Zoology & Physiology, Louisiana State University, Baton Rouge. Clockwise, from upper left: *Thamnophis exsul* (USNM 166423, holotype: Coahuila); *Thamnophis sumichrasti* (USNM 7079a: Veracruz); *Thamnophis scalaris* (MVZ 144489: Veracruz); *Thamnophis mendax* (LSUMZ 35340: Tamaulipas). Readers interested in the systematics of this group of Mexican garter snakes are referred to the following publication: D. A. Rossman. 1992. Taxonomic status and relationships of the Tamaulipan montane garter snake, *Thamnophis mendax* Walker, 1955. Proc. Louisiana Acad. Sci. 55:1–14.

SSAR BUSINESS

Annual Report (1994) Grants-In-Herpetology Committee

Five awards of $500 each in three categories were made this year, as follows:

Graduate Student Research.—W. Anthony Frankino, Biology Department, Indiana University. Title: "Behavioral mediate of reproductive costs in nature: an experimental test."

Graduate Student Research.—J. Scott Keogh, Biological Sciences, University of Sydney, Australia. Title: "Phylogenetic systematics and historical biogeography of the Australian proteroglyphous snakes."

Field Work.—Sean Doody, Department of Biological Sciences, Southeastern Louisiana University. Title: "A comparative nesting study of two sympatric species of softshell turtles (*Apalone spinifera* and *Apalone mutica*)."

Field Work.—Rafe M. Brown, Biology Department, Miami University. Title: "An investigation into the systematics and biogeography of the Philippine stream frog: biochemical evolution, morphological variation and acoustical diversity in the *Rana signata* (Gunther) complex."

Conservation.—Patrick Kain, Department of Biological Sciences, Southeastern Louisiana University. Title: "Habitat use and management of the eastern diamondback rattlesnake (*Crotalus adamanteus*)."

Committee: Dawn S. Wilson (University of South Florida), Anders G. J. Rhodin (Chelonian Research Foundation), Charles W. Painter (New Mexico Department of Game and Fish), Julian C. Lee (University of Miami), Randy Jennings (Western New Mexico University), Carole L. Hom (University of California, Davis), Maureen A. Donnelly (University of Miami), A. Dale Belcher (Chair; Rio Grande Zoo).

NEWSNOTES

Second World Congress of Herpetology Abstract Volumes Available

Bound volumes of the Abstracts for the Second World Congress of Herpetology (see report of the Congress elsewhere in this issue) are available from the Congress Director. The cost is A$20 plus A$15 postage and packing. Copies of the menu (sure to become a collector's item) can be obtained for US $2 (postage included). Other products are available upon inquiry. Orders (along with checks or international money order) should be sent to: *Michael J. Tyler, Department of Zoology, The University of Adelaide, South Australia 5005, Australia.*

Directory Of Neotropical Herpetologists Now Available

A comprehensive directory of neotropical herpetologists has been published as Volume I of the Proceedings of the II Latin American Congress of Herpetologists.

The 158-page paperback lists 431 herpetologists worldwide who work on Latin American amphibians and reptiles. Each alphabetical directory entry gives the full name of the herpetologist, complete mailing address, telephone and FAX numbers, area of scientific activity, geographic region of interest, and specialization by Order.

This publication also has listings of the herpetologists by country of residence (28 countries), scientific activity (20 categories), and area of specialization by Order.

The *Directorio de Herpetologos Neotropicales* is available for US $10.00 (including air mail delivery) from: *Fundacion Fauna Andina, Casilla Postal 25, La Hechicerca, Mérida 5152, Venezuela.*

1994 California Native Species Stamp Available

California's 1994 wildlife preservation stamp—featuring a California tiger salamander (*Ambystoma californiense*) painted by artist Edward Rooks—will be on sale through 31 December 1994. Stamps can be purchased for $9.75 by mail or at California Department of Fish and Game offices in Sacramento, Redding, Rancho Cordova, Yountville, Fresno, and Long Beach.

The color painting featured on the stamp was selected from among more than 85 entries in the fourth annual native species stamp art contest. The painting was inspired by the artist's observations of a tiger salamander population at the Hastings Natural History Reservation in central California.

Also available for sale are a First Day of Issue cancelled souvenir envelope retailing at $13.50, special perforated sheets of four for $39.00, and a special collector's package including three perforated sheets of four and one limited edition non-perforated sheet of four, for $156.00. A print will be available later this year. Unsold stamps and souvenir sheets remaining after 31 December 1994 will be destroyed except for a few to be preserved for archival purposes, and the stamps allocated to the prints. Cancelled envelopes will remain available until stock is depleted.



Orders can be placed by contacting: *California Department of Fish and Game, License and Revenue Branch, 3211 "S" Street, Sacramento, California 95816, USA; tel. (916) 227-2244.* Mastercard or VISA purchases must be made by mail. For more information contact Monique Born, Research Writer, at (916) 653-4776.

A New Book from the Society for the Study of Amphibians and Reptiles

CAPTIVE MANAGEMENT AND CONSERVATION OF AMPHIBIANS AND REPTILES

Edited by James B. Murphy, Kraig Adler & Joseph T. Collins • Foreword by Gerald Durrell



This new book (written by 70 leading authorities from throughout the world representing universities, museums, conservation organizations, zoos, aquariums, and the private sector) is a current review of techniques for managing and breeding animals in captivity for purposes of conservation. The emphasis is on endangered species, special and new techniques, and on diagnosing problems, yet the coverage is comprehensive and includes a broad array of issues.

• General Issues

Herpetological Conservation from a Global Perspective
The Roles of Zoos and Aquariums

• Reproduction and Management

Nutrition of Carnivorous Reptiles
Nutrition of Herbivorous Reptiles
Effects of Temperature
Light Requirements
Veterinary Procedures for Acquisition and Release
The Physical Environment for Incubation of Reptilian Eggs
Conservation and Management of Tortoises
Chemoreception in the Feeding Behavior of Reptiles
Captive Maintenance and Lineage Senescence
Conservation of Commercially Important Reptiles
Reproductive Strategies and Conservation of Tropical Frogs
Control of Amphibian Reproduction
Reproductive Patterns of Amphibians and Reptiles
Implications of Phenotypic Plasticity
Assessing Genetic Variation in Captive and Natural Populations
Inducing Reproduction in Reptiles
Ethological Approaches to Reproductive Success
Experimental Manipulations of Clutch Size and Offspring Size

• Model Programs

Separate chapters focus on particularly successful programs. These cover salamanders, caecilians, dendrobatid frogs, hylid frogs, bufonid toads, mud turtles, Galapagos reptiles, iguanid lizards, day geckos, Old World chameleons, prehensile-tailed skinks, boid snakes, colubrid snakes, rattlesnakes, crocodilians, and tuataras.

• Future Directions

Role of the Private Sector
Future Research at Academic Institutions
Zoo Programs for Management, Breeding, and Conservation

• Contributors

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Paul J. Weldon
Thane Wibbels
Robert J. Wiese
Mark A. Wise
Robert T. Zappalorti
Elke Zimmermann
Helmut Zimmermann

SPECIFICATIONS: About 400 pages, 27 photographs, 50 figures, 55 tables, 1 color frontispiece, index, format 8.5 × 11 inches (21.5 × 28 cm), cloth bound. To be published November 1994.

SEND ORDERS TO: Dr. Robert D. Aldridge, Publications Secretary, Society for the Study of Amphibians and Reptiles, Department of Biology, St. Louis University, St. Louis, Missouri 63103, USA (*telephone* 314-658-3900 or -3916; *fax* 314-658-3117). Make checks payable to "SSAR"; receipt sent on request only. Overseas orders must be paid in USA funds. Orders may be charged to MasterCard or VISA (account number and expiration date required). Price list of SSAR publications and membership application available on request.

PRICES: SSAR members before 1 November 1994.....US$35
Institutions and non-members.....$58

POSTAGE: Add US$2 for orders from the USA; add $4 for orders from all other countries.

Chelonian Research Foundation Linnaeus Fund — 1993 Grant Recipients

Chelonian Research Foundation (CRF), established as a 501(c)(3) nonprofit private operating foundation in 1992, administers a turtle research endowment fund named The Linnaeus Fund. For its second annual Linnaeus Fund selections, CRF awarded four grants of $500 each on 26 December 1993. Awards granted were as follows:

BOUCHER, TIMOTHY P. Relationships between temperature and rainfall in the timing of spring emergence in the eastern box turtle (*Terrapene carolina carolina*). George Mason University, Fairfax, Virginia.

GRAHAM, TERRY E. An analysis of navigational cues and terrestrial migration of the eastern long-necked turtle, *Chelodina longicollis*, from Jervis Bay Territory, coastal New South Wales, Australia. Worcester State College, Worcester, Massachusetts.

WILSON, DAWN S. Nesting ecology of the striped mud turtle, *Kinosternon baurii*, in a central Florida population. University of South Florida, Tampa, Florida.

WINOKUR, ROBERT M. Morphology and histology of the digestive system of the threatened desert tortoise (*Gopherus agassizi*) with comparisons to other terrestrial chelonians. University of Nevada, Las Vegas, Nevada.

Linnaeus Fund awards are granted annually to individuals for specific turtle research projects, with either partial or full support as funding allows. Priority is given to projects concerning freshwater turtles, but tortoise and marine turtle research proposals are also considered. Priority is given sequentially to the following general research areas: Taxonomy and Systematic Relationships, Distribution and Zoogeography, Morphology, Ecology and Natural History. Other topics may also be considered. Priority is given to projects that demonstrate potential relevance to the scientific basis and understanding of Chelonian Diversity and Conservation Biology. Award recipients agree to publish at least partial or summarized results of the supported research in a CRF-sponsored publication, such as *Chelonian Conservation and Biology*.

Awards for 1994 are also expected to be $500 each for four research proposals. We hope that, with time, there will be increased grant support as the endowment fund grows. The annual application deadline is 15 November, with disbursement prior to 31 December. Submit applications in formal grant proposal format: title page, project objective, background and research rationale, methods, materials, total project expenses, funding requested from CRF, funding available or requested from other organizations, general timetable, bibliography, and curriculum vitae for all key personnel. Awards will be granted through a review process carried out by the Director and members of the Scientific Advisory Board of CRF. Submit applications to: *ANDERS G.J. RHODIN, Chelonian Research Foundation, 168 Goodrich Street, Lunenburg, Massachusetts 01462, USA.*

Research Opportunities At Cano Palmo Biological Station, Costa Rica

The Canadian Organization for Tropical Education and Rainforest Conservation is a Canadian non-profit education, research and conservation organization whose mission is to provide leadership in the wise use of the natural resources in the tropics. To this end, COTERC has established Cano Palmo Biological Station in Costa Rica for biological and botanical education and research.

The facilities at Cano Palmo are available for use by students, researchers and those who simply wish to experience the rainforest. The station consists of approximately 100 acres of Atlantic lowland rainforest, and is located four miles north of the small village of Tortuguero on the northeast Caribbean coast of Costa Rica, in Limon Province. The weather conditions here are favorable for the proliferation of dense tropical rainforest, providing a habitat for the most species-rich ecosystem in Costa Rica. The final list of tree species could reach 300–500. The station is situated within the boundaries of Barra del Colorado Wildlife Refuge and it is only 200 meters from the Caribbean Ocean, thus offering the additional opportunity for ocean-related studies. The adjacent beach is a major nesting site for leatherback and green sea turtles. Loggerheads and hawksbills have also been sighted. The census studies of the wildlife in the region are far from complete; however, thus far 120 species of mammals, over 300 bird species, and more than 100 species of reptiles and amphibians have been documented. Six of the seven nationally endangered reptiles occur in the region. The living facilities are comfortable and inexpensive, with three meals a day included in the fee. Guides, boats, laborers, and transportation are all available at reasonable rates.

For further information on the station, research opportunities, or COTERC, please contact: *Marilyn Cole, Executive Director, COTERC, P.O. Box 335, Pickering, Ontario L1V 2R6, Canada. Tel. (416) 683-2116; FAX (416) 392-4979.*

MEETINGS

Second World Congress Of Herpetology

Adelaide, Australia: 29 December 1993 – 6 January 1994

An account of the First World Congress of Herpetology (FWCH) was prepared by J. Eric Juterbock in his capacity as SSAR Secretary, and published in *Herpetological Review* 21(1) of March 1990. I am not sure that as the Congress Director I can provide as splendid and unbiased an account of the Second Congress. I can but try.

When the First Congress was mooted many believed that it would be held in Europe or North America simply because of the number of herpetologists in those continents. It followed that it could be assumed, for the same reason, that the Second would be held in the alternative continent. At Canterbury it became clear that with two major herpetology meetings being held each year in the USA, it was unlikely that a third major event would be attractive in that continent. Because Australia appeared to be the flavour of the month a bid was made for the Second World Congress of Herpetology (SWCH) to be held at the University of Adelaide.

The nature of the organisation of the SWCH was totally different from the FWCH. The FWCH had financial and other support from thirty leading national and international herpetological societies, and was staffed and organised by volunteers.

By such means a highly efficient Congress management was set in place. But at the outset of contemplating a bid to hold the SWCH in Adelaide, it was evident that a similar structure would not work at that venue. The reason was simply that in Australia (and particularly Adelaide) herpetologists are thin on the ground. The only way in which a Congress could be organised involved a professional team to undertake all routine administration. This structure was an integral part of the Adelaide bid. The change is quite profound. Almost all of us have devoted countless hours to the organisation of conferences, but there comes a point at which we appreciate that it is not cost effective and also is a burden. For Adelaide the 'option' was obligatory.

Planning started in early 1990. Lyall Klaffer was appointed Executive Director and Elliservice was appointed the conference organisers. We commenced operations with no funds, and without the logistic and other support provided to the FWCH. We became an incorporated body to protect those involved in the planning exercise and commenced a program of fund raising. We raised about $50,000 from the corporate sector, but were conscious of working in a declining economy; potential sponsors were reluctant to express a commitment.

As the world slipped into a period of recession the Australian dollar depreciated significantly against the U.S. dollar and many other currencies, so creating a financial climate in which travel to Australia became far more economical than had been anticipated.

But lacking funds we had no option than to borrow to provide the core to proceed; it is an expensive exercise to distribute the first brochure. The brochure itself was 'glossy' but it was funded totally from government sources devoted to promoting tourism. But its glossiness led to an assumption that we were either solvent or wasting money.

The Australian Society of Herpetologists with less than 200 members donated $2000 (which represented most of its assets) and the Congress proceeded.

Adelaide

The venue for the Congress was the city campus of the University of Adelaide. Occupying only 30 acres (12 hectares) it constitutes the smallest in Australia. But small is beautiful for a Congress because physical movement between symposia becomes simple.

The proximity between the campus and the surrounding city presented considerable advantages to the organisers. Most visitors stayed at Lincoln College about 1.0 km north of the campus, or at the nurses' quarters at the Royal Adelaide Hospital adjacent to the Congress venue.

Travel Subsidies

Fund raising to provide travel subsidies for students and other needy candidates was almost entirely an Adelaide initiative. Approximately $74,000 was raised as a result of 40 separate applications. Nineteen applicants were wholly funded by the International Science Foundation, the Australian Indonesian Association, the Consul General of Greece, the South Australian Museum Board, the Jasmin Restaurant, and the University of Queensland. A further $2500 was made available by the World Congresses of Herpetology. Most of these grants were made direct to the chosen applicants and will not therefore appear in our statements of income and expenditure. Many other registrants received institutional support to varying degrees.

Loans

A total of $19,130 in interest-free loans was borrowed from the South Australian Government, the Australian Government, the I.U.B.S., and the World Congresses of Herpetology.

Sponsorships

Major sponsors ($1000+ in cash or kind) were the Australian Society of Herpetology, I.B.M., Telecom, Western Mining Corporation, Energy Resources of Australia, the Australian National Parks and Wildlife Service, Carlton United Breweries, University of Adelaide, Australian Government, Hardy's Winery, Australia and New Zealand Bank, Dominant Chemicals, Adela Gallery, Mount Isa Mines Holdings Ltd., and the SSAR. These totalled $50,400. A further $10,000 was received in smaller sums.

Marketing

Exhibition/Trading rights were taken up by Telecom, Andrew Isles Bookshop, and Krieger Publishers. Trading tables were also hired by a large number of organisations and individuals from Australia, Germany, and the USA, and staffed by volunteers coordinated by Bruce Firth and Ingrid Belan.

The step was taken to sell goods bearing the SWCH logo: T-shirts, sweat-shirts, torches, caps, and stubby holders. These all added to the profit of the Congress and provided high quality souvenirs.

Postcards advertising the Congress designed by Paul Morton in the U.K. were printed in 1990 and sold through a variety of outlets including SSAR meetings. Australia Post produced a commemorative envelope for the first and last days of the Congress.

The SSAR published in its facsimile series *The Reptiles and Amphibians of South Australia* by Edgar R. Waite (1929). A separate print run of 1000 copies in a limp back edition was produced in Adelaide following considerable assistance from Kraig Adler.

Media Liaison

Burke and Associates was appointed media consultants to provide media coverage prior to and throughout the Congress. Many of the themes discussed at the Congress attracted international interest and the study of herpetology was promoted substantially as a consequence.

Scientific Program

The scientific program design was coordinated by Michael Bull of Flinders University and was structured differently from that of the FWCH, in that the day started with two plenary lectures held from 0900 h to 1030 h in the largest lecture area, the impressive Bonython Hall. The gathering permitted the presentation of housekeeping information in the preceding ten minutes. Then, following morning tea there were six concurrent symposia at lecture theatres within a 100 m radius of the Congress registration area.

The Plenary Lecture Themes, speakers, and chairpersons were: *Evolution*: Arnold Kluge and Roger Thorpe (Marinus Hoogmoed); *Zoogeography*: Joel Cracraft and Paul Müller (Michael Tyler); Physiology: Raymond Huey and Roger Seymour (Kraig Adler); *Ecology*: Ric Shine and Joe Travis (Murray Littlejohn); *Ethology*: Michael Ryan and Judy Stamps (Ric Shine); *Conservation and Captive Care*: Craig Moritz and Rene Honegger (Harold Cogger).

A total of 570 papers were presented in symposia or as sessions of contributed papers grouped as closely as possible into common themes. There were also 215 posters. The titles and authors of these 785 contributions are listed in the Programme and details



NARAMA—the largest display of reptiles and amphibians assembled in Australia—held at Wayville Showgrounds during the Congress.



The Second World Congress of Herpetology attracted approximately 750 attendees.

are provided in the volume of Abstracts. Copies of these publications are available for purchase. (See Newsnotes elsewhere in this issue). The poster display was organised by Ingrid Belan and Bruce Firth, and the publication of the Programme and Abstracts by Margaret Davies, Rachel Norris, and Marcus Brownlow.

Round Tables were held on Data Recording, Elapid Phylogeny, and Caecilian Biology, Workshops on Galapagos Tortoises and the Cane Toad *Bufo marinus*, an Open Forum on Commercial Trade in Reptiles and Amphibians, meetings of the Australian SSC Amphibian and Reptile Specialist Group, the Australian Society of Herpetologists, the Society for Research on Amphibians and Reptiles of New Zealand, and the SSC Directors of the Declining Amphibian Populations Task Force.

World Congress Meetings

The Executive Committee of the World Congress of Herpetology met on two occasions and a Business Meeting on one occasion. These functions were chaired by the Secretary-General, Marinus Hoegmoed. The incoming Executive Committee elected Marvalee Wake Secretary-General and Roger Avery Treasurer.

Associated Activities

For the first time in Adelaide's history all of the major cultural institutions agreed to have a single theme of special exhibitions to coincide with the Congress. The State Library produced an exhibition of herpetological literature, the South Australian Museum provided a preview of its shortly to be opened new Reptile and Amphibian gallery, the Art Gallery drew attention to amphibians and reptiles appearing on paintings, the Adelaide Zoo had an exhibition of the history of the treatment of first-aid, produced by Gael Philips, whilst a group of local herpetologists led by Geoff Coombe and Harold Ehmann assembled a large display of reptiles and amphibians (that they called Narama) in a venue at the Wayville Showgrounds on the edge of the city.

Social Program

An extensive programme of social activities was devised for delegates and accompanying persons. Legal constraints required us to employ the services of a registered tour operator, and the Convention Travel Management Company was appointed to organise and arrange all tours. These ranged from half or one day excursions to several of more than ten days.

Because the Congress dates included the period between Christmas and the New Year, a major focus was the New Year's Eve Dinner. A fleet of buses transported folk from the centre of Adelaide to the Hardy Winery at Reynella some 20 km south of the city. The night was cool but the organisation superb. A staff of 80 provided South Australian wines, kangaroo steaks, etc., but the menu promised more. Following the 'Cordon Noire' reputation

of Ric Shine abetted by Gordon Grigg (Cordon Noire is Cordon Bleu blackened a bit), our guests began to understand that the organisers could not always be trusted. The menu selections included:

Soup: Filesnake Slough Consomme. A delightful blend of freshly shed skin from *Acrochordus arafurae*, together with whipped cream and chocolate-coated gastroliths from juvenile Saltwater Crocodiles. Guaranteed to serve as effective ballast during diving.

Entree: Froglegs au Adelaide. Tender hind limbs of *Limnodynastes*, specially cultured in the sedimentation tanks at the University of Adelaide's sewerage treatment plant. This marinade imparts a unique flavour to the gastrocnemius muscle, and the piquancy is enriched with a subtle blend of prostaglandins from the gastric mucosa of *Rheobatrachus vitellinus*.

Main Course: Grilled Fillet of Sleepy Lizard. A traditional Australian favourite, from our hand-reared stock at Flinders University. All of the lizards used are guaranteed to be the result of monogamous matings, slaughtered at the end of sustained metabolic experiments so that their muscles are tenderised by maximum lactate accumulation. Served with autotomised *Nephrurus* tails, grilled to perfection, each with their own terminal knob for convenience in handling. (When in season).

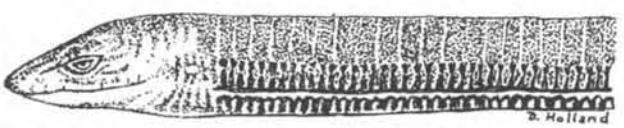
Dessert: Spermatophore Custard. Chocolate-covered spermatophores from North American plethodontids, swimming in sauce made from special "kin recognition" pheromones mixed with liver homogenates rich in mitochondrial RNA. Gene sequences of the RNA available from the chef, on request. The purity of these preparations has been assayed by monitoring tongue-flick rates of newborn herpetologists.

The birth of the New Year was heralded by a kilted Scot (John Wombey) playing his bagpipes. Riotous dancing continued until the wee hours, and guests understood why that day was bereft of a scientific program more taxing than looking for reptiles.

MICHAEL J. TYLER
Department of Zoology
The University of Adelaide
South Australia 5005, Australia.

LEGISLATION & CONSERVATION ALERT

U.S.A.: U.S. Fish and Wildlife Service: The U.S. Fish and Wildlife Service has designated critical habitat for the Mojave population of the desert tortoise (*Gopherus agassizii*), a species federally listed as threatened under the Endangered Species Act of 1973, as amended (Federal Register, Vol. 59, No. 26, 8 February 1994). This final rule became effective on 10 March 1994 and designates 6.4 million acres in Arizona, California, Nevada, and Utah. Critical habitat is defined as those lands that possess physical or biological features essential to the conservation of the species and which may require special management considerations or protection. Critical habitat receives protection under Section 7 of the Endangered Species Act with regard to actions carried out, funded, or authorized by a Federal agency. For further information contact: *David L. Harlow, Field Supervisor, Nevada Field Office, USFWS, 4600 Kietzke Lane, Building C-125, Reno, Nevada 89502, USA. Tel. (702) 784-5227.*



SSAR Grants-in-Herpetology

Proposals are now being accepted for the 1995 SSAR Grants-in Herpetology Program. This program is intended to provide financial support for deserving individuals or organizations involved in herpetological research, education, or conservation. Grant proposals will be considered in the following categories:

1. CONSERVATION OF AMPHIBIANS AND/OR REPTILES. Proposals should address research (particularly conservation biology) on species endangered or threatened at the state, national, or international level, or address research on potentially threatened habitats or species, or on introduced injurious species. Proposals must be accompanied by a letter of support from another member of the SSAR or a student's major advisor or committee chairperson.

2. FIELD RESEARCH. Proposals may address needs for field station fees or equipment and materials in field oriented projects, or the field work portions of broader studies. This might include in-situ behavioral studies, ecological, life history, or sexual selection studies. Survey work by individuals or regional societies may be submitted here or in TRAVEL below depending on how the funds are to be used. Proposals must be from individuals only and be accompanied by a letter of support from another member of the SSAR, the president of the sponsoring regional society (if applicable), or a student's major advisor or committee chairperson.

3. LABORATORY RESEARCH. Proposals may address needs for equipment or materials in laboratory projects or laboratory portions of broader projects. This might include studies in behavior, biochemistry, molecular biology, biomechanics, or physiology. Proposals must be from individuals only and be accompanied by a letter of support from another member of the SSAR or a student's major advisor or committee chairperson.

4. HERPETOLOGICAL EDUCATION. Proposals may address an educational project or start up support for an educational program in a zoo, museum, park, nature center, regional herpetological society, etc. The project must focus on an herpetological topic. Proposals must be from individuals only and be accompanied by a letter of support from the herpetological curator, the director of the facility, or the regional society president.

5. TRAVEL. Proposals may address support for travel to field study sites near or far, or to utilize distant collections or facilities. If funding is sought to get from one place to another, proposals should be submitted in the TRAVEL category. Proposals normally submitted in the CONSERVATION or FIELD RESEARCH categories should be submitted here if travel funding is being sought. Proposals must be accompanied by a letter of support from another member of the SSAR or a student's major advisor or committee chairperson, or the regional society president.

In keeping with the Society's goal of encouraging participation by the broadest possible community, preference may be given to individuals who might not have access to other funding sources. All applicants must be members of the SSAR with the exception of those applying for support of regional herpetological society projects. Membership dues must be paid (to SSAR Treasurer) no later than 31 December 1994 for proposals to be considered. Applicants are limited to submission of one proposal in one category per year. If proposals in any of the categories are not forthcoming, or judged not to be of sufficient quality, the funds in those categories may be transferred to other categories. Each proposal must include the following: (A) BACKGROUND AND OBJECTIVES of the proposed project. (B) METHODS of carrying out the project. (C) COMPLETE PROJECT BUDGET (regardless of whether the SSAR grant will entirely cover expenses). (D) BRIEF RESUMÉ of the applicant or project coordinator. (E) LETTER OF SUPPORT. The proposal must be typed, double spaced, and must not exceed five pages excluding resumé and budget.

Applicants must designate to which of the five categories their proposal is submitted (although the committee reserves the right to reassign categories). All proposals must be submitted (postmarked) no later than 31 DECEMBER 1994 to be considered. Please include office and home phone numbers, as well as fax number if available. It is often necessary to contact applicants quickly. Failure to meet the guidelines may result in elimination of a proposal from consideration. The awards will be announced by 1 April 1995. Successful applicants will be expected to submit a written report of the results of this support within a reasonable amount of time after the project year is completed. They are also encouraged to submit the results of research projects for publication in the *Journal of Herpetology* or *Herpetological Review* or to present their findings at the annual meeting of the SSAR. Submit proposals or questions regarding application procedures to: *Dale Belcher, Chair, SSAR Grants-in-Herpetology, Rio Grande Zoo, 903 Tenth St. SW, Albuquerque, New Mexico 87102-4098, USA. Tel. (505) 843-7413, FAX (505) 842-7281.*

Financial contributions by SSAR members, institutions, and other benefactors support this program significantly and can increase the number and/or size of awards. Your tax-deductible contribution to this program will directly benefit meritorious research and education in herpetology. Contact the Treasurer of SSAR for additional information on contributing to the Grants-in-Herpetology Program. If you are employed by an organization that will match donations made to nonprofit organizations, please notify your employer that you have made a donation to the Grants-in-Herpetology Program.

IN MEMORIAM

Mangven Chang (1903–1993): Pioneer Herpetologist Of China

Professor Mangven Chang *(Pinyin spelling:* Mengwen Zhang), one of the leading Chinese herpetologists of the 20th century, died in Shanghai on October 2, at the age of 89. Chang was one of that group of Chinese biologists who earned their doctorates overseas prior to the Second World War and then returned to China in order to lead the country's modernization of biological research and teaching.



Chang was born in Ningbo City, Zhejiang Province, on May 7, 1903. He was a student of the famous biologist Chih Ping (Zhi Bing) at Southeastern University in Nanjing (now Nanjing University), and graduated in 1926, after which he became associate professor in the School of Agriculture at Peking University where he taught zoology and anatomy. In 1934, he went to France to earn his doctorate under Louis Roule at the University of Paris at which time he was also associated with Fernand Angel of the Muséum National d'Histoire Naturelle. Chang's thesis, completed in 1936, was published in book form the same year, entitled "Contribution à l'Étude Morphologique, Biologique et Systématique des Amphibiens Urodèles de la Chine" (reprinted by Society for the Study of Amphibians and Reptiles in 1968). This was the first comprehensive review of the salamanders of China.

Chang returned to China in 1937 and held a number of positions, successively, at Zhejiang University, Fudan University (at the Chongqing campus, where he was chairman of biology), Heilongjiang University, Harbin Normal University, and finally at East China Normal University in Shanghai. Chang had many prominent herpetological students, including Huiqing Gu, Buqing Hu, Zhengyi Huang, Zhixun Li, Kentang Zhao, and Yu Zong, who went on to productive careers of their own.

In addition to his book on salamanders, Chang published many significant monographs on amphibians and reptiles, in particular about those species native to Sichuan and Zhejiang provinces. He published several general books (on vertebrate zoology, 1987; comparative anatomy of vertebrates, 2 volumes, 1986–1988; history of biology, 1956). He was an outstanding teacher, actively lecturing on many biological topics. He was one of the founders of the Chinese Zoological Society, served as president of the Shanghai Zoological Society, and was Honorary President of the Herpetological Society of China at the time of his death. His contributions to Chinese biology and particularly to herpetology were fundamental and he is justly remembered as a pioneer herpetologist of China.

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ARTICLES

Exotic Larval Bullfrogs (*Rana catesbeiana*) As Prey For Native Garter Snakes: Functional And Conservation Implications

The ability of an exotic species to invade and establish in a new community is determined in part by its competitive status relative to native species (Brown 1989), and in part by its vulnerability to local predators. Bullfrogs (*Rana catesbeiana*) are currently invading the South Fork of the Eel River in northern California. Along reaches where they are common, especially at large pools, native anurans are rare or absent (S. J. Kupferberg, unpublished data). Experimental results suggest that larval competition between bullfrogs and two native species, the Pacific treefrog (*Pseudacris regilla*), and the foothill yellow-legged frog (*Rana boylii*), may contribute to exclusion of these natives from previously occupied stream habitat (Kupferberg 1993). While garter snakes commonly eat larval and metamorphic anurans (Arnold and Wassersug 1978), bullfrog larvae can exceed the mass of native anurans by an order of magnitude. The question arises, will western aquatic garter snakes (*Thamnophis atratus*), the most common snake at the site, be an effective predator of bullfrog tadpoles and metamorphs?

Here I report feeding events in which *T. atratus* eat large bullfrog tadpoles that had over-wintered. In addition, I present data on snake size distribution to illustrate that large individuals likely able to consume bullfrog tadpoles are uncommon. Even the largest snakes observed had considerable difficulty swallowing second-year bullfrog tadpoles. The relatively large prey size leads to handling behavior akin to tool use. Prey shape, in particular the diameter of bullfrog tadpoles' heads and bodies, rather than their overall mass, may reduce bullfrog vulnerability to snake predation.

Field work was conducted in the vicinity of the Northern California Coast Range Preserve, Mendocino Co., California (39°44'N, 123°39'W). Sizes of snakes and anuran larvae were recorded when animals were being collected for experimental predator/prey and competition investigations between 1990 and 1992. Wide size ranges of animals were collected and then the most similarly sized individuals were used for experiments; data reported here are for the full range of those collected. Snakes were captured by hand in June and July, 1990 and 1991, which might have biased the size distribution towards larger snakes because neonates do not appear until August. This however would yield a conservative estimate for the purpose of my hypothesis. The sizes of over-wintering *R. catesbeiana* tadpoles come from those caught by hand using dip nets while wading or snorkeling on 8 June 1992. Tadpoles were weighed using an electronic field balance to the nearest 0.1 g. Observations of snake predation on bullfrogs were made opportunistically during the course of field surveys and experiments with tadpoles, June through September, 1990–1993.

Only the largest snakes ate large second-year bullfrog tadpoles (Fig. 1) and I did not observe snake predation on first-year larvae. The mean mass of second-year bullfrog tadpoles (20.2 ± 6.8 g, range 7–45 g, N = 70) far exceeds the maximum size attained by tadpoles of native species (1.6 g for *R. boylii*, 0.9 g for *P. regilla*) at the site. On two occasions I observed snakes in the process of consuming tadpoles, and on three occasions I offered tadpoles to snakes to better observe the attack-capture-ingestion process (Table 1). Tadpoles removed from the water and placed on the shore in close proximity to foraging snakes were quickly attacked.

The difficulty that *T. atratus* has in handling larval bullfrogs is exemplified by an unusual behavior I observed on one occasion when a snake pushed a tadpole against a rock to facilitate engulfing the partially ingested prey. On 10 July 1993 (1630 h), I placed

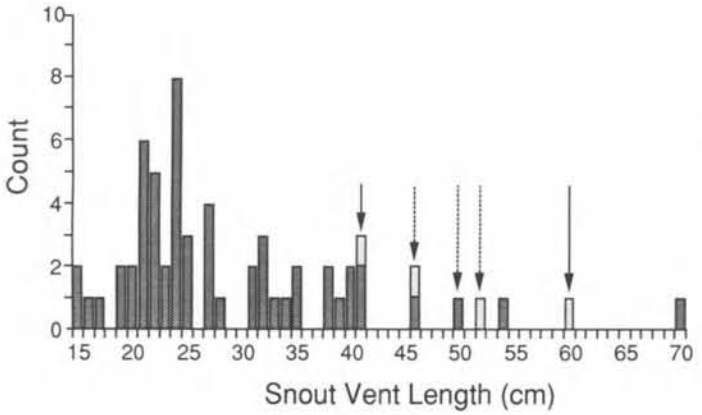


FIG. 1. Size distribution of *Thamnophis atratus* (mean SVL = 28.7±10.3 cm, N = 57; mean mass = 12.7±12.3 g, N = 53). Arrows point to sizes of snakes observed consuming larval/metamorphic *Rana catesbeiana* prey. Solid arrows indicate natural observations, and dashed lines indicate that prey were offered to the snake. Dark bars indicate snakes that were captured during summers 1990 and 1991, and light bars indicate snakes observed during subsequent years.

a *R. catesbeiana* tadpole by the edge of a stranded side pool (22 m x 6.5 m x 0.25 m deep), where a *T. atratus* was foraging. Within one minute the snake attacked and bit the tadpole's tail. The tadpole attempted to swim away, the snake chased it, bit the tail again and held on as the tadpole thrashed from side to side. After another minute the tail was almost completely consumed. Swallowing began underwater at the capture site, but it became difficult for the snake to continue swallowing when it reached the round tadpole body. The snake swam 1.5 m to the opposite bank, hauled one third of its body out of water, wedged itself between three rocks, and began swallowing the body of the tadpole. Two boulders were opposite each other, 11 cm apart, and a third boulder made a headwall. The gravel substrate between the rocks sloped up towards the headwall rock. The snake braced its body between the two parallel boulders, with points of the s-curve against each rock. Its head was up-slope at the headwall rock. Periodically over a twenty minute period the snake pushed the snout of the tadpole against the headwall rock while continuing to brace with the sides of its body and made slow progress in advancing its jaws over the body of the tadpole. When not pushing against the rock the snake lifted its head and tilted it backward. By 1655 h, the tadpole's snout was at the snake's snout, but the sides of the tadpole's deformed body protruded from the sides of the snake's mouth. The tadpole was fully consumed five minutes later. On the occasion when a bullfrog tadpole prey was offered to a garter snake in captivity, handling time was excessive, 2 h, perhaps because in the confines of a round bucket, the snake could not employ any of the behaviors described above.

These observations show that *T. atratus* can eat bullfrog tadpoles, but these snakes are not likely to be effective bullfrog predators. Snake size distribution suggests that most are too small to feed on second-year larvae and even the largest individuals had difficulty handling bullfrog prey. Those snakes which can attack bullfrog tadpoles are likely to have low overall feeding rates when single large prey items are consumed. With higher surface to volume ratios, large prey would likely be digested more slowly thereby decreasing the rate of prey consumption and reducing per capita risk. Long handling times also increase the risk of predation on snakes by avian predators. Additionally, *T. atratus* displays an ontogenetic shift in foraging mode away from tadpole prey towards fish and salamander prey as snake size increases (Lind 1990). At a creek containing only *R. boylii* as anuran prey, tadpoles constituted 60% of neonate *T. atratus* stomach contents, and only 26% and 29% of juvenile and adult stomach contents (Lind 1990). *T. atratus* take large Pacific giant salamanders (*Dicamptodon tenebrosus)* up to 133 mm SVL and 88% of snake mass (Lind and Welsh 1990) which are comparable in size and weight ratio to large bullfrog larvae (Table 1). Shape, however, especially with respect to roundness, is not comparable between salamanders and bullfrog tadpoles. The ratio of prey diameter to a snake's head diameter is the aspect of prey size likely to determine a snake's ability to ingest prey (Greene 1983). Specialization on round prey necessitates morphological modifications that would increase gape, as in the African egg-eating snakes (Gans 1974). It is also interesting to note that where bullfrogs are native and common, they do not appear in water snake (*Nerodia sipedon*) gut contents, whereas other co-occurring smaller ranids have historically constituted a portion of water snake diet (King 1993). Future investigations should focus on whether *T. atratus* will select prey by size or by species and whether there will be a shift in the snake size distribution.

TABLE 1. *Thamnophis atratus* feeding events on larval *Rana catesbeiana* prey (—indicates no data).

Date	Tadpole Size SVL, TL (cm)	Tadpole ≈ Stage	Snake SVL (cm)	Location/timing of observation	Handling time (min)
20 Jul 1991	5.5, 9	(41)43-44	50 (59 g)	Snake in plastic bucket; live prey enclosed.	120
21 Sep 1992	7, —	43-44	60	Snake on a rock in a riffle; in progress.	—
10 Jul 1993	4.5, 12	37-39	52	Snake in water; prey offered at bank.	5
10 Jul 1993	3.8, 8.5	37-39	46	Snake in water; prey offered at bank.	30
13 Aug 1993	5.5, 13	39-40	41	Snake in grass at edge of pool; in progress.	—

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Distribution And Abundance Of *Perochirus ateles* (Gekkonidae) In The Mariana Islands

Perochirus ateles (Micronesian gecko) has a fairly large range that includes the Caroline and Mariana Islands, and Marcus Island (Brown 1976). In the Marianas, Brown examined specimens from Cocos, Guam, and Tinian Islands, implying that the range is the southernmost islands in the archipelago. Museum records and recent surveys of most of the islands in the Marianas (Rodda et al. 1991) confirmed the presence of this species only on Cocos, Guam, Tinian, and Saipan Islands, all of which are the southernmost islands in the archipelago. Despite surveys on Rota (an island between Guam and Tinian) in 1988 (Wiles et al. 1990) and in 1991 (McCoid, unpub. data), *P. ateles* was not recorded.

With the exception of Cocos Island, museum data and survey information indicate that *P. ateles* is rare, uncommon, or extirpated on islands in the Marianas where it has been recorded. On Guam, the last museum record is 1978 and virtually continuous surveys from 1984 to the present have not revealed the presence of this species. On Tinian, the only known specimen was collected in 1946 and recent surveys (Rodda et al. 1991; Wiles et al. 1989) have not yielded any additional sightings or specimens. On Saipan, three specimens were collected between 1979 and 1984 and there have been several reliable sightings subsequently (D. Stinson, pers. comm.). On Cocos Island, a fringing atoll approximately two km south of Guam, we found *P. ateles* to be a conspicuous and abundant member of the nocturnal herpetofauna. In the area (a resort that occupied the eastern 1/3 of the island) that we frequently surveyed during 1989 and 1990, *P. ateles* formed about 5% of the gekkonid community (63 captures (MJM Private Collection) in 30 h of searching). It was also abundant on the remainder of the island (1/3 of which was relatively undisturbed atoll forest dominated by *Casuarina*, *Hernandia*, and *Cocos*), but surveys were infrequently conducted in this area of the island.

Sabath (1981) characterized *P. ateles* as a forest habitat specialist. Rodda et al. (1991) adopted this view and stated that this species occurred in relatively undisturbed forests or in situations adjacent to forests. On Cocos Island substantial numbers of *P. ateles* occurred on buildings and lighted porches in areas of moderate human activity. We conclude that this species tolerates a fair amount of habitat alteration.

The ability of *P. ateles* to persist despite habitat destruction and environmental perturbations is emphasized by the Cocos Island population. This island has a surface area of approximately 37 ha and underwent the development of a coconut plantation prior to WWII, construction of a U.S. military installation (formerly occupying approximately 1/4 of the island), two resorts (occupying a total of 1/2 the island), and at least three typhoons (see below) since 1949 that have overwashed the island (Neubauer and Neubauer 1981; per. obs.). Only about one third of the island remains as regenerated atoll forest. In late 1990 and 1991, typhoons hit Guam and Cocos Island causing tremendous damage on both islands. The resort was destroyed by the cumulative effects of the typhoons and subsequent clearing by a private company that controlled the resort. The remaining two thirds of the island were completely defoliated of all broadleaf vegetation and an estimated 50 to 60% of the trees were lost. Due to radical alteration of the habitat we were unable to quantify the post-typhoon gekkonid population using the survey techniques employed earlier. However, no lizards of any species were sighted at the resort end of the island after debris clean-up was initiated by the resort in early 1992. Because at least one third of the island no longer harbored any lizards and a substantial portion of the remaining habitat was lost, a conservative estimate is that a 30+% population decline of *P. ateles* occurred on Cocos Island as a result of the storms and subsequent clean-up activity.

Reasons for rarity on the other islands have not been established. Although Wiles et al. (1989) speculated that the absence of *P. ateles* from Tinian was due to extensive clearing for agriculture, suitable habitat (primary, secondary, and beach strand forest) remains on approximately 28% of the island. Unless there was an island-wide decline in all habitats, *P. ateles* should have persisted in these areas despite large scale ecological disturbances over most of the island. The single known specimen from Tinian was collected after the termination of large scale agricultural practices and construction associated with WW II. Specimens from Saipan have come from a number of situations, including from inside a house, but the few recent sightings all involve relatively undisturbed limestone forest. Since Saipan did not experience the extensive agricultural development that Tinian did, substantial tracts of primary and secondary forest still exist. Presence on Rota is expected, as approximately 60% of the island is primary typhoon forest (Wiles et al. 1990) and the island is bracketed by known populations. However, if the *P. ateles* population on Rota had experienced an island-wide decline similar to that presumed for Tinian and Saipan, failure to record this species would not be unexpected. In contrast to the more northern islands in the Mariana archipelago, Guam had once substantial populations of *P. ateles*. Sabath (1981) estimated that in the late 1960s *P. ateles* comprised 11–18% of the gekkonid fauna in beach strand and limestone forest, respectively. By the mid-1980s, the species was extirpated from Guam, possibly due to predation by the introduced brown tree snake, *Boiga irregularis* (Rodda and Fritts 1992).

It is unlikely that introduced species have played a role in large-scale population declines on Rota, Tinian, and Saipan. Although an introduced gekkonid has been shown to adversely affect a native species (Petran et al. 1993), confamilials (e.g., *Hemidactylus frenatus*) have never been shown to cause, through competition, the extirpation of native reptiles (Case and Bolger 1991). The pattern of island occupation by other potentially detrimental introduced species (*Rattus* spp. and *B. irregularis*) does not correlate with known or suspected populations of *P. ateles*. Rats are, or were, abundant on Guam, Rota, Tinian, and Saipan, but also occur on Cocos. *Boiga irregularis* occurs only on Guam. *Suncus murinus*

(a shrew) is introduced in the southern Marianas, but is not a likely factor in population declines of arboreal gekkonids as this shrew does not climb very well (Barbehenn 1962).

The prognosis for *P. ateles* in the Mariana Islands is not favorable. Considering the current low population density on Saipan, the possible extirpation on Tinian, the failure to record the species on Rota, the definite extirpation on Guam, and the substantial population reduction on Cocos, *P. ateles* should be viewed as a rare species in the Mariana Islands. The greatest historical population densities occurred on Guam and Cocos and not on more northern islands. Reasons for the absence on Rota and Tinian, and rarity on Saipan are currently unknown. The densest population will continue to be on Cocos Island, but future typhoon damage may further destabilize this population. Most importantly, the possible establishment of *B. irregularis* on Cocos Island from Guam (there have been several sightings of *B. irregularis* on Cocos) will likely extirpate the last remaining dense population of *P. ateles* in the Mariana Islands. *Perochirus ateles* is now protected by the Commonwealth of the Northern Mariana Islands (all islands north of Guam) and has been proposed for protection by the Territory of Guam.

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Eggs, Hatchling Sizes, And Oviposition Sites Of Lizards On Guam, Mariana Islands

Early life history information on many species of lizards in the western Pacific, particularly the Mariana Islands, is poorly known. A single study (Sabath 1981) estimated clutch size in some gekkonids on Guam. To fill in this information gap, eggs and hatchlings (N = 252) of 13 of the 15 species of lizards occurring on Guam, or neighboring Cocos Island, were collected. No information was garnered on the remaining two species (*Nactus pelagicus* and *Lipinia noctua*) as they have either been extirpated or occur at very low densities (Rodda et al. 1991). Data were collected between 1988 and 1992. Eggs were incubated under ambient temperatures (25–30°C) and measurements taken the day of hatching. Egg measurements were taken throughout incubation on species with parchment-shelled eggs (scincids) and once during incubation on calcareous-shelled eggs (gekkonids). Time of egg measurement for parchment-shelled species (just prior to hatching or at deposition) is noted in the text. If incubation was unsuccessful, or eggs were not available, the smallest known specimens with umbilical scars were used to infer approximate size at hatching.

Scincidae

Carlia fusca—This abundant, introduced skink (McCoid 1993a) is ubiquitous in all habitats on Guam. Sites of oviposition are beneath virtually any object, ranging from discarded trash to vegetation root masses, that has been in place long enough to alter microhabitats to provide adequate temperature and humidity incubation requirements. Communal nesting has been observed with *Gehyra oceanica*, *Anolis carolinensis*, and *Emoia caeruleocauda*. Clutch size is an invariant two and eggs are parchment-shelled, ovate, and have a mean length at deposition of 11.96 mm (SD 0.882, N = 13). Hatching is 34 to 35 days and eggs gain size and weight during incubation (mean % weight gain during full-term incubation 37.5, SD 26.541). Mean hatchling SVL is 23.42 mm (SD 0.98, N = 129).

Cryptoblepharus poecilopleurus—While this species has never been recorded on Guam (Rodda et al. 1991), it is abundant on Cocos Island, a fringing atoll approximately 2 km south of Guam. On Cocos Island, this arboreal species is most conspicuous on the windward (east) side where it commonly occurs in *Casuarina equisetifolia* groves. While no eggs have been found on Cocos Island, a captive female deposited two parchment-shelled, ovate eggs (mean length 11.8 mm). Schwaner (1980) found a mean egg length from American Samoa of 10.1 mm. McCoy (1980) stated an invariant clutch size of two for the Solomon Islands, but necropsied females (N = 7) from Cocos Island contained one or two oviductal eggs (mean clutch size 1.51). The Cocos clutch size data are similar to those presented by Schwaner (1980) for American Samoa. No hatchlings were obtained from incubated eggs, but two free-living lizards (20.6 and 21.7 mm SVL) with prominent umbilical scars were collected. Observations of this species on Cocos Island included only rare terrestrial movements, suggesting that eggs may be deposited in the root masses of occupied trees.

Emoia atrocostata—This is another species never recorded on Guam (Rodda et al. 1991), but is relatively abundant on Cocos Island. The species is restricted to the tidal splash zone on the windward side of the island. No eggs or hatchlings have been collected, but several small *E. atrocostata* (estimated 20–25 mm SVL) have been observed. Greer (1968), Alcala (1986), and McCoy (1980) reported a clutch size of two from other island groups and egg deposition above the tidal zone. Dense thickets of *Pemphis acidula* border the splash zone on Cocos Island and are a likely area for egg deposition.

Emoia caeruleocauda—Known egg deposition sites on Guam are beneath concrete bricks and fallen logs. McCoy (1980) found eggs

in ground debris in the Solomon Islands. Communal nesting on Guam with *Carlia fusca* and *Gehyra oceanica* has been observed. Greer (1968) and McCoy (1980) indicated an invariant clutch size of two and necropsies of females (> 40 mm SVL, N = 25) from Guam (based on oviductal eggs and secondary follicles) corroborate this pattern. Ten ovate and parchment-shelled eggs (four clutches of two and two singles) (mean egg length within one day of hatching 12.25 mm, SD 0.777, mean width 9.45 mm, SD 0.058, N = 4) were incubated from three to 26 days and mean SVL of hatchlings was 22.75 mm (SD 0.817, N = 10).

Emoia cyanura—A sighting of this species (Kami et al. 1974) is the only record for mainland Guam, but this species is relatively common on Cocos Island. No eggs were collected, but a 24.6 mm SVL specimen possessed a prominent umbilical scar. Greer (1968) reported a clutch size of two, but Schwaner (1980) in American Samoa and Zug (1991) in Fiji found a mean clutch size of less than two. Hatchling size ranged from 22 to 23 mm SVL in Fijian specimens and mean hatchling SVL in Samoan specimens was 22.0 mm. Based on necropsied adult females from Cocos Island (N = 4), clutch size is an invariant two. Egg deposition sites on Cocos Island are probably in debris and beneath logs.

Emoia slevini—This is the only endemic reptile in the Mariana archipelago and natural history information is limited to a short description of habitat (Brown 1991). Because this is primarily a terrestrial forest-dwelling species, egg deposition sites are probably similar to other forest-dwelling *Emoia*. No eggs have been collected, but a specimen from Cocos Island (SVL 32.0 mm) possessed a prominent umbilical scar. Eggs were observed (Falanruw 1989) on Asuncion Island (Mariana Islands) but no description was provided.

Gekkonidae

Gehyra mutilata—Sites of egg deposition on Guam were in discarded feed bags and behind wooden slats of an abandoned shack. Zug (1991) found eggs on Fiji in flower bracts, leaf axils, beneath bark, and in buildings. Fitch (1970) reported an invariant clutch size of two, but Schwaner (1980) found clutches of one or two in American Samoa. Clutch size on Guam is an invariant two (Sabath 1981) and eggs (mean length 9.5 mm, mean width 8.2 mm, N = 2) are calcareous, subspherical, and adhesive. Mean egg mass of Guam specimens was 0.31 g (SD 0.023, N = 3) and mean hatchling SVL 20.9 mm (SD 0.942, N = 9). Brown and Alcala (1978) reported hatchling size range of 18.5–23.0 mm SVL in the Philippines.

Gehyra oceanica—Literature reports of egg deposition sites indicate an apparent degree of opportunism (McCoy 1980; Zug 1991) and conspecific communal nesting (Zug 1991). On Guam, a clutch (along with egg shards from a previous clutch) was found buried in soft dirt with clutches of *Carlia fusca* and *Emoia caeruleocauda*. Egg shards have also been found buried in guano heaps of the cave-dwelling island swiftlet (*Aerodromus vanikorensis*). Eggs (mean length 13.85 mm, mean width 12.8 mm, mean mass 1.36 g, N = 2) were calcareous, subspherical, and non-adherent. Schwaner (1980) reported clutch sizes of 1–4 on American Samoa and Sabath (1981) reported clutch sizes of 1–2 for Guam. The mean hatchling SVL of the above clutch was 32.6 mm.

Hemidactylus frenatus—This common human commensal is abundant on Guam and has an invariant clutch size of two (Schwaner 1980). Eggs (mean length 8.62 mm, SD 0.325, mean width 7.59 mm, SD 0.342, N = 26) are subspherical, calcareous, and non-adhesive. Schwaner (1980) reported incubation of 77–88 days in American Samoa and Brown and Alcala (1957) 70+ days in the Philippines; incubation period on Guam was 53–54 days. Communal nesting in non-urban situations with *Lepidodactylus lugubris* in plant axils and holes in trees has been observed. In urban situations on Guam, *H. frenatus* will deposit loose eggs in the bottom frames of sliding windows while *L. lugubris* will glue eggs along the upright frames of the same windows. *Hemidactylus* will also opportunistically deposit eggs in a variety of novel situations, including in stacks of dishes, beneath cushions on a couch, and inside televisions, radios, and videotape players. Mean egg mass of specimens from Guam was 0.27 g (SD 0.032, N = 66) and mean hatchling SVL was 20.32 mm (SD 0.832, N = 66). These data closely resemble the summary presented by Zug (1991).

Lepidodactylus lugubris—This parthenoform is typified by a clutch size of two (McCoy 1980; Zug 1991) but may lay a single egg (Sabath 1981; Zug 1991). Large females (> 45 mm SVL) on Guam may also contain three oviductal eggs. Conspecific communal nesting has been reported (McCoy 1980; Zug 1991) and is common on Guam. Communal egg laying on Guam has also been observed with *Hemidactylus frenatus*. Nesting sites on Guam are similar to those reported in the literature (McCoy 1980; Zug 1991) and include tree holes as little as 13 cm from the ground. Eggs (mean length 9.24 mm, SD 0.406, mean width 6.99 mm, SD 0.247, N = 10) are ovate, calcareous, and adhesive. Gibbons and Zug (1987) reported a mean egg mass of 0.4 g for Fiji and 0.23 g for Tonga; mean egg mass on Guam was 0.25 g (SD 0.03, N = 19). Brown and Alcala (1978) reported a hatchling SVL range of 15.5–17.6 mm in the Philippines and Zug (1991) a mean hatchling SVL of 16 mm. Specimens from Guam had a mean SVL of 18.9 (SD 0.614, N=19). McCoid and Hensley (1991) reported that 76% of *L. lugubris* encountered were clone 'A' (fide Ineich 1988). All hatchlings reported on here from Guam were clone 'A.'

Perochirus ateles—This Micronesian endemic has a reported clutch size of 2–3 (Sabath 1981). A single captive female laid two subspherical, calcareous, adhesive eggs. No measurements were taken, but eggs were larger than dimensions given for *Hemidactylus frenatus* and smaller than for *Gehyra oceanica*. Three probable hatchlings (mean SVL 19.9 mm, SD 0.458) were collected on Cocos Island.

Polychridae

Anolis carolinensis—After the introduction on Guam in the mid-1950s (McCoid 1993a), the entire island was colonized, although predation by introduced *Boiga irregularis* currently restricts distribution to urban areas. Clutch size is one (Hamlett 1952), although a single necropsied female contained two oviductal eggs. A single parchment-shelled, ovate egg (no measurements) was found, along with several eggs of *Carlia fusca*, in loose dirt beneath an ornamental tree. Incubation was 30 days and hatchling SVL was 21.0 mm.

Varanidae

Varanus indicus—Eggs from captive females on Guam have never been successfully incubated. Data from DOR females (McCoid 1993b) suggests that clutch size for medium to large females (≥ 380 mm SVL) is at least 10 eggs. The only known oviposition site (containing egg shards only) is in guano deposits of a cave-dwelling bird (*Aerodromus vanikorensis*). Oviductal eggs were oblong, parchment-shelled, and ranged from 40.5 to 46.7 mm in length (McCoid 1993b).

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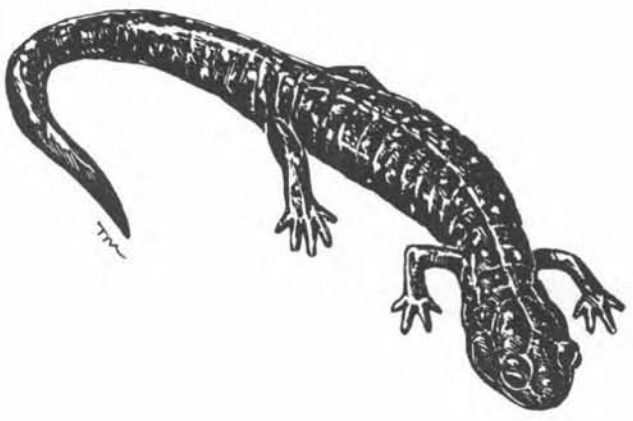
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Aneides flavipunctatus (Black Salamander). USA, California: Mendocino Co., near Willits. Illustration by Tim Manolis.

POINTS OF VIEW

Editor's note: The following article is part of a recently published monograph [Campbell, J. A., and D. R. Frost. 1993. Anguid lizards of the genus Abronia: *Revisionary notes, descriptions of four new species, a phylogenetic analysis, and key. Bull. Am. Mus. Nat. Hist. 216. 121 pp. (pp. 53-56 reprinted here)].*

Conservation Biology

Although *Abronia* represents more than half of gerrhonotine anguid lizard species diversity (approximately 25 out of 45 species), restricted distributions and habitats disturbed or destroyed by human development have made most members of the genus *Abronia* among the most endangered species of lizards in the world. Moreover, because cloud forest species tend to be restricted to single or adjacent cloud forests, several undescribed species of *Abronia* likely have already become extinct with the human destruction of cloud forests on several of the volcanoes of southern Guatemala and adjacent El Salvador. As an example of this habitat destruction, the ranges of *A. mitchelli* (known from a single specimen) and *A. fuscolabialis* (known from only five specimens) in Oaxaca, Mexico, are currently being clear-cut, much of it apparently illegally. This destruction is irreversible and inexorable; there is ample evidence that officials who stand in the way of the cutting of Oaxacan forests are at risk of assassination by logging interests (Katz 1992).

Our decision to address the issue of imminent extinction of *Abronia* was not taken lightly. Systematic biologists have been slow learners when it comes to the political realities of "biological conservation," and it has become very clear that the usual consequence of biologists supplying information on endangerment of species is the regulation of biologists (and therefore of information acquisition) and not habitat protection (Hedges and Thomas 1992; personal observ.). As the world fauna and flora becomes increasingly endangered by human overpopulation (the primary manifestation of which is habitat degradation), the freedom of biologists to survey rapidly disappearing natural faunas and floras has been increasingly restricted. Regardless of this counterproductive effect of species-based regulation, in the past two decades many species of amphibians and reptiles have been listed by federal and state governments, or, more onerously and less effectively, by the Convention on International Trade in Endangered Species of Flora and Fauna (CITES). Particularly in tropical countries, this regulation has had negligible influence on habitat destruction and, with the exception of a few large and/or photogenic mammals and birds, extirpation of species.

Once species are legally protected, study by biologists usually requires expensive and/or difficult-to-obtain permits. In effect, legislation limits access to regulated animals to those most able to pay (i.e., commercial interests) or to those whose activities indirectly extirpate species (e.g., subsistence woodcutters). For example, at the time of this writing, scientific collecting permits for non-nationals in Mexico are $1000/permit, clearly far above their administrative overhead cost, and obviously aimed at restricting access of non-Mexican scientists to that rapidly disappearing fauna. There appears to us to be no effective limitation of habitat destruction in that country. The extinction of the frog *Rana tlaloci* (O. Flores-Villela, personal commun.) within 10 years of its discovery (Hillis and Frost 1985), due entirely to the effects of urbanization of central Mexico, is an example of this regulatory asymmetry. That is, it would have cost a non-Mexican biologist $1000 to legally collect a single specimen of *Rana tlaloci* from the canals of Xochimilco, even as the unregulated effects of urbanization were driving them extinct. Although we note regulatory conditions in Mexico, where many *Abronia* occur, regulatory conditions in other countries (including the United States[8]) and internation-

ally are frequently the same or worse, so these are widespread problems. With respect to international regulation, in recent years we have witnessed the CITES listing of dendrobatid frogs on the basis of no evidence of endangerment whatsoever (C. W. Myers, personal commun.; see also Mrosovsky 1988, and Bringsøe 1992), as well as the U.S. delegation to the 1987 CITES convention vote against the delisting of an Australian mammal, even though there was no evidence of trade in the species, Australia initiated the proposal for delisting, and Australian laws were considered adequate for its protection (DRF, personal observ.). In other instances, conservation legislation such as CITES listing or the Endangered Species Act appears to be largely irreversible and in some instances continues to protect some species for which a secure future has been won (Enderson 1992), thus wasting valuable funding and effort that might be allotted to those species and habitats in critical need of protection.

At a more local administrative level, U.S. state wildlife agencies often deny biologists access to "endangered" species (e.g., *Batrachoseps wrighti* in old-growth forests in Oregon) while other regulatory agencies may be promoting destructive development or logging in the same areas, although this development causes many deaths of these protected organisms. The state of California protects the sand dune-restricted species *Uma inornata*, but allows access of all-terrain vehicles in their habitat with murderous results[9] (Brattstrom 1988; Brattstrom and Bondello 1983). It is obvious to us, and many others (Gans 1992; Hedges and Thomas 1992) that the only viable approach to maintaining self-renewing natural populations of many organisms, including *Abronia*, is to protect blocks of natural environments, not by attempting to protect individuals or particular species, the regulatory approach often taken by state and federal governments, and frequently promoted by conservation organizations.

Further, if individual populations are to be protected adequately, they must be discovered and recognized while still viable. Ingram (1991) reported that a single specimen of the gastric-brooding frog (*Rheobatrachus silus)* was collected possibly as early as 1915, yet this species was not described until 1973. Now thought to be extinct, *Rheobatrachus silus* and its habitat might have received sufficient protection to ensure its survival had it been described 57 years earlier. This observation, plus the fact that even some of the most thoroughly explored parts of the earth (e.g., California) still hold undiscovered vertebrates (Greene and Losos 1988), suggests to us the need for expanded, rather than restricted, scientific collecting on a global basis.

What the counterproductive aspects of wildlife regulation demonstrates, of course, is that biologists, besides being the smallest among those groups interested in wildlife issues, are the least vocal and politically weakest group among logging, construction, and recreational interests, the leather industry, and animal importers and exporters. All of these other interests can afford legal aide (e.g., Pet Industry Joint Advisory Council) against disorganized, underinformed, and heavily bureaucratized international (e.g., CITES), federal (e.g., U.S. Fish and Wildlife Service [USFWS]), and state agencies. The result is that scientists, the segment of the "consuming" public that is the smallest and the least punitive to natural populations and one of the most important for rational habitat regulation, is also the most regulated. As an example of the resources of commercial compared with research interests, recently, in response to USFWS discussion of increased regulation of bird importation, the Pet Industry Joint Advisory Council was able to make a direct mailing to 1,000,000 households (Anon. 1992). This kind of effort is beyond the capability of any research organization.

Currently, the *documented* (Brautigam 1991; Busack 1974; W. King *in* Dodd 1986; Fitzgerald et al. 1991) commercial trade in amphibians and reptiles and their products is responsible for more than five times as much collecting *per year* than scientific collecting has accomplished in total for its *entire* history (data from Wake et al. 1975, plus estimates of non-U.S. collection holdings). This translates to scientific collecting being responsible for less than 1% of the annual regulated take of amphibians and reptiles. Further, the undocumented effects of human overpopulation and urban development are surely directly responsible for several orders of magnitude more deaths of amphibians and reptiles per year than either commercial or scientific collecting. Given that annual takes of amphibians and reptiles for commercial purposes are multiples of the number of specimens ever deposited in scientific collections, one must wonder if regulation of scientific collection is worth the administrative effort, particularly because few biologists have any interest in commercially valuable or truly endangered species. Although we agree that governments and international treaty organizations certainly have the right to regulate scientific collecting, it does seem that a more rational and expedient means could be found to insure the protection of species that are truly endangered rather than the unworkable and detrimental arrangement now in place. Further, if the failure of the United Nations Conference on Environment and Development (UNCED, Rio de Janeiro) to distiguish between scientific and commercial activities is any indication (Barton 1992), we likely can look forward to biodiversity research (i.e., systematics) being throttled by increased "biodiversity" legislation.

We expect that our comments presented here will have no effect on reducing habitat destruction where *Abronia* occur. We expect that we will live to see *A. mitchelli, A. fuscolabialis, A. fimbriata, A. anzuetoi, A. ornelasi, A. reidi, A. matudai, A. smithi, A. ochoterenai. A. leurolepis. A. montecristoi. A. bogerti,* and *A. chiszari* extinct, or found only in such small tracts as to be biologically nonviable. *Abronia montecristoi* may already be extinct inasmuch as its only known locality is one of the best known in Central America and no additional specimen has been collected in over 30 years[10]. Species inhabiting pine-oak woodlands (*A. aurita, A. lythrochila, A. deppii,* *A.* species "Guerrero," *A. gaiophantasma, A. graminea, A. mixteca, A. oaxacae,* and *A. taeniata*) may survive somewhat longer because of their more extensive habitats, even though this habitat is generally more accessible to humans. Nevertheless, we doubt seriously if any of these species (representing half of gerrhonotine anguid diversity) will survive the twenty-first century, with little possibility of any additional understanding of these animals because of legal restrictions that are part and parcel of these species' destruction. We also expect that our comments here will have the undesirable effect of making it more difficult to obtain collecting permits and export licenses from the pertinent countries, with no effective improvement of habitat conservation. After all, permit officials are human, and they do not enjoy being told that their policies and actions are counterproductive.

In short, most species of *Abronia* have already had their habitats severely disturbed and many species face extinction in our lifetimes. Our messages are: (l) protect their remaining habitats; (2) if this cannot be done effectively, let anyone have access to these organisms without permit—at least herpetoculturists will keep some of them going into the next century and they will be available for their nontrivial aesthetic value. If the effect of our statements is to make others press for legal restrictions in the taking of these animals, without serious protection of their habitats, then we can only lament that these people will have failed what is, in effect, a conservation biology IQ test. They will have put a new roof on a burning house.

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FOOTNOTES

8. The plethora of overlapping U.S. state and federal wildlife laws, as well as visa policies, make it effectively impossible for Mexican nationals (as well as other non-U.S. citizens) to pursue collecting-based research in the United States.

9. Indeed, the state of California has opened state parks to off-road vehicles, providing that they remain on pre-existing trails, a restriction of dubious practical value.

10. The conclusion that this one specimen was the "last of its species," killed off by a scientific collector, would be almost certainly incorrect. El Salvador is well-known for its leadership in habitat destruction in Central America, an ongoing process well advanced in the region of the Hacienda Monte Cristo.

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Anonymous Reviews: A Response To Wilson And McCranie

Wilson and McCranie (1993) have provided a generally good series of arguments for and against the anonymous peer review system, and both authors certainly are familiar enough with the system to qualify as knowledgeable critics. However, I was surprised to read several of their opinions, qualified as ". . . incendiary. . .," against the system, especially #2 which alleges that ". . . the editor and such a [vindictive] reviewer form a secret pact against the author."

While my publications experience is not as extensive as that of the authors, I have served as editor of various publications series, have had peer-reviewed manuscripts and grant proposals accepted, and have had some rejected. All of the editors it has been my good fortune to have known regarded their role not as part of any pact, but rather as a sort of interface between prospective authors and science. Some even went so far as to be a publication facilitator for novices or persons not fluent in English. Only once, for a co-authored funding proposal, have I received a rejection based in large part upon the snide commentary of a review committee member who implied a former association with my department, and whose identity I can guess. Happily, the work is proceeding with very adequate and diverse corporate support, privately solicited; sometimes success is the best revenge!

I can accept the thought that there are editors who are less conscientious about their role, and it seems that Wilson and McCranie (and persons with whom they discussed their stance) have encountered them. After all, editors, like other scientists, are human first and scientists/editors second, with all the room for ego abuse and lack of character that implies. While locating persons qualified and willing to serve as editors is not at all easy, neither is it impossible. Wilson and McCranie's criticisms, therefore, seem less appropriate to the system than to publishers who fail to replace dishonest or vindictive editors. I write this with the full realization that an author may pin an additional target on their derriere by making such an accusation against an editor, but not to speak perpetuates injustice—ultimately, we're entitled to all the rights and justice we're willing to stand up and defend. And several authors leveling such charges at an abusive editor would be, I feel, a considerable threat to the status of a journal and hence to that of its publisher.

Selection of reviewers and disposition of manuscripts after review together constitute a unique art form. It definitely is time consuming, but I am not at all sure it would be more expedient for authors and reviewers to correspond directly—in fact, I can easily imagine this process requiring **more** time than the present system! Direct correspondence might enhance cooperation, but I wonder at what point a cooperative known reviewer recommending constructive revisions would feel they ought to be a co-author? The editor's time per manuscript would be reduced, but this interface is a necessary part of editorial functioning.

For an anonymous reviewer to use the system to suppress competition is to my mind utterly contemptible, and is another damning indictment of the bucks-grabbing, overhead-generating nature of much research-mill science. An editor receiving one poor review and two good ones clearly needs to examine critically their choice of reviewers as well as the science involved, and failure to do so is editorial cowardice. But again, this is addressable through the publisher. Yes, there are economic decisions involved, and it's certainly possible to keep costly journal pages filled with papers which have received unanimously good reviews. But does this approach best serve science? I doubt it, and I expect Wilson and McCranie would agree. Reading Bob Jaeger's example of "academic revenge" saddened me—it really did—but it did not surprise me. If that's the logic with which tenure decisions routinely are made everywhere, then academia ought to

be about ready to implode. Why would a graduate student want to spend years developing in order to enter a system that routinely eats its young?

All of the editors interviewed by Wilson and McCranie seemed to agree (as do I) that the system is far from perfect, though it seems ultimately better than most alternatives. However, in the course of informal discussion with a mammalogy graduate student here (Mike Stokes, pers. comm.), I learned of an interesting and logical variant under discussion among KU's mammalogists (and, doubtless, elsewhere)—TOTALLY anonymous peer review, wherein the author is unknown to the reviewer, who remains anonymous to the author. This is easy for editors to implement, preserves the valuable parts of the present system, and reviewers who wish to identify themselves could continue to do so.

In conclusion, I thank Wilson and McCranie for initiating what I expect will be extensive, and I hope productive, discussion.

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Cladism: The Great Delusion

"What a lovely day. Let's go and dig up some nodes."
—What palaeontologists don't say.

"Although the thrills of novel thoughts are to be nurtured, and all students to be introduced to them, there is an inherent danger that should be recognized, namely that a new concept be not mistaken through the thrill it bestows as a sort of 'divine revelation' of THE TRUTH."—H. M. Smith (1972)

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Once again, traditional or evolutionary systematics has clashed with the "new science" of cladistics. Lazell (1992) has questioned the results of the application of the cladistic method to the classification of iguanine lizards (Frost and Etheridge 1989), and has been firmly rebuffed (Frost and Etheridge 1993).

But has he? Lazell may be a reactionary, but he is a very well-informed and thoughtful one; he deserved better than the patronizing "most people think as we do nowadays" condescension of Frost and Etheridge's reply. The truth is that cladism, while taking on the overtones of religious dogma at times amongst adherents who casually dismiss the wisdom of earlier great minds, is neither unanimously accepted amongst biologists, nor is it the "hard science" or "objective approach" that its supporters insist.

To the claim that cladism is the consensual philosophy of systematists of the nineties, I would observe that the many writings of S. J. Gould (a useful sample reprinted in Gould 1980) summarize some of the problems with the cladistic approach, and give examples of some of the implications of rigorous application of the rules of cladism (and I know of no cladist who *demands* less than rigorous application, though he may wisely stop short of *applying* such rigor). Gould has argued that not only does cladism force one to abandon such commonsense vernacular concepts as "fish," "zebras," or "apes," but it even prohibits one from considering dinosaurs to be reptiles unless one is also prepared to consider that birds are reptiles. Gould also notes that cladism relies upon inference and hypothesis, ignoring the fossil record almost entirely, not only in its details as regards the past history of particular groups, but also in its overall suggestions and hints as to how the evolutionary process has historically proceeded.

Foolish, too, would be the cladist who casually discounts the contributions to systematics and evolutionary biology of Ernst Mayr, who, in a recent updating of his 1969 work *Principles of Systematic Zoology* (Mayr and Ashlock 1991), went to some length (over sixty pages) to present a refutation of the cladistic philosophy, an approach that clearly disappointed an otherwise respectful cladist reviewer (de Queiroz 1992).

Other noteworthy doubters include the late A. d'A. Bellairs, probably the most prestigious British herpetologist of recent decades, who wrote in a book review (Bellairs 1989): "The emphasis is on characters of systematic interest rather than upon functional anatomy, a concomitant of the cladistic approach which will lead morphology into even greater disrepute than it currently 'enjoys' among other kinds of biologists. Furthermore, the work makes minimal concessions to the general herpetologist; for example, one looks in vain for any summary of the cladistic method or for a glossary of its wretched jargon. Elitism! One is just supposed to know, though one doubts if the subject is taught in any university in the United Kingdom."

More recently, the veteran herpetologist R. F. Laurent (1992) has presented a thoughtful essay on the shortcomings of cladism, noting some of the absurdities that can result from rigorous application of the Rules, and observing that any system that uses discontinuous categories (e.g., species) cannot accurately reflect true (presumably continuous) phylogeny. Other systems, he observed, are not truly phylogenetic either, but they do not pretend to be.

But I prefer not merely to appeal to inventories of prestigious nay-sayers and "magister dixit" arguments alone. I will try to categorize and analyze the problems with cladism in as objective a way as possible, keeping "ad hominem" arguments to the bare minimum (an ideal perhaps not achieved by Frost and Etheridge). Nonetheless, comments about practitioners of alternative approaches that can only be classified as "snide" do seem to be a stock-in-trade of cladists (note, e.g., the comments at the foot of page 99 in Farris 1990), so the reader is asked to forgive my occasional descent into a similar spirit in the arguments below.

The problems with cladism may be summarized as follows:
i) "Straw man" arguments that misrepresent the actual nature of competing approaches to systematics.
ii) The absence of new concepts behind the new and opaque jargon.
iii) Deliberate rejection of "hard" data, and incompatibility with the fossil record.
iv) The erroneous axiom that evolutionary history has been simple and overwhelmingly divergent (the principle of parsimony).
v) Subjectivity masquerading as objectivity throughout the discipline of cladistics, such subjectivity being evident in a) determination of character polarity; b) selection of sister groups; c) determination of which shared characters represent parallelism or convergence, and which represent evidence of common ancestry; d) arbitrary (or prejudicial) wording utilized to force complexly varying characters into "A or B" dichotomies.
vi) A concerted drive to assert with finality (or at least until the next hypothesis) that which one does not actually know.

These objections may be further elaborated as follows.
i) "Straw Man" arguments. Cladists (e.g., Frost and Etheridge) equate their procedure with the "recovery" of natural, phylogenetic groupings, and portray the primary opposing approach (evolutionary or traditional systematics) as defending absurdities such as the concept of the group that includes "my car and three geese." Yet traditional systematists have long sought to identify "natural" rather than "artificial" groups, primarily by examination of all aspects of the morphology (and fossil history) of a group

to identify parallelism. They have always acknowledged that convenient, "button-sorting" characters result in artificial keys, not natural ones. Thus, it was not cladists but traditional systematists who decided that a thylacine, despite appearances, was not a wolf. And while some early categories (e.g., the Pachydermata, for thick-skinned, huge, nearly hairless mammals like elephants, rhinos, and hippos) were clearly mistakes, such were abandoned long before cladists came on the scene.

It is in fact the traditional taxonomist of today, rather than the cladist, who uses judgment to note which characters are likely to be fundamental ones and which are recent, plastic, or adaptive ones, and who emphasizes the former and rejects the latter. A cladist, on the other hand, constrained by a ban on using "judgment" as to the quality of characters, and excluding most or all fossils on the usual ground that they don't reveal all the characters of interest, might easily end up with a "Pachydermata" clade, or some other grouping of species with certain superficial similarities.

ii) The language of cladistics is singularly inelegant. "Autapomorphy," "symplesiomorphy," "homoplasy," or "Wagner Neighborhood" are not attractive terms. Many sciences, of course, have to develop a body of technical terms to refer to concepts that have no simple name. But cladism, in introducing these new terms, is merely juggling and renaming old concepts (parallel evolution, convergence, shared derived characters, etc.) that have been familiar for over a century. The motivation may be either to give the veneer of a "new" science by introducing new words, or perhaps to impress the layman with the "difficult" new terminology—a philosophy summarized by the phrase "*omne ignotum pro magnifico*," which may be roughly translated "if you can't understand it, it's gotta be great." Neither of these is legitimate justification. The procedure recalls that of some of the "soft" social-study disciplines, preoccupied with recognition as "real" sciences, that have developed graceless and unnecessary terminology accordingly.

iii) In developing multi-character cladograms for complex groups of organisms, the only actual points of contact with past truth are those of the fossil record, with all of its deficiencies. But fossils are usually incomplete, often only fragmentary specimens, almost never with indications of soft parts. Since few of the cladists' preferred characters are likely to be evident, the first thing they do in developing a cladogram is to dump most or all of the fossils, on the pragmatic grounds that the characters of interest are not all detectable. For example, Pritchard and Trebbau (1984) listed and gave summary information on no fewer than 33 genera of pelomedusid turtles, of which only five had extant members. But Gaffney and Meylan (1988) included only nine genera (the five living forms, and four fossil ones) in their cladogram of the Pelomedusidae, without challenging the validity of the remaining 24 genera. Their chosen procedure gave them only one other choice—either dump most of the genera, or dump most of the characters. But in rejecting "inconvenient" or incomplete fossils, cladists also reject all contact with past reality, and plunge entirely into the field of speculation.

If cladistics were indeed a "hard" science, with predictive capability, it would be possible to foretell, from examination of extant taxa and application of the method, what one would find in the fossil record. Reading a cladogram in the approved fashion from the top down (and assuming the universally uncalibrated y-axis to represent "Time"), one may not be able to predict much about what may be discovered very early in the history of the group, but the most recent hypothesized bifurcation events should occasionally be subject to confirmation. The concept of the "node" and what it really is has been much discussed. Some consider a node to be a higher taxon; but a node does not include the taxa that derive from it, whereas a higher taxon includes both a node and its derived forms. Others (e.g., Brooks et al. 1984) consider a node to be a representation of a speciation event. But to include "events" and "taxa"—the intangible and the tangible—as comparable concepts in a scientific hypothesis raises difficulties of the apples-and-oranges type.

In the last analysis, a node, in order to have any standing in scientific discourse (i.e., be subject to at least potential confirmation by observing the real world) has to be a species, or at least an interbreeding population of organisms that may or not be conspecific with other, isolated populations, identified at that point in its evolution at which it first undergoes irrevocable branching into two lineages each destined to become distinct species. (They may ultimately become distinct at a higher taxonomic level). With this as a working definition, we would anticipate that fossilized "nodes" (the "missing links" of an earlier generation of evolutionists), or at least near-nodes, or arguable nodes, would be abundant. We would also expect that series of fossils from successive strata would document the morphological evolution of life, leading by progressive stages and regular dichotomous splitting to the taxa found today. Through the course of time, an early, modest diversity of generalized taxa would be seen to change progressively, bifurcate regularly into two (not three or more) branches, each of which would continue to change, and become more specialized as the complex modern fauna evolved.

This scenario is completely alien to what one actually finds. The real-world fossil record is characterized by such unpredicted findings as:

a) Fossil forms are often fully as specialized as living ones, and in many cases are more specialized (Gould 1980; Zangerl 1980). Forms that are clearly ancestral to living forms, unless essentially identical to them, are very scarce. Most fossil forms represent the ends of their respective evolutionary lineages, destined for extinction rather than alteration.

b) The predicted "nodes," or points of dichotomous bifurcation, are virtually absent from the fossil record. Even "near-nodes" are very scarce. And, curiously, cladistic palaeontologists do not even seem to be looking for them, or expect to find them. Somehow they lack faith in their own philosophy.

c) A typical taxon appears rather abruptly in the fossil record, and remains unchanged, or undergoes only inconsequential change, before becoming extinct several million years later (Gould 1980).

d) At very rare intervals, a spectrum of fundamentally new lineages appears essentially simultaneously, presumably in response to some drastic change in competition, or world climate or ecology. Such "adaptive radiation" may be dismissed as "unresolved polychotomies" by the cladists, but the important thing is, not to attempt to identify minuscule chronological separation between the origins of these diverse lineages, but to recognize that they were essentially (i.e., geologically) simultaneous.

Modern molecular systematists have tended to confirm what traditional systematists have known for a long time—that adaptive radiation is real. Thus, in the mtDNA sea turtle phylogeny presented by Bowen et al. (1993), the three branches of the Cheloniidae (Carretini, Chelonini, *Natator*) have essentially identical length, and apparently diverged soon after the K-T boundary. While the "molecular clock" may not tick at identical speed for all kinds of organisms, it clearly represents a useful tool for comparing divergence times within a group of related organisms. The cladist, on principle, cannot accept the statement that the three fundamental branches of modern cheloniid turtles diverged at essentially the same time; but the molecular data indicate that they did.

e) The greatest fundamental diversity (i.e., at the phylum level) appeared at the beginning of the fossil record (e.g., in the Cambrian Burgess Shale), not at the end of it (Gould 1989).

If one starts with the real data about the past, i.e., the fossils rather than the suppositions, one will come up with models such as the Punctuated Equilibrium model of evolution of Eldredge and Gould (1972), and will also show more than casual respect for

the concept of contingency—the purely accidental, unpredictable events of mutation, of selection, of chance, that happened to have occurred (but that would never have occurred again), that ultimately led to the modern fauna. One will find little evidence for the cladistic model. One will also inevitably form the view that speciation must most commonly occur in small populations, isolated by chance events in remote places where the selective forces are very different from those to which the species as a whole is subject. Most such populations will quickly go extinct; but a few, by dint of happy and appropriate mutations and not a little luck, will adapt to their new environment, and will speciate rapidly, *with the founder stock remaining unchanged*. We would have to use the same taxonomic designation for this founder stock before and after the splitoff occurred, since no difference can be detected. On the other hand, the offshoot stock, easily distinguished by many characters, should obviously have taxonomic recognition. But this is not acceptable under the Rules of Cladistics.

A sociological parallel would be that of a twenty-generation lineage of peasants. Let us assume that, somewhere about the tenth generation, forces of contingency conspired to educate the eighth daughter of one of the families so that she became an urban professional. She married into this class also, and all her descendants became urban professionals of one sort or another also. "Cladistics" would insist that, if generations 1–10 were all peasants, and subsequent generations except for the urban professionals were also undifferentiated peasants, then the offshoot lineage must be considered peasant also. Yet any observer would note that, if people look like yuppies, smell like yuppies, talk like yuppies, maybe, just maybe . . . .

As an example of the nomenclatorial, logical, and philosophical contortions forced upon cladists by some of their own arbitrary rules, note the "cure" proposed by de Queiroz and Gauthier (1992) for the cladistically unacceptable, although simple, statement "the Agamidae were ancestral to the Chamaeleonidae," a remark that does not elevate the blood pressure of the traditional systematist in any way.

The cladist may not disagree with the facts of the matter, but he cannot accept that the Agamidae, a successful, modern family, should have the same name both before and after it gave rise to the Chamaeleonidae. The proposed initial solution is to call the entire complex by the oldest available family name (i.e., Chamaeleonidae), thus utilizing a familiar name for an unfamiliar purpose, to designate both the agamids and the chamaeleons, and to leave nameless the two familar families recognized today. To this mess, de Queiroz and Gauthier resolve a further, even more drastic solution—the dumping of the entire Linnean system of nomenclature. Such iconoclasm is unlikely to appeal to anyone except highly theoretical cladists, in that most consider the Linnean system remarkably time-tested, having withstood the general acceptance of the theory of evolution, for example, without significant compromise. Those who do real, practical zoology, and need stable names to refer to the entities they study, will also not welcome total sacrifice of nomenclatorial stability on the altar of a theory that may well not survive the decade, let alone the centuries. Perhaps they will resort to standardized vernacular names, as have many ornithologists.

iv). In general, I have no problem with Occam's Razor (i.e., where several explanations of a phenomenon are possible, choose the simplest until it is disproved), nor with Dollo's Principle, which states that evolution does not reverse itself. But my visceral response to the Rule of Parsimony is to observe that nature is bountiful, not parsimonious. It is extremely unlikely that the actual sequence of past events can be portrayed by the *Hyphaene*[1] model; the *Salsola*[2] model is actually far more probable, in that evolution has demonstrably been extraordinarily complex, and species can be formed in many ways, including such bizarre means as tetraploidy, where interspecific hybrids become fertile with each other but not with either parental species (Wilson 1992). This results in the rejoining of divergent evolutionary branches into new, "composite" species, a phenomenon shown in no cladogram I have ever seen. As George Gaylord Simpson once said, "evolution does not work in straight lines, but the minds of some scientists do."

Furthermore, the assumptions underlying the Rule of Parsimony, i.e. that both evolutionary reversal and parallelism or convergence are so rare that the model that includes the least of these is necessarily the one of choice, may be hopelessly flawed. Dollo's Principle is not breached when individual characters reverse themselves, it only states that an entire organism cannot exactly duplicate an ancestor unless connected to that ancestor by a chain of identical generations. In the small, well-studied family Testudinidae, with about forty living species, parallelism and convergence—in shell shape, alternating octagonal and tetragonal neurals, radiating scute markings, gigantism, dwarfism, bifurcate gulars, male plastral concavity, thickened xiphiplastra, thickened or thinned epiplastra, enlarged forelimb scales, absence of bony cores in forelimb scales, elongate neck, single gular, conical vertebral scutes, absence of maxillary ridges, loss of nuchal scute, and many other characters (Loveridge and Williams 1957)—are so extensive that a cladogram simply collapses under the weight of the known homoplasies, let alone the reasonable suspicion of many more. Yet there is no reason to believe that homoplasies are atypically frequent in the Testudinidae—we simply have studied the present and past representatives of the group well enough to have identified many of them.

One might also consider zoogeographic reasonableless in deciding whether widely separated forms are likely to be congeneric, or whether the observed similarities are simply symplesiomorphic or homoplastic. Thus, Bour (1985) could find nothing to differentiate certain testudinid fossils from the Balearic Islands (western Mediterranean) from the sub-Recent Mascarene tortoises of the genus *Cylindraspis*; nor could Loveridge and Williams (1957) find definitive grounds for reversing Lydekker's (1889) allocation of the European Eocene *Emys comptoni* and Upper Miocene *Emys scutella* to the South African endemic tortoise genus *Homopus*. But in both cases "good zoogeographic judgment" (and not much else) would resist lumping such forms into single genera.

When a cladist generates a series of cladograms of which the "true" one is identified as such because it includes 23 rather than 25 cases of reversal or homoplasy, it must be realized that the real-world history of the group probably included hundreds or thousands of reversals, plesiomorphies, and homoplasies, most undiscovered or lost forever by the vagaries of the fossil record. So whether the gross simplification of that history that is offered by the cladogram identifies 23 or identifies 25 reversals or plesiomorphies is absolutely meaningless. There is, in reality, no valid way to choose between these two scenarios.

The Principle of Parsimony is a means of estimating the nature of something unseen by assuming that nothing unusual took place, that the sequence of events that is, statistically, the most probable can be hypothesized as that which actually occurred. A homely example will illustrate the absurdity of this process. Let us suppose you were to hold up an opaque sack containing a hundred live turtles, and asked a colleague to guess which species they were. The Rules of Parsimony would require that the colleague be familiar with all species of turtle and to know their relative abundance; they also require that he not be bound by any rules of common sense.

Even if you gave a helpful hint and showed that the first twenty turtles were, say, *Pseudemydura umbrina*, Parsimony would continue to insist that the 21st turtle was not this very rare form, and might constrain our cladist friend to guess that the remaining eighty turtles were all *Trachemys scripta*, on the grounds that any other turtle species was less abundant than *T. scripta*, and therefore less likely to be in the bag.

Clearly this is nonsense. Even if *Trachemys scripta* were the most abundant turtle in the world, the "guess" is unjustified, not just because the first 20 turned out to be something else (and that should tell us *something*, just as a coin giving heads every time after twenty tosses should tell us something), but also because representatives of this species certainly do not outnumber representatives of *all other species put together*. In other words, the category of all non-*scripta* turtles is more numerous, and thus more probable, than the category of *scripta* turtles alone. So also is the composite category of several different cladograms each with 25 plesiomorphies more probable than the single cladogram presented with 23 plesiomorphies.

Obviously there are times in life when one does not have enough information to make a useful guess to interpret a complex situation, and at such times scientists should decline to commit themselves. The traditional or evolutionary taxonomist is entirely within his rules to designate a family that contains several dozen genera, without any obligation to group them into subfamilies or suprageneric groups if he feels that the data are insufficient to guide such a grouping. On the other hand, a cladist working with the same group is obliged by *his* rules to illustrate the dichotomous branching that led to the extant array of genera, even if the data are subject to different interpretations (as they usually are). A great strength of the Linnean system is that it only *requires* barebones categories (Kingdom, Phylum, Class, Order, Family, Genus, Species) for a given organism or group, leaving other categories to the discretion of the reviewer. They can be filled in later, when the data become available, without doing violence to the established structure.

A further shortcoming of the methodology of cladism is that it does not differentiate between known, indisputable homoplasies; cases where homoplasy is possible; and cases where homoplasy is extremely improbable.

v). a). Determination of character polarity. Polarity (i.e., whether a character is primitive or derived) is a critical consideration, in that clades have to be justified by the sharing of *derived (i.e. apomorphic)* characters. It sounds simple, but it is often not so with real-life examples, yet cladism collapses if polarity cannot be determined unambiguously — too many characters entered without prior ordering will quickly generate logical chaos. It is important to remember that all organisms alive today, in the last analysis, have had the same amount of time to evolve, although some may *seem* to have made better use of their time than others. Thus, characters thought to be primitive may only seem so — they may appear similar to the characters shown by very early members of a lineage, but if they have been retained, they must either be selectively neutral, or (more likely) they are highly, even if subtly, adaptive to modern conditions. And if adaptive, and not connected to ancestral forms by a continuous fossil record, the possibility must be entertained that they disappeared and reformed.

I will take some examples from within my own field of specialty — turtles, the Order Chelonii. Let us say that we wish to determine whether the roofed skull of modern cheloniid sea turtles; or the broadly rounded carapace of modern *Lepidochelys*; or the presence of bones in the posterolateral margins of the leathery carapace of *Lissemys*, are primitive or derived. The fossil record does not help in that the continuity with the superficially similar characters of early ancestors (or near-ancestors) cannot be demonstrated.

Outgroup comparison can be attemped first. The obvious sister group for the cheloniids is *Dermochelys*, that happens also to have a roofed skull. But this is non-useful, in that the feature may be an adaptive one, common to all marine turtles, a shared derived condition, that conceivably formed independently more than once, of the lineage that includes both the dermochelyids and the cheloniids.

Bowen et al. (1992) used *Chelydra* as a sister group for the cheloniid/dermochelyid lineage. In this form the skull roof is highly emarginate. But if we had, with equal justification, selected the other living chelydrid genus, i.e. *Macrochelys*, we would have found a completely roofed skull. Going back further, we find that the earliest turtles and other anapsids had a complete skull roof, as do certain isolated living genera (*Pseudemydura*, *Platysternon*, *Peltocephalus*). But despite an unusually rich fossil record, and a group that has attracted many competent students, it remains unclear whether the fully-roofed condition of these turtles is a sporadically-retained primitive feature or a highly adaptive one associated with megacephaly, non-retractability, or something else.

As regards the wide carapace of *Lepidochelys*, both ontogenetic considerations (i.e., the wide, rounded shell of most hatchling turtles) and paleontological ones (i.e., the wide shell of certain early sea turtles such as *Toxochelys*) suggest that the discoidal form is primitive (Zangerl 1980). Yet those who have witnessed the unique, specialized nest-closing behavior of *Lepidochelys* can quickly become convinced that this feature is an advanced, specialized one associated with the "sand-thumping" post-ovipositional "dance" of these turtles. Or perhaps it is truly primitive but serendipitously pre-adapted for an important behavioral function of modern *Lepidochelys*.

Finally, in *Lissemys*, we find a trionychid genus in which homologs or analogs of some of the peripheral bones of other turtles are present, in a family of moderate diversity in which peripheral bones are otherwise lacking. The bones are sufficiently different in form and in number from normal chelonian peripherals as to raise significant question about their homology. Ecologically, the genus is unusual and apparently specialized within its family in that its preferred habitat is shallow, often temporary waters, and it has cutaneous plastral flaps that allow it to close its shell openings, presumably to retard dehydration under desiccating conditions. When tightly closed, the series of "peripheral" bones (which are not sutured to each other) are tightly folded or buckled on each side of the tail.

Accepting Meylan's (1987) proposal of *Carettochelys* as the sister-group to the trionychids, we find a continuous series of peripheral bones to be present in this genus. By this criterion, the "peripherals" of *Lissemys* are primitive. But careful analysis of the peripherals of *Carettochelys* raises questions as to *their* homology — there are only ten pairs (PCHP 3990 has only nine) instead of the usual eleven, and unlike the peripherals of almost all other turtles they do not become sutured with either the costal or the plastral bones even in old adults.

The homologous status of the peripherals of *Carettochelys* is thus also thrust into doubt, and this doubt then extends to the peripherals of *Lissemys*. The argument for primitive, "relictual" status of the latter is confounded also by the presence of a "preneural" bone in the anterior periphery of the carapace in this genus, a feature not found in non-trionychid turtles, and one that suggests neomorphic development rather than retention of primitive features. If such an autapomorphy can form at the front of the trionychid shell, then there is no reason why it could not form in the posterolateral region also. I recently picked up a large live *Lissemys scutata* in a restaurant in Beijing, and was struck by the extraordinary utility of this scrap of armor. When the head is retracted, the prenuchal bone bends downward, to meet the raised anterior plastral lobe. The head is thereby effectively and neatly helmeted—a potential life-saver, hardly a useless relic! On the other hand, Meylan (1987), in an exhaustive cladistic analysis of the trionychids, concluded that the peripheral bones of *Lissemys* were primitive. Primitive features may be adaptive, of course, but they cannot be consider derived. The polarity of the "peripheral" bones of *Lissemys* must remain an open question.

One might also ask how a conscientious cladist would determine character polarity in the rather small and nondescript Mexican emydid *Terrapene coahuila*. Noting the relatively vaulted shell and generalized (neither elephantine nor webbed) foot structure,

he would probably identify this species as a primitive form, perhaps close to the ancestral testudinid line, an aquatic species in process of becoming terrestrial, with the single specialization of a plastral hinge. But by bringing to bear paleontological, taxonomic, ecological, and genetic insights, one would recognize that this was an aquatic species in an otherwise terrestrial genus, which in turn was a member of a family of mostly aquatic species, which in turn were derived (through unclear pathways) from the presumably terrestrial earliest turtles. After just a few such reversals, the concept of "primitive" becomes subjective indeed, since the terrestriality of other members of the genus *Terrapene*, primitive when compared with *T. coahuila*, is clearly derived when compared with the Emydidae as a whole.

The optimistic cladist might have anticipated that his methodologies, elaborated just as molecular approaches to systematics were dawning, would be confirmed by these new techniques, but this has not proved to be the case. Thus, in the absolute sense, what may be considered to be the "primitive" state for a given character is ultimately reflected in a particular sequence of nucleotides within a DNA molecule. Each position within such a sequence is defined, not in subjective terms of "polarity," but simply as one of four possible states — A, C, G, or T. The cladist would be forced to accept majority rule as his criterion of polarity at the DNA level, since obviously no individual purine or pyrimidine could be considered "primitive," and this is clearly an unsatisfactory situation.

b). Polarity is often defined by comparing a morphological trait to the condition in a "sister group," or a wider "out-group" — ideally, a monotypic lineage that separated just below the base of the "clade" in question. Unfortunately, both selection and interpretation of sister groups is also fraught with subjectivity. Whether a usable sister group exists at all depends both upon whether such a group ever evolved, and whether it had the good fortune to survive to be studied. The cladistic process is itself utilized in identifying a sister-group, and this requires knowledge of character polarities; on the other hand, comparison with a sister-group is the main way of establishing character polarities in the first place. The process is thus tautological. Good judgment can be utilized to reduce the tautology, but in this nominally objective process, good judgment is not acceptable. Establishment of character polarity by comparison with a sister group is also highly vulnerable to misinterpretation through that persistent bugbear, homoplasy.

A parallel would be to attempt to determine what one's great-great-grandparents were like by looking for long-lost cousins. Not only has the "cousin" and his immediate forebears been living in the same changing world as oneself and thus making parallel life-style changes (does the fact that they all have televisions mean that one's ancestors must have had televisions?), but, as a parallel to the problems facing cladists, one may even be mistaken in accepting that the individual in question really is a relative! Moreover, the problem is further compounded if the "cousin" has many close relatives with whom he shares relatively few characteristics—the ideal "sister group" has to be monotypic, or nearly so, or the analysis becomes too complicated.

Finally, an example will illustrate that, even if one correctly identifies the polarity of a trait, one may nevertheless reach inappropriate phylogenetic conclusions. Many of the subspecies of the Galapagos tortoise (*Geochelone nigra*) show an unusual, shared condition, notably the saddlebacked shell, that correlates with many other characters (reduced size, relatively long limbs and neck, flared posterior carapace margin, white coloration of the head and throat, and various behavioral traits including sparring for dominance by raising the head as high as possible, and a tendency to flee rather than withdraw into the shell when threatened). Yet, although these characteristics certainly qualify as "synapomorphies," the conclusion that the saddlebacked tortoises form a "clade" may be incorrect. As Marlow and Patton (1981) have demonstrated by means of starch-gel electrophoresis techniques, the various isolated saddlebacked tortoise populations in the Galapagos archipelago almost certainly evolved independently, on their different islands, from dome-shelled ancestors. Zoogeographic considerations—the scattered appearance of saddlebacked tortoises in parts of the archipelago where arid conditions prevail (Pritchard 1979)—lend support to this hypothesis.

c) Character selection is critically important to the development of phylogenetic hypotheses. One can never include *all* characters, so the selection of characters to be used will inevitably have a subjective element. The cladist attempts to utilize numerous characters and in this way hopes to identify multiple synapomorphies. The evolutionary phylogeneticist, on the other hand, tries to identify those traits that seem especially conservative and that are not closely associated with function in order to establish fundamental points of evolutionary divergence. He is not fooled, for example, by the fact that both of the chelid turtle genera *Chelodina* and *Hydromedusa* have very long necks and flattened heads, or by the fact that *Terrapene* and *Cuora* both have a mid-plastral hinge, even though both characters are linked with a number of associated morphological and functional similarities. Gaffney (1977) established the taxon Infratribe Hydromedusad for *Chelodina* and *Hydromedusa*, but Pritchard (1984) argued that the characters of the head and neck that were used are obviously related to the feeding behavior or ecology of the animals. Rather, the evolutionary taxonomist would note that the anterior shell scutellation of the first two genera, a classic non-adaptive feature, is drastically different, and that the skull of *Chelodina* differs from that of *Hydromedusa* in having a uniquely single frontal bone and no parieto-squamosal arcade — subtly adaptive, perhaps, but not obviously so. And he would not be fooled by the superficial similarities of the two box turtle genera, in that the plastral scute formulae or the configurations of the pygal bone relative to the supracaudal scutes (conservative, probably non-adaptive features) are strikingly different.

Sometimes, numerous characters may, in fact, be expressions of a single, recent adaptive modification. A classic example of this is the effect that durophagy, even of an individual as opposed to a lineage, can have upon the skull of a turtle (see Stejneger, 1944). I once identified a complex spectrum of differences between the skulls and lower jaws of the two species of *Lepidochelys* (Pritchard, 1969); but apart from a few that could be attributed to the diurnal nesting habit of *L. kempi* (and associated with a smaller orbit), all were expressions of the durophagous habits of this species, manifest in many ways in the jaw musculature, tomial surfaces, and osteological features.

The cladist is drawn towards easy-to-describe, dichotomous characters (e.g. "maxillae in contact;" "frontal bone entering orbit;" "interpectoral seam longer than interfemoral seam.") But the functional significance of such characters may be that the skull, for reasons associated with the mode of feeding, has become narrower, and the orbits larger, perhaps to improve visual acuity. These adaptations may ultimately result in the maxillae achieving contact, or the frontal entering the orbit; but these are incidental by-products of the change in skull shape, and in themselves may be totally unimportant. Functionally, and phylogenetically, a close approach to the derived condition may be as significant as attainment of that condition. But, if the character is selected, not in a way to differentiate between forms that show the derived character and those that don't, but simply to differentiate between those that pass a threshold easily expressed in dichotomous terminology, then we will erroneously link taxa that do not show the character and those that do (but do not reach the threshhold), declaring them more closely related than those that almost reach and those that exceed the threshhold. Similarly, if the plastron changes shape for functional reasons, the key question may not be whether the interpectoral seam is actually longer than the interfemoral seam, but whether it is about as long (i.e., almost as

long or slightly longer), as opposed to 50% as long. In other words, the important development of relative lengthening of the anterior plastral lobe may be obscured if one's only criterion is whether a certain easily-defined threshhold has been passed.

In truth, characters can be selected, or described in carefully chosen words, to prove anything one wishes to prove, and this has often been done. A cynic might observe that cladists were intellectual PAUPers who not only use, but have, bad characters. If one wanted to argue that Galapagos and Mascarene tortoises, for example, formed a natural clade, one could identify the synapomorphies of gigantism, pigmentation, neck elongation, absent nuchal scute, foreshortened plastron without epiplastral thickening, sexual dimorphism greatly favoring males, enlarged anterior and posterior shell openings, absence of bony cores to the forelimb scales, tendency towards saddleback shell form, and certain other traits, and establish a "natural" clade—as did Darwin (1839), subconsciously or consciously, when he utilized the name *Testudo indica* for the Galapagos tortoises, until he was corrected (Darwin 1845). But no modern systematist considers these groups to be closely related.

Sometimes extensively varying characters—and the genuinely binary character is unquestionably exceptional—can only be forced into the "either/or" or binary configuration favored by cladists after considerable verbal gymnastics. As an example of the ease with which carefully defined binary characters can be used to confirm one's preconceptions, those who would argue that the chelid turtle genus *Phrynops* was close to the genera *Hydromedusa* and *Chelus* might use the character of "neural bones present" to distinguish this group from the remaining chelid genera, in which neurals are usually lacking. On the other hand, *Phrynops*, that often has rather few neurals, shifts into the camp with *Elseya*, *Emydura*, *Chelodina*, *Rheodytes*, *Pseudemydura*, *Platemys* and *Acanthochelys* if one uses the slightly different criterion of "neural bones reduced."

In this same vein, Meylan (1987) (a friend and valued sparring-partner in academic debate) may have been correct in suggesting that the trionychids, carettochelyids, and staurotypine turtles formed a natural clade, but the characters he utilized to demonstrate this are clearly riddled with homoplasies, if not downright bogus.

They include the shared presence of a foramen intermaxillaris; of an anterior plastral hinge; and of the presence of 18 or fewer peripheral bones. Yet examination of the first of these indicates that the irregular opening in the premaxillary area of large adult staurotypines (and, incidentally, in many large adult chelydrid specimens also) is a direct result of the deep upper rhampothecal invagination (that accommodates the long mandibular "hook") penetrating the nasal capsule and eroding through the bone in this area. The foramen in trionychids, that lack a mandibular hook, is entirely different in nature, and is present at all ontogenetic stages, although barely expressed in such forms as *Chitra*. It may or may not be homologous to the foramen in carettochelyids, in which there is a vast, cavernous connection between the palatal area and the nasal capsule that combines the internal nares with the foramen intermaxillaris, but Meylan is certainly incorrect in claiming that the function of this foramen in *Carettochelys* is to accommodate a symphyseal hook. As may be seen upon inspecting a skull and mandible of this form, the hook is short, and when the mouth is closed the point of the hook rests against the underside of the (single) premaxilla rather than penetrating the foramen.

It is true that all members of this "clade" have 20 or fewer peripherals, as opposed to the 22 typical of other turtles. But to suggest that the presence of 20 peripherals in *Staurotypus* and in *Carettochelys* and of none in trionychids is a manifestation of the same phenomenon is untenable. The peripherals of trionychids (as Meylan himself states) almost certainly disappeared by progressive and simultaneous reduction or retardation of all elements in the series, until finally they failed to appear altogether. This is different in kind from the reduction of a series of 22 fully-developed peripherals to 20 fully-developed ones.

As to the use of plastral kinesis as a synapomorphy, this seems to be the most homoplastic character of all in the Order Chelonii, with an astonishing array of independently-derived hinges, cutting across the front, the middle, and the rear of plastra; across genera, across species, across sexes; and in many cases absent in juveniles and developing with ontogeny. The diversity of hinging just amongst the living chelonians is reviewed by Pritchard (1993). Clearly kinesis is highly adaptive, and can develop extremely easily, and it has occurred so many times—apparently to accommodate better protection of the extremities, to facilitate oviposition, to facilitate visceral displacement during neck retraction, to facilitate respiration, to allow the turtle to gape threateningly with head retracted, or just to reduce the otherwise straitjacket effect of the shell, that the wonder is that *any* turtles remain (like the minds of cladists?) in an unhinged condition.

vi) The "zeal of the newly converted" shown by the younger cladists is not just superficial, and their self-congratulatory posturing ("now we have a Formula!") seems to me to stem from the psychological urgency of their obsession with becoming practitioners of a "hard science" rather than being "merely" historians. Furthermore, they have convinced themselves that the available evidence (even the minuscule fragment to which they have access) is indeed adequate to reconstruct the details of the phylogenetic history of life on earth, or at least to present a "most probable" hypothesis that is sufficiently credible as to be worth presenting. Yet, just as one is about to launch a reasoned critique of an inane cladogram, they withdraw it anyway and present a completely different one. I know of no other example where adherents to a particular scientific procedure show so much confidence in a methodology and so little in its results. They argue that convergent cladograms utilizing independent data sets will show progressive asymptotic approach to what really happened historically; yet they seem unembarrassed, for example, by the fact that the cladograms derived from, say, turtle skull characters may be grossly different from those derived from shell characters. One or the other must be wrong, and they do not indicate which.

Just as the majority of people in virtually every culture on earth profess to know the basically unknowable when it comes to the nature of the afterlife—a result of their intense *desire* to know rather than of their actual knowledge—so the cladist claims unshakable faith in his interpretation of the forelife, as a manifestation primarily of his overwhelming personal *need* to know what has gone before, or of his dissatisfaction with having so much morphological, or even genetic, biochemical, or paleontological information, available without knowing what it all means. Yet this process can lead to conclusions so ambiguous as to be absolutely useless. For example, Frost (1992) was able to develop 36 equally parsimonious trees for his data on the genus *Tropidurus*, and found no fewer than 26,588 "unrejected trees" for the same data set. The traditional systematist must be forgiven for wondering how systematics are advanced by such a plurality of interpretations.

The cladistic process—the drawing up of "Rules" for the creation of a finished product called a "cladogram"—is an extraordinarily legalistic and formalized process, whose revealed truth is entirely dependent upon the accuracy of the assumptions discussed above. Cladistic guidebooks such as that of Brooks et al. (1984) are disconcerting in that the style, in its dogmatic assertion of the "Rules," reads more like the Koran than a work of science. Take a couple of shaky axioms, mix with some slightly subjective, or uncritically selected, characters, run it all through the computer, and the approximations and inaccuracies of the raw material are compounded with the wild guesses that one would have preferred not to have had to make into a conclusion that bears no relationship to objective truth. But because it came out of a computer, it is often assumed by the naive to represent

unchallengable insight. (Wiser cladists simply dump computer output that seems wrong or goes against their grain, and try again until the results parallel their preconceptions! I have seen them do it.)

True, the computer program itself does nothing more than speed up what may otherwise take weeks or months to do by hand. It is the digestion, the massaging, the wholesale disposing, of the data that is necessary before the computer can handle it that is the problem. We live in an age characterized by a preoccupation with relegating difficult decisions or intellectual functions to machines. This may be harmless enough in some cases — the use of calculators, spell-check features, translation machines, and other modern conveniences does provide a useful result quickly, and the principal down-side is that they characterize (or cause?) a generation that not only cannot calculate, spell, or translate, but even expresses arrogance about its inability to do these things when machines are available.

But the use of computer programs to make judgmental decisions, whether they be on phylogenetic relationships between organisms or on one's suitability for a college education, is more sinister in that the product is likely to be less accurate than "informed human judgment" would have been, yet it is portrayed as superior. It represents an abdication of the responsibility of accumulating insight and knowledge in favor of employing a briefly-trained technician with a computer program and a small amount of standardized information forced (sometimes kicking and screaming) into "format." As O'Rourke (1993) said, "there's a difference between information and knowledge. It's the difference between Christy Turlington's phone number and Christy Turlington."

The preparation of a cladogram is nonetheless reminiscent of one of my own favorite pursuits in biology, that of the careful application of a set of arbitrary rules to the creation of a work of art known as a Synonymy. There is joy in the patient application of the Rules of Priority; the rejection of non-binomial forms; the careful identification of nomina nuda, nomina oblita, nomina rejecta, nomina conservanda, and others; the smoking-out of ever-older, more obscure, and more inaccurate works of the past; the delight in discovering a century-old typographical error; the terse and standardized abbreviation of the titles of ancient works, so rare that even few libraries have them, as if they were in everyone's household, on every coffee table; the triumphant declaration that the name everyone has used for the last century must now be challenged by a completely unfamilar earlier one, or even better, a new one; above all, the labored and loving cataloging of ancient mistakes, for that is what a synonymy is—a literal and chronological catalog of errors, with one tentative line of truth somewhere at the beginning, middle, or end of the structure. It is fun to formulate such things, and you need to know your group and its literature well to do it well, and it is certainly scholarship. But it is not really science, and the things it regards as important, whether they be old publications or old specimens, generate no special insight into objective biology. A holotype, for example, is only important because we have decided that it is important—it was probably a thoroughly undistinguished representative of its taxon, or (even worse) may even have been unrepresentative or atypical.

The saving grace of a synonymy is its lack of pretention. It undertakes only to follow the Rules and to research the literature in cataloging man's historical errors, his slow footsteps towards truth. Moreover, the true systematics scholar can use the Rules, not to change well-established names, but to find legitimate reasons why such names should be retained despite the challenge that more obscure or less-used names seem to present.

But a cladogram is more sinister—it claims insight into biological and historical reality, even convergence upon absolute truth, although the little problem of multiple equally parsimonious cladograms nixes any claim of actual representation of absolute truth. Yet it too is simply the product of the application of far-from-absolute rules. Strange that competing cladograms for the same groups of organisms, presented as showing progressive or asymptotic approach to objective reality, show so much more diversity than do even the most elaborate independent synonymies for the same species! Strange—or perhaps not so strange—is that those ultimate guardians of biodiversity and evolutionary evidence, the curators of natural history museums, are amongst the last to respond to cladistic hypotheses with enough conviction to cause them to relabel their stock, or even the doors of their cabinets. Perhaps it is just a manpower shortage, or perhaps experience has taught them to wait for the dust to settle, which inevitably happens literally, but rarely figuratively.

Yet cladism is not useless. It was invented by an entomologist (Hennig 1966), and in this field the subject species outnumber systematics researchers by hundreds or thousands to one. The fossil record of insects is minuscule. Many insects can fly, and thus have potentially unlimited powers of dispersal, so zoogeographical considerations and isolation are rarely helpful. In the face of an indigestible plethora of morphological data on contemporary species, and little else, one needs some formalized procedure for getting a "first cut" on how the incredible diversity of species may be related to each other. But application of cladistics to smaller, better studied groups with abundant fossil records is a different matter.

The parallel I would draw is as follows. To a beginning student breaking into a new area of study, the best approach may well be to get a printout of titles of relevant papers from an appropriate computer database, to "apply the formula," and see what it yields. He will learn much, and may well think he has learned everything. But he will not, overnight, gain the insight of a veteran in the field, who knows the literature (and knows which papers are worthwhile and which are not), has extensive unpublished contributions and "gray literature" in his files, and has a lifetime of experience, insight, and extraction of information and ideas from a huge variety of sources. He also has a keen, and humble, realization of how little he actually knows, of the shortcomings of his knowledge, and will say "I don't know" without hesitation when circumstances so demand. The former is in the position of the cladist, the latter in the position of the evolutionary or traditional systematist.

In conclusion, and in the (translated) words of Laurent (1992), "after the storm of pheneticism more or less 20 years ago, we are now faced with the hurricane of cladism." One can almost hear Laurent's *sotto voce* murmur "this too shall pass." The opaque language of cladism has become the *lingua franca*, the unchallenged dogma, of many systematists. Curiously, concepts not only of organic evolution by mutation, but also of punctuated equilibria, of cladograms, even of nodes and of the alternative interpretations of nodes either as species that are ancestral to two or more other species, or as genera or other higher taxa, were all anticipated as early as 1832, by C. S. Rafinesque in a letter to Dr. J. Torrey of New York; they did not originate with Darwin, Eldridge and Gould, or Hennig.*

So too, the objections I have raised to cladism are, for the most part, not new—many have been raised by such luminaries as Ernst Mayr, George Gaylord Simpson, and Stephen Jay Gould—but I fear that the contemporary peer pressure by the Cladistic Police is such that a great number of systematists are loath to point out the emperor's shortage of clothes. But I for one propose to remain unClad.

*Rafinesque on evolution: "The truth is that Species and perhaps Genera also, are forming in organized beings by gradual deviations of shapes, forms, and organs, taking place in the lapse of time... This is a part of the great universal law of PERPETUAL MUTABILITY in every thing."

Rafinesque on punctuated equilibria: "There is a tendency to deviations and mutations through plants and animals of gradual steps at remote irregular periods."

Rafinesque on nodes and cladograms: "My last work on botany . . . will be on . . . the reduction of our Flora from 8000 to 1200 or 1500 primitive Sp. with genealogical tables of the gradual deviations having formed one actual Sp. . . . It is not impossible to ascertain the primitive Sp. that have produced all the actual; many means exist to ascertain it: history, locality, abundance, etc."

Rafinesque on whether nodes are species or higher taxa: "Almost every genuine or primitive species will be found to constitute a peculiar genus."

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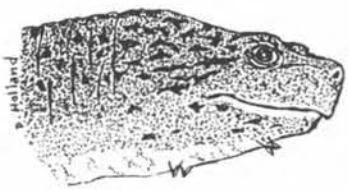
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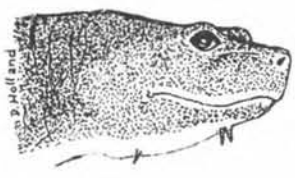
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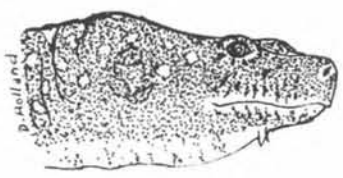
FOOTNOTES

[1]The doum, or gingerbread palm, of eastern Africa, notable for the trunk that divides dichotomously and geometrically into two, then four, then eight, and so on.

[2]Tumbleweed.







HERPETOLOGICAL HUSBANDRY

Double Clutching Gould's Monitors (*Varanus gouldii*) And Gray's Monitors (*Varanus olivaceus*) At The Dallas Zoo

It is well established that the normal reproductive mode for a large number of squamates includes the production of multiple clutches of eggs per season, both in the wild (Fitch 1970; Iverson 1978; Lewke 1979) and in captivity (Brecke et al. 1976; Cohen 1978; Greatwood 1978; Naulleau 1973; Romer 1979; Tryon and Murphy 1982), but this capability has not been well documented in varanids (Auffenberg 1988). This report describes double egg clutches in *Varanus gouldii* and *V. olivaceus* at the Dallas Zoo.

Females are introduced to males for short periods during the captive reproductive season. At the Dallas Zoo, introductions for both species are usually initiated in late January, coinciding with lengthening photoperiods and artificial rain cycles (*V. olivaceus*). Specimens are introduced biweekly for durations of several days until courtship or copulation is observed. Pairs are then left together until breeding activity stops.

One *V. gouldii* (SVL=69 cm, tail length=97 cm), and one *V. olivaceus* (SVL=108 cm, TL=169 cm) produced two clutches per year for two consecutive years. The pair of *V. gouldii* copulated in December 1991 resulting in a fertile clutch on 1 April 1992. Forty-two days later a second clutch was deposited (infertile). Copulation in January 1993 resulted in a fertile clutch on 19 March 1993. The female copulated again on 2 May, and deposited a second fertile clutch on 16 July 1993.

TABLE 1. Interval in days between copulation and clutch dates for *Varanus gouldii* and *V. olivaceus* at the Dallas Zoo.

First copulation date	First clutch date (interval)	Second copulation date (interval)	Second clutch date (interval)
V. gouldii			
29 December	1 April (91)	— (—)	12 May (42)
11 January	19 March (67)	2 May (44)	16 July (84)
V. olivaceus			
17 February	16 May (88)	— (—)	4 July (49)
? March	24 May (?)	9 July (46)	7 October (136)

The pair of *V. olivaceus* was observed copulating in February 1992 with subsequent oviposition on 16 May 1992. A second clutch was deposited (infertile) 49 days later. In March of the following year a copulatory episode resulted in a fertile clutch on 24 May 1993. Breeding behavior was again observed on 9 July and resulted in a second clutch that was deposited on 7 October 1993. A summary of clutch intervals is presented in Table 1.

During 1992 and 1993 a total of 33 eggs (28 fertile) were produced by one female *V. gouldii*, of which 21 hatched. A total of 28 eggs (8 fertile) were laid by the female *V. olivaceus*, of which one hatched. See Tables 2 and 3 for mean egg dimensions and neonate measurements.

TABLE 2. Egg morphometrics of *Varanus gouldii* and *V. olivaceus*.

Mean Diameter (mm)	Mean Length (mm)	Mean Weight (g)	# of Eggs
V. gouldii			
Clutch #1			
33.7	59.8	38.6	8
Clutch #2 (infertile)			
6.9	19.0	11.3	5
Clutch #3			
34.5	55.0	39.4	10
Clutch #4			
33.9	58.0	39.0	10
V. olivaceus			
Clutch #1			
37.2	60.2	49.0	8
Clutch #2 (infertile)			
10.4	16.5	17.0	4
Clutch #3			
39.0	61.5	42.4	8
Clutch #4			
38.0	60.0	43.2	8

TABLE 3. Morphometrics for neonate *Varanus gouldii* and *V. olivaceus*.

Mean SVL (mm)	Mean Tail Length (mm)	Mean Weight (g)	# of Neonates
V. gouldii			
Clutch #1			
131.0	180.0	36.0	8
Clutch #2			
—	—	—	0
Clutch #3			
135.2	182.0	37.8	5
Clutch #4			
129.5	180.4	37.0	9
V. olivaceus			
Clutch #1			
142.0	170.0	41.0	1
Clutch #2			
—	—	—	0
Clutch #3			
—	—	—	0
Clutch #4			
—	—	—	0

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Crotalidae

Porthidium COPE, 1871
Contributors : Dixon (see comment under *Bothrops*), Schätti, Smith

Porthidium Cope 1871b.
Type species : ***Bothrops nasutus*** Bocourt 1868 by subsequent designation (Dunn E.R. & Dunn M.T. 1940).
Atropos Rüppell 1845 *Atrops* Rüppell 1845 ***Atropus*** Müller J.W. 1865 ***Thanatophis*** Posada-Arango 1889b ***Thanatos*** Posada-Arango 1889b ***Lachesis*** Boulenger 1896a (part.) *Porthridium* Reyes et al. 1989 ***Atropoides*** Werman 1992 ***Cerrophidion*** Campbell & Lamar 1992
Range : central Mexico to Venezuela and Amazon basin of Peru and Bolivia
References : Campbell & Lamar (1989), modified by Schätti & Kramer 1993

Porthidium almawebi SCHAETTI & KRAMER, 1993
Porthidium almawebi Schätti & Kramer 1993.
Type locality : San Francisco de las Pampas (0°26'S, 78°57'W, Cotopaxi, alt. 1800 m).
Lachesis pulcher Boulenger 1896a (non ***Trigonocephalus pulcher*** Peters W. 1862c) ***Bothrops pulchra*** Amaral 1930c ***Bothrops pulcher*** Klemmer 1963 ***?Bothrops campbelli*** Freire-Lascano 1991
Range : Pacific slopes of Ecuador and Pacific lowlands of Colombia
Type : Muséum d'Histoire naturelle de Genève, 2248.12 (holotype)
Notes : 1) Campbell & Lamar (1989 and 1992) [illegible] under the name *Bothrops*

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Acknowledgments.— I would like to thank J. B. Murphy, L. A. Mitchell, C. M. Garrett, D. M. Boyer, D. T. Roberts, and M. W. Doles for helpful advice in the preparation of the manuscript.

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Ectopia Cordis In Hatchling *Alligator mississippiensis*

Ectopia cordis is an unusual developmental anomaly in which the heart protrudes through a congenital cleft in the ventral body wall (Cotran et al. 1989). We have noted this abnormality extremely rarely in hatchling American alligators *Alligator mississippiensis*, which either died during incubation or were likely to be non-viable at the time of hatching. During the alligator hatching season in August 1991 however, we observed several cases of this unusual anomaly in hatchling alligators which initially appeared to be otherwise strong and vigorous. We attempted to salvage these alligators and herein describe their courses.

In June 1991, approximately 25,000 alligator eggs were collected from marshes in southwest Louisiana and from Rockefeller Wildlife Refuge in Grand Chenier, Louisiana. The eggs were collected and incubated as previously described (Joanen and McNease 1977, 1987, 1989). Incubation temperatures were checked daily with bulb thermometers, and water and incubator temperatures monitored continuously with Taylor recorders. The average temperature was 31–32°C. The first clutch of eggs hatched on 6 August 1991 and the peak of hatching was 19 August 1991.

Alligator "A" hatched on 16 August 1991 and a small ventral body wall defect with protruding heart and pericardium was noted immediately (Fig. 1). The heart was beating in a regular fashion and the hatchling was quite vigorous—able to support its own weight, swim, and locomote normally. It was separated from other alligators in a plastic storage box tilted to provide an area of clean water and a dry resting area. The container was left in the incubator at 31–32°C to avoid any sudden change in temperature. Attempts were made to keep the container and water as clean as possible, with minimal disturbance to the hatchling. On 17 August 1991 the hatchling measured 25.0 cm in length, and weighed 50.6 g. By the morning of 18 August 1991 the alligator was much less vigorous, with less spontaneous movement, and continued to deteriorate throughout the day. The alligator was found dead the next morning. At necropsy a pericardial exudate was found, and the lungs appeared slightly atrophic and congested. The liver appeared unusually fatty and residual yolk mass was 7.7 g. Internal examination of the gonads showed the animal was a female.

Alligator "B" hatched on 18 August 1991 and was 25.5 cm in length, and weighed 46.4 g. The hatchling was treated and maintained in the same manner as alligator "A." It also appeared normal and healthy except for the ectopia cordis. However, the hatchling gradually deteriorated and on 19 August was becoming lethargic, had little spontaneous movement, and showed development of a thin pericardial film. The hatchling was found dead on 21 August 1991, though it had probably died on 20 August 1991. On necropsy what appeared to be a heavy pericardial fibrinous exudate was noted, though histopathology was not available. The lungs were slightly congested and atrophic. The liver and other abdominal organs appeared normal, and the residual yolk mass was 6.1 g. Internal and external examination showed the hatchling was a female.

Alligator "C" hatched on 23 August 1991. The hatchling was 25.5 cm long and weighed 49.2 g on 25 August. The hatchling was reasonably strong; it was able to support its weight, locomote, and swim normally. We believed that the development of the pericardial film may have compromised cardiac function or led to the development of pericarditis in the two hatchlings already described, thus we mechanically stripped off the gray pericardial material exudate in alligator "C" and the area was cleansed with betadine, an antimicrobial solution.

On 26 August the alligator appeared somewhat weaker. The pericardial material had reaccumulated, and was stripped and the area cleaned again. Despite these measures, the animal was found dead on 27 August. At necropsy the gray pericardial film was again noted, but the lungs were normal. The liver was moderately fatty, and the residual yolk mass was 8.3 g. Internal and external examination again revealed the hatchling was female. No attempts were made to feed alligators A, B, or C as we generally do not initiate feeding until hatchlings are three to four days old.

Three other alligators were hatched with ectopia cordis and multiple other defects. No attempts were made to sustain life, the animals were immediately euthanised.



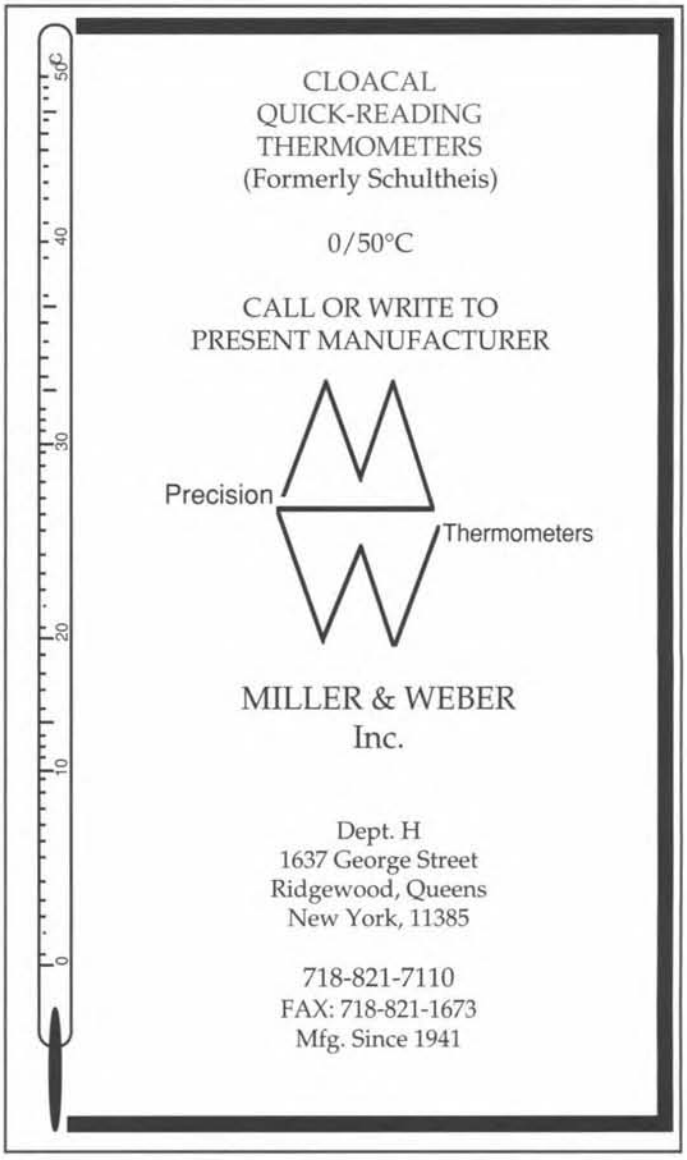
FIG. 1. Hatchling *Alligator mississippiensis* with ectopia cordis.

Alligator "D" had a large ventral defect with protrusion of the beating heart, stomach, fat body, and residual yolk. The weight was 45.9 g after formalin fixation. Alligator "E" also had a massive ventral cleft with herniation of the entire heart, and parts of the stomach, gall bladder, spleen, liver, and intestine. Other abnormalities included spinal scoliosis, hypopigmentation, and absence of the mandible. The weight was only 24.96 grams after formalin fixation. Alligator "F" had a massive yolk herniation in association with the cardiac defect and craniofacial abnormalities, including bilateral anophthalmia, and maxillary and mandibular malformation. The length was 15.5 cm and weight 28.1 g. Residual yolk mass was 11.0 g. A thick black material covered the exposed heart. The sex of alligator "F" could not be determined due to tissue necrosis; alligators "D" and "E" were females by cloacal examination of the clitoropenis.

Many congenital abnormalities have been described in reptiles (Bellairs 1981; Ewert 1979) and reptilian developmental anomalies were recently reviewed (Frye 1991). Ferguson (1985) reviewed developmental abnormalities of crocodilians including thoracoabdominal herniation, and the comparative anatomy of the crocodilian heart has been studied in detail (Webb 1979). We are not aware of previous descriptions of living alligators with ectopia cordis. A similar condition has been described previously in an eastern hog-nosed snake, *Heterodon platyrhinos* (Frye 1991). We are aware of only one other case of ectopia cordis in another crocodilian; Dr. G. Webb (pers. comm.) noted one case in approximately 31,000 *Crocodylus porosus* hatchlings examined; the animal was believed to be non-viable and was euthanised.

The pathogenesis of most reptilian developmental abnormalities is unknown; abnormally high or low incubation temperatures have been suggested as possible factors (Ferguson 1985; Frye 1991). Webb and Cooper-Preston (1989) noted more abnormal embryos developed at high incubation temperatures in *C. porosus*. It is of interest that all alligators in our series able to be sexed were females, as most crocodilians are known to have temperature dependent sex determination. We are unaware of any abnormal high/low temperatures incurred during incubation of the affected alligators, and temperature recordings were continuous on 24 h recorders.

The alligators in our study were probably too small to attempt surgical repair of the ventral defect. Further study is warranted as to the pathogenesis of reptilian developmental anomalies, particularly in the interest of commercial and conservation crocodilian farming and ranching programs, which incubate and hatch thousands of crocodilians worldwide annually.



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Observations Of Growth After Injury In The Slider Turtle, *Trachemys scripta elegans*

An abnormally shaped red-eared slider (*Trachemys scripta elegans*) was collected 31 July 1991 in Slate Creek, 3.2 km S of Wellington, Sumner Co., Kansas, T32S, R1W, Sec. 26. The specimen had a rubber "O" ring around its carapace and plastron which had restricted normal growth, and had formed this specimen into an hourglass shape (Fig. 1). Recovery from this type of induced deformity has not been reported previously. The purpose of this study was to determine whether the turtle's shell would return to normal shape by natural means once the "O" ring was removed. Additionally, the effect of this constriction on the turtle's skeletal development was investigated.

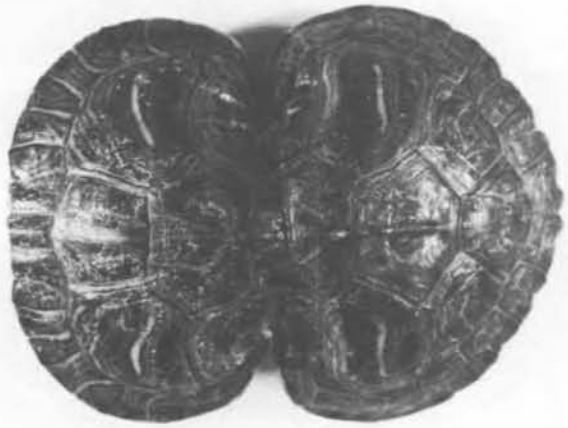


FIG. 1. Photograph of observed specimen after "O" ring was removed.

The study was carried out between November 1991 and October 1992. Age of this male specimen, determined by counting growth annuli on the carapace (Zug 1991), was seven years at the beginning of the investigation. The turtle was kept in captivity, and food, temperature, and light were maintained as near to normal conditions as possible. The turtle was not exposed to a winter cooldown however, as it was believed this would hamper potential for growth during the short time period of this study. Air temperature was held between 20 and 25°C, with a basking site of 32–38°C. Infrared heat lamps were used in combination with fluorescent and filtered natural lighting. No dietary supplements or other artificial growth enhancements were used. Food was varied to keep with the omnivorous habits of *T. scripta* (Parmenter and Avery 1990). Diet included live and frozen native fish, live goldfish, invertebrates, plant matter, and a carrion substitute (stewing beef).

For the first 28 days, weekly measurements were made by ruler, as follows: carapace length (CL), carapace total width front (CTWF), carapace total width rear (CTWR), restricted carapace width (RCW), and plastron length (PL) (Fig. 2). Subsequent measurements were made on a monthly basis. Two radiographs were taken on 6 November 1991, a lateral view and a superior view through the dorsal surface. Another set of radiographs was taken on 14 October 1992 using the same technique to allow comparison and to check for growth in the specimen. Body depth measurements were made from the radiographs from top of carapace to bottom of plastron for the anterior (ABD), posterior (PBD), and constricted (CBD) regions. Other measurements of skeletal structure were length of right femur, distance between pelvic and shoulder joints along the midline, and width of skull.

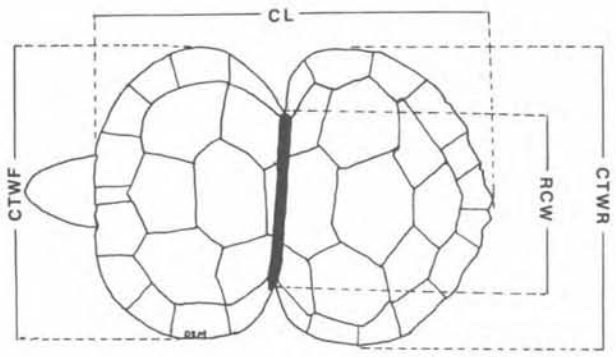


FIG. 2. Regions measured on *Trachemys scripta elegans* specimen.

During the initial 28-day period, no measurable growth occurred. When final measurements were taken on 14 October 1992 (see below), some changes had occurred, but no differences were noted in measurements of the right femur, distance between shoulder and pelvic joint along midline, width of skull, or CTFW. Measurements (in mm) taken 6 November 1991 and 14 October 1992 (343-day interval) are as follows: CL 121/129, CTWR 94/96, RCW 41.5/43, PL 117/122, ARD 45/47, PBD 44.5/48, CBD 33.5/38.

Very little growth occurred over the period of 343 days in which observations were made, nor did the carapace and plastron return to normal shape. In a study of two *T. scripta* populations, Cagle (1946) reported that adult male turtles had an average increase of 2.7 mm PL per 100 days of growing season. The specimen in this study had an average increase of 1.5 mm PL per 100 days. Observations showed that the shell deformity did not seem to inhibit food consumption, digestion, or motility. Radiographs of this specimen showed no indication of internal structural deformity other than a slightly depressed spinal cord at the point of constriction.

Dunham and Gibbons (1990) monitored growth of three populations of known age specimens of *T. scripta*. The average PL for 10-year-old males was 162.6 mm and the average for five-year-old males was 143.6 mm. Based on their results, the average size of an eight-year-old male would be approximately 155 mm PL. This can be compared with 122 mm PL of the study specimen.

One possible explanation for slow growth rate in this specimen is that growth was limited during the period of observation due to captive maintenance. Individuals kept in captivity often do not attain the size of specimens in the wild.

Another possibility is that the depressed spinal cord shown in the radiographs influenced growth rate by affecting the central nervous system (CNS). This prospect is less likely because such damage would be indicated by sensory and motor abnormalities in the rear limbs, none of which was observed. Slow growth of the shell around the "O" ring would cause the spinal cord to grow with the shape of the shell, thus inducing a re-routing of the CNS rather than a directly interfering injury.

A third explanation for the slow growth could be that the specimen was similar to that of 29% of males (100–110 mm PLs) in Cagle's (1946) study which showed only slight growth during his investigation. It may be that this specimen had a naturally lower than average growth rate. Further, Legler (1960) suggested that growth may temporarily cease in *Terrapene ornata* following injury. Thus, constriction of this turtle's shell could have slowed growth rate of this individual.

Acknowledgments.—I thank David Edds for his assistance, helpful comments, and criticisms throughout this project, and J. E. Simmons for encouragement, comments, discussion, and for graciously providing requested material. I also thank P. Shipman and T. Lindskog for making this turtle available for study. This specimen was collected during research on aquatic turtle assemblages funded by a grant from the Emporia State University Faculty Research and Creativity Committee and by a Chickadee Checkoff grant from Kansas Department of Wildlife and Parks' Nongame Wildlife Improvement Fund.

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NATURAL HISTORY NOTES

Instructions for contributors to Natural History Notes appear in volume 25, number 1.

ANURA

BUFO BOREAS (Western Toad). **PREDATION.** *Bufo boreas* is prey of *Corvus corax* (common raven) in Oregon, USA (Olson 1989. Copeia 1989(2):391–397). Based on Olson's description of the carcass remains, Corn (1993. Herpetol. Rev. 24(2):57) reported finding similar remains of *B. boreas* in Colorado, USA and suggested predation by the same species. This note documents predation on *B. boreas* by *Corvus brachyrhynchos* (American crow).



FIG. 1. *Bufo boreas* carcass after feeding by *Corvus brachyrhynchos*

On 13 and 14 April 1991, I observed two *C. brachyrhynchos* pecking at live toads at the water edge of a 0.05 ha pond located in Sec. 32, T4N, R4E, Boise Co., Idaho, USA (elevation 987 m). On 14 April binoculars were used. One crow dragged an adult *B. boreas* from the water. It then forcefully pecked the toad repeatedly. Following series of pecks, the crow wiped its beak on the ground. The crow repeatedly turned the toad on its back. Initially, the toad would right itself. After a few more forceful pecks, the toad would be overturned again. When the toad did not right itself, pecking commenced on the underside. Feeding began when the crow had pecked a hole through the toad's venter. Entrails were pulled out



FIG. 2. View of the underside of a *B. boreas* (as it was found when feeding by *C. brachyrhynchos* was interrupted) revealing puncture wounds and an opening made for feeding.

and consumed. Periodically, the second crow would feed on the toad. After eating the entrails, the crows fed on muscle tissue of the body and limbs through the hole, making it progressively larger. The remains of the toad carcass appeared to have been turned inside out and dismembered, with much of the skin intact (Fig. 1). Two other toad carcasses were found at the site and the remains were similar. Oviducal egg masses of a female were not consumed. On 7 April 1993, two crows again fed on an adult *B. boreas* at the same pond. They were disturbed before consuming much of the toad. The toad carcass revealed early feeding signs, including beak puncture marks (Fig. 2). These observations suggest that *C. brachyrhynchos* may also be an important predator of adult *B. boreas*.

Submitted by **DONALD R. BROTHERS**, HC 33, Box 1176, Boise, Idaho 83706, USA.

BUFO MARINUS (Marine Toad). **FEEDING BEHAVIOR.** Since introduction on Guam, Mariana Islands in 1937 (Chernin 1979. unpubl. MS thesis, Univ. Guam, 56 pp.), populations have reached substantial densities and are currently viewed as a pest species (McCoid 1993. Herpetol. Rev. 24:16–17). Marine toads are ubiquitous on Guam and can reach mean population densities as high as 225 toads/ha at certain sites (Chernin, *op. cit.*). Opportunism in feeding of extralimital urban dwelling *B. marinus* has been documented (Alexander 1965. Herpetologica 20:255–259; Tyler 1989. Australian Frogs. Viking O'Neill Publ., Ringwood, Victoria, 220 pp.). Alexander (*op. cit.*) observed feeding on kitchen scraps and canned dog/cat food in Florida and Tyler (*op. cit.*) observed feeding on dog food in bowls in Australia. To these extralimital feeding events, I add observations from Guam. Over a several month period in 1990, while a dog was being raised on Division of Aquatic and Wildlife Resources (DAWR) property, a number of *B. marinus* would gather daily, immediately after dried dog food was poured into a bowl. A group of at least six (sex unknown) toads (estimated SVL 7–10 cm SVL) would gather at the bowl after the food was poured, generally beating the dog to the food. Upon

arrival of the dog, toads would withdraw < 1 m and resume feeding only after the dog had departed. Toads would space themselves equally around the bowl and feed on the dried dog food by flicking their tongues into the food and drawing a piece into their mouths. This spacing has been observed in a native population exploiting a shared food source and was termed a "snap zone" (Zug and Zug 1979. Smithson. Contrib. Zool. 284, 58 pp.). Presumably, by equal spacing, overlapping snap zones would be minimized and toads would be able to share a resource area (Zug and Zug, *op. cit.*). Previous field and laboratory studies of snap zones used animate objects as targets; observations presented here suggest the use of snap zones with inanimate prey.

Zug and Zug (*op. cit.*) suggested that *B. marinus* learn to eat stationary food. An additional observation on Guam also indicates that toads attempt to ingest unusual inanimate prey. During an outdoor barbeque at which revelers casually discarded bones on the lawn, at least one *B. marinus* was photographed hopping off into the underbrush with a pork rib bone protruding from its mouth.

I thank Robert A. Anderson (DAWR) for supplying photographs of the pork rib incident. Rebecca Hensley reviewed a draft of the manuscript. Portions of this study were supported by the Endangered Species Conservation Program, Project E4.

Submitted by **MICHAEL JAMES MCCOID,** Division of Aquatic and Wildlife Resources, P. O. Box 2950, Agana, Guam 96910, USA. Present address: Caesar Kleberg Wildlife Research Institute, Texas A&M–Kingsville, Kingsville, Texas, 78363, USA.

HYLA MINUTA (NCN). **PREDATION.** Metamorphosing anurans are common prey for a variety of vertebrate and invertebrate predators (Duellman and Trueb 1986. Biology of Amphibians. McGraw-Hill, New York. 670 pp.). Although aquatic invertebrates represent important predators for some hylid tadpoles, there are few reports of predation on adults (Hinshaw and Sullivan 1990. J. Herpetol. 24:196–197). Herein, we report predation by a spider and a water bug of a metamorphosing and an adult (respectively) neotropical hylid frog, *Hyla minuta.*

On 1 August 1992 at 2015 h (air temperature 18°C), we found an adult male *H. minuta* (21.8 mm SVL) on the edge of a temporary pond in São Mateus (18°42'S; 39°1'W), State of Espírito Santo, Brazil. that was being eaten by the water bug *Lethocerus delpontei* (58.9 mm body length). The water bug held the treefrog by the back with its raptorial forelimbs. Males of *H. minuta* usually call from branches of emergent vegetation or the ground close to the water. These calling sites expose the treefogs to invertebrate predators.

On 10 February 1993 at 2200 h (air temperature 19.5°C, water temperature 22°C) in a permanent pond at Ribeirão Branco (24°13'S; 48°46'W). State of São Paulo, Brazil, there was a large number of newly metamorphosed *H. minuta* (mean TL = 24.9 mm total length, N = 17) on vegetation near the water. We found a spider *Dolomedes* sp. (15.3 mm cephalothorax and abdomen length), perched on a rush 50 cm above the water, eating a metamorph *H. minuta.* The water bug and the spider are preserved in the Museu de História Natural (ZUEC. without numbers), UNICAMP.

We thank A. S. Abe, C. F. B. Haddad, and A. d'Heursel for suggestions on text, J. Vasconcellos-Neto and E. Gianotti for identifications of the spider and the water bug, respectively, to the CAPES and CNPq, to the ARACRUZ CELULOSE S. A. (Projeto Sapé do Norte I) and FAPESP for financial support (C. F. B. Haddad, proc. 92/0631–2) .

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LEPTODACTYLUS OCELLATUS (Rana criolla). **PREDATION.** Reviews of the evolution of parental care in frogs cite *Leptodactylus ocellatus* as one of a few documented cases where a female guards a school of tadpoles. Vaz-Ferreira and Gehrau (1975. Physis 34:1–14) speculated that females protect the tadpoles from avian predators. However, natural avian predation on tadpoles has never been confirmed.

On 19 February 1993, at 0925 h we observed natural predation by six great kiskadees (*Pithangus sulphuratus*) on a school of unattended *L. ocellatus* tadpoles. The tadpoles were in a dense aggregation partially hidden by vegetation in the center of a 4 x 2.5 m shallow (< 30 cm deep) temporary pool near Arroyo del Toro Muerto in Flor Serrana, Province of Cordoba, Argentina.

The birds landed either on a small island in the pond or perched on a fallen tree near edge of the pond and flew to the aggregation, captured tadpoles and returned to the tree or island where they ingested them. Although the individuals alternated between capturing and feeding on the tadpoles, two or three different birds fed constantly on tadpoles.

We found several dead tadpoles in premetamorphic stages 40 to 41 (Gosner 1960. Herpetologica 16:183–190) ranging from 41.2 to 48.3 mm in total length. Remains of numerous tadpoles' intestines indicated that the kiskadees were feeding.

Leptodactylus ocellatus tadpoles form conspicuous, tightlypacked aggregations that move constantly, making the entire school noticeable to predators requiring visual cues. Such aggregations could be related to the distastefulness of the individuals (Wassersug 1973. *In* J. L. Vial (ed.), Evolutionary Biology of the Anurans, pp 273-297. Univ. Missouri Press, Columbia). However the present observation does not support this hypothesis.

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RANA PRETIOSA (Spotted Frog). **REPRODUCTION.** On 23 March 1993 in the Bishop Springs Marsh complex, Snake Valley, Millard County, Utah, a 49 mm snout-vent length (SVL) male spotted frog (*Rana pretiosa*) and a 52 mm SVL female leopard frog (*R. pipiens*) were observed in amplexus. The frogs were observed in an 8 m x 14 m pool within a spring-fed marsh complex. The water temperature was 19.5°C and the air temperature was 27°C. A second *R. pipiens* (23 mm SVL) and 23 *R. pretiosa* egg masses were also observed nearby. Egg masses of *R. pretiosa* had some eggs exposed above the water surface, were unattached to vegetation (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co. Boston, Massachusetts. 336 pp.), and consisted of at least twice the gelatinous material as those of *R. pipiens*. Egg masses of *R. pipiens* were deposited in dense, firm clusters, attached to vegetation, and did not float above the water surface. We found no previous reports of interbreeding between *R. pretiosa* and *R. pipiens*, but *R. pretiosa* hybridizes with *R. cascadae* in Oregon (Green 1985. Herpetologica 41:262–267) and with other ranid frogs in the laboratory (Dumas 1966. Copeia 1966:60–74; Haertel and Storm 1970. Herpetologica 26:436–446). An evaluation of the magnitude and significance of interbreeding between these two species in Snake Valley requires further study. We thank P. S. Corn and P. Hovingh for reviewing this note.

Submitted by **DAVID A. ROSS, DAVID W. KUEHN,** and **MARK C. STANGER**, Native Wildlife Section, Utah Division of Wildlife Resources, 1596 West North Temple, Salt Lake City, Utah 84116-3195, USA.

RANA UTRICULARIA (Southern Leopard Frog). **ROAD MORTALITY**. Investigators conducting surveys of road-killed vertebrates generally encounter few amphibians (e.g., Christoffer 1991. Florida Sci. 54:65–68; McClure 1951. J. Wildl. Manag. 15:410–420; Scott 1938. Amer. Midl. Nat. 20:527–539). This is undoubtedly due to the small, relatively fragile body of amphibians which is easily overlooked, readily obliterated by vehicular traffic, and quickly consumed by predators. Furthermore, road-kill surveys are typically performed diurnally, a time of reduced amphibian activity (Pechmann and Semlitsch 1986. Can. J. Zool. 64:1116–1120), as well as from a moving vehicle, a perspective from which amphibians are often overlooked (pers. obs.).

This paper details anectodal observations of road-killed *Rana utricularia* metamorphs adjacent to a semi-permanent pond approximately 2.7 km N of Blountstown, Calhoun County, Florida (TlN, R8W, Sec. 20) on 19 April 1991. The 1.2 ha pond is within a developing subdivision. Approximately one half of the pond is surrounded by an open field dominated by weedy graminoids, the other half by a stand of mature *Quercus virginiana* (live oak), *Q. nigra* (water oak), and *Nyssa sylvatica* (black gum). Observations were made along 0.3 km of a 5 m wide, dead-end, clay-sand road which passes within 8–20 m of the east-southeast end of the pond.

Mortality of emigrating *Rana utricularia* from vehicular traffic was assessed by slowly walking and scanning the road surface with the aid of a headlamp between 2115 and 2145 h. The road was wet from a late afternoon thunderstorm. All living and freshly-killed metamorphs encountered were collected and counted. Live metamorphs were released. The mean wet-mass body weight of eight intact dead metamorphs was 4.65 g (measured with a Pesola spring scale). The air temperature at ground level was 19.8° C and the surface water temperature near shore was 21.8° C.

I counted 74 (57%) living *Rana utricularia* metamorphs and 55 (43%) dead. Emigration of metamorphs did not begin until sunset; therefore emigrants were exposed to an undetermined number of passing vehicles for approximately one hour. The number of frogs killed by vehicular traffic seems high considering that the road is a dead-end and only twelve families live beyond the pond. However, since *R. utricularia* migrate principally after dark (Pechmann and Semlitsch, *op. cit.*), a migration pulse is likely immediately after sunset, resulting in a relatively high emigration rate.

The percentage of emigrating frogs killed is probably inflated because some frogs may have successfully crossed the road prior to my arrival. Some dead frogs also may have been undetected because they were generally flattened to the level of the road surface and did not attract attention by movement. Still, frog mortality can be high during migration periods on a lightly traveled secondary road when the road is adjacent to a breeding pond.

The published rates at which frogs are killed on roads as determined by diurnal road cruising can be misleading. For example, *Rana pipiens* was killed at the rate of 0.002 frogs/km (Scott, *op. cit.*); McClure (*op. cit.*) found 0.0008 frogs/km; and Christoffer (*op. cit.*) found one *Bufo* killed (.0002 frogs/km). Diurnal estimates imply that vehicular traffic is not a threat to frog populations. Surveys of anuran habitat under meteorological conditions conducive to frog movement reveal a much different picture. Immediately following a storm, Scott (*op. cit.*) observed 10 dead frogs/m^2 along 0.8 km of highway adjacent to a marsh. Gelder (1973. Oecologia 13:93–95) recorded the death of 122 *Bufo bufo* along 1.5 km of road near breeding ponds in 84 nights of observation. My observations document the death of 55 *Rana utricularia* metamorphs along 0.3 km of road adjacent to a pond. These results underscore the need to assess the mortality of amphibians on roads nocturnally under proper meteorological conditions. Although quantitative data regarding the impact of vehicular traffic on amphibians is available for some European species (Langton 1989. Amphibians and Roads. ACO Polymer Products Ltd., Bedfordshire, England), few data are available for North American amphibians. Better understanding of the effect of vehicular traffic on amphibian populations will require nocturnal surveys, particularly during, or immediately following, precipitation, and surveying on foot.

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CROCODYLIA

ALLIGATOR MISSISSIPPIENSIS (American Alligator). **NESTS**. We discovered two unusually constructed alligator nests at Brazos Bend State Park, Fort Bend Co., Texas during 1992. Alligators typically build terrestrial mound nests composed of plant material and soil. One nest found on 29 July possessed an egg cavity completely below ground level. The nest measured 31.8 cm at its highest point, and the uppermost egg was 7.6 cm below ground level. It was composed primarily of soil mixed with some sticks and finer plant material. Although we documented four nests that were lower in height, none had eggs in a subterranean cavity. A nest discovered on 30 June was unusual in that it was built on a pile of logs surrounded by water. A previous study of nesting at the park showed that islands were preferred nesting sites over banks (Hayes-Odum et al. 1993. Texas J. Sci. 45:51–61). However, islands used for nesting were well defined areas of land many times larger than the nests. This pile of logs extended >l m out of the water, and thus afforded substantial protection from flooding. Nest material consisted of grass, leaves, and soil.

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TESTUDINES

CARETTA CARETTA (Loggerhead Sea Turtle). **DIURNAL NESTING**. Among the sea turtles, diurnal nesting is well known in only the Kemp's Ridley, *Lepidochelys kempi*, and occasionally in the Olive Ridley, *Lepidochelys olivacea*, especially during peak arribadas (Pritchard et al. 1983. Manual of Sea Turtle Research and Conservation Techniques. Center For Environmental Education, Washington, D.C. 126 pp.). During the 1992 and 1993 nesting seasons, researchers on Wassaw National Wildlife Refuge, Chatham County, Georgia were fortunate to view two loggerhead sea turtles (*Caretta caretta*) which nested during daylight hours.

On 23 June 1992, an untagged loggerhead possessing no previous signs of tagging (CCL=101.0; tags: QQP768, QQP784, 0000158E46) was found as it emerged from the surf at 1300 h on Wassaw Island. The turtle emerged just prior to high tide, crawled above the high water mark, and nested. The day was sunny and notably hot (ca. 35°C). The turtle was seen again during two additional nesting visits in the 1992 season, both of which occurred at night.

On 1 July 1993, a loggerhead tagged during a previous season (CCL=102.0 cm; tags: QQB144, QQZ077, 00001582BA) emerged from the water at 1645 hours. As in the previous case, this turtle also emerged just prior to high tide, crawled up the beach, and nested on this sunny, hot day. This turtle had been observed on two other nesting crawls during the 1993 season, both of which were at night.

TABLE 1. Observations of diurnal nesting of *Caretta caretta*.

Source	Number	Time	Location
Caldwell et al. 1959. Bull. Florida State Mus. 4:295–308.	3	dawn–0905 h	South Carolina Georgia, Florida
Fritts and Hoffman. 1982. J. Herpetol. 16:84–86.	7*	0540–1930 h	Florida
Bustard, R. 1973. Sea Turtles, Their Natural History and Conservation. Taplinger Publ. Co. 220 pp.	Several	1630–1725 h	Australia
LeBuff, C. H., Jr. 1990. The Loggerhead Turtle in the Eastern Gulf of Mexico. Caretta Research Inc. 216 pp.	2	1130 h, 1140 h	Florida

*One *Chelonia mydas* was also observed nesting in daytime during this study.

Some authors (Bustard 1973. Sea Turtles, Their Natural History and Conservation. Taplinger Publ. Co.; Fritts and Hoffman 1982. J. Herpetol. 16:84–86) suggested daytime emergences are timed with high tides. In the two examples of diurnal nesting on Wassaw Island reported here, the turtles emerged approximately 45 min prior to high tide. However, other turtles have been observed through the years on Wassaw during twilight hours of the day or night, either beginning or ending their land activities in full daylight. One such example was an untagged loggerhead found on 22 June 1985 at 0547 h as she emerged from the water, one hour after the tide had begun to flood. After crawling about 85 m, the turtle (SCL = 91.0 cm; tags: GA6791; GA6815) began digging a nest at 0602 h and did not return to the water until well after daylight.

On Wassaw Island, one out of 139 (0.72%) crawls in 1992 and one out of 57 (1.75%) crawls in 1993 were confirmed as diurnal. Observations by other researchers (Table 1) confirm that diurnal nesting behavior in loggerheads is extremely rare.I thank the U.S. Fish and Wildlife Service, the Wassaw Island Trust, and the Skidaway Island Boat Club for their continued help and support of the Caretta Research Project. Special thanks is extended to all the volunteers who participated in this program since its inception in 1973.

Submitted by **ROBERT A. MOULIS**, Savannah Science Museum, 4405 Paulsen Street, Savannah, Georgia 31405, USA.

CARETTA CARETTA (Loggerhead Sea Turtle). **PREDATION**. Marine turtles are threatened throughout the world by various biotic and abiotic factors, either natural or man-induced, including incidental catch, pollution, disappearance of suitable nesting sites, and predation. At nesting beaches predation is generally limited to eggs and hatchlings (Frazer 1992. Cons. Biol. 6:179–184; Pritchard 1980. Amer. Zool. 20:609–617). Mortality of nesting females by large terrestrial predators has been documented rarely. This note reports predation of nesting female loggerhead turtles, *Caretta caretta* by golden jackals.

During June–August 1991 and June–September 1992 we studied the loggerhead population breeding on the beaches of the Göksu Delta, on the Turkish Mediterranean coast, 80 km west of Mersin. Based on the numbers of nests observed during daily beach patrols and assuming an average clutch frequency of 3 nests per female per season (Frazer and Richardson 1985. Herpetologica 41(3):246–251; Talbert et al. 1980. Copeia 1980(4):709–718), we concluded that in the Delta 45 (1991) and 35 (1992) *C. caretta* had nested. In both years several nesting females were killed by large canid predators. These females, 4 in 1991 and 3 in 1992, represented approximately 10% of the nesting females in each year.

All evidence clearly indicated that the predator involved was the golden jackal, *Canis aureus*. Although predation was never observed by us, numerous canid footprints, all of jackal shape and size, were found around dead females. The delta supports a population of golden jackal (D.H.K.D. 1992. Towards Integrated Management in Göksu Delta, a Protected Special Area in Turkey, Feasibility Report. Istanbul. 272 pp.), and additionally, local fishermen claimed to have observed jackals attacking sea turtles on the beach.

The female turtles were usually killed soon after emerging from the sea, even before the start of nest excavation. Tracks and prints at the sites indicated that the jackals operated either alone or in groups of a few individuals, and that turtles were often killed after a short struggle. They were attacked at the neck and opened via the shoulder, through which some of the viscera were removed. Several carcasses were thoroughly cleaned out, others only partly devoured and one individual was left almost intact.

Predation of adult sea turtles by terrestrial predators has never been reported before in the Mediterranean. Worldwide, only few anecdotal or speculative data are available and the impact on turtle populations is thought to be minimal (Márquez 1990. FAO Fisheries Synopsis. No. 125, Vol. 11. Rome. 81 pp.; Stancyk 1982. *In* K. A. Bjorndal (ed.), Biology and Conservation of Sea Turtles, Washington D.C., pp. 139–152). However, withdrawal of reproductive females has a relatively large impact on a population and the effect of jackal predation on this vulnerable *C. caretta* population could be profound if it continues on this scale tor several years.

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CHELONIA MYDAS (Green Turtle). **PREDATION**. During a three month sea turtle tagging and monitoring program in 1991 on Gielop Island (9°56'N, 139°54'E), Yap State, Federated States of Micronesia, coconut crabs (*Birgus latro*) were observed feeding on naturally emerged hatchling green turtles. In addition, coconut crabs were found preying on green turtle hatchlings which had surfaced into open-top nest enclosures. One could periodically observe one or two coconut crabs a night, sometimes for several nights in a row, eating hatchling green turtles.

Coconut crabs were not observed to burrow down to nest eggs, as has been noted in the Seychelles Islands by Honegger (1967. British J. Herpetol. 4:8–11). However, coconut crabs were frequently sighted scavenging sea turtle eggs which were strewn from previously laid nests by nesting green turtles.

Other observed land predators of hatchling green turtles at Gielop Island include ghost crabs (*Ocypodes* sp.) and hermit crabs (Paguridae).

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GRAPTEMYS GEOGRAPHICA (Common Map Turtle). **PARASITES**. On 28 June 1993, an adult female *Graptemys geographica* was captured by hand as it foraged in 250 mm of water. The capture site was on the northern edge of Sand Point, Bellows Bay, Ottawa River, Westmeath Tp., Renfrew Co., Ontario, Canada. The turtle was host to six leeches. Three of the leeches were the commonly encountered turtle leech *Placobdella parasitica* (ROMIZ I2188). The remaining three leeches were *Placobdella ornata* (ROMIZ I2187). This is the first observation of parasitism by *P. ornata* on *G. geographica*. One of the *P. ornata* was attached to the ventral surface of the marginal scute located immediately posterior to the left plastral bridge. The second *P. ornata* was affixed to the bottom of the turtle's left posterior foot. The last *P. ornata* was similarly placed, but on the right posterior foot. All three *P. parasitica* were found in the posterior axial area, on the integument anterior to the limbs.

On 25 August 1993, a juvenile *G. geographica* (CL=91.55 mm; CW=78.35 mm; Pl=79.5 mm; PW=40.25 mm) was captured in a hoop trap at the Big Creek National Wildlife Area, Long Point, Haldimand-Norfolk Co., Ontario, Canada. Only one *P. ornata* (ROMIZ I2186) was found attached to this specimen. The leech was affixed to the right femoral scute of the turtle.

On 26 May 1993, five adult female, two male, and three other small *G. geographica* were observed basking on a single large boulder in 450 mm of water on the north shore of the Ottawa River, 1.5 km S. and 2.0 km E. of the eastern most tip of Cranson Lake, L'Ile-aux-Allumettes Tp., Pontiac Co., Québec, Canada. All turtles dove off the rock upon being approached. A *P. ornata* (ROMIZ I2185) was found on the boulder moving at a rate of 2.2 mm/s to the water's edge in bright sunlight, on a dry substrate. This is the second report of a leech becoming separated from its host during thermoregulation (Vogt 1979. Auk 96:608–609).

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SAURIA

CRYPTOBLEPHARUS POECILOPLEURUS (Snake-eyed Skink). **ACTIVITY**. Crombie and Steadman (1986. Pac. Sci. 40:44–57) characterized the species, in the Cook Islands, as preferring sunny habitats, being strictly diurnal and active between 0800 and 1700 h. McCoid and Hensley (1993. Herpetol. Rev. 24:87–88) reported nocturnal behavior under special conditions. Herein, we report on emergence times and activity periods for a population of *C. poecilopleurus* from Cocos Island, a small atoll (37 ha) 2 km south of Guam, Mariana Islands. The population on Cocos Island is entirely arboreal and primarily found in *Casuarina equisetifolia* (Australian Pine) groves. Activity surveys (N = 6, 1989–1990) were begun before dawn and generally continued until approximately 1000 h, with occasional surveys (N = 4) made at sunset. Temperatures ranged daily between 22° and 33°C. On clear to partly cloudy days, emergence of the skinks occurred at dawn (0630 h) and they were found < 1 m from the ground in sunlit areas on bases of trees. By 0900 h, lizards could be observed on bases of trees, up to 2 m from the ground, and by 1100 h, they could be observed foraging over the entire tree, as high as 10 m. Approaching sunset (>1600 h), the *C. poecilopleurus* returned to the ground and basked in sunlit areas near the base of the trees. These observations suggest that nocturnal refugia were at bases of occupied trees, probably beneath loose bark or in root masses. On cloudy days, emergence might be delayed for one to two hours, or until air temperatures reached 26–28°C. On windy days (estimated 32–50 kph), emergence might also be delayed about an hour. Tropical Storm conditions (>72 kph wind) suppressed emergence. Rain suppressed emergence, or forced early retreat to refugia. Occasional light showers did not appear to affect activity. *Cryptoblepharus poecilopleurus* was also observed to be consistently spaced on occupied trees. Usually one, and never more than three *C. poecilopleurus*, were observed on a single tree; trees with trunk diameter >2.5 cm usually were occupied. Placement of several individuals into a single bag always resulted in the loss of tails of all the individuals. They would continuously fight unless sufficient detritus for refugia was also placed in the bag. Interaction with other species of scincids in the same bag was not noted, however. This intraspecific aggression may account for the observed spacing of free-living *C. poecilopleurus*.

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ELGARIA KINGI (Arizona Alligator Lizard). **SIZE**. On 30 July 1992 at 1936 h, I captured a large male Arizona alligator lizard (*Elgaria kingi*) in the Camp Geronimo Boy Scout Preserve, Gila County, 6 km east of Pine, Arizona. This specimen (Arizona State University Herpetology Collection #29011) measured 133 mm SVL, 114 mm tail length, and weighed 37.5 g. In my measurements of >400 alligator lizards throughout Arizona, this was the largest specimen ever encountered. Both Stebbins (1985. A Field Guide to Western Reptiles and Amphibians, 2nd Ed, Houghton Mifflin Co, Boston, Massachusetts, 336 pp.) and Smith and Brodie (1982. A Guide to Field Identification Reptiles of North America, Golden Press, New York, 240 pp.) list the maximum SVL of *E. kingi* as 125 mm and 127 mm, respectively. Both listings are substantially less than the 133 mm SVL of this specimen from Camp Geronimo.

Submitted by **ROBERT W. BOWKER**, 2030 E. Colgate Dr., Tempe, Arizona 85283, USA.

SCELOPORUS MAGISTER (Desert Spiny Lizard). **CANNIBALISM**. Although *S. magister* is commonly reported to include other lizards in its diet (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Company, Boston, Massachusetts. 336 pp.), the literature contains few specific references. Vitt and Ohmart (1974. Herpetologica 30(4):410–417) reported one juvenile *Cnemidophorus tigris* among 1897 prey animals found in the stomachs of 66 *S. magister*. Parker and Pianka (1973. Herpetologica 29(2):143–152) reported one vertebrate out of 7928 prey items removed from 123 specimens of *S. magister*. Knowlton and Thomas (1934. Utah Acad. Sci., Arts, and Let. 11:257–259) reported a small *Cnemidophorus tessellatus* consumed by *S. magister*. The only previously documented case of conspecific cannibalism occurred at the Nevada nuclear test site where a hatchling *S. magister* was discovered in the stomach of one of 21 adults examined (Tanner and Krogh 1973. Great Basin Nat. 33(3):133–146).

This report provides the third account of lizard predation by *S. magister* and the second account of conspecific cannibalism.

On 8 August 1993, I collected a female *S. magister* (SVL = 69 mm) at 0740 h PST among granite boulders on a sunny south facing desert hillside at 955 m elevation in the town of Apple Valley, San Bernardino County, California (T5N, R4W, Sec 2, NW 1/4). Seconds after capture, the animal spontaneously regurgitated a conspecific neonate (SVL = 36 mm; tail = 73 mm, tip missing; mass = 1.4 g). A dark umbilical wound was visible. Mass of the larger animal was 13.3 g after regurgitation. Photographs of dorsal and ventral views of the regurgitated animal are deposited at the University of Texas at Arlington, UTA slide nos. 17023 and 17024.

I thank William W. Lamar for valuable suggestions about literature for this paper.

Submitted by **MICHAEL CARDWELL**, P.O. Box 492, Victorville, California 92393-0492, USA.

SCELOPORUS OCCIDENTALIS. (Western Fence Lizard). **ASSOCIATION.** On 18 March 1993, while hiking in the Los Padres National Forest, Santa Barbara County, California, USA, I noosed an adult male *Sceloporus occidentalis*. This lizard had a thin layer of bright golden/yellow pollen over its entire dorsal surface, from the snout to the tip of the tail, including the appendages and digits. The lizard was found in a Coast Live Oak Woodland (119°56'15"E and 34°45'09"N) that included *Quercus agrifolia, Pinus sabiniana, Ceanothus megacarpus, Ribes speciosum, Juglans californica,* and *Eriogonum* sp. Other *S. occidentalis* (N = 4) in the immediate vicinity possessed no obvious pollen encrustations.

Visual inspection of the lizard with a dissecting scope indicated a coarse, granular film of pollen over the entire dorsum. No pollen was observed on the ventral surface. The film of pollen was attached to the lizard in such a way that removing it was difficult without the aid of a scraping tool. The pollen could not be identified to species, but was of a grass (family Poaceae) (Henrickson, pers. comm.). It is unlikely that the *S. occidentalis* is involved with plant reproductive strategies since it is predominantly an insectivore; it may, however, become incidentally involved with pollination.

The pollen coating poses several problems to the lizard, such as: l) thermoregulation; 2) social behavior; and 3) pineal organ function (as the parietal eye was also covered by the pollen). Some of the thermoregulatory functions would appear to be influenced by the light coloration and the coating of the pollen, such as heat absorption and heat dissipation. Intraspecific behavioral interaction may be affected because of the yellow pollen-coated dorsal coloration. This individual would seem conspicuous to predators because of its bright golden/yellow coloration as this was how the lizard was noticed by the author, a potential predator! The pineal organ and ultimately circadian rhythm and thermoregulation might be impaired in this individual as a result of the pollen coating.

I thank B. H. Brattstrom for intellectual input and reviewing this manuscript, J. Burk and C. E. Jones for their assistance in the SEM laboratory, S. Karl for preparing the SEM specimen, and J. Henrickson for assistance with pollen identiflcation.

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UROSAURUS ORNATUS (Tree Lizard). **SPERM STORAGE.** Females of many lizard species are capable of storing sperm in the oviducts during the reproductive season (Cuellar 1966. J. Morph. 119:7–20). While sperm may remain viable in the lizard oviduct for as long as 7 months (Porter 1972. Herpetology. W. B. Saunders Co., Philadelphia, pp. 388–390), duration of viable sperm storage is unknown for most phrynosomatid lizards. To ascertain whether over-winter sperm storage occurs in *U. ornatus*, we looked for sperm in females that had definitely produced offspring or mated in the previous season, and subsequently over-wintered with no access to males.

Twenty female *U. ornatus* were captured at Aguirre Spring Recreation Area at 1700 m elevation in the Organ Mountains (32°22'N, 106°33'W, Doña Ana County, New Mexico) 6–8 April 1992. Lizards were maintained at New Mexico State University, Las Cruces, New Mexico, USA. Thirteen females were housed individually with a mature male in semi-natural outdoor pens measuring 2 X 2 m. The remaining seven females were housed together in a similar pen with a single male. Ten of the 13 singly-housed females laid from one to three clutches of eggs that hatched in the pens. At least three of the grouped females laid viable clutches, but we could not determine which females produced these clutches. At the end of the activity season (October 1992) the females from both groups were placed together, in the absence of any males, in one pen to overwinter. In late April 1993, the females, all of which survived hibernation, were preserved in 10% neutral buffered formalin and deposited in the Natural History Museum of Los Angeles County (LACM 140868–140887).

Histological examination of the oviducts did not reveal the presence of sperm in any of the females, even though there were vaginal folds similar to those shown to store sperm in *Sceloporus jarrovii* (Goldberg 1970. Ovarian Cycle of the Mountain Spiny Lizard *Sceloporus jarrovi* Cope. Ph.D. Thesis, The University of Arizona, Tucson, 115 pp.). This raises the possibility that *U. ornatus* females may store sperm during the breeding season. However, our observations indicate that no over-winter sperm storage occurred. Thus, for *U. ornatus*, it appears that production of offspring in a given year is dependent on inseminations during that particular year.

Submitted by **STEPHEN R. GOLDBERG**, Department of Biology, Whittier College, Whittier, California 90608, USA, and **NAIDA ZUCKER**, Department of Biology, Box 30001, New Mexico State University, Las Cruces, New Mexico 88003-0001, USA.

SERPENTES

CLONOPHIS KIRTLANDII (Kirtland's Snake). **SUBTERRANEAN PREY CAPTURE.** *Clonophis kirtlandii* is a secretive snake, known to feed on earthworms, slugs, leeches, crayfish, and fishes (Conant 1938. Am. Midl. Nat. 20:1–200; Minton 1972. Indiana Acad. Sci. Monogr. 3:v + 1–346; Tucker 1977. Bull. Maryland Herp. Soc. 13:193–195; Bavetz, pers. comm.). No observations have been published concerning how this species captures its prey.

A simulation of the normal environment of free ranging *C. kirtlandii* was made using an aquarium (92 cm x 31 cm x 43 cm) modified by placing a partition 19 cm from the top of the tank. This partition was 23.5 cm long and joined to a vertical partition extending from the bottom of the tank. The vertical partition was set 7.5 cm from the front of the tank. These two partitions formed a chamber that was filled to a depth of 82 cm with soil obtained from the site where the snakes were caught. The portion of the tank not filled with soil was filled with water to a depth of 6 cm to keep the soil moist.

Observations were conducted intermittently between 1900 and 2400 h each night during a two week period. During observations the tank was lit by ambient light from the fixtures in the room.

A total of 60 earthworms (*Lumbricus* sp.) were allowed to adjust to the tank for one week, during which time they formed a series of burrows within the observation chamber which allowed their behavior to be observed.

Four specimens of *C. kirtlandii*, two males (TL = 430 and 425 mm) and two females (TL = 210 and 461 mm), from Effingham, Illinois (Brown et al. 1975. Herpetol. Rev. 6:78–79) were placed in the aquarium. These snakes had been maintained on a diet of earthworms and were feeding well. No period of starvation was used to stimulate feeding.

The snakes were observed feeding on 12 occasions. In three instances, snakes were observed to emerge from hiding places and assume a Z-shaped alert posture, with the head up. When an earthworm was exposed in the vicinity of the snake, tongue flicking increased, and the snake searched for and attacked the earthworm. On five other occasions, snakes that were initially seen in the Z-shaped alert posture were later observed swallowing earthworms. On many occasions, snakes seen in the Z-shaped alert posture retreated to their refugia without attacking or feeding.

On two occasions, *Clonophis* seen within earthworm burrows attacked and swallowed the earthworm occupying the burrow. On two other occasions, snakes were found swallowing earthworms inside burrows. Snakes were not seen pursuing an earthworm into a burrow. In no instance, did the earthworms react to the presence of the snake until bitten.

This is the first report of feeding within earthworm burrows for *C. kirtlandii*. However, that the snakes enter earthworm burrows in search of prey should be expected considering the adaptations for fossorial existence present in the species (Conant 1943. Am. Midl. Nat. 29:313–341).

Submitted by **JOHN R. TUCKER**, Illinois Natural History Survey, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

CROTALUS VIRIDIS VIRIDIS (Prairie Rattlesnake). **RECORD RATTLE-STRING**. In August, 1985, the first author (DC) captured a male *Crotalus v. viridis* (Rafinesque) in the vicinity of Pawnee Buttes, Weld Co., Colorado. The snake was maintained in his laboratory at the University of Colorado in Boulder, until its death 2 August 1993. It is now preserved as no. 56799 in the University of Colorado Museum herpetological collection.

At the time of death the snake measured 879 mm SVL, tail 58 mm. Its only obvious unusual feature is its record rattle-string of 38 segments. All segments have approximately the same maximum dimension of 12 mm, and the string is of uniform diameter throughout its 135 mm length. Hence it is incomplete by at least ten or twelve segments by Klauber's (1956. Rattlesnakes: Their Habits, Life Histories and Influence on Mankind. Univ. California Press, Berkeley and Los Angeles. p. 252) generalization—the point at which little or no further change in lobe size occurs. The terminal dozen or so segments bear small, irregular indentations, progressively more apparent toward the distal end of the string.

This rattle-string is much longer than any previously reported (of authentic integrity; Klauber, *op. cit.*: 250–260 discussed many longer ones of unacceptable authenticity) for either captive or freshly captured specimens, of any species of rattlesnake. Klauber (*op. cit.*: 260) cited records of 17 for a complete string (in *C. adamanteus* Beauvois) and 23 for an incomplete string (in *C. atrox* Baird and Girard) in freshly caught specimens, and 18 for a complete string (in *C. tortugensis* Van Denburgh and Slevin) and 29 for an incomplete string (in *C. horridus* Linnaeus) in captive specimens. The present string is therefore nine segments longer than any previously recorded in its category (incomplete string in a captive specimen), and the longest for any category.

The exceptional length of the string of 38 segments was probably attained as a result of several factors, including the unusually mild temper of the snake, the simplicity of its quarters (minimizing the chance of catching the rattle string on an obstacle, or of wearing it against abrasive surfaces), the infrequency of assuming a protective or resting coil together with the relatively light weight of the snake (minimizing the chance of catching the string under the snake's body), the damping effect through inertia of distal segments when the string was shaken, and the regular offering of dead food. Under such conditions a potential exists for growth of even longer strings in this and other species.

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DIADOPHIS PUNCTATUS PUNCTATUS (Southern Ringneck Snake). **ANTI-OPHIOPHAGOUS BEHAVIOR**. Small snakes may be especially susceptible to predation by ophiophagous snakes. Here, we report one observation of a captive longnose snake (*Rhinocheilus lecontei lecontei*) attempting to feed upon a *Diadophis p. punctatus* which suggests a possible defense against ophiophagy by *D. p. punctatus*.

We placed a 275 mm TL *D. p. punctatus* collected in Hillsborough County, Florida, in a glass aquarium measuring 61 x 30 x 25 cm which housed a 640 mm TL *R. l. lecontei* collected in Pima County, Arizona. The *Rhinocheilus* immediately approached and seized the *Diadophis* by the tail. Instead of struggling the *Diadophis* remained motionless and was swallowed almost entirely (tail first) before moving. When the head of the *Diadophis* entered the mouth of the *Rhinocheilus*, it turned its head 90°, and bit the floor of the larger snake's mouth. After 6 h in this position the *Diadophis* was regurgitated but not released, and the *Rhinocheilus* positioned for a mid-body approach. Once again, when the smaller snake's head entered the mouth of the larger, the biting response was repeated, which again resulted in an apparent deadlock lasting roughly 6 h. The whole cycle was repeated for a third time.

The *Rhinocheilus* remained motionless after 16 h from the beginning of these observations, and was presumed to have died shortly thereafter. Seventeen hours after the initial attack, the *Diadophis* slowly worked its jaws free and crawled out of the now dead *Rhinocheilus*.

This behavior and its fatal consequences raises several questions. Was the *Rhinocheilus* envenomated by the ringneck? *Diadophis punctatus* has enlarged saber-like teeth at the posterior end of the maxillary bones and there are several anecdotes of bites from this species causing a burning sensation (Myers 1965. Bull. Florida St. Mus. Biol. Sci. 10:43–90.). Myers (*op. cit.*) also reported that other forms of *Diadophis* salivate copiously when handled excessively.

The authors thank Joseph A. Butler and Lee A. Fitzgerald for their helpful comments.

Submitted by **JOHN V. ROSSI**. Division of Science and Mathematics, Jacksonville University, Jacksonville, Florida 32211, USA, and **ROXANNE ROSSI**, North American Snake Institute, 7451-13 103rd St. Suite 68, Jacksonville, Florida 32210, USA.

DRYMARCHON CORAIS COUPERI (Eastern Indigo Snake). **PREY**. The diet of the eastern indigo snake includes a variety of mammals, birds, reptiles (and their eggs), amphibians, and fish (Ernst and Barbour 1989. Snakes of Eastern North America. George Mason Univ. Press. Fairfax, Virginia, 282 pp.). Few invertebrates have been reported.

On 17 May 1993, a juvenile eastern indigo snake measuring 61 cm TL was captured in Baker County, Florida. Within several minutes of capture, the snake regurgitated a large slug, *Philomycus* sp. The slug was approximately 7.5 cm in length.

Philomycus slugs are numerous in some areas of Florida and may be an important food source for the secretive hatchling and juvenile indigo snakes in certain microhabitats.

The authors thank Kurt Auffenberg for his assistance in identifying the slug and Lee A. Fitzgerald for his helpful comments.

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ELAPHE OBSOLETA (Rat Snake) **REPRODUCTION**. According to Plummer (1990. Herpetologica 46(2):190–195), "nesting in hollow trees is unknown for snakes other than *Opheodrys aestivus*...." However, W. M. Palmer, of the North Carolina Museum of Natural History (1993, pers. comm.), is aware of an incident of *Elaphe obsoleta* nesting in a tree cavity in North Carolina and another in Virginia. This note documents an occurrence of *E. obsoleta* nesting in a tree cavity.

On 12 June 1992, fourteen snake eggshells were discovered in a cavity of a beech tree (*Fagus grandifola*) 2.5 miles N of Elizabeth City, Pasquotank County, North Carolina. The tree was in a wooded area with the upper portion removed and cut into sections which exposed the nest cavity. The cavity opening was located 6.0 m above the ground.

The cavity opening appeared to be a rot hole from a broken limb and measured 20.8 x 11.7 cm. The cavity was approximately 0.07 m^3 (39 x 33 x 93 cm). It was about half full of decomposed wood and contained what appeared to be a squirrel (*Sciurus* sp.) nest.

Most of the eggshells exhibited typical longitudinal slits like those made during hatching. Two contained irregular holes which suggest they did not hatch. The two eggs that apparently did not hatch retained their near-natural shape. The more perfect of the two measured 41 x 23 mm which is consistent with egg size for *E. obsoleta* (Ernst and Barbour 1989. Snakes of Eastern North America. George Mason University Press. Fairfax, Virginia. 282 pp.). The size and surface texture of the eggshells are consistent with other *E. obsoleta* eggs found previously in the Elizabeth City area by the author (Brothers 1965. J. Elisha Mitchell Sci. Soc. 81(2):119–124). The eggs of *Coluber constrictor* have a coarse texture, and *Elaphe guttata* is not known from the area despite many years of observations (Brothers, *op. cit.*, pers. obs.). The North Carolina Museum of Natural History considers the eggshells as those of *E. obsoleta* (NCSM 32025).

I thank Leroy Seier for making me aware of the find and allowing me to visit the site and W. M. Palmer for comments on the manuscript.

Submitted by **DONALD R. BROTHERS**, HC 33, Box 1176, Boise, Idaho 83706, USA.

EUNECTES MURINUS GIGAS (Northern Green Anaconda). **CANNIBALISM**. There are very few reported instances of true intraspecific cannibalism amongst the boids (Mitchell 1986. Cannibalism in Reptiles: A Worldwide Review. SSAR Herpetol. Circ. No. 15:1–37) .

We removed a live female *Eunectes murinus gigas*, 1940 mm SVL (2320 mm TTL), from a nylon monofilament fisherman's gill net set above rapids, along the Guyanese bank of the Ireng River on the Guyana/Brazil border at Orinduik, western Guyana on 6 September 1993.

Shortly after capture the anaconda disgorged the recognizable remains of a smaller conspecific. Due to the advanced state of decomposition it was impossible to determine the exact length (ca. 1.5 m TTL), sex, or cause of death of the cannibalized specimen. The live individual was released. *Eunectes murinus* is a known predator of mammals, waterbirds, and caiman, but I have been unable to locate any reports of ophiophagy or cannibalism for this species in the wild. However, Holmstrom and Behler (1981. Zool. Garten NF, Jena 51 (5/6):353–356) and Neill and Allen (1962. Quart. J. Florida Acad. Sci. 25:73–75) reported ingestion of extraembryonic membranes and an undeveloped egg, and aborted embryos by adults in captivity. Live neonates were not eaten.

I thank Col. John Blashford-Snell and Julian Matthews for inviting me to participate in the "Land of El Dorado Expedition" and all the members of the expedition and the Guyanan Defense Force who assisted with the herpetological/ichthyological surveys. Particular thanks go to Darren Finch of London and Mr. Chung of Orinduik. This fieldwork was funded by Discovery Expeditions of Motcombe, near Shaftesbury, Dorset, England.

Submitted by **MARK T. O'SHEA**, 46 Buckingham Road, Penn, Wolverhampton, WV4 5TJ, England.

LAMPROPELTIS PYROMELANA (Sonoran Mountain Kingsnake). **TEMPERATURE, ACTIVITY**, and **SIZE**. During the past 11 yrs (1983 to 1993), I documented activity temperatures, times when observed, and body size on a population of the little known Sonoran mountain kingsnake (*Lampropeltis pyromelana*) at Camp Geronimo Boy Scout Preserve, 6 km E Pine, Arizona at the base of the Mongollon Rim. I gathered data on 11 snakes that were active (none was found by log or rock turning). An additional 69 snakes, brought in by campers and staff, were measured to assess population size structure.

Average body temperature of the 11 active snakes was 26.8°C ± 0.60 SE (range 23.0–29.2) and was significantly correlated with air (26.7°C ± 0.79 SE; range 20.0–29.8; $r = 0.615$, $P < 0.05$, $df = 10$) and substrate (25.2°C ± 0.91 SE; $r = 0.75$, $P < 0.01$, $df = 10$) temperatures. Brattstrom (1965. Am. Midl. Nat. 73:376–422) gave the mean body temperature for *L. zonata*, a kingsnake with a similar habitat to *L. pyromelana*, at 27.5°C. *Lampropeltis pyromelana*, like many squamate species in shaded habitats (Huey and Slatkin 1976. Quart. Rev. Biol. 51:363–384), appears to be a thermoconformer to air and substrate temperatures.

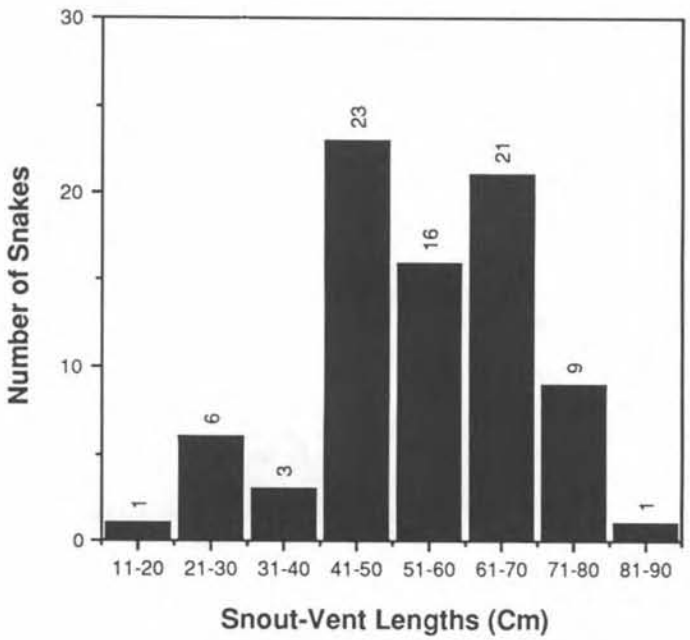


FIG. 1. Age distribution of *Lampropeltis pyromelana* in the Theodore Roosevelt Preserve of Camp Geronimo.

Over 470 h (from April to October) were spent searching for kingsnakes and only 11 activity records were recorded, a rate of 1 snake every 42.8 h of search time! Despite the small sample, a diurnal activity pattern is evident. All snakes were captured between 1140 and 1810 h. Peak activity (3 captures) was between 1500 and 1600 h, a rate of 1 snake every 12.7 field h. A yearly activity cycle is also evident in this small sample; 8 of the 11 snakes were found in July and August, a rate of 1 snake every 22.6 h of field time. All 8 snakes from July and August were above 41 mm SVL; therefore, hatchlings have not inflated this figure.

Size range for individuals in this population was between 19.5 and 88 cm SVL, with most (75%) snakes measured between 41 and 70 cm SVL (Fig. 1). Hatchlings were brought in during July and August and were between 19.5 and 27 cm SVL. Sex of the snakes could not be accurately determined.

Absence of recapture data from 40 marked and released snakes suggests a large population. However, the low probability of encountering an active snake and the rarity that campers and staff encountered this species suggests that density may be low and also may indicate that this species is wide-ranging or very secretive.

I am grateful to the staff of the Camp Geronimo Boy Scout Camp for making their property available to me and providing me with snakes to measure. Additionally, I am grateful to the hundreds of boy scouts that directly or indirectly contributed snakes for this study.

Submitted by **ROBERT W. BOWKER**, 2030 E. Colgate Dr., Tempe, Arizona 85283, USA.

PITUOPHIS MELANOLEUCUS DESERTICOLA (Great Basin Gopher Snake). **BEHAVIOR**. We report here on an unusual encounter in the wild between a *Pituophis melanoleucus deserticola* and a golden-mantled ground squirrel (*Spermophilus lateralis*).

On 28 May 1993, in a small limestone canyon near the Colorado-Utah border in Dinosaur National Monument, Uintah Co., Utah we found a ground squirrel challenging a *P. m. deserticola* of approximately 165 cm TL. The ground squirrel was making no attempt to flee its potential predator, which was loosely coiled in low vegetation and obviously had eaten recently. If the snake moved, the ground squirrel would feign a charge or actually dart in to attack the snake, usually about the head, and then quickly retreat to a log 40 cm from the snake. The ground squirrel appeared to be defending the area around the log. Despite the attacks, the snake, which had been bloodied below its left eye, also was not making an attempt to depart.

We observed this encounter from a stream bank at a distance of 2 m for 10 min. The temperature was 22–25°C under sunny skies. The encounter ended when the ground squirrel was frightened away by a flash from our camera. At that time, we captured the snake, and it was easily observed that it had recently eaten two prey items.

We know of no other observation in the wild where a *P. melanoleucus* was held at bay by a ground squirrel or other potential prey. We believe the ground squirrel was defending a nest in the vicinity of the log, because 15 min after we released the snake, the ground squirrel returned to the log and appeared to search for the snake in the area of the confrontation.

Submitted by **RICHARD M. ENGEMAN**, Denver Wildlife Research Center, USDA/APHIS/ADC, P.O. Box 25266, Bldg 16, Denver Federal Center, Denver, Colorado 80225-0266, USA, and **JAMES J. DELUTES III**, P.O.Box 1623, Boulder, Colorado 80306, USA.

PYTHON SEBAE (African Rock Python). **REPRODUCTION**. The reproductive biology and breeding behavior of the African pythons are poorly known, even for the large *Python sebae* (Branch 1988. Field Guide to the Snakes and other Reptiles of Southern Africa. New Holland, Ltd. Cape Town, South Africa. 328 pp; Pitman 1974. A Guide to the Snakes of Uganda. Wheldon and Wesley, Ltd. Codicote, England. 290 pp.; Starin and Burghardt 1992. The Snake 24:50–62). There appear to be no published accounts of the behavior of neonates of any of the large pythons at the nest site; therefore observations of the breeding behavior and post-hatching neonatal behavior in the wild are particularly valuable.

On 3 September 1991, a local fisherman found a nest with eggs of an African rock python (*Python sebae*) in Gombe Stream National Park, on the eastern shore of Lake Tanganyika in Tanzania. The female and her eggs were in a burrow on a steep grassy slope about 25 m above the gravel beach of the lake, with a western exposure and sunlight falling on the hole from mid afternoon until sunset. Holes are numerous in slopes at Gombe, and are frequently dug by pangolins. The female python was coiled around her eggs; her length was estimated at 2.75 m. About 20 eggs were deposited 60 cm into the recess of the burrow. It is not known how long the eggs and mother had been present at the time they were first observed.

The eggs hatched on 20 or 21 November, and hatchlings were visible around the entrance to the nest site. The incubation period was thus at least 78 days. I made frequent trips to the nest to observe the behavior and dispersal pattern of the neonates. The maximum number of hatchlings seen on a single trip was 19. Three hatchlings were measured and had an average total length of 57 cm. On the first day the hatchlings were observed, the mother was visible deep within the nest hole; she was not seen again, and it is not known whether she left the site once the eggs hatched or remained nearby.

A strong degree of nest site fidelity was observed in the hatchlings. For the first week after hatching, the hatchlings left the nest hole and basked in pairs or small groups on the hill in a 4 m radius from the hole. They typically left the nest hole as soon as the sun rose above the slope of the hill on which the nest site was located. By late afternoon, the hatchlings reentered their nest hole and appeared to remain there until the following day. When I approached the nest, some of the hatchlings would flee into the hole, while others remained coiled in the sun nearby. Even those hatchlings located up to 4 m away from the hole retreated to it when frightened. When hatchlings were captured and handled, they fled into the nest hole from up to 2 m away immediately upon release; hatchlings that were handled and released more than 2 m away did not return to the nest hole.

On 26 November, the hatchlings began to enter their first skin shed cycle. They continued to bask in the sun each afternoon and use the nest hole as a home base. Beginning on 29 November fewer hatchlings were seen in or near the nest hole, and by 1 December all appeared to have left the site, probably after their first shed. The nest hole was thus used as a shelter for about 10 d, after which the hatchlings dispersed. This hole was apparently not reused as a nest site in 1992 or 1993.

I thank the Tanzanian Commission for Science and Technology (COSTECH) and the office of Tanzania National Parks, and Dr. Jane Goodall for permission to work in Gombe National Park. Financial support was provided by the National Geographic Society and the L.S.B. Leakey Foundation. Harry Greene made helpful comments on the manuscript.

Submitted by **CRAIG B. STANFORD**, Department of Anthropology, University of Southern California, Los Angeles, California 90089-0032, USA.

SIPHLOPHIS PULCHER (NCN). **PREY**. Feeding habits of the five recognized species of the neotropical snake genus *Siphlophis* are scarcely documented and the information seems controversial. The widespread *S. cervinus* is nocturnal, terrestrial to semiarboreal, and is reported to prey on birds and lizards (e.g., Duellman 1990; Zimmerman and Rodrigues 1990. *In* Gentry, ed. Four Neotropical Rain Forests. Yale Univ. Press, New Haven, Connecticut, 612 pp.). However, the few substantiated prey items include two species of lizards: *Bachia trisanale*, a fossorial gymnophthalmid (Duellman 1978. Univ. Kansas Mus. Nat. Hist. Misc. Publ. 65:1–349), and *Thecadactylus rapicaudus*, a nocturnal and arboreal gekkonid (Nascimento et al. 1987. Bol. Mus. Para. Emilio Goeldi, sér. Zool. 3:33–65). We are unaware of reliable dietary information on any of the three species of *Siphlophis* from the coastal rain forest of southeastern South America.

Here we report on six instances of *S. pulcher* feeding on squamate prey, and comment on the need to reassess the importance of bird prey in the diet of *S. cervinus*. Specimens of *S. pulcher* were observed in, or came from, the Atlantic Forest of eastern and southeastern Brazil (States of Bahia and São Paulo) during the wet season from October to March in the years 1991 and 1993. Vouchers of snakes and their prey are in the Instituto Butantan, São Paulo (IB 54225), the Museu de História Natural de Campinas, São Paulo (ZUEC 1636, 1659), and the Centro de Pesquisas do Cacau in Itabuna, Bahia (CEPEC 1580, 2376).

One adult *S. pulcher* (SVL = 695 mm; tail = 179 mm; tail tip missing) was found in early morning on 10 October 1991 on the ground within a cacao grove at Ilhéus, Bahia. The snake was swallowing an adult and considerably longer blunt-headed tree snake, *Imantodes cenchoa* (SVL = 770 mm; tail = 348 mm), a nocturnal colubrid (Cunha and Nascimento 1978. Publ. Avuls. Mus. Para. Emilio Goeldi 10:1–218; Duellman 1990, *op. cit.*). We found the remains of an unidentified gekkonid lizard in the gut of the same *S. pulcher* and a recently eaten *Anolis* sp. in the gut of the *Imantodes*. A juvenile *S. pulcher* (SVL = 220 mm; tail = 65 mm), also from a cacao grove at Ilhéus and received March 1993, contained a broken, recently swallowed lizard tail (60 mm) and two lizard eggs (7 x 3 mm), presumably of a gymnophthalmid. An adult *S. pulcher* (80 cm TL) was found on the evening of 15 December 1991 on branches of a fallen tree, 1 m above ground within a secondary forest at Caraguatatuba, São Paulo. Upon capture it disgorged a freshly eaten specimen of the terrestrial gekkonid, *Gymnodactylus darwini*. An adult female *S. pulcher* (SVL = 535 mm; tail = 165 mm; mass = 32 g), caught 1 February 1991 on the ground at Caraguatatuba, contained a whole specimen of the diurnal gymnophthalmid lizard *Placosoma glabellum* (SVL = 60 mm; tail = 55 mm; mass = 3 g) and the tail of a second one in its gut. Another female *S. pulcher* (SVL = 615 mm; tail = 182 mm; mass = 64 g) caught February 1993 in Ubatuba, São Paulo, contained the ubiquitous gekkonid lizard, *Hemidactylus mabouia* (SVL = 60 mm; tail = 90 mm; mass = 5 g). A specimen of *S. pulcher* (65 cm TL), caught at Boracéia, São Paulo and received alive at the Instituto Butantan on 14 January 1991, disgorged the remains of a *Placosoma* sp. (O. A. V. Marques, pers. comm.).

Our observations on *S. pulcher* and literature data on *S. cervinus* indicate that these snakes are nocturnal active foragers searching for prey both on the ground and on vegetation. These snakes feed on inactive diurnal vertebrates (lizards and possibly birds), active nocturnal ones (lizards and snakes), and squamate eggs. The importance of birds in the diet of *Siphlophis* should be reassessed, since reliably documented records indicate squamates as prey. Although Cunha and Nascimento (*op. cit.*) stated that only birds were found in the diet of *S. cervinus*, they failed to mention whether prey were found in only one or a few of the nine snakes they examined. We suspect additional data will support our conclusion that species of *Siphlophis* feed primarily on squamates, a condition found in many if not most pseudoboine snakes.

We thank O. A. V. Marques and G. Puorto for data on the IB specimens and their prey; V. Rodrigues for the Ilhéus adult snake; M. J. Silva for the Ubatuba snake; M. T. Rodrigues for the identification of two *Placosoma* prey; the CNPq and the Fundação Banco do Brasil for financial support.

Submitted by **IVAN SAZIMA**, Departamento de Zoologia, Universidade Estadual de Campinas, 13081-970 Campinas, São Paulo, Brazil, and **ANTÔNIO J. S. ARGÔLO**, Centro de Pesquisas do Cacau, Caixa Postal 7, 45600-000 Itabuna, Bahia, Brazil.

THAMNOPHIS RUFIPUNCTATUS (Narrow-headed Garter Snake). **COLOR** and **SIZE**. Hedges et al. (1989. J. Herpetol. 23:450–455) reported natural, physiological color change to be uncommon in snakes, being known to occur in seven species of insular non-colubroidean snakes and in two species of mainland crotalines. These snakes are terrestrial (eight species) or arboreal (one species).



FIG. 1. *Thamnophis rufipunctatus*, light phase, photographed 1 October at 1500 h.

On 1 October 1988, at 1500 h (air temperature ca. 24°C), a 953 mm female *Thamnophis rufipunctatus* was found lying at the shoreline of the Black River at Buffalo Crossing, Apache Co., Arizona. At time of capture the snake was tan with darker brown spots (Fig. 1). The snake was kept alive overnight in complete darkness. On 2 October, at ca. 1100 h (air temperature ca. 20°C), the snake was taken into direct sunlight and found to be soot colored dorsally, with the darker spots indistinct (Fig. 2). The snake was left in indirect sunlight for two hours but showed no indication of a return to the previous pale coloration, even after subsequent preservation. Conspecifics found in the Black River on 1 October were of the tan phase (three) or dark phase (two).



FIG. 2. *Thamnophis rufipunctatus*, dark phase, photographed 2 October at 1100 h; same specimen as Fig. 1.

This is apparently the first record of both a colubrid, and an aquatic snake, exhibiting physiological color change. This specimen (California Academy of Sciences 186445) exceeds the previously reported maximum length of 86 cm (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co. Boston, Massachusetts. 336 pp.).

Submitted by **JEFF BOUNDY**, Museum of Natural Science, 119 Foster Hall, Louisiana State University, Baton Rouge, Louisiana 70803, USA.

THAMNOPHIS SAURITUS SACKENII (Peninsula Ribbon Snake). **BEHAVIOR**. A female *Thamnophis sauritus sackenii* was observed eating a *Hyla cinerea* 5.72 m up in a red maple tree (*Acer rubrum*). Distress calls by the frog caused us to notice the ribbon snake. The snake was captured after we vigorously shook the tree. As the snake fell the frog escaped from the snake's jaws and hopped away apparently unharmed. The 17.4 g snake (SVL = 41.2 cm) was found at 1720 h on 20 September 1993, in a hammock with sabal palm and live oak canopy. Air temperature was 28–30°C. Rain had fallen 24–72 h earlier. To our knowledge, this is the first report of *Thamnophis sauritus sackenii* foraging in a tree canopy.

We thank Fred Link for tree shaking and Peter May for helpful comments.

Submitted by **LIANNE A. BISHOP** and **TERENCE M. FARRELL**, Department of Biology, Stetson University, DeLand, Florida 32720, USA.

GEOGRAPHIC DISTRIBUTION

Instructions for contributors to Geographic Distribution appear in Volume 25, number 1.

Cosymbotus platyurus In Florida: Ten Years Of Stasis

At present, Florida is colonized by eight species of geckos (Wilson and Porras 1983, The Ecological Impact of Man on the South Florida Herpetofauna. Univ. Kansas Spec. Publ. 9, Lawrence, 89 pp.; Lawson et al. 1991. Herpetol. Rev. 22:11–12; Meshaka et al. 1994. Herpetol. Rev. 25:80-81). Herein we report an established colony of *Cosymbotus platyurus*, a species new to Florida and the United States, based on a voucher (USNM 244208) collected by us on 7 November 1993 from a colony located in Clearwater, Pinellas County.

This colony is located on a strip mall in downtown Clearwater and has been known to one of us (JL) since 1983. The presence of *C. platyurus* coincided with the opening of a pet shop two years prior to the detection of this colony. The pet shop, still in existence, deals in the exotic reptile trade. From one walk around the mall on the evening of 13 November 1993, we counted 51 individuals (45 adults, 6 hatchlings). The largest adults, presumably males, were consistently found at the tops of the buildings and were extremely wary. Almost all hatchlings were observed <1.5 m above the ground. When dazzled with the flashlight, hatchlings elevated and wriggled their tails.

We found few to no individuals on nearby buildings. This observation, like our census on the main building, was consistent with observations by JL since 1983. Unlike other hemidactylines of Florida, *C. platyurus* has shown little ability to disperse from its original site of introduction. Too little is known about the natural history of this species to explain its poor colonizing ability in this target area. To date, this population of *C. platyurus* represents an end point in the spectrum of successful colonizers. The colony is persistent and healthy but thus far unable to expand from one very localized site.

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Hemidactylus frenatus Established On The Lower Florida Keys

Hemidactylus frenatus is an Old World gecko with a large natural and human-assisted geographic range. In the United States it has flourished in Hawaii, where it was presumably transported on equipment during World War II (McKeown 1978). Here, we report the establishment of *H. frenatus* on Stock Island and Key West, Monroe County, Florida, provide some natural history information from our collections and field observations, and comment on its presence in syntopy with other hemidactylines on the lower keys.

All specimens were collected by the authors and will be deposited in the United States National Museum (USNM). Snout-vent lengths (SVL) of all specimens from this series are given in mm. Ronald I. Crombie kindly identified specimens USNM 217918, 217920, and 217923. Vouchers documenting this discovery are from:

Monroe Co: Stock Island. 21 September 1993. USNM 217933–217935. Immatures, 35, 27, and 30 mm, respectively. USNM 217906. Male, 54 mm. USNM 217907. Female, 47 mm.

Monroe Co: Key West. 23 September 1993. USNM 217918–217919. Males, 53 & 50 mm, respectively. USNM 217920, 217922–217923. Females, 47, 46, and 49 mm, respectively. USNM 217921. Immature, 23 mm.

All four females collected contained four sets of follicles >1.0 mm. Of these, shelled eggs (diameters in parentheses) were found in USNM 217922 (7.4 and 8.6 mm) and USNM 217923 (8.0 and 9.0 mm). Our single collection of series precluded estimation of the egg-laying season. However, *H. frenatus* is known to produce eggs continuously in source areas (Church 1962; R. I. Crombie, pers. comm.). Female *H. frenatus* which mature at 38 mm SVL in Java (Church 1962) could represent the smallest minimum size at maturity of the hemidactyline geckos in Florida (Meshaka 1993; Meshaka et al. 1994b).

No *Hemidactylus frenatus* were found on any of the other keys we visited during this trip. On Stock Island, where we collected five *H. frenatus*, we also collected thirteen *H. mabouia* and observed but failed to collect two *H. garnotii*. On Key West, where we collected six *H. frenatus*, we collected seven *H. mabouia*, three *H. garnotii*, and one *H. turcicus*. Our method of collecting geckos was to not target any particular species in order to be as nonselective as possible. Results of this collecting method yielded proportions of species similar to what we observed.

In our collections, *Hemidactylus mabouia* was the most common hemidactyline gecko throughout the Florida Keys, having replaced *H. turcicus* in Key West (Meshaka et al. 1994a). Indeed, the *H. turcicus* we collected was the only individual seen throughout the Florida Keys during this trip. *H. garnotii*, which was only

recently detected in the Florida Keys (Wilson and Porras 1983), was infrequently seen by us and primarily at opposite ends of the Florida Keys. At present, *H. frenatus* does not yet appear to be established farther north than Stock Island where it was outnumbered more than 2:1 by *H. mabouia* in our collecting effort.

A likely source of the introduction for *Hemidactylus frenatus*, we believe, was a pet shop in Key West which has been in existence for almost twenty years. This store dealt in the exotic reptile trade, including old world species. *H. frenatus* could have reached Key West via transportation on shipments as stowaways from wholesalers in southern Florida. If this is true, further collecting on mainland southern Florida might detect its presence near the airport in Miami and/or at wholesale distributors of reptiles, and place *H. frenatus* on the long list of exotic species established through a weakly restricted exotic wildlife trade.

The rapidly spreading urban habitat of Florida has brought with it an endemic herpetofauna including four hemidactylines. The source for many of these exotic species has been the pet trade. This system has resulted in an unnatural experiment in colonization, niche partitioning, and competition. Among the house geckos, *Hemidactylus frenatus* appears to be the most recent invader and is similar in appearance to its congeners.

The current status of *Hemidactylus frenatus* on the lower keys lends this species well to testing two working hypotheses. First, rapid expansion of *H. frenatus* along the chain of keys would corroborate our suggestion that *H. frenatus*, a proven successful colonizer, is the most recent invader of the hemidactyline geckos on the Florida Keys. Second, replacement of *H. mabouia* by *H. frenatus* in southern Florida will test the hypothesis that, unlike the colonization of anoles in Florida (Wilson and Porras 1983; pers. obs.), ecological overlap on buildings of the four hemidactyline species currently in Florida may be too great to permit a stable coexistence of more than one dominant species at one time.

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Range Extensions For Louisiana Amphibians And Reptiles

A survey of recently accessioned amphibian and reptile specimens in the Louisiana State University Museum of Natural Science (LSUMZ) has revealed a number of range extensions, based on comparison with localities depicted on range maps by Dundee and Rossman (1989). Each specimen represents a parish record. Identifications were verified by Douglas A. Rossman or David A. Good.

AMBYSTOMA TALPOIDEUM (Mole Salamander). East Feliciana Par: 4.8 km (by air) S Jackson. 2 April 1993. J. Boundy, J. Slowinski. LSUMZ 55796.

EURYCEA QUADRIDIGITATA (Dwarf Salamander). Tensas Par: 1.6 km S Waterproof. 2 March 1965. L. Wilson, A. Romano. LSUMZ 51827. 1.4 km W Newlight. 16 April 1966. L. Wilson. LSUMZ 43524, 43525.

NECTURUS BEYERI (Gulf Coast Waterdog). Natchitoches Par: Kisatchie Creek, Natchitoches. 24 February 1954. C. Ward. LSUMZ 51953.

NECTURUS MACULOSUS (Mudpuppy). Bienville Par: Saline Bayou at La. Rt. 155 bridge. 5 June 1993. E. DeWalt. LSUMZ 56119.

PLETHODON KISATCHIE (Louisiana Slimy Salamander). Natchitoches Par: 14.4 km W Derry on Red Dirt Road. March 1969. L. Wilson. LSUMZ 28668.

ACRIS CREPITANS (Northern Cricket Frog). West Baton Rouge Par: 17.6 km W Mississippi River on Rt. 190. 15 Feb 1962. F. Hayse. LSUMZ 18023. 4.0 km ENE Rosedale on Rt. 76. 8 March 1968. A. Rekas. LSUMZ 22714, 22717. 7.2 km SSE Arbroth on La. Rt. 415. 30 March 1969. A. Varkey. LSUMZ 50929. 8.0 km (airline) W Brusly. 30 March 1968. J. Cattan. LSUMZ 21004. 8.0 km S Port Allen, 0.8 km W La. Rt. 1. 14 Feb 1990. J. Wilkinson, S. Doody. LSUMZ 49494.

HYLA CHRYSOSCELIS (Cope's Gray Treefrog). Tensas Par: 9.6 km SW jct of Hwy 65 and La. Rt. 128. 2 March 1965. L. Wilson, A. Romano. LSUMZ 51543.

HYLA SQUIRELLA (Squirrel Treefrog). West Baton Rouge Par: Rosedale Road. 7 April 1964. L. Wilson, A. Romano. LSUMZ 51606.

RANA GRYLIO (Pig Frog). Cameron Par: Grand Cheniere. 28 April 1957. S. Russell. LSUMZ 50204.

SCAPHIOPUS HOLBROOKII (Eastern Spadefoot). Winn Par: Cloud Crossing Recreation Area, WSW Brewsters Mill. 26 April 1969. R. Munz, G. Alvarez III. LSUMZ 50861–50864.

APALONE MUTICA (Smooth Softshell). West Feliciana Par: Mississippi River at mouth of Thompson Creek. 13 September 1982. Connor, Brennan and Boyer. LSUMZ 54377. 4.8 km S Rt. 66 in Bayou Sarah. 23 Aug. 1991. S. Doody. LSUMZ 54239–54246. Thompson Creek at Rt. 61. 7–9 Sept. 1991. S. Doody. LSUMZ 54247–54251.

MACROCLEMYS TEMMINCKII (Alligator Snapping Turtle). Vermilion Par: no further data. LSUMZ 55602.

TERRAPENE CAROLINA (Eastern Box Turtle). St. Bernard Par: jct of La. Rt. 46 and La. Rt. 39. 27 March 1978. Ludvet. LSUMZ

47491. Winn Par: 5.0 km W jct of La. Rt. 505 on La. Rt. 126. 20 May 1973. R. and P. Blaney. LSUMZ 53436, 53437. 13.0 km ESE Calvin on La. Rt. 501. 26 April 1969. W. Eberle, R. Blaney. LSUMZ 23985.

TRACHEMYS SCRIPTA (Slider). Ascension Par: Petite Amite River. 20 April 1975. LSUMZ 47620, 47624, 47635–47639. St. Bernard Par: Chalmette Water Board Road. 2 May 1973. LSUMZ 47621.

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). Evangeline Par: between Mamou and Ville Platte. Sept. 1990. J. Fairchild. LSUMZ 49571, 49572.

COLUBER CONSTRICTOR (Racer). Acadia Par: Rayne. 10 April 1993. D. O'Quinn. LSUMZ 55908.

LAMPROPELTIS TRIANGULUM (Milk Snake). La Salle Par: Muddy Bayou, Saline Wildlife Management Area. 26 July 1993. J. Slowinski. LSUMZ 56153.

STORERIA OCCIPITOMACULATA (Redbelly Snake). Iberville Par: 435 Pecan Drive, 6.4 km N St. Gabriel. 19 April 1993. S. Cardif; D. Dittmann. LSUMZ 55882.

MICRURUS FULVIUS (Eastern Coral Snake). Acadia Par: 300 Pinewood Drive, Crowley. Oct. 1993. B. Core. LSUMZ 56314.

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County Records For Texas Amphibians And Reptiles

An examination of distribution maps provided by Dixon (1987) has revealed that a number of amphibian and reptile specimens in the Louisiana State University Museum of Natural Science (LSUMZ) collection represent county records. Specimen identifications were verified by either Douglas Rossman, David Good or Joseph Slowinski.

SIREN INTERMEDIA (Lesser Siren). Polk Co: Texas Farm Road 943, 0.7 km NW jct. Texas Farm Road 2798. 24 March 1991. D. A. Good. LSUMZ 53305.

NOTOPHTHALMUS MERIDIONALIS (Black-spotted Newt). Starr Co: Walker Lake. 22 April 1962. F. A. Hayse. LSUMZ 6827–6830.

SCAPHIOPUS HOLBROOKII (Eastern Spadefoot). Lavaca Co: vicinity of Vienna. 25 Sept. 1978. L. Landry. LSUMZ 39584.

TERRAPENE ORNATA (Ornate Box Turtle). Borden Co: 17.8 km W Gail on Tex. Rt. 180. 20 May 1975. R. M. and P. K. Blaney. LSUMZ 30880.

HOLBROOKIA PROPINQUA (Keeled Earless Lizard). Aransas Co: Rockport City dump. May 1967. L. D. Wilson. LSUMZ 28960, 28974–28979, 29364–29369. Rockport. 23 May 1967. D. E. Hahn. LSUMZ 29639–29651.

EUMECES MULTIVIRGATUS (Many-lined Skink). Irion Co: Barnhart. 1 June 1969. L. D. Wilson. LSUMZ 33828, 33829.

HETERODON NASICUS (Western Hognose Snake). Blanco Co: Edwards Plateau. March 1961. W. Fox. LSUMZ 9275.

LAMPROPELTIS CALLIGASTER (Prairie Kingsnake). Franklin Co: 9.6 km N Mt. Vernon. 27 July 1966. R. Laval. LSUMZ 18763.

LAMPROPELTIS GETULA (Common Kingsnake). Hale Co: Plainview. 4 June 1971. F. Rose. LSUMZ 24691. San Jacinto Co: FM 1725 at San Jacinto River. 16 Sept. 1978. L. Landry. LSUMZ 39585. Uvalde Co: Tex. Rt. 83, 6.4 km S Uvalde. 5 Sept. 1964. R. E. Olson. LSUMZ 10313.

LAMPROPELTIS TRIANGULUM (Milk Snake). Live Oak Co: 20.5 km SSW George West on U.S. Rt. 59. 7 Sept. 1966. L. D. Wilson. LSUMZ 32645.

MASTICOPHIS TAENIATUS (Striped Whipsnake). Lee Co: 8.0 km E Giddings on U.S. Rt. 290. 5 June 1966. H. Hermann. LSUMZ 43562.

PITUOPHIS MELANOLEUCUS (Bullsnake). Willacy Co: 22.4 km S Norias. 18 April 1965. L. D. Wilson. LSUMZ 41906.

REGINA GRAHAMII (Graham's Crayfish Snake). Colorado Co: 3.2 km W Eagle Lake on U.S. Rt. 90. 23 May 1980. L. Landry, W. Shoop. LSUMZ 39550. Lavaca Co: 16 km S Sheridan on FM 2437. 23 May 1980. L. Landry, W. Shoop. LSUMZ 39549.

SONORA SEMIANNULATA (Ground Snake). Jim Hogg Co: 4.8 km W Hebbronville. 18 June 1980. L. Landry, W. Shoop. LSUMZ 39578.

STORERIA DEKAYI (Brown Snake). Starr Co: Roma Los Saenz. 6 Aug. 1968. R. E. Olson. LSUMZ 23502.

TRIMORPHODON BISCUTATUS (Lyre Snake). Jeff Davis Co: 13.0 km W of Valentine. 10 Aug. 1977. J. S. McLean, R. Queen. LSUMZ 34726.

VIRGINIA STRIATULA (Rough Earth Snake). Blanco Co: Blanco River Bluffs. 1 April 1961. D. A. Rossman. LSUMZ 7254. Edwards Plateau. 1 April 1961. W. Fox. LSUMZ 8852.

MICRURUS FULVIUS (Eastern Coral Snake). Sabine Co: between Hemphill and Burkville, around Toledo Bend. 2 Sept. 1973. J. E. McCann. LSUMZ 26886.

SISTRURUS MILIARIUS (Pigmy Rattlesnake). Shelby Co: 5 km W jct. Tex. Rt. 139 and Tex. Rt. 1820 on Tex. Rt. 1820. 1 Sept. 1967. L. D. Wilson. LSUMZ 33877.

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Not The Last Picture Show: New Collection Records From Paris, Texas (And Other Places)

Dixon (1987) provided comprehensive distribution maps, by county, of the herpetofauna of Texas. Numerous distribution gaps still exist, and new records are constantly being added. The following specimens were collected on several field trips, although the majority (62%) are from Camp Maxey, near Paris, Lamar County, in northeast Texas. Quadrangle names (in parentheses) refer to the USGS 7.5-minute topographic series for Texas.

Camp Maxey (Pat Mayse Lake East Quadrangle) was a mosaic of small impoundments, wooded stream drainages, marshes, pine-oak and oak-hickory woodlands, and grasslands. As part of a contract between the Texas Parks and Wildlife Department (Texas Natural Heritage Program), and the Texas National Guard, the herpetofauna of Camp Maxey was surveyed during 22–24 June 1993. (Field notes are on file at the Texas Natural Heritage Program.)

ANURA

SCAPHIOPUS COUCHII (Couch's Spadefoot). McCulloch Co: US Rt. 87, 2.6 km E of jct FM 3022 (West Sweden), 31°41'31"N, 99°28'13"W. 15 July 1990. Martin J. Whiting. Verified by James R. Dixon. TCWC 68182.

HYLA CHRYSOSCELIS (Cope's Gray Treefrog). Coryell Co: Mother Neff State Park (Eagle Springs), 31°19'55"N, 97°27'54"W. 9–11 April 1993. Martin J. Whiting and James R. Dixon. Individual was a male vocalizing from a dead branch ca. 1 m above a pond; a recording of the vocalization was verified by James R. Dixon. TCWC 70347. Collected with permit SPR 0290-022 issued to JRD. Lamar Co: Camp Maxey National Guard Training Area (Pat Mayse Lake East), 33°48'43"N, 95°32'03"W. 22–24 June 1993. Martin J. Whiting and Andrew H. Price. Verified by Tod W. Reeder. TNHC 52065–8.

BUFO AMERICANUS CHARLESMITHI (Dwarf American Toad). Lamar Co: Northwest of Pat Mayse State Wildlife Management Area (Pat Mayse Lake West), 33°50'N, 95°42'W. 5 April 1991. James H. Yantis. Verified by David C. Cannatella. TNHC 52102–07.

HYLA CINEREA (Green Treefrog). Lamar Co: Camp Maxey National Guard Training Area (Pat Mayse Lake East), 33°47'24"N, 95°32'38"W. 22–24 June 1993. Martin J. Whiting and Andrew H. Price. Verified by Tod W. Reeder. TNHC 52077.

RANA CLAMITANS CLAMITANS (Bronze Frog). Lamar Co: Camp Maxey National Guard Training Area (Pat Mayse Lake East), 33°47'58"-48'08"N, 95°34'20"-34'44"W. 22–24 June 1993. Martin J. Whiting and Andrew H. Price. Verified by Tod W. Reeder. TNHC 52078–81.

RANA PALUSTRIS (Pickerel Frog). Lamar Co: Camp Maxey National Guard Training Area (Pat Mayse Lake East), 33°48'03"N, 95°34'23"W. 22–24 June 1993. Martin J. Whiting and Andrew H. Price. Verified by Tod W. Reeder. TNHC 52070.

TESTUDINES

CHELYDRA SERPENTINA SERPENTINA (Common Snapping Turtle). Taylor Co: Dyess Airforce Base (Abilene West), 32°25'30"N, 99°48'50"W. 7 June 1993. Martin J. Whiting. Verified by James R. Dixon. TCWC 70372. Taylor Co: Summer Hill Road adjoining Double Lazy J. Ranch. 1982. Jack Joy. Verified by Carol K. Malcolm. UTACV R 12830.

STERNOTHERUS ODORATUS (Common Musk Turtle). Lamar Co: Camp Maxey National Guard Training Area (Pat Mayse Lake East), 33°47'22"N, 95°32'38"W. 22–24 June 1993. Martin J. Whiting and Andrew H. Price. Verified by Tod W. Reeder. TNHC 52064 (shell only).

TERRAPENE ORNATA ORNATA (Ornate Box Turtle). Lamar Co: Camp Maxey National Guard Training Area (Pat Mayse Lake East), 33°48'28"N, 95°35'05"W. 22–24 June 1993. Martin J. Whiting and Andrew H. Price. Verified by Tod W. Reeder. TNHC 52063 (shell only).

SERPENTES

THAMNOPHIS PROXIMUS PROXIMUS (Western Ribbon Snake). Lamar Co: Camp Maxey National Guard Training Area (Pat Mayse Lake East), 33°48'07"N, 95°34'43"W (TNHC 52073); 33°47'53"N, 95°34'03"W (TNHC 52082). 22–24 June 1993. Martin J. Whiting and Andrew H. Price. Verified by Tod W. Reeder.

NERODIA RHOMBIFER RHOMBIFER (Diamondback Water Snake). Comanche Co: US Rt. 67 at jct with the Leon River (Proctor), 31°56'25"N, 98°27'32"W. 13 July 1989. Martin J. Whiting. Verified by James R. Dixon. TCWC 68539. Found dead on the road.

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BOOK REVIEWS

Herpetology of China, by Er-Mi Zhao and Kraig Adler. 1993. Society for the Study of Amphibians and Reptiles, in cooperation with Chinese Society for the Study of Amphibians and Reptiles. Contributions to Herpetology, Number 10, 522 pp., 48 color plates. Hardcover US$60. Library of Congress Catalogue Number 92-61941. ISBN 0-916984-28-1. Available from Robert D. Aldridge, SSAR Publications Secretary (see inside front cover of this issue of *HR* for address).

This remarkable volume consists of: introduction, history of herpetological studies in China, illustrated keys to Chinese amphibians and reptiles, color plates, annotated checklist, distribution of the Chinese herpetofauna, a gazeteer to localities in the literature on herpetology of China, and various appendices and indices. The first page of each of these sections has a series of labeled rectangles along the margin with the indicator of the particular section in black, a device that facilitates finding a distant section when one gently bends the edges of a large number of pages. Several of the longer sections have tables of contents (referred to as "guides"), which also speed finding particular topics or taxa.

As China, defined here to include Taiwan, has such an enormous geographic reach—18° to 53° N, from sea level (and even depressions below sea level) to the Himalaya Mts of Tibet, from wet forests to deserts—it is not surprising that the known herpetological fauna comprises 661 species (as of mid-1992). The introduction has a table showing the breakdown of the fauna into genera, species, and endemic species along ordinal lines. Frogs constitute the largest group (36% of the total) with snakes (30%) a close second. As a resident of North America, I am impressed by the low number (35) of salamanders. Ignoring the caecilians and crocodilians (with one species each), the relative rates of endemism are: salamanders—80%, frogs—61%, lizards—43%, turtles—35%, and snakes—28%. In absolute terms, endemic frogs almost outnumber all the rest of the orders combined.

The historical account ranges from the time of Confucius to 1992 and covers field and laboratory investigations, as well as published work. Because this analysis has a chronological framework, the authors consider separately the work of foreign and Chinese scientists, first the early Chinese scholars, then the Westerners (mainly European) of the 18th–20th centuries, and then the Chinese of this century. The account of work by Chinese scholars since 1949 is divided along disciplinary lines. Work prior to then, whether by foreigners or Chinese, was essentially in systematics or biogeography. Photographs of the researchers and explorers give this chapter a charm and value that most histories of science lack. As this section covers 66 pages, it is not trivial or superficial.

Illustrated keys to genera constitute the next section. It is rather standard, but clear, and the illustrations useful. After each generic name are given relevant plate numbers (see below) and checklist page numbers. Each of the 48 colored plates consists of five to nine photographs with four of the plates devoted to landscapes distributed across the major biogeographic regions (see below). Forty to 52% of the species, varying with the order, are depicted in the photographs. A very small percentage of the subjects are preserved specimens and a few are reproductions of drawings. The small size of the photographs limit their aesthetic quality, but the majority show general habitus and coloration well enough for the purposes of this book. In fact, several plates confirm my own prejudices: *Pelophryne*(?) *scalpta*—I don't know the proper generic allocation for this bufonid, but it does not look like *Pelophryne*. I have doubted the occurrence of *Rhacophorus reinwardti* in southern China and the photograph intensifies my doubt.

The annotated checklist, the next section, has an introduction that carefully spells out the conventions and arguments used in arriving at decisions. In addition, special cases are dealt with by notes. Synonyms are given for all nominate forms that have Chinese type localities. The authors adopt a conservative taxonomic approach. For example, they do not adopt Dubois's conclusions concerning Chinese species of *Micrixalus* because those forms have not been adequately studied, a reasonable decision even though Dubois is probably correct. Also they note they were unable to use Dubois's recent classification of the Ranidae because their checklist was prepared before the appearance of Dubois's publication; that may be an advantage, in view of the uncertainties that surround some of Dubois's conclusions. This checklist is an important contribution, assembling current taxonomic information on this large fauna in one place and, for herpetologists who do not read Mandarin, making the complete Chinese fauna accessible.

The chapter on biogeography gives the distribution of every species in the fauna according to political provinces and biogeographic regions. There is also a brief geographical description of each of the regions and subregions, including a few comments on the herpetofaunal species most characteristic of each. An outline map labels both biogeographic regions and provinces and is a boon to workers not expert in this part of the world. The utilitarian approach of this book is shown again in the 14-page distributional table, which gives the checklist page number for each species. One minor criticism I would make of this section is the poor legibility of a fold-out, sepia tone map of land forms of China.

As a reviewer of this book, I find it difficult to avoid repetition of the adjective "utilitarian." Consider the section titled "Annotated Bibliography." Although most of its 100 pages are devoted to references cited in the text, it also has five pages of "General References" (categorized by topics, such as natural history and venomous snakes) and 15 pages of "Regional References" sorted by Chinese provinces and adjacent countries. With an eye to easing access to the literature, each citation is given in full including place of publication. All abbreviations are explained at the end of the bibliography.

There are three appendices. The first, on Chinese geographical names, gives Pinyin/Wade-Giles equivalents for provinces and modern equivalents for literature names that have changed. Both of these are significant aids to Westerners dipping into the herpetological literature of China. The second appendix, on procedures for collecting and preserving herps, was written by John E. Simmons, The University of Kansas. Although it is well done, this is the only part of the book that mystifies me. Why is it in this book? The final short (three pages) appendix lists Chinese herpetological journals with dates of publication for volumes and numbers. The concluding index is divided into two sections, one for names of persons and a second for scientific names.

I return to earlier comments. This is a remarkable book. It is packed with current information that in many cases is available only to persons who can read Mandarin; it is, as the authors say, the only comprehensive review of all the herpetological taxa of China; it is organized and presented in a way that makes it easy for a reader to move from section to section as one tries to concentrate on a particular taxon. Although ecology or natural history are not dealt with, those topics were outside the stated purpose of the book (". . . a summary of the current taxonomic status and distribution . . .") and anyway their inclusion would have doubled the size of the work. The book is not cheap—$60—but it is none the less a bargain.

ROBERT F. INGER
Field Museum of Natural History
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Amphibians and Reptiles of Connecticut and Adjacent Regions, by Michael W. Klemens.1993. State Geological and Natural History Survey of Connecticut Bulletin No. 112 , Hartford, ISBN 0-942081-04-8. xii + 318 pp. 32 color pl. US $39.95 + $3 shipping (cloth). A special price of $25 + $3 shipping is available to qualified libraries. Librarians should contact the Geological and Natural History Survey at the Natural Resources Center, DEP, 165 Capitol Ave., Hartford, Connecticut 06106, USA.

I must begin this review by stating that I would have been much happier if this book had been published before I moved out of Connecticut. *Amphibians and Reptiles of Connecticut and Adjacent Regions* is the first in-depth modern work to come out of the Northeast. There have been several recent books from New England states (DeGraaf and Rudis 1983; Hunter et al. 1992) that provide good natural history information, but these are not based on original research from the states involved. DeKay (1842) and Fowler (1907) are classics for the region, but they are long out of date. Klemens has spent 17 years collecting detailed information on the distribution, habitat, life history and current population status of Connecticut's 45 species of amphibians and reptiles.

The introductory chapters provide detailed background into this long-running study. The "History of Herpetology in Connecticut" includes an interesting sidelight on the loss of Lamson's 1931 manuscript of *The Reptiles of Connecticut* (Lamson 1935). Landscape regions of the state are well described as are the habitat

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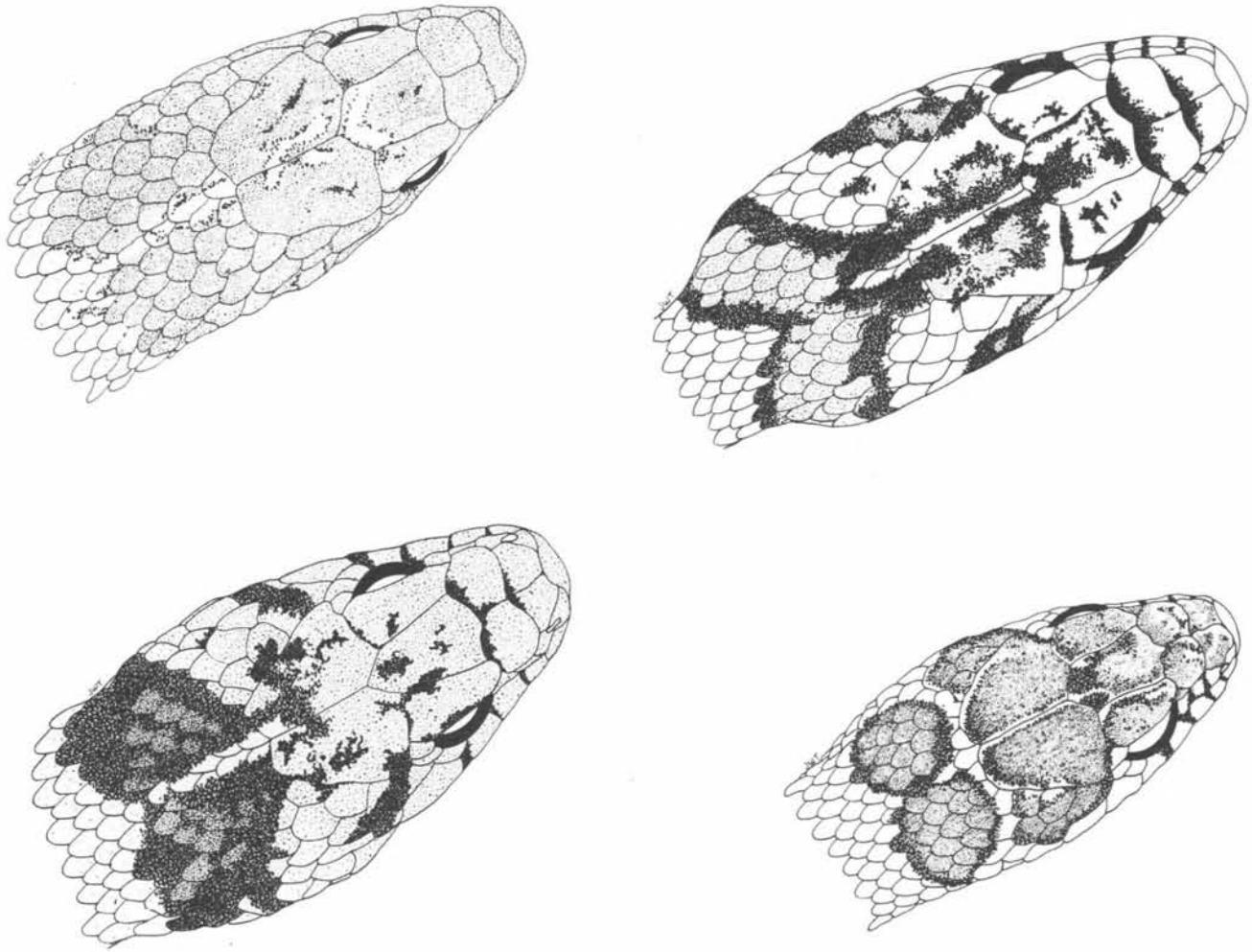
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About the Cover.—The cover illustrations were executed by Jeffrey W. Tamplin, Department of Zoology & Physiology, Louisiana State University, Baton Rouge. Clockwise, from upper left: *Thamnophis exsul* (USNM 166423, holotype: Coahuila); *Thamnophis sumichrasti* (USNM 7079a: Veracruz); *Thamnophis scalaris* (MVZ 144489: Veracruz); *Thamnophis mendax* (LSUMZ 35340: Tamaulipas). Readers interested in the systematics of this group of Mexican garter snakes are referred to the following publication: D. A. Rossman. 1992. Taxonomic status and relationships of the Tamaulipan montane garter snake, *Thamnophis mendax* Walker, 1955. Proc. Louisiana Acad. Sci. 55:1–14.

SSAR BUSINESS

New SSAR Publication

The Society for the Study of Amphibians and Reptiles announces a new publication series, *Herpetological Conservation*, to present information about the preservation and management of amphibians and reptiles. This series will be published about once per year and each issue will concentrate on a single subject. Most often, an issue will consist of a monograph, but proceedings of topical symposia may be considered. Papers submitted for publication should document thoroughly a need for conservation and evaluate and recommend management alternatives.

Herpetological Conservation will be rigorously refereed. Manuscripts submitted for publication should be derived primarily from data or analyses not published previously.

Submit manuscripts or direct inquiries to the editor: *Stephen Corn, National Biological Survey, 4512 McMurry Avenue, Fort Collins, Colorado 80525-3400, USA. Tel. (303) 226-9464, Fax (303) 226-9230, email: CornS@mail.fws.gov.*

Donations Needed For SSAR Symposium

"West Indian Herpetology: A Symposium in Memory of Albert Schwartz," is to be held at the 1994 SSAR/HL meeting. Several of the invited participants living in the West Indies require assistance with travel expenses in order to attend the symposium. Donations are being sought from individuals and institutions to help defray travel costs.

All donations are tax-deductible, and may be made payable to "Zoology Trust—Schwartz Symposium," and mailed to *Dr. Robert Henderson, Milwaukee Public Museum, 800 W. Wells St., Milwaukee, Wisconsin 53233, USA.* All contributors will be acknowledged in the symposium program and in any publications emanating from the symposium.

MEETINGS

Venomous Snakes: Ecology, Evolution And Snakebite

A meeting will be held at the London Zoo on 27-28 April 1995, under the auspices of the Zoological Society of London. Areas covered will be "Ecology," "Evolution, biogeography and systematics," "Molecular evolution," and "Venom and snakebite." Proceedings will be published as part of the "Symposia of the Zoological Society of London Series." Persons interested in further details should contact: *Roger S. Thorpe (Venomous Snake Symposium), School of Biological Sciences, Brambell Building, University College of North Wales, Bangor, Gwynedd LL57 2UW, Wales, UK.*



NEWSNOTES

ASC Publication Announcement

The Association of Systematics Collections has published the report, "Guidelines for Institutional Database Policies," the result of its two-year study and workshop on data sharing and database ethics. The report contains guidelines for natural history institutions housing specimen-based databases which address legal ownership, responsibilities of owners and users, and financial support. In addition the report contains examples of data sharing agreements, presentations from the data sharing workshop, the ASC position on collections use agreements, and references on data sharing and transfer policies. 76 pp., 1993. Copies are available for $12 (including postage) from: *ASC, 730 11th Street, NW, Washington, D.C. 20001-4521, USA. Tel. (202) 347-2850.*

Request For Scientific Literature

Do you have scientific books or journal series that you no longer use and would like to donate for distribution to Cuba? The Association of Systematics Collections (ASC) is developing a program to exchange systematics and biodiversity information between North American institutions and Cuban institutions. Please contact the ASC office with the titles of books, journals, or reports in systematics/biodiversity (especially related to Caribbean biota) that you are willing to donate, and we will arrange to ship the materials to an appropriate institution in Cuba. For more information and to contribute contact: *Elizabeth Hathway, ASC, 730 11th Street, NW, Second Floor, Washington, D. C. 20001-4521, USA. Tel. (202) 347-2850; Fax (202) 347-0072.*

Charles Stearns Grant-In-Aid For Herpetological Research At The California Academy Of Sciences

The Department of Herpetology is pleased to provide limited financial aid—mostly to cover round trip transportation and limited per diem expenses—to graduate students who wish to visit our collections to support research in systematics.

Proposals should include a short—no more than one page—description of the research project, a budget, and a letter of support from the student's faculty advisor.

Proposals are due by 15 October 1994, with notification by 1 December 1994. Grantees are expected to complete their Academy visit by 15 September 1995. Please call 415-750-7037 for further information.

Send proposals to: *Herpetology Research Grants, Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118-4599, USA.*

Missouri Department Of Conservation

Six wildlife research assistant positions will be availablefrom 24 August–2 November 1994 to work on the herpetological study in the Missouri Ozark Forest Ecosystem Project. Workers must be able to identify amphibians and reptiles to species. The wage is $8/hr for a 40-hr week. Housing, utilities, and vehicles are provided. Inquiries to: *Rochelle Renken, Missouri Department of Conservation - Wildlife Research Section, 1110 South College Ave., Columbia, Missouri 65201. Tel. (314) 882-9880. Deadline for receipt of applications is 1 July 1994.*

SSAR/HL Meeting Highlights

Dates: 28 July–1 August 1994
Place: The University of Georgia, Athens, Georgia

Keynote Lecture: "The Evolution of Reptilian Viviparity Revisited," by Richard Shine (University of Sydney).

Forum: "Issues in Conservation: Point-Counterpoint." *Moderator*: Robert Jaeger. *Speakers*: Henry Wilbur and S. Bradley Shaffer.

Symposium: "Field and Behavioral Endocrinology." *Organizer*: Diana Hews. *Participants:* Dale DeNardo, Louis J. Guillette, Tyrone Hayes, Lynne D. Houck, Rosemary Knapp, Robert T. Mason, Mary Mendonça, Catherine Propper, Matthew Rand, and Thane Wibbels.

Symposium: "Interfaces Among Inter-individual Variation, Life Histories, and Population Dynamics of Reptiles and Amphibians." *Organizer:* Arthur E. Dunham. *Participants not yet finalized.*

Symposium: "West Indian Herpetology: A Symposium in Memory of Albert Schwartz." *Organizers:* Robert W. Henderson and Robert Powell. *Participants (tentative)*: Karen Anderson, Karen A. Bjorndal, Alan B. Bolten, Hans E. A. Boos, M. Butler, P. A. Burrowes, Ellen J. Censky, Brian I. Crother, Mark L. Day, C. Kenneth Dodd, Jr., William E. Duellman, Alberto R. Estrada, Richard Franz, Mary Garvin, Carla A. Hass, S. Blair Hedges, Duncan Irschick, Thomas A. Jenssen, Rafael L. Joglar, Hinrich Kaiser, Julian C. Lee, Allen R. Lewis, Jonathan B. Losos, Walter E. Meshaka, Jr., José A. Ottenwalder, Octavio Pérez-Beato, Douglas P. Reagan, Jonathan Roughgarden, Andreas Schubert, Sharoni Shafir, Margaret M. Stewart, Richard Thomas, Roger S. Thorpe, Peter J. Tolson, Daniel S. Townsend, and Peter Vogel.

Colloquium: "Turtle Biogeography and Phylogeography." *Organizer:* Brian Bowen. *Participants:* Eugene S. Gaffney, S. Bradley Shaffer, Scott Davis, Edward O. Moll, Fredric J. Janzen, DeEtte Walker, Sandra Encalada, Peter Dutton, Anna Bass, Arthur Georges, Matthew Ostentoski, Trip Lamb, Anders Rhodin, Eli Stahl.

Herpetological Travelogue Slide Shows: Profusely-illustrated lectures of exotic herps and habitats.

Multimedia Presentations: "Herps of the West," and "Amphibians of the Appalachians," by David Dennis and Eric Juterbock; "Namesakes of North American Amphibians and Reptiles," (new) by Kraig Adler and David Dennis.

Oral and Poster Sessions: Several concurrent sessions each day.

Student Paper Awards: Seibert Prizes (SSAR) to be awarded to the two best student-presented papers at the meeting ($250 first prize, $150 second prize). The Herpetologists' League Award for Graduate Research is for the best student-authored manuscript; winner receives $500 and ten years back issues of *Herpetologica*.

"The Great Reprint Scavenge" (for students only!). Professionals are asked to clear unwanted duplicate reprints out of their offices (and receive free raffle tickets as a "thank you").

Social Activities: Welcoming Social, the SSAR Annual Auction, Barbecue Picnic, Graduate Student Program ("Graduate School: The Greatest Pit-fall Trap of All") & Social, local tours.

Field Trips: Zoo Atlanta, Savannah River Ecology Lab, Highlands Biological Station, Okefenokee Swamp, and Sapelo Island.

Art Exhibit: Featuring art with a herptile focus. $100 cash award for the art work judged the most unique and interesting.

Live Exhibit: Featuring herps of the region. Sponsored by Savannah River Ecology Lab.

Costs: Registration $80 student, $115 regular; $160 late registration fee after 20 June. Lodging at Residence Hall (air-conditioned dorms): $13 person/day (double occupancy) and $19 person/day (single occupancy). Lodging at Georgia Center (meeting location) or local Hotel: $45-$51/day (single occupancy) and $52-$55/day (double occupancy).

Further Details: See December 1993 issue of *Herpetological Review* (pages 117–119). Meeting Announcement/Call for Papers was mailed to all North American members of SSAR and HL in March 1994; it is also available on request from *Amy Edwards, Program Coordinator, Museum of Natural History, University of Georgia, Athens, Georgia 30602, USA (telephone 706-542-4137; FAX 706-542-3920; email AEDWARDS@ZOOKEEPER.ZOO.UGA.EDU).*

LEGISLATION & CONSERVATION ALERT

Call for information on the status of amphibians and reptiles: *This column serves to update the herpetological community on the regulatory status and protection measures implemented for rare, threatened, and endangered herps. We are in need of more information, especially on the State and Province level. Please send pertinent information to the Section Editor.*

U.S.A.: Department of the Interior: The U.S. Fish and Wildlife Service is soliciting additional information on population trends, levels of trade, and the effect of trade on population status for review in deciding whether to submit a proposal to include the genus *Terrapene* (box turtles) in Appendix II of CITES, while retaining *Terrapene coahuila* in Appendix I. According to USFWS data, 26,817 box turtles were exported from the United States in 1992, and 18,134 were exported in 1993. However, the 1993 data are not yet complete (Federal Register, Vol. 59, No. 18, 27 January 1994). Concerned scientists, conservationists, and citizens should write to: *Dr. Charles W. Dana, Chief, Office of Science Authority, Room 725, Arlington Square Building, U.S. Fish and Wildlife Service, Washington, D.C. 20240, Tel. 703-358-1708, FAX 703-358-2276.* This information was brought to the section editor's attention by: Allen Salzberg, The New York Turtle and Tortoise Society, 163 Amsterdam Avenue, Suite 365, New York, New York 10023, USA.

U.S.A.: Department of the Interior: On 29 November 1993, the U.S. Fish and Wildlife Service proposed the flat-tailed horned lizard (*Phrynosoma mcallii*) as Federally Threatened. The lizard is found in sandy flats and valleys of the western Sonoran Desert in the Coachella Valley through the Imperial Valley, California, and several other areas in México and Arizona. Approximately 40% and 20% of the lizard's habitat has been lost in California and Arizona, respectively. An estimated 95% of the current suitable habitat in California and 35% in Arizona is threatened by continuing human alterations (Endangered Species Tech. Bull. Vol. XIX No. 1, 1994).

The giant garter snake (*Thamnophis gigas*) was listed as Federally Threatened on 20 October 1993. The species occurs in wetland habitats in portions of California's Central Valley. It has been extirpated from two-thirds of its original range (Endangered Species Tech. Bull. Vol. XIX No. 1, 1994).

A proposed rule to list the northern copperbelly watersnake (*Nerodia erythrogaster neglecta*) as Federally Threatened was signed by the Director of the USFWS on 26 July 1993 (Federal Register, Vol. 59, No. 18, 27 January 1994). The current range includes southwestern Indiana and adjacent Illinois and Kentucky, and southern Michigan, northeastern Indiana, and northwestern Ohio. Habitat loss and fragmentation of cypress and willow-buttonbush swamp wetlands are the primary factors threatening the continued existence of the subspecies, however the snake also requires upland wooded hibernation sites above the floodstage line (Federal Register, Vol. 58, No. 158, 18 August 1993).

U.S.A.: Colorado: At the 18 November 1993 meeting of the Colorado Wildlife Commission, the boreal toad (*Bufo boreas boreas*) was uplisted from Special Concern to Endangered. This toad has suffered severe population declines in the past several years. The wood frog (*Rana sylvatica*) was retained as Threatened on the state list. Any person can possess up to 6 of any nongame amphibian or reptile species, except for Threatened or Endangered species. No take is permitted of midget-faded rattlesnakes (*Crotalus viridis concolor*) and massasaugas (*Sistrurus catenatus*).

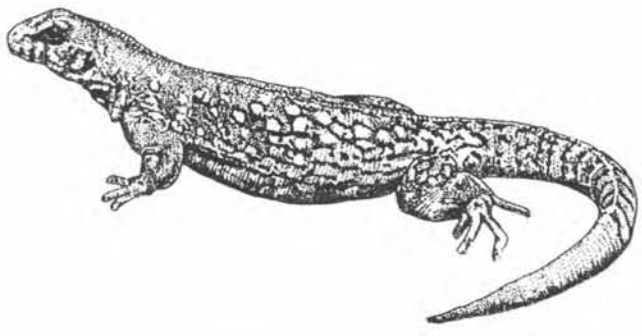
The snapping turtle (*Chelydra serpentina*) and prairie rattlesnake (*Crotalus viridis viridis*) are considered small game species. At the 13 January 1994 meeting of the Colorado Wildlife Commission, new provisions were adopted for the prairie rattlesnake: season from 15 June – 15 August, bag limit = 3, possession limit = 6. This represents increased restrictions for the take of prairie rattlesnakes, as previously there were no bag limits and the season was open year around. Bullfrogs (*Rana catesbeiana*) and tiger salamanders (*Ambystoma tigrinum*) are also considered game animals, and are covered under fishing regulations. For more information contact: *Colorado Division of Wildlife, 6060 Broadway, Denver, Colorado 80216, USA.* This information was submitted by Lauren J. Livo, 1215 S. Osceola Street, Denver, Colorado 80219, USA.

USA: Federal Memorandum of Understanding: On 25 January 1994 the heads of five federal agencies (Bureau of Land Management, Fish and Wildlife Service, U.S. Forest Service, National Marine Fisheries Service, National Park Service) signed a formal Memorandum of Understanding (MOU) in Arlington, Virginia, whereby they all agreed to cooperatively seek ways to protect the habitats of potentially endangered and threatened species. Species to be targeted include those listed under Category 2 status by the U.S. Fish and Wildlife Service and sensitive species listed by the U.S. Forest Service. A Habitat Conservation Assessment (HCA) will be drafted for each species or group of species. This document describes the species' current status and lists the measures that will be undertaken by the appropriate agency to protect its habitat. Much of the focus of the MOU is on interforest, interregional, and ecosystem approaches to conservation. Species requiring conservation efforts can be protected in more flexible and creative ways than would be required under the Endangered Species Act. Once a HCA has been drafted and a formal Conservation Agreement is signed by the appropriate agencies, the likelihood of that species being listed as endangered or threatened is substantially reduced or eliminated.

The first Conservation Agreement, signed by the heads of the U.S. Fish and Wildlife Service regional office and the George Washington National Forest (GWNF) also on 25 January, is for the Cow Knob salamander (*Plethodon punctatus*). This agreement and its companion HCA restricts or eliminates certain activities, including timber harvesting and off-road vehicles, in a 43,000-acre area on Shenandoah Mountain located on the Virginia and West Virginia state line in the GWNF. This reserve, designated by the U.S. Forest Service as the Shenandoah Mountain Crest Special Interest Area, contains approximately 90% of the known range of *P. punctatus* and a number of rare plant species and communities. A Conservation Team, currently being assembled, will oversee all activities in this area.

This information was submitted by Joseph C. Mitchell, Department of Biology, University of Richmond, Richmond, Virginia 23173, USA.

KURT A. BUHLMANN
SSAR Conservation Committee.



Dipsosaurus dorsalis (Desert Iguana). USA, Arizona: Pima Co., Mile Wide Road. Illustration by Chuck Smith.

IN MEMORIAM

James Clarence Battersby
1901 – 1993

Mr. J. C. Battersby died at his home in Surrey, England, on 3 December 1993, aged 92. For 44 years he was a valued and efficient custodian of the herpetological collections in the British Museum (Natural History). A Londoner, he lived the early part of his life in Chelsea, close to the Museum.

His museum career began in 1917 when, at the age of 16, he was hired as a laboratory assistant to George Albert Boulenger, the renowned taxonomic herpetologist and naturalist. Under Boulenger's tutelage Jim Battersby absorbed a wide knowledge of the rich and historically valuable herpetological collections and developed sound curatorial methods. Almost to his dying days the care, enhancement and maintenance of these collections remained his overriding concern. He was greatly influenced by his master's tireless energy, intellect, and enormous output of scientific papers, catalogues and books and he was deeply appreciative of the example set for him. The museum's established tradition of providing unstinting assistance to visiting scientists from home and abroad was maintained by Battersby and he quickly learned to cope with the vast number of enquiries that flooded into the Reptile and Amphibian Section from both lay persons and specialists.



Boulenger's aversion to dissecting specimens to study their anatomy rubbed off on Battersby. However, following the arrival in 1923 of a young Cambridge University graduate in biology and chemistry, Hampton Wildman Parker, who took charge of the section, the sanctity of type and other material was disturbed. Soft parts and bones came in for close scrutiny and rather less reliance was placed on painstakingly accumulated data. Jim Battersby's strong sense of duty and allegiance to his head of section ensured his accepting what must initially have been considered by him to be a profanity.

When World War II threatened, plans were drawn up for the type material stored in alcohol to be removed to a place of safety in caves in the chalk hills of Surrey, south of London. Jim Battersby, along with ichthyologists Dr. Ethelwyn Trewavas and Fraser Brunner, played the active part in these arrangements. Later, during the height of the London Blitz when bombs were raining down on and around the museum, Jim Battersby was one of the firefighting team. All too soon army service beckoned and he was conscripted. He served as a driver in the Royal Army Service Corps and saw action, first in the North African campaign, then in Italy.

Shortly after the cessation of hostilities Battersby returned to the Museum. In 1946 he took on the additional task of compiler of the Amphibia and Reptilia part of the *Zoological Record*, a most tedious, time-consuming job necessitating burning the midnight oil and working through lunch hours. Remuneration was extremely poor, varying from £15 to £20 per part per annum but the spin off in keeping abreast of the literature was well worthwhile. After the Amphibia and Reptilia parts were separated in 1953, Battersby continued until 1960 to index the section on Recent reptiles. His gracious wife, Nina, joined him to work part-time in the section, transferring references from the *Zoological Record* to card indexes to the families, genera and species. For this wearisome job, but one extremely valuable to staff and visitors alike, she was paid £80 per annum. It cannot be said that the Battersbys got rich from these supernumerary jobs!

In 1951 I was appointed to fill the vacancy that had existed in the Reptile and Amphibian Section since 1947 when Dr. Parker was promoted to head (officially, Keeper) of the Department of Zoology. Battersby lacked the necessary academic qualifications to become head of the section. It said much for Jim Battersby's forbearance that he accepted with good grace a whippersnapper newly fledged from a university in Scotland, a country with an impoverished herpetofauna consisting of one species of snake, frog and toad, two species of lizard and three species of newt. But harder to bear must have been my total ignorance of herpetology. Fortunately he had his first collecting trip to look forward to and soon after my arrival he went off to Kenya's Northern Frontier Division, leaving me behind with a totally inexperienced, part-time lad; we floundered in his absence, though Dr. Parker's visits to the section helped me find my feet.

On JCB's return after his fruitful expedition all three of us were a lot wiser but to guard against any possibility of egos being upset and discontent Dr. Parker wisely advised that I should give Jim Battersby full control of the snake collections. That tactical move helped establish a good working relationship. However, long after Battersby's retirement I was called upon by the Keeper and the Director to update Parker's little popular book, "Natural History of Snakes." A copy of the new edition presented to JCB was greeted with ridicule. The book was never again referred to. His copy disappeared from his shelves. Thankfully his breezy style and wit returned later and good relations were restored.

Battersby's burden of curatorial duties was so heavy that very little time and opportunity were available for original research. Identifying world-wide collections of reptiles, fetching comparative material from the storerooms, and returning to the shelves all specimens used both by him and visitors to the section, formed a major part of his job. He took such pride in his accurate accessioning and in the well-organized collections that he seemed almost to resent and feel guilty breaking off to study material in depth for his own projects. But his herpetological interests were quite broad geographically, including the West Indies, East Africa, the Middle East, and Nepal. His primary focus was snakes and lizards, and most of his relatively few publications—which were meticulous and detailed—dealt with faunal studies and descriptions of new species. His last publication was a personal and sensitive biography of his master, prepared as an introduction to the reprint of Boulenger's papers on American herpetology, issued in 1971 by the Society for the Study of Amphibians and Reptiles.

Dr. Francis C. Fraser, who succeeded Dr. Parker as Keeper, was most anxious that Battersby should continue in museum service beyond the age of 60. But for years JCB had vowed he would retire at 60 and, true to his word he did, in 1961. He and his wife then moved out of London to Surrey where they lived a very quiet life, apparently utterly content in each other's company and with no hobbies other than reading. Nina's severe stroke came as a cruel blow but even as her physical and mental processes deteriorated he insisted on her being at home where he would look after her. His was a very demanding task that would have quickly drained anyone of a weaker frame and character. As her condition worsened he was forced, reluctantly, to give in and employ nurses to help. He outlived her by five years. They had no children.

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ARTICLES

A Re-evaluation Of Suffocation As The Cause Of Death During Constriction By Snakes

How do constricting snakes kill their prey? Ditmars (1910:148) probably summarized the knowledge in his day when he stated that "A few large individuals [pythons] are bold enough to retain a coil or two of the body that could crush out a human life. ...All [boids] kill their prey by constriction—squeezing it to death." FitzSimons (1930:23) may have been the first to mention a physiological process (asphyxia) as the cause of death of constricted prey: "The python's object is to crush the body so effectually that the lungs are unable to expand, and death follows quickly from asphyxiation. ...When the python is sufficiently large to constrict its victim efficiently, the prey suffers little or no pain. The unsuspecting creature is seized in the great jaws by their formidable armature of recurved teeth and, almost on the instant, its ribs and lungs are crushed in, death being practically instantaneous." Shortly thereafter, Ditmars (1931:49) concluded that constrictors prevented breathing: "It should also be understood that constriction is not so pronounced that the prey is crushed into an elongated mass and thus rendered easier to swallow. There is little or no change in the form of the animal. It is simply killed by being so squeezed that it is unable to breathe." Although Ditmars' idea may have come from FitzSimons, both appear to have influenced most herpetological books that followed, even to the present day, e.g., "Boas and pythons are constrictors, meaning they kill their prey by suffocation." (Stoops and Wright 1993:39).

It has been pointed out that when a python killed a human being (Chiszar et al. 1993) or when the ratio of prey to snake mass (Greene 1992) is large (K. V. Kardong, A. H. Savitzky, pers. comm.), suffocation rather than circulatory arrest could become a significant factor in death. However, a prey/snake mass ratio greater than one is not common in boids (Greene 1988). Here I argue in favor of circulatory arrest and against suffocation as the cause of death by constriction. The assumption is made that the mass of endothermic prey constricted is less than that of the snake. The implications of the combined use of venom and constriction by some colubrid, elapid and hydrophiid taxa (Shine and Schwaner 1985) are not discussed.

Three terms used in this paper are defined as follows: *Asphyxia*—a lack of oxygen and an excess of carbon dioxide in the body, usually from interruption of breathing; *Circulatory failure*—pump failure of the heart with arrest of the circulation beyond the point of recovery as a result of asystole (noncontraction), electromechanical dissociation (electrocardiographic complexes are present in the absence of cardiac output) or ventricular fibrillation (electrical chaos); *Suffocation*—cessation of external respiration (exchange of oxygen and carbon dioxide across the pulmonary membrane) by preventing ventilation (the movement of air in and out of the lungs) through mechanical restraint of the prey's chest wall. (Although "suffocation" is also used in a broader sense, my definition for this discussion does not include strangulation, upper airway obstruction alone, or interference with internal respiration—the uptake of oxygen and release of carbon dioxide at the cellular level. Webster's Medical Desk Dictionary defines *suffocate* as: "1: to stop the respiration of (as by strangling or asphyxiation) 2: to deprive of oxygen: to die from being unable to breathe." [Pease 1986:688]).

At least 32 other herpetological books state prey death from constriction is the result of suffocation, asphyxiation or prevention of breathing (Alvarez del Toro 1982:148; Auerbach 1987:152; Burton 1991:38; Carr 1963:74; Coborn 1985:13, 1991:43; Cogger 1992:600; Englemann and Obst 1981:34; Frank 1978:70; Gibbons 1977:32; Goin et al. 1978:316; Honders 1975:35; Isenmonger 1968:23; Jackson 1983:14; Lanworn 1972:35; Loveridge 1945:110; Mara 1993:16; Marais 1985:75, 1992:130; Marcus 1981:64; Mattison 1986:82; McFarland et al. 1979:479; Morris and Morris 1965:175; Parker 1963:68; Parker and Grandison 1977:38; Shaw and Campbell 1974:22; Shine 1991:168, 1992:186; Sprawls 1979:112; Stidworthy 1974:45; Stoops and Wright 1992:6; Zug 1993:134). Eight other texts indicate that both suffocation and restriction of heart function play a role (Bellairs 1970:123; Bellairs and Attridge 1975:179; Coborn 1992:45; Mehrtens 1987:18; Minton and Minton 1973:218; Oulahan 1976:42; Schmidt and Inger 1957:176; Stafford 1986:26), and in six the cause of death is not discussed (Broadley 1983; Gans 1975; Halliday and Adler 1987; Lancini 1979; Mushinsky 1987; Porter 1972). One book stated that death resulted from stopping the heart from beating (Crompton 1963:95).

Rochelle and Kardong (1993) reported time to subdue prey by a constricting colubrid snake (*Boiga irregularis*) and in their discussion attributed death to suffocation, citing Bellairs (1970). However, Bellairs (1970) included both ". . . stopping its heart beating and preventing it from breathing," but gave no reference for his statement. Rochelle and Kardong (1993) also stated that constriction can rupture blood vessels or organs within the prey and bring about death, but offered no evidence for that conclusion. Thus the specific physiological changes resulting in death of constricted prey appear to await investigation.

In subduing endothermic prey, constricting snakes coil around the thoracic cage containing the heart and lungs. As the coils tighten, it appears the heart is compressed by the ribs and diaphragm, and the latter stabilized by the abdominal viscera, while the lungs are deflated. The force exerted seems greater than that required for control of struggling prey and the prevention of breathing. Based on physiological principles (Parmley 1991), heart compression results in three events which make constriction efficient in affecting immediate circulatory arrest. (1) The increase in intrathoracic pressure interrupts flow of blood from systemic and pulmonary venous systems into the right and left chambers of the heart, respectively. With lack of venous inflow to the ventricles there can be no arterial outflow to the pulmonary and systemic arterial circulations. (2) Cardiac compression prevents expansion of atria and ventricles so cardiac chambers do not fill during diastole. (3) Following contraction, myocardial fibers cannot lengthen due to external compression and effective contraction of the ventricular wall is not possible.

Thoracic compression results in immediate circulatory arrest followed by failure of cellular respiration of the myocardium (heart muscle) and brainstem. Within seconds the capillary circulation to the major organ systems stops and their cells begin to undergo irreversible metabolic changes. Suffocation should take longer to cause death because arterial blood, albeit desaturated and carrying decreasing amounts of oxygen with time, continues to perfuse the capillaries of the myocardium and brain providing some respiration to their tissues. Although thoracic compression interrupts ventilation (breathing) and suffocation is initiated, it is unlikely the latter is the proximate cause of such a rapid demise.

For suffocation to be the primary cause of death, chest compression must be sufficient to prevent breathing while at the same time have limited effect on cardiac output. Systemic circulation would be normal or elevated and would perfuse tissues for a number of minutes. The decrease in oxygen supply and increase in acidosis would proceed at a slower rate than with circulatory arrest. Death could result from both circulatory failure and suffocation, and admittedly compression effectively decreases residual air in the alveoli of the lungs, accelerating oxygen desaturation of pulmonary blood. However, since little or no blood is circulating through the lungs during constriction, lung deflation and suffocation presumably are not major factors in death of constricted animals.

As endothermic prey, mammals and birds are particularly vulnerable to constriction because their high metabolic rate means lack of oxygen to tissues disrupts cellular function quickly. I simulated constriction in twenty laboratory mice (*Mus musculus*) using digital compression of the thorax. With sustained loss of heart beat and failure to revive serving as endpoints, the mean time to death was 42.0 s (SD ± 4.5). Twelve live-trapped white-throated woodrats (*Neotoma albigula*) succumbed in a mean time of 78.6 s (SD ± 13.9). Rochelle and Kardong (1993) reported similar findings for constriction by brown tree snakes (*Boiga irregularis*) which killed laboratory mice by constriction (and without simultaneous envenomation) in a mean time of 50.5 s (SD ± 18.9) from initial seizure to last muscle twitch. Because reptiles and amphibians often have low resting metabolic rates and rely on anaerobic metabolism for much of their energy requirement, they require less oxygen and lower cardiac output. Thus, ectothermic prey should tolerate tissue hypoxia longer and be less vulnerable to death by constriction.

Historically constriction as a prey-subduing behavior may have appeared during the time when a major component of early snake diet was ectothermic (Greene 1983; Greene and Burghardt 1978) and could have evolved initially as a mechanism to immobilize rather than kill proportionately heavier prey prior to consumption (K. V. Kardong, A. H. Savitzky, pers. comm.). I observed an adult colubrid (*Lampropeltis getula*) immobilize a yearling viperid (*Crotalus atrox*) within several minutes of constriction. The rattlesnake was then eaten without resistance and appeared alive as it was engulfed. A possible physiological explanation for this observation involves the reliance of snakes and most other reptiles on anaerobic metabolism allowing rapid energy input when needed without the high maintenance costs of aerobic metabolism. However, anaerobic energy production is of short duration and consequently muscles fatigue more quickly (Pough 1983). Thus ectothermic prey can be effectively immobilized and consumed by a larger snake after several minutes of nonlethal constriction. Further studies are needed to elucidate the physiology of constriction, utilizing both endothermic and ectothermic prey.

Ditmars was an editor of the *Bulletin of the Antivenin Institute of America* and it seems likely he would have read the following: "The ground-mole is a tough customer; yet, a strong, energetic mole was dead in a few seconds from the time it was seized and enfolded by a 5-foot pine snake. It was neither strangled nor suffocated, and the pine snake is not poisonous. None of the snake's folds were at any time around its head or neck. When the snake uncoiled and began to swallow it the mole's body was not unduly distorted.... The coils are then quickly tightened until the pressure interferes with and finally stops the heart's pulsations, which means, of course, that the victim is dead. The process may be assisted somewhat by the incidental deflation of the victim's lungs, but death is too speedy to be accounted for by this suffocation alone." (McLees 1928:105). The argument was compelling, but the one-page essay was apparently given little credibility. It may have been overlooked by others because of limited distribution. (As an aside, Afranio do Amaral, Editor of the *Bulletin*, added to the bottom of the McLees article, "Note: The Neotropic ophiophagous species, *Pseudoboa cloelia* [= *Clelia clelia*] ("Mussurana"), after coiling around its victim, twists the latter's body in such a way as to disjoint the vertebral column before it attempts to crush the skull.— A. do A.").

In summary, death by constriction is most likely the result of circulatory arrest followed by rapid tissue hypoxia of vital organ systems. Although suffocation occurs simultaneously with circulatory arrest, it is not the proximate cause of death. This hypothesis is based on general physiological principles and awaits controlled testing. In the meantime, "circulatory arrest" is a better bet than "suffocation." It is not simply semantics because physiologically there is a significant difference. Frank McLees figured that out at least 65 years ago, but his ideas had little impact.

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New Legislation For The Protection And Management Of *Dermatemys mawii* In Belize, Central America

The Central American river turtle *Dermatemys mawii* is a large, highly aquatic, herbivorous, freshwater turtle of the Atlantic drainages of southern Mexico, Belize, and Guatemala (Alvarez del Toro et al. 1979; Iverson 1986; Iverson and Mittermeier 1980). It is the monotypic living representative of the formerly widespread and diverse family Dermatemydidae, which dates from the Jurassic of Europe and the Cretaceous of North America, Europe, and East Asia (Hutchison and Bramble 1981; Iverson and Mittermeier 1980; Romer 1956). Throughout its restricted range *Dermatemys* is intensely persecuted for its meat (Alvarez del Toro et al. 1979; Holman 1964; Lee 1969; Mittermeier 1970, 1971; Moll 1986), which is consumed by rural people and sold in urban markets. Because *Dermatemys* lays its eggs in scattered locations during high water periods of the late rainy season, exploitation of nesting females and their eggs is inconsequential (Polisar 1992). Years of unrestrained exploitation have caused concern about the status of *Dermatemys*, and it is listed on Appendix II of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES 1984), as endangered under the provisions of the U.S. Endangered Species Act (Code of Federal Regulations 1987), and as a high priority species in the IUCN Species Survival Commission Action Plan for the Conservation of Tortoises and Freshwater Turtles (IUCN/SSC/TFTSG 1991).

Hunting has virtually eliminated *Dermatemys* from much of its former range in southern Mexico (Vogt, pers. comm.), and the status of the species in Guatemala is unclear. As late as 1984 *Dermatemys* was common to abundant in sparsely populated areas of Belize, but declining where accessible to a harvesting public (Moll 1986). Moll (1986) urged that the remaining relatively intact populations in Belize offered an opportunity to obtain the biological data needed to manage this important species.

That opportunity was seized when the seven villages of the Community Baboon Sanctuary, a grassroots wildlands management project that maintains riparian forest habitat for black howler monkeys (*Alouatta pigra*) (Horwich 1986, 1990; Horwich and Lyon 1988), invited me to study *Dermatemys* in the 32 km section of the Belize River that bisects their sanctuary. The invitation stemmed from concern that local levels of harvest had become unsustainable. Field research began in late 1989 and expanded rapidly, eventually including an additional 54 km of the Belize River, 39 km of tributary systems, an additional five villages, urban market counts, and fieldwork in the Rio Bravo Conservation and Management Area and the Crooked Tree Wildlife Sanctuary. The focal points of the two-year study were reproductive biology and exploitation patterns. The abundance of local cooperation greatly enhanced the collection of data on reproductive cycles, minimum sizes at maturity, nesting and mating seasons, incubation periods, methods of exploitation and marketing, and seasonality, scale, and effects of exploitation. Extended immersed residence in the villages provided an understanding of local perspectives, needs, and customs.

Although exploitation occurred year-round, it peaked during the last two months of the dry season, April and May, when low water levels facilitated captures. In northern Belize there was a strong tradition of having *Dermatemys* (locally called hickatee) for Easter dinner in April. The data showed that repetitious, intense hunting within an area resulted in decreased densities, and lower proportions of adults, particularly adult females. All three methods of hunting (harpoons, nets, and freediving) selected for larger size classes. When the small juveniles that had previously eluded capture matured, they too were collected, providing an illusion of continued abundance in populations that were actually non-

productive and in decline. These dynamics appeared less severe in lightly and intermittently exploited populations. The status of the central Belize River population in the vicinity of the Baboon Sanctuary, and that of other heavily exploited populations, indicated that a more conservative level of harvest was necessary.

The ultimate objective of the project had been to synthesize information on reproductive biology, exploitation patterns, marketing patterns, cultural traditions, and legal and community conservation opportunities, in order to develop pragmatic management recommendations that could function in a rural, undeveloped setting with minimal wildlife law enforcement. Following the analysis those recommendations were delivered to Belize in the form of multiple copies of a lengthy comprehensive report and a short illustrated project summary, seven slide presentations (in urban government and NGO offices, and in village community centers), two radio interviews, and numerous meetings and discussions.

In this country of low human population density, and in the absence of strong enforcement capabilities, restricting the activities of commercial hunters who removed large numbers for profit seemed a feasable initial strategy. Nets and diving tended to result in the removal of larger numbers of animals. Both also tended to be used for commercial hunting. Although numerically more people occasionally harpooned turtles for personal consumption, they removed fewer total turtles. However, there were divers and net men whose take was quite reasonable, making method restrictions innappropriate. A complete ban would be inoperable because noncompliance would be universal. In contrast, a harvest strategy that emphasized the reduction of large scale removal for profit stood some chance of obtaining public support. By allowing continued small scale removals by subsistence hunters, the support of that numerically large constituency might be maintained. It was also essential to recommend some completely closed zones. Those could provide insurance should harvest management prove difficult to implement. Closed zones also had the potential of serving as natural restocking areas.

Some villages were interested in *Dermatemys* conservation, while others were not. Some hunters and villages wanted mechanisms that would enable them to stop what they considered to be excessive and wasteful levels of hunting during the dry season. One example, the village of Freetown Sibun, was interested in establishing legal restrictions for their section of the Sibun River. They were concerned about the decline of turtles in their area, and resentful that non-resident market hunters were removing turtles to sell elsewhere. The village possessed strong leadership and was already close to consensus. Other villages expressed the same concerns, but were less well organized. I worked closely with Freetown Sibun, and they developed a request for local regulations that was submitted to the Ministry of Natural Resources. That document was taken into consideration, as were my detailed recommendations for the remainder of northern Belize, when the Belize Fisheries Department drafted nationwide comprehensive legislation protecting and managing *Dermatemys mawii* in April of 1993 (Statutory Instrument No. 55 of 1993).

This new legislation includes year round possession limits (which should eliminate large scale removals without reducing small scale use), a short closed season (1–31 May), a complete prohibition on the sale and purchase of *Dermatemys*, and a series of protected zones in the major waterways of northern Belize, including the entire Rio Bravo system, a section of the Belize River, a section of the New River Lagoon, Cox and Mucklehany Lagoons, and the lower Sibun River. This includes large and small whitewater rivers, a large clearwater lagoon, darkwater lagoons, brackish lagoons, and an estuary.

Although it is premature to label this a success story, nonetheless it is a positive progress report. Several follow-through activities are advisable. One is continued work with rural communities to increase appreciation of the uniqueness and vulnerability of *Dermatemys*, to assess compliance, and to identify any need for further fine-tuning of the regulations. Although it is essential to ensure compliance in urban meat markets, the substantial trade that has been taking place outside those formal markets will also need to be monitored. Field research on large, spatially dispersed, herbivorous turtles occupying large, deep aquatic habitats can be surprisingly labor intensive and expensive, making one of the most urgent needs difficult to realize due to funding constraints. The densities and population structures of exploited and unexploited sections of rivers should be compared over time. That would provide a true assessment of the efficacy of the new management measures, and might also provide information useful for the management of other turtles in other regions.

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The Proper Spelling And Dates For Certain Names Associated With The Endemic West Indian Genus Of Toads (Amphibia: Bufonidae)

The revival by Pregill (1981) of Fitzinger's (1843:32) nominal genus *Peltophryne*, for the endemic bufonids of the West Indies formerly referred to *Bufo* Laurenti, has received universal acceptance since then (e.g., Duellman 1993; Frost 1985; Powell 1992; Schwartz and Henderson 1991).

However, Schwartz and Henderson (1985:8), contrary to Frost (1985), Powell (1992), Duellman (1993), and most other workers, changed the spelling of the generic name in conformance with the gender of its component words: "We have here amended the spelling of this genus. Since *pelta* and *phryne* are both feminine, the correct spelling is *Peltaphryne*, not *Peltophryne*."

Schwartz and Henderson were not the first to note the etymologically correct spelling (correct as confirmed by Dr. Eckart Schütrumpf, Chair of the University of Colorado Classics Department) of Fitzinger's name, and to change the original spelling accordingly. As early as 1933, the generic index of Schulze et al. (1933:2565) recorded that Cope (1862b:358) first proposed *Peltaphryne* as a substitute for *Peltophryne* in his prescient arrangement of species formerly referred to *Bufo*.

Even that citation, by Schulze et al., was in error, for the name first appeared, without explanation or source citation, in the article describing *P. empusa* (Cope 1862a), immediately preceding the cited article (Cope 1862b). In neither work was the reason for substitution given, but undoubtedly it was on etymological grounds; Cope was well versed in classical Greek and Latin. The first work clearly implied substitution of *Peltaphryne* for *Peltophryne* Fitzinger, even though not explicitly so stated, by citation of "*P. peltocephalus*" (Tschudi), the type species of *Peltophryne* (although Fitzinger cited a subsequent use, by "Duméril and Bibron," rather than the original author of the name *Bufo peltocephalus*). Cope maintained usage of the spelling *Peltaphryne* in 1869, in his description of *P. lemur*. Hence the change from *Peltophryne* to *Peltaphryne* clearly was not an "erroneous subsequent spelling," which has no nomenclatural status.

Peltophryne and *Peltaphryne* are separate, distinct generic names under Art. 56 of the International Code of Zoological Nomenclature (hereinafter referred to as the "Code"): "Even if the difference between two genus-group names is only one letter, these two names are not homonyms." *Peltaphryne* is an "emendation," as defined by Art. 33(b) of the Code, being a "demonstrably intentional change in the original spelling of a name other than a mandatory change," and as such is nomenclaturally occupied.

Unfortunately the change in spelling of *Peltophryne* to *Peltaphryne* is contrary to rules of the Code. As kindly pointed out to us by R. W. Henderson (pers. comm.), Powell (1992:3) explicitly rejected the spelling change on that basis: "The use of *Peltaphryne*, initially by Schwartz and Henderson (1988) [actually 1985] and subsequently in other publications by the same authors, was based on the premise that, as *phryne* is feminine, the adjectival portion of the name should agree in gender (A. Schwartz, pers. comm.). However, the ICZN does not ordain this agreement and I have continued to use the traditional spelling." In reality no part of the generic name is adjectival; both component words (*pelto* and *phryne*) are nouns, and indeed must constitute a noun in the nominative singular in order to conform with rules of the Code (Art. 11(g)).

Although we agree that *Peltaphryne* is invalid, the real basis for rejection of the change in spelling is not failure of gender agreement of parts of the name *Peltophryne* (which may be desirable but is not required by the Code), but is found in Art. 32(c)(ii) of the Code, which explicitly eliminates as inadvertent errors (i.e., those that constitute erroneous original spellings subject to correction) any "incorrect transliteration or latinization and *use of an inappropriate connecting vowel*" (our italics).

Therefore, although Schwartz and Henderson (1985), as well as, presumably, Cope (1862a), were quite correct in holding that the two words from which *Peltophryne* was compounded are nouns of feminine gender, rules of the Code require the connecting vowel chosen by Fitzinger (1843) in coining the name to be retained unchanged regardless of being "inappropriate."

Turning to problems associated with species-group names, the proper endings for *peltocephalus* Tschudi and *longinasus* Stejneger, when transferred to the feminine nominal genus *Peltophryne* from their original masculine nominal genus *Bufo*, require attention. Adjectival species group names change endings to agree with the gender of their generic name when transferred from a genus of one gender to that of a different gender, whereas substantive species-group names (nouns) do not. In neither present case did the author indicate whether the species-group name was proposed as a noun or an adjective, and in both cases it could have been either ("shield-headed," as an adjective, or "shield head," as a noun, for the former; "long-nosed," as an adjective, or "long-nose," as a noun, for the latter). In such cases, Art. 31(b)(i) of the Code applies: "Where the author of a species-group name did not indicate whether he or she regarded it as a noun or as an adjective, and where it may be regarded as either and the evidence of usage [original, or subsequent by the original author] is not decisive, it is to be treated as a noun in apposition to the name of the genus; its spelling [i.e., ending] is not changed if it is combined with a generic name of different gender."

Therefore, under the Code the proper endings for these two names are *P. peltocephalus* and *P. longinasus*.

Another species-group name-change to be considered is Cope's (1862b) etymological correction of *peltocephalus* to *peltacephala*, changing the connecting vowel from the original "o" to an "a." As Schwartz and Thomas (1985:13) noted, "many [subsequent] authors have used the [same] etymologically correct" spelling. However, the rules of the Code that require retention of the original connecting vowel of *Peltophryne* do the same for *B. peltocephalus*.

Therefore, Cope's species-group name *P. peltacephala* (as of 1862b) is an unjustified emendation and objective junior synonym of *P. peltocephalus* (Tschudi).

Finally, while examining the name-changes previously discussed, we noted that the dates of publication of some of the names involved have been commonly cited incorrectly. Although many of the articles appearing in the later pages of the early volumes for given years of the Proceedings of the Academy of Natural Sciences of Philadelphia were actually published the following year, both of Cope's articles of present context (1862a, b) appeared in 1862, not in 1863 as cited by Schwartz and Thomas (1975:11) and Schwartz and Henderson (1988:45; 1991:132) for the description of

P. empusa. Nolan (1913:xiii) recorded that signatures 7–9, pp. 321–404 (which embrace both Cope articles) were "Presented to the Academy meeting, October 28, 1862." Their date of publication is therefore clearly 1862. On the contrary, the description of *P. lemur* Cope (1869) did appear in the year following the 1868 Academy meetings, not in 1868 as commonly cited. The description appeared on p. 311 of the sixth signature of Vol. 20 for 1868, but receipt of the fourth signature (pp. 201–296) was not acknowledged by the Smithsonian Institution until 6 February 1869. Although no dates of receipt are given (Nolan 1913:xiii) for signatures 5 (pp. 297–382) or 6 (pp. 383 *et seq.*), they undoubtedly were not mailed until 1869.

Therefore, the correct date of publication for *Peltaphryne* and *P. empusa* is 1862, not 1863, and for *P. lemur*, 1869, not 1868.

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Sarcophagid Fly Parasitoidism On Developing Turtle Eggs

The larvae of members of two families of polyphagous dipterans (Phoridae and Sarcophagidae) are known to infest turtle eggs (Mullen et al. 1984; Trauth and Mullen 1990; and Acuña-Mesén and Hanson 1990), although in some cases it is unclear whether the larvae function as scavengers (i.e., feeding on non-developing eggs) or as parasitoids (i.e., predating developing eggs; e.g., Acuña-Mesén and Hanson 1990).

Two species of phorid flies (*Megaselia scalaris* and/or *Puliciphora borinque*) have been found infesting the eggs of the Atlantic green turtle *Chelonia mydas* and the hawksbill *Eretmochelys imbricata* in Costa Rica (Bjorndal et al. 1985; Fowler 1979), the slider turtle *Trachemys scripta* in the Canal Zone of Panama (Moll and Legler 1971), and the painted wood turtle *Rhinoclemmys pulcherrima* in northwestern Costa Rica (Acuña-Mesén and Hanson 1990).

Three genera of sarcophagid flies are known to attack the flexible-shelled eggs of turtles. The genera *Phrosinella* and *Eusenotaynia* are known to infest the eggs of the leatherback (*Dermochelys coriacea*) and the Pacific ridley (*Lepidochelys olivacea*) (Andrade et al. 1992). In addition, the genus *Eumacronychia* infests the eggs of the Pacific green turtle *Chelonia mydas* (= *C. agassizii* of some authors) along the coast of southwestern México (Lopes 1982; López Barbosa 1989). Furthermore, the larvae of unidentified (apparently sarcophagid) flies have been recorded as infesting the rigid-shelled eggs of the softshell turtle *Apalone mutica* in Illinois (Muller 1921) and the pliable eggs of the diamondback terrapin *Malaclemys terrapin* along the east coast of the the United States (Aldrich 1916) and the Pacific ridley in El Salvador (Acuña-Mesén and Hanson 1990). We here report the first confirmed infestation of eggs of a non-marine turtle (the eastern box turtle, *Terrapene carolina*) in Georgia by larvae of the genus *Eumacronychia*.

The junior author has maintained an outdoor captive colony of *Terrapene carolina major* (originally from near Port St. Joe, Gulf County, Florida) in Atlanta, Georgia for 12 yrs. Five females nested during late evening in late May and early June of 1991 and their flexible-shelled eggs were removed by 0900 h the next morning for incubation together at room temperature in a peat moss-vermiculite substrate in a tightly covered aquarium. After about thirty days incubation one to two eggs of each clutch appeared indented (i.e., were no longer turgid) and were removed to another container since they were thought to have ceased development. However, over the next several days adult flies were observed emerging from the dimpled eggs through a single, small oval hole (apparently chewed by the larvae) through each egg shell. This characteristic exit hole had also been observed in occasional eggs in nests left in the ground.

Because infertility rates had previously never been as high as 1 to 2 eggs per clutch, and because eggs did not dimple until a month after deposition, it was assumed that the flies were attacking fertile, developing eggs (i.e., they were predators rather than scavengers). Neither the flexible-shelled eggs of map turtles (*Graptemys*) and chicken turtles (*Deirochelys*) nor the rigid-shelled eggs of tortoises (*Testudo*) nesting in the same enclosure were ever found to be infested (in the ground or in the incubator).

Emerging flies were photographed, collected, pinned or liquid preserved, identified by Dr. Robert Hall, and deposited in Atlanta's Fernbank Science Center collection (FSC 92.28.1-4, specimens, and 92.29.1-2, kodachromes of emerging flies). The flies were identified as *Eumacronychia sternalis*, which is very similar to *E. nigricornis*, and previously reported to attack the flexible-shelled eggs of the lizard *Sceloporus undulatus* in the southeastern United States (Trauth and Mullen 1990).

Given that this genus of sarcophagid fly is now known as a parasitoid of the eggs of turtles from southwestern México to central Georgia, and of lizard eggs from Arkansas to Alabama, its

role as a predator on flexible-shelled reptile eggs across North America is probably much more significant than currently realized. Whether the larvae are capable of entering rigid-shelled turtle eggs through their pores (as phorid flies are known to do; Acuña-Mesén and Hanson 1990) remains unknown.

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Illustrations Wanted For HR

The editorial staff is looking for high quality illustrations of herpetological subjects for possible publication in *Herpetological Review*. Original drawings should be of a scale that would permit reduction to approximately 30 x 90 mm or smaller. Of particular interest are drawings of material for which locality data or museum catalogue numbers are available; this information should be included with the drawings. Original art (or photocopies) should be packaged to ensure safe delivery and sent to the Editor (address on inside front cover).

The Diet Of Kraits (Elapidae: *Bungarus*)

While X-raying snakes of the Asiatic elapid genus *Bungarus*, commonly known as "kraits," in the course of a phylogenetic study of the genus, I noticed that several individuals of some of the rarer species contained potentially identifiable stomach contents. Considering it useful to publish these records, I dissected the specimens and identified the remains. I decided that a report of these records would be more useful if combined with a summary of all available published information on krait diet. Consequently, I exhaustively searched the herpetological literature for information on krait diet. Diet records for captive kraits were disallowed as probably not accurately reflecting diet in the wild. The present note summarizes the results of the literature search together with the results of my own dissections. In all, dietary information is presented for 112 individuals in nine of the 13 currently recognized species of *Bungarus* (Golay 1985). The individual records are presented in the Appendix and a summary of the records is given in Table 1.

As Table 1 demonstrates, kraits are largely ophiophagous, but some species are more ophiophagous than others. Of the four species represented in the Appendix by at least 15 individuals, *B. ceylonicus* was the most ophiophagous with 90% of the individuals (18/20) containing snake remains. The proportion of individual kraits containing snakes in the other three well-represented species was as follows: *B. fasciatus*, 80% (12/15); *B. caeruleus*, 66% (19/29); and *B. multicinctus*, 34% (13/38). The large proportion of fish and semiaquatic snakes (*Enhydris*) in the diet of *B. multicinctus* from Taiwan was attributed by Mao (1970) to that species' preference for habitats near water. Mao stated that while smaller *B. multicinctus* preferred fish, larger kraits preferred snakes.

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TABLE 1. Stomach contents in nine of the 13 species of *Bungarus*. The numbers in each prey category represent the number of individual kraits containing that type of prey item.

Species	Prey					
	fish	amphibian	snake	lizard	mammal	egg
B. bungaroides			2		1	
B. caeruleus		6	19		4	
B. candidus				1		
B. ceylonicus			18	1	1	
B. fasciatus	1		13	1		2
B. flaviceps			3			
B. lividus			1		1	
B. multicinctus	24		13	1		
B. niger			1			

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APPENDIX

The diet records are presented below, organized by species of krait. Each numbered record represents an individual krait. The identifications of the diet items are preceded by whatever information (sex [F = female, M = male], length, and institutional number) was available on the krait and followed, in parentheses, by whatever information (sex, length, and institutional number) was available on the prey item. Prey items are presented exactly as they were described in the original reference. In situations where only a common name was given or the nomenclature for a taxon has changed, the most likely modern scientific name is presented whenever possible in square brackets immediately following the diet item. Non-amphibian and non-reptilian taxa likely to be unfamiliar to herpetologists are identified in square brackets. Each record ends with the reference.

Bungarus bungaroides.—(1) spotted viper [*Echis*], Shaw and Shebbeare (1930); (2) M, 810 mm, BMNH 80.11.10.140, *Trachischium fuscum* (410 mm, USNM 323255), this study.

B. caeruleus.—(1) F, 806 mm, *Lycodon aulicus* (464 mm), Wall (1904); (2) M, 597 mm, frog, Wall (1907); (3) M, 1067 mm, frog, Wall (1907); (4) M, 565 mm, young *Varanus flavescens*, Wall (1907); (5) M, 1168 mm, *Bufo andersonii*, Wall (1907); (6) F, 927 mm, musk rat, *Crocidura caeruleus*, Wall (1907); (7) F, 343 mm, *Typhlops braminus* [*Ramphotyphlops braminus*] (95 mm), Wall (1907); (8) M, 334 mm, *Typhlops braminus* [*Ramphotyphlops braminus*] (121 mm), Wall (1907); (9) F, 349 mm, *Typhlops braminus* [*Ramphotyphlops braminus*] (57 mm), Wall (1907); (10) M, 368 mm, two small *Typhlops braminus* [*Ramphotyphlops braminus*], small frog, Wall (1907); (11) M, 330 mm, *Typhlops braminus* [*Ramphotyphlops braminus*], Wall (1907); (12) 349 mm, small mammal, Wall (1907); (13) M, 864 mm, *Bufo andersonii*, Wall (1907); (14) M, 927 mm, mammal, Wall (1907); (15) M, 1219 mm, *Bungarus walli* [*B. sindanus*], Wall (1907); (16) M, 819 mm, six young mice, Wall (1907); (17) F, 597 mm, two *Typhlops braminus* [*Ramphotyphlops braminus*] (105 and 133 mm), Wall (1907); (18) 806 mm, *Lycodon aulicus* (464 mm), Wall (1905); (19) toad, Minton (1966); (20) unidentified snake, Minton (1966); (21) 610 mm, *Dipsas gokool* [*Boiga gokool*] (851 mm), Traill (1895); (22) *Zamensis mucosus* [*Ptyas mucosus*], Phipson (1895); (23) rat snake, Ferguson (1895); (24) 787 mm, *Dipsadomorphus trigonatus* [*Boiga trigonata*] (978 mm), Smith (1910); (25-27) *Typhlops fletcheri* [*Ramphotyphlops braminus*], Wall (1919); (28) 1181 mm, *Bungarus*

caeruleus (991 mm), Smith (1914); (29) M, 1230 mm, *Bungarus caeruleus* (F, 980 mm), Dattatri (1984).

B. candidus.—(1) F, 1050 mm, USNM 142422, 3 tail fragments of an unidentified scincid lizard, this study.

B. ceylonicus.—(1) M?, 432 mm, *Aspidura guentheri*, Wall (1921a); (2) M?, 482 mm, *Aspidura guentheri*, Wall (1921a); (3) F?, 425 mm, *Acontias burtoni* [*Nessia burtoni*], Wall (1921a); (4) M, 445 mm, *Aspidura guentheri*, Wall (1921a); (5) 548 mm, *Aspidura guentheri*, Wall (1923); (6-7) *Rhinophis drummondhayi*, Wall (1921b); (8) mammal, Wall (1921b); (9) F, 706 mm, 2 *Aspidura guentheri* (87 and 112 mm), Wall (1924); (10) M, 258 mm, *Aspidura guentheri* (137 mm), Wall (1924); (11) F, 694 mm, 2 *Aspidura guentheri* (100 and 137 mm), Wall (1924); (12) M, 676 mm, *Typhlops braminus* [*Ramphotyphlops braminus*], Wall (1924); (13) F, 564 mm, *Typhlops braminus* [*Ramphotyphlops braminus*], Wall (1924); (14) 500 mm, *Aspidura guentheri*, Wall (1924); (15) 256 mm, *Aspidura guentheri*, Wall (1924); (16) 275 mm, *Typhlops braminus* [*Ramphotyphlops braminus*], Wall (1924); (17) F?, 628 mm, *Aspidura guentheri* (150 mm), Wall (1924); (18) 289 mm, *Aspidura guentheri*, Wall (1924); (19) uropeltides [uropeltid], Günther (1864); (20) 812 mm, *Dipsadomorphus ceylonicus* [*Boiga ceylonicus*] (861 mm), Phillips (1929). Note: De Silva (1987) reported that an unspecified number of *B. ceylonicus* contained *Rhinophis trevelyana*. Because the number of individuals was not specified, this information is not contained in Table 1.

B. fasciatus.—(1) F, 1257 mm, *Tropidonotus stolatus* [*Amphiesma stolata*] (546 mm), Wall (1910); (2) *Zamensis mucosus* [*Ptyas mucosus*], Wall (1910); (3) M, 1346 mm, unidentified snake and *Zamensis korros* [*Ptyas mucosus*] (1283 mm), Wall (1910); (4) M, 1518 mm, 5 snake eggs, Wall (1910); (5) F, 921 mm, unidentified snake and unidentified fish, Wall (1910); (6) M, 1232 mm, unidentified snake, Wall (1910); (7) *Mabuya multifasciata*, Wall (1910); (8) chicken eggs, Shaw and Shebbeare (1930); (9) 1524 mm, *Tropidonotus piscator* [*Xenochrophis piscator*] (762 mm), Evans (1904); (10) 946 mm, grass snake (838 mm), Primrose (1899); (11) 1560 mm, *Xenochrophis piscator* (300 mm), Biswas (1984); (12) BMNH 1956.1.13.9, *Hypsirhina* sp. [*Enhydris*], catalogue of the British Museum of Natural History (unpublished); (13) M, 1405 mm, *Cylindrophis*, Bergman (1962); (14) 1497 mm, *Homalopsis*, Bergman (1962); (15) F, 1314 mm, *Natrix vittata* [*Xenochrophis vittatus*], Bergman (1962); (16) 800 mm, *Xenochrophis piscator*, Saint Girons (1972).

B. flaviceps.—(1) *Trimeresurus albolabris*, Campden-Main (1970); (2) *Ahaetulla*, Campden-Main (1970); (3) M, USNM 51656, unidentified snake, this study.

B. lividus.—(1) M, 700 mm, BMNH 1936.2.3.11, *Ramphotyphlops braminus* (136 mm) and 1 unidentified scolecophidian, this study; (2) M, 835 mm, BMNH 1936.2.3.10, 3 rodents of the genus *Mus*, this study. Note: this last record is apparently the same as reported by Barker (1936). Barker, however, incorrectly described the mammals as "three young shrews."

B. multicinctus.—(1-10) *Misgurnus anguillicaudatus* [cobitid fish], Mao (1970); (11-24) *Fluta alba* [symbranchid fish], Mao (1970); (25-33) *Enhydris plumbea*, Mao (1970); (34) *Bungarus multicinctus*, Mao (1970); (35) snake, Mao (1970); (36) *Eumeces chinensis*, Mao (1970); (37) *Amblycephalus moellendorffi* [*Pareas margaritophorus*], Pope (1935); (38) snake, Pope (1935).

B. niger.—(1) yellow-bellied roughside [Colubridae], Shaw and Shebbeare (1930).

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POINTS OF VIEW

Systematics And Subjectivity: The Phylogeny And Classification Of Iguanian Lizards Revisited*

In 1989, Frost and Etheridge published a cladistic reanalysis of relationships among iguanian lizards along with a new taxonomy of the group. Lazell (1992) attacked this work, questioning its methods and most of all its utility, to which Frost and Etheridge (1993) have recently replied. The latter two papers represent antipodal approaches to systematics generally and iguanian systematics specifically. Because some of my work (Schwenk 1988) has been used to support both points of view and since I, like many herpetologists who work on squamates, have a vested interest in seeing these issues resolved, it seems reasonable for me to explore, and hopefully clarify, the nature of the disagreement.

First, it is worth pointing out that in systematics one is dealing with three overlapping issues: (i) phylogeny reconstruction (identification of evolutionary entities); (ii) classification (what entities are to be named); and (iii) rules of nomenclature (how the entities are to be named). The distinctions among them are at once obvious and complex. Some of the complexity stems from the fact that there are competing schools of thought for each of the three subdisciplines. For example, some traditional systematists ("evolutionary" or "synthetic" taxonomists) have conceded that cladistic methodology is best for character analysis and phylogeny reconstruction, but adopt a non-cladistic approach to classification by promoting paraphyletic taxa in their formal classifications (e.g., a "Reptilia" that excludes birds) in order to highlight subjective degrees of phenotypic difference (Mayr 1981; Mayr and Ashlock 1991). Cladists, on the other hand, insist on classifications based on monophyly (evolutionary entities), but at the same time have heretofore accepted rules of nomenclature based on the non-evolutionary system of Linnean categorical ranks (de Queiroz and Gauthier 1990, 1992, 1994). In his general broadside against the Frost and Etheridge (1989) paper, Lazell (1992) has muddled these three different issues, possibly throwing the baby out with the bath water. A fruitful approach might be to consider iguanian systematics generally, and the Frost and Etheridge (1989) study specifically, in light of these separate issues.

Phylogeny Reconstruction

Evolution *is* the unifying principle of biology and, as Frost and Etheridge (1993) pointed out, each lineage has an evolutionary history (phylogeny) that exists whether or not we attempt to discern it, or whether or not we do so accurately. There is now an overwhelming consensus among biologists that phylogeny reconstruction is central to virtually all aspects of comparative, evolutionary biology (Brooks and McLennan 1991; Harvey and Pagel 1991; Lauder 1981, to name only a few). Therefore, phylogeny reconstruction is not only an end in itself, but is the necessary starting point for many evolutionary questions. Seen in this light, any rigorous attempt to reconstruct phylogeny is laudable. Therefore, Lazell's (1992:109) initial question of "why—what good does it do" indicates a failure to appreciate the fundamental importance of Frost and Etheridge's (1989) attempt to reconstruct the phylogeny of Iguania and that the fragmentation of the traditional family Iguanidae into several, less inclusive taxa follows directly from this attempt. Therefore, we need to separate the attempt to delimit monophyletic groups from the taxonomic decisions based on the results. My sense is that Lazell (1992) (and possibly other herpetologists) is so upset by Frost and Etheridge's

(1989) *taxonomy*, that he fails to recognize the service they have done by tackling the phylogeny of an historically refractory group. The identification of monophyletic groups, no matter how unresolved the relationships among them, can only be applauded.

In terms of methodology, I have already pointed out that even so steadfast a supporter of "evolutionary taxonomy" as Ernst Mayr has capitulated on the point of phylogeny reconstruction. The recognition that phylogeny must be inferred from synapomorphy (shared derived features; Hennig 1966) is almost universally accepted by practicing systematists, as Frost and Etheridge (1993) have pointed out. Lazell's (1992) use of "gestalt" for "grouping" species is truly anachronistic and can no longer be abided. Certainly gestalt is useful in field identification, but it is anathema to phylogeny reconstruction. There are countless examples to illustrate this. I conclude that Lazell's (1992) criticism of Frost and Etheridge's (1989) cladistic approach is without basis.

What about his criticism of their characters? Character analysis is the soft underbelly of all systematic studies and is always vulnerable to attack. Cladists may be paying the price for years of published polemics that touted the new systematic methodology as an "objective" science. The heavy reliance of cladistics on computer analysis and its associated jargon has done little to diminish this perception. However, relative to previous methods, there is certainly truth to cladists' claims of rigor. Nonetheless, *a computer analysis is only as good as its character analysis*. And at the heart of any character analysis is investigator subjectivity. Subjectivity is perhaps most apparent at the earliest stages of the analysis: what *is* a character? Most of Lazell's (1992) criticisms fall into this category. We can rarely identify with certainty a single, heritable unit that could reliably be called a character. Such a unit might be atomized into three putatively independent bits of morphology (characters) by the investigator such that a particular hypothesis of relationship is three times falsely strengthened (we have more confidence in a clade supported by three characters than in one supported by a single character). The opposite is also true (one "character" might actually represent three independent bits). In the face of no opposing evidence, we assume that characters are independent and hope that, in any case, enough "good" characters will outweigh such hidden redundancy. Since we cannot judge the quality of a character (i.e., its "phylogenetic signal") except in light of a phylogeny, we can never test our assumptions directly, only indirectly by their congruence with other character sets.

I digress to this extent because I believe that we have made too much of objectivity in systematic analyses. Character analysis, and therefore systematics, will *always* be subjective to some extent. I think that workers such as Lazell (1992) react to the *impression* of objectivity projected by some cladistic studies. Lazell (1992) is right to nit-pick because it is only through a truly thorough understanding of the morphology and all its manifestations that meaningful character analysis is possible. Frost and Etheridge (1993) concede that some of their characters might be more variable than initially described, although they dispute most of Lazell's (1992) specifics. They also agree with the need for rigorous character analysis. In any case, I believe that this is the most constructive plane on which to base criticism, because controversy in the realm of characters, first, is usually resolvable and second, generates greater breadth and depth of knowledge of the phenotype and therefore can only advance our understanding. The key point then, is not that character analysis is an objective process, but that the *reporting of the character analysis is explicit so that dispute is possible!* Thorough character description, description of multiple character states, the rationale for their attribution as plesiomorphic or apomorphic, and representation of the distribution of the states among all salient taxa are all hallmarks of cladistic studies, including Frost and Etheridge (1989). Gestalt cannot accomplish this level of analytical rigor because it cannot be replicated among investigators. The mere fact that Lazell (1992) *is able* to dispute Frost and Etheridge's (1989) character analysis is a testament to the power of their study. While there might be room for disagreement regarding particulars of Frost and Etheridge's (1989) characters, Lazell (1992) is unfair in his wholesale rejection of their study. It would be more useful to see him re-score their characters in a manner consistent with his own interpretation of the morphology, add a few additional characters, justify his decisions with sufficient information (so that others might dispute *him*) and redo the analysis. Then we might have the basis for a real controversy. Until then, we have only an expression of his dissatisfaction.

Finally, Lazell's (1992) accusation of unreasonable emphasis by Frost and Etheridge (1989) on some characters (regarded, without support, by Lazell as trivial) and not others is thought-provoking, but as pointed out by Frost and Etheridge (1993), there is a vast literature, unacknowledged by Lazell (1992), on the pros and cons of character weighting, a controversy that continues to the present moment. Evolutionary taxonomists have long relied on "key characters," (a form of weighting), but one person's key character is another's trivial one. Arguments can be made against any weighting scheme, and it is perfectly reasonable that Frost and Etheridge (1989) did not judge the merit of their characters *a priori*.

The irony is that Frost and Etheridge (1989) and Lazell (1992) have arrived at remarkably similar conclusions about the *phylogeny* of iguanians (so far as we know it): the chameleons form an undoubted monophyletic group; there is a second "group" of non-chameleon taxa that comprises several recognizable (putatively monophyletic) subgroups, some traditionally "iguanid," others traditionally "agamid," the relationships among which are mostly unresolved. The apparent point of disagreement is that Lazell (1992) argues (but does not support) that the non-chameleon taxa form a monophyletic group, whereas Frost and Etheridge (1989) disallow this possibility, suggesting that some subgroups (traditional agamid taxa) are likely to be more closely related to chameleons than to other subgroups, and further point out that there is no evidence to support the collective monophyly of the remaining subgroups. In fact, even this difference fades upon scrutiny: Lazell (1992) uses the word "monophyly" (with reference to his "Iguanidae") in the traditional sense that includes the cladistic notion of paraphyly (Lazell 1992:109). As such, he allows that his "Iguanidae" may, indeed, be paraphyletic, as Frost and Etheridge (1989; 1993) suggest. Therefore, in terms of phylogenetic conclusions (if not the methods used to arrive at them), the differences between Lazell (1992) and Frost and Etheridge (1989) are trivial. Given this similarity, controversy largely reduces to what to do with the putative, monophyletic taxa once we have them. In other words, we have identified the evolutionary units, now what and how are we to name them?

Classification

For Lazell (1992), the crucial aspect of a classification is its utility "for highly communicable information about *easily identified groups*" (Lazell 1992:111; italics added). This view, as compared to that of Frost and Etheridge (1989, 1993) represents a fundamental schism regarding the *nature* of the entities to be named—the basis of classification. For Frost and Etheridge (and cladists, generally), the entities to be named must be "recovered evolutionary units," monophyletic in the strict sense. For Lazell, they are phenotypically distinct groups, easy to tell apart. Some of the members of Lazell's group might be more closely related, in an evolutionary sense, to another group (i.e., paraphyletic) so long as the group is not composed of two or more separate lineages (i.e., polyphyletic). Therefore, Lazell (1992) names as a formal taxon his "Iguanidae" in full knowledge that some of its members may be more closely related to his "Chamaeleonidae" than to other members of the "Iguanidae." He bases this classification largely on "gestalt" and argues that it is more useful to him as a field biologist.

I fully accept Lazell's (1992) cry for "utility" in classification, but

like Frost and Etheridge (1993), I cannot agree that utility is better served by a classification that obscures evolutionary history. While I concede that phenotypically uniform groups communicate something, what they communicate is only sensible in light of evolutionary history. As such, concepts such as evolutionary stasis, convergence, parallelism, adaptation, etc., arise from knowing how phenotypic traits are distributed across the phylogeny. Lazell's (1992) classification cannot accomplish this level of communication. While his subjective classification is of use to him in his individual efforts, it is less likely to be of use to another comparative biologist than is a cladistic classification representing accurately the evolutionary history of Iguania. These arguments are now old. Cladists have long suggested that traditional, paraphyletic classifications could lead to erroneous evolutionary generalizations owing to their inaccurate representation of phylogeny. This fear has been realized, for example, very close to home in the literature on squamate sensory modes, in which false evolutionary conclusions followed directly on Camp's (1923) paraphyletic classification of the group (Schwenk 1994).

In sum, Lazell (1992) argues that phenotypically uniform, easily identifiable groups are the most useful for recognition as formal taxa in classification, even though such taxa might not represent evolutionary history accurately, or may, at best, obscure it. Frost and Etheridge (1989, 1993) embrace cladistic doctrine which eschews the naming of paraphyletic taxa and therefore name only cladistically determined, monophyletic (in the strict sense) groups. They argue that a classification reflecting evolutionary history is the most useful. I concur with the latter view and point out that a cladistic classification is arguably of use to the greatest number of comparative biologists, is certainly the least ambiguous, and is demonstrably the least prone to evolutionary misdirection.

Nomenclature

It seems likely that many herpetologists will accept cladistic practices as thus far described but are, nonetheless, unhappy with Frost and Etheridge's (1989) taxonomy. This taxonomy is radical not because of the evolutionary entities (monophyletic units) identified, nor because of Frost and Etheridge's (1989) philosophy about which entities are to be named (which, after all, is standard practice; Frost and Etheridge 1993), but mostly because of the particular names chosen to represent the taxa and their elevation to family status. However, the names and family status follow directly from Frost and Etheridge's (1989) interpretation of the rules of nomenclature, as outlined by the International Code of Zoological Nomenclature (ICZN). Nonetheless, taxonomy is dynamic and it is heuristically useful to consider alternatives to the taxonomy proposed by Frost and Etheridge (1989).

(i) *The hybrid approach*.—The recognition of several monophyletic groups within the Iguania is not a recent finding, stemming from the early work of Etheridge and others (Etheridge 1959, 1964, 1966; Etheridge *in* Paull et al. 1976; Etheridge and Williams 1985; Savage 1958) and given cladistic legitimacy by Etheridge and de Queiroz (1988) and Frost and Etheridge (1989). These works promoted common usage of a series of informal names designating the various groups (e.g., anolines, sceloporines, etc.) which came to be widely regarded as subfamilies within the family "Iguanidae." When Frost and Etheridge (1989) elevated these (or very similar) groups to family status, most of these informal names were eliminated, as directed by rules of priority, and the ICZN. Frost and Etheridge (1989), themselves, acknowledged that this aspect of their work would be most controversial. The new names (Polychrotidae, Phrynosomatidae, etc.) disrupted decades of common usage based on reference to Etheridge's original, informal, "subfamily" epithets and might, therefore, be argued to be "destabilizing." As one of the foremost objectives of the ICZN is to promote stability, it is conceivable that an appeal could be made to recognize as formal family names the previously informal subfamilial epithets by addition of the Linnean family ending, -idae. As such, Polychrotidae would become Anolidae (preserving the sense of "anoline") and Phrynosomatidae would become Sceloporidae (sceloporine), etc. This is a hybrid approach in the sense that it accepts the cladistic conclusions of Frost and Etheridge (1989) and use of the ICZN, but at the same time seeks to retain the association between existing names and the clade with which they have previously been identified (de Queiroz and Gauthier 1992; see below). There is a formal appeal process for such exceptions to ICZN rules and stability is one of the principal criteria on which exceptions are allowed. In any case, one would still end up with multiple families where previously there were three, a result unlikely to please many, including Lazell.

(ii) *The metataxon approach*.—Relationships among the recognized groups within Iguania remain obscure owing to contradictory or equivocal evidence (Etheridge and de Queiroz 1988; Frost and Etheridge 1989; Williams 1988). In their study of squamate relationships, Estes et al. (1988) accepted the monophyletic taxa identified by Etheridge and de Queiroz (1988) and could not, themselves, find convincing evidence of "iguanid" and "agamid" monophyly. They represented this ambiguity by designating these families *metataxa*, denoted by an asterisk next to the family name (e.g., Iguanidae* and Agamidae*). This convention was adopted by Gauthier et al. (1988) and these workers for higher taxa and the concept was then extended to species (*metaspecies*) by Donoghue (1985) (note that Donoghue's paper was published first owing to delay in publication of the Gauthier et al. and Etheridge and de Queiroz manuscripts). Kluge (1989) disputed use of the metataxon convention for taxa in which evidence for monophyly is *contradictory*, as opposed to *absent*. In other words, any evidence of paraphyly would eliminate the possibility of monophyly, even if the characters indicating paraphyly are contradictory (incongruent). Kluge (1989) suggested that, in any case, cladistic conventions already exist for such situations (when polytomies result from character incongruence), namely conventions 4 and 6 of Wiley (1981), which place such taxa within a classification as *sedis mutabilis*, or written with shutter quotes and marked *incertae sedis* (see Wiley [1981] for details). In making the latter suggestion (convention 6), Wiley (1981) was simplifying Patterson's (1973) earlier method of using parenthetical codes next to taxon names in a classification to denote mono-, para-, and polyphyletic taxa, and taxa of unknown status. In so doing, Wiley (1981) lumped together known para- and polyphyletic taxa, on the one hand, with taxa of unknown status. Thus, the metaxon situation (for taxa of unknown status; Patterson's [1973] code, [IK]) is actually obscured by the shutter quote/*incertae sedis* convention. According to de Queiroz (*in litt.*), the *sedis mutabilis* convention reflects unresolved relationships among several taxa (i.e., polytomies) and the *incertae sedis* convention reflects the uncertain position of a taxon within a higher taxon, but neither reflects the uncertain monophyletic status of an individual taxon, i.e. the *metataxon* convention.

Kluge (1989:293) further argued that the metataxon convention (as applied to higher taxa) was overly conservative (contra Frost and Etheridge 1993) and potentially constraining, and that it "merely describes a fact about our ignorance." However, this is exactly the intention of the metataxon concept: to call attention to our ignorance about the status of a taxon.

The metataxon convention and Kluge's (1989) paper are important to consider because the latter is central to Frost and Etheridge's taxonomic decision-making. Following Kluge (1989), they rejected the metataxon status of Iguanidae* because there is character incongruence (contradictory evidence of paraphyly). They rejected metataxon status of Agamidae* because it "is not consistent with recovered historical relationships" (Frost and Etheridge 1989:29). It is for these reasons that they chose to recognize as families, *sedis mutabilis*, the largest taxa for which they had reasonable evidence (a strict consensus tree) of monophyly. Once this decision was made, Frost and Etheridge (1989)

used the traditional rules of zoological nomenclature (e.g., the principles of synonomy and priority) and the Linnean system of categorical ranks, resulting in a highly non-traditional classification.

As I indicated above, taxonomic conventions are not writ in stone. For example, one might question Kluge's (1989) restriction of metataxa to groups for which there is merely the *absence* of synapomorphy. Given contradictory evidence of paraphyly (the situation with "Iguanidae"), monophyly of the taxon might be just as likely as paraphyly, despite the present lack of evidence. Character incongruence is a common phenomenon. Do we dismiss the *possibility* of monophyly in the face of it? I have shown that Wiley's (1981) conventions do not precisely distinguish this situation. The metataxon convention, using preexisting names (the approach of Gauthier et al. [1988] and Estes et al. [1988]) might more accurately reflect our current understanding of iguanian relationships while simultaneously promoting taxonomic stability. The asterisk tells us, "don't mistake this for a monophyletic group; relationships within this taxon need to be investigated further," and it does this while preserving names that most workers are familiar with. Such stability of names is usually considered desirable, so long as it does not violate known evolutionary history (which is true at least for Iguanidae*). I am not convinced, as is Kluge (1989), that the metataxon convention will necessarily have a chilling effect, tending to preserve the *status quo*.

(iii) *The phylogenetic taxonomy approach.*—Recent papers by de Queiroz (1992) and de Queiroz and Gauthier (1990, 1992, 1994) propose a radical departure from traditional practices by deriving all taxonomic principles and methods, including those of synonymy and priority, from the central tenet of common evolutionary descent. They show clearly that many aspects of the Linnean system are not compatible with an evolutionary world view and demonstrate that a truly phylogenetic nomenclatural system will have to dispense with many long-held notions. Under their system, taxon names would be very stable because they are defined on the basis of common ancestry and not Linnean categories (de Queiroz and Gauthier 1994). Rules of priority and synonomy would not force abandonment of names traditionally associated with particular lineages, as has occurred with Frost and Etheridge (1989). Both de Queiroz and Gauthier are squamate systematists (Etheridge and de Queiroz 1988; Gauthier et al. 1988; Estes et al. 1988 and other papers) and use the problem of iguanian relationships to illustrate some of their proposals. They note that in a phylogenetic taxonomy, the name Chamaeleonidae would continue to be associated with the undisputed monophyletic taxon with which it has always been associated and that the clade formed by the "agamid" taxa (Agaminae and Leiolepidinae of Frost and Etheridge [1989]) plus chameleons would be named Acrodonta, the name historically associated with that clade. In contrast, in Frost and Etheridge's (1989) taxonomy (based on the traditional use of the Linnean system), Chamaeleonidae is equivalent to "Acrodonta" and therefore includes the traditional agamids, a highly non-traditional usage. Thus, greater taxonomic stability would ensue in the "phylogenetic taxonomic" system, even given Frost and Etheridge's (1989) phylogenetic conclusions. Such stability extends to the fact that lumping and splitting, the latter particularly characteristic of cladistic classifications and deplored by Lazell (1992), would be avoided (de Queiroz and Gauthier 1994).

The proposals of de Queiroz and Gauthier will, undoubtedly, be hugely controversial. One cannot overturn deeply entrenched practices painlessly. However, in my opinion their suggestions need to be considered seriously by all comparative biologists. I urge the readership of *Herpetological Review*, systematists and non-systematists alike, to evaluate "phylogenetic taxonomy" themselves. The pay-off for iguanian systematics specifically and the field of systematics generally is potentially great. Indeed, if accepted, "phylogenetic taxonomy" would obviate most of the discussion herein; questions of paraphyly and metataxa would be things of the past, as would an Iguania comprising nine families (de Queiroz and Gauthier 1994)!

Conclusions

What is clear is that we are in a difficult and undoubtedly protracted transitional stage in systematic biology. We have seen cladistics become preeminent among practicing systematists, despite persistent resistance (e.g., Lazell 1992). Lazell (1992) notwithstanding, the battle is won and biologists must adapt or be peripheralized. However, in the arena of classification and nomenclature, there is much to discuss. The newly proposed system of phylogenetic taxonomy (de Queiroz and Gauthier 1992, 1994) may be the next battlefield.

Although I disagree with most of Lazell's (1992) particulars, I share with him a certain dissatisfaction with the iguanian taxonomy proposed by Frost and Etheridge (1989). I am not persuaded by the arguments against the metataxon convention that would have allowed traditional family names to stand until the weight of evidence showed otherwise. I am not convinced that use of formal family names for traditional "iguanid" taxa, rather than informal names, helps us to understand better evolution within Iguania, so long as we are clear about their monophyletic status. However, these feelings are moot; Frost and Etheridge's (1989) taxonomy will stand or fall depending on usage. Its widespread acceptance in the comparative literature indicates that it is here to stay.

It is possible that a rigorous phylogeny of Iguania will elude us. This terrible possibility stems from the fact that fragmentation and speciation of ancestral iguanians may have occurred over a geologically short period of time and in a geographically contiguous area (Williams 1988). Given virtually simultaneous origin of some or most of the major groups within Iguania, we should expect few clear synapomorphies. The situation is analogous to the origin of the mammalian orders which, to this day, defy unambiguous cladistic resolution (e.g., Novacek 1992). The possibility is that contradictory character distributions and unresolved polytomies reflect the *reality* of the origin of the group (Schwenk and Williams 1989; Williams 1988). Cladistic resolution might be beyond the sensitivity of current morphological and molecular techniques. We must bear this possibility in mind while searching ever deeper for phylogenetic clues.

I have attempted here to clarify some of the issues, as I see them, surrounding current controversy regarding iguanian taxonomy. I conclude that Lazell's (1992) critique of Frost and Etheridge's (1989) methodology is not supportable and suggest that rigorous character analysis is the proper avenue of future investigation. I share with Lazell (1992) some uneasiness about the Frost and Etheridge (1992) taxonomy. I have tried to show, however, that their taxonomy is consistent with current practices, yet is not the only possible outcome. To this end I have explored alternative strategies for dealing with Frost and Etheridge's (1989) phylogenetic results, if only for heuristic purposes, since their classification is a *fait accompli*. Finally, I conclude that a new phylogenetic taxonomy (*sensu* de Queiroz 1992; de Queiroz and Gauthier 1990, 1992, 1994) is sensible and desirable and urge consideration of its proposals.

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*Note added in proof: I had not seen Lazell's (1994. Herpetol. Rev. 25:9–10) reply to Frost and Etheridge (1993) when I wrote this commentary, but its consideration does not cause me to alter the present account.



Aneides lugubris (Arboreal Salamander). Illustration by Ronald Gonzales.

TECHNIQUES

Fish Tags For Observing Free-ranging Rattlesnakes

A field study in February 1990 on movements of free-ranging *Crotalus adamanteus* in Jasper County, South Carolina evaluated the use of fish tags for identifying rattlesnakes. Tags needed to be clearly visible at 10 m with binoculars. In addition, each tag needed to contain an address for its return and notification of the researcher in the event the rattlesnake was captured or killed.

Ferner's (1979) review of marking techniques for amphibians and reptiles offered several possible methods, including Pendlebury's (1972) method of attaching colored vinyl discs to the second proximal rattle segment. This would have allowed for identification from a distance, but it would not have provided for the inclusion of a return address.

Floy Tag and Manufacturing (P.O. Box 85357, Seattle, Washington 98105, USA) provided external tags of opaque, flexible plastic (1.5 x 0.5 cm). A hole drilled at each end allowed a monofilament line to be threaded through the holes, looped between the two proximal rattle segments, and knotted as close to the tag as possible (Fig. 1). Excess line was clipped off, and the knots were secured using a single drop of Superglue™. The tags were imprinted with sequential identification numbers on one side and an address and telephone number on the opposing side.

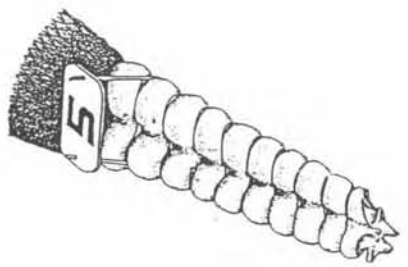


FIG. 1. Installation of fish tag on proximal rattle of *Crotalus adamanteus*.

During the first two months of this study, a total of five small (51–86 cm TL) *Crotalus adamanteus* were tagged. Three snakes were not observed again and one was verified by returned tag as having been killed. One snake, tagged on 7 February 1990, was captured and measured 16 mo later on 10 May 1991. This individual still had the tag attached and had increased its length by 23 cm, demonstrating a potential field use of this identification method with rattlesnakes. An exact life-span of the tags could not be determined, but it may be possible that with occasional replacement of the monofilament line, these tags may remain functional for several years before they are either removed by rattle breakage or disappear with the segmental growth of the rattle by shedding.

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HERPETOLOGICAL HUSBANDRY

Captive Management And Breeding Of *Cuora aurocapitata* (Testudines: Emydidae)

The increase in Chinese turtles in the pet trade since 1985, mainly through the efforts of the Hong Kong animal trader Mr. Shiu, has resulted in the availability and the description of several new species. One of these, *Cuora aurocapitata* (Luo and Zong 1988), is a beautifully colored species that is known only from Nanling County, Anhui Province, China, some 300 km west from Shanghai. This species is closely related to *Cuora pani* (Song 1984). The latter occurs more inland in Shaanxi Province and differs in color pattern from *C. aurocapitata*. It has been suggested that *C. aurocapitata* may be a subspecies of *C. pani* (McCord and Iverson 1991). Here, the results of four years of experience with this species in captivity is reported.

A pair of *C. aurocapitata* was obtained via the pet trade in January 1989. Male #1 had a straight-line plastron length (PL) of 10.0 cm and weighed 168 g. Female #1 had a PL of 11.9 cm and weighed 275 g. A second pair of *C. aurocapitata* was obtained in June 1990. Male #2 measured 12.1 cm PL, weighed 275 g, and was missing the portion of the tail posterior to the cloaca. Female #2 measured 14.7 cm PL and weighed 530 g. Microscopic examination of their feces revealed the presence of amoebae; treatment followed with metronidazole (Flagyl, Rhône-Poulenc) 35 mg/kg orally for 10 days.

The first pair was kept in a tank with a water basin measuring 100 X 40 X 20 cm, and an island measuring 40 X 30 cm. Water temperature averaged 22°C. Under a heating lamp mounted above the island the temperature was 27°C. The second pair was kept in a similar tank at first, but because the male was extremely aggressive toward the female he was kept separately in a small tank and introduced to both females approximately 1–2 days every six weeks to encourage mating. Aggressive behavior consisted of biting limbs, head, and shell, and chasing other turtles. Female #2 occasionally exhibited aggression, but could be kept together with other turtles without major difficulties. Male #1 was also placed with female #2 occasionally to facilitate mating, as was male #2 with female #1. They are kept together with other Asian turtles: *Annamemys annamensis*, *Chinemys reevesi*, *Chinemys nigricans*, and *Sacalia bealei "quadriocellata."* They were exposed to 11 h light and 13 h darkness, with the only variation in daylight length being the light coming in through a south-facing window in the room. The animals were fed twice a week on meat mixed with a multivitamin-mineral preparation (Carmix, Hope Farms, The Netherlands), cat food (Brekkies, Effem b.v., The Netherlands), banana, strawberry, and shrimp.

TABLE 1. Growth of hatchling *Cuora aurocapitata*.

	Hatchling #1		Hatchling #2	
Weeks After Hatching	PL	Weight	PL	Weight
2	3.4 cm	10 g	3.1 cm	4 g
8	3.6 cm	12 g	2.9 cm	7 g
18	4.0 cm	15 g	3.5 cm	12 g
28	4.5 cm	20 g	4.1 cm	14 g

Courtship was not restricted to a particular time, but was observed all year. It is less intricate than that reported for *Cuora trifasciata*. Male courtship behavior consisted of approaching the female from the rear, followed by mounting. Once mounted, the male extended his very long neck and the female was bitten and held by her neck. Because of this, the female retracted her head, thereby making her cloaca more accessible. Subsequently, the male would move downwards until his plastron rested on the posterior part of the female's carapace. In this position, penetration was attempted, and sometimes took place. With successful penetration the male would release his neckbite on the female and withdraw his legs from her carapace, after which he was attached to her only by his penis. Mating took place in this position.

On 31 July 1992 one egg was found in the water basin, while female #1 was trying to find a nesting site on land by exploring the island and "smelling" the substrate. She was injected with 60 mg/kg of calcium (Calcium Sandoz) subcutaneously in the rear leg followed by 80 mg/kg two hours later, and subsequently with 6 IU/kg of oxytocin (Piton-S, Organon) intramuscularly one hour thereafter. One hour later one egg was laid, and hour and a half after the administration of oxytocin another egg passed. On 11 August 1992 female #2 was remarkably restless, and palpation of the inguinal regions revealed the presence of eggs. The next day, 80 mg/kg of calcium was given followed by the same dose one hour later, and 6 IU/kg of oxytocin one hour thereafter. One hour later an egg was laid, and 1.5 h later another egg passed. Twelve days later a third egg was laid. The eggs were hard-shelled and oval. Eggs produced by female #1 measured 39 X 21 mm; those from female #2 measured 42 X 24 mm. All eggs were put in moist peat and incubated at 28°C and 95% relative humidity. The 3 eggs produced by female #1 showed no signs of development, eventually became moldy, and were discarded. Of 3 eggs laid by female #2 the first two appeared to be fertile, as a white band developed in the middle of the eggs after 3 days of incubation. After 64 days the two developing eggs showed some cracks at one of the poles. Two days later the hatchlings had opened the eggs with their egg tooth and forelimbs. One hatchling had a large yolk sac which could be seen through the hole. To avoid suffocation in albumen and other egg fluids, the animal was removed from the egg on day 66. It was a very small turtle (31 mm PL, 4 g) with a yolk sac ca. 1 cm in diameter. The animal was placed on a wet tissue and within a few hours the yolk sac had fallen off. The other animal hatched on day 67 and was considerably larger (34 mm PL, 10 g).

One day after hatching, both animals were placed on soaked peat with a little water pan, and 11 days later they were put in an aquarium measuring 20 X 12 cm with 1.5 cm of water. Some weeks later the water level was raised to 5 cm and a flat stone was introduced into the aquarium that provided a platform with a water depth of 2 cm. The smaller animal was more active and ate within a few days of hatching, whereas the other initially refused food during the first days. The animals are presently kept at a temperature of 25°C during the day and 20°C at night. They are fed three times a week on beef heart, cat food ("Brekkies"), or shrimp. Growth of the hatchlings is shown in Table 1.

Our experience indicates that *C. aurocapitata* is relatively easy to manage in captivity. The animals thrive, mate, and females produce fertile eggs when kept in small turtle tanks at moderate temperatures. Nanling County in Anhui Province, the type locality of this species, has a subtropical climate with a mean winter temperature of 5°C and summer temperature of 26°C (Hildebrand 1989; Liangxing 1983). It has yet to be determined whether reproduction can be repeated under these circumstances, or whether these animals need a period of hibernation. The young are voracious feeders, grow quickly, and appear healthy. The smaller of the two neonates has shown a more rapid growth rate. Eighteen weeks after hatching it had increased its body weight by 300%, while the other hatchling had an increase in weight of 150% at that time.



FIG. 1. Hatchling *Cuora aurocapitata*.

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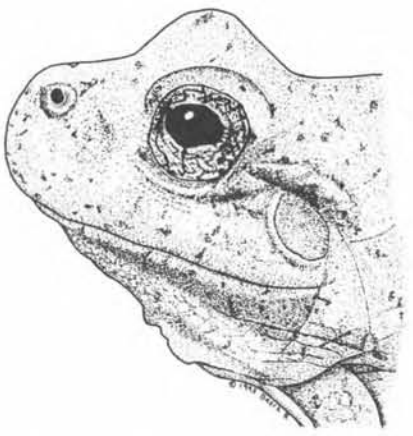
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Hyla arenicolor (Canyon Treefrog). USA, Utah: Zion National Park. Illustration by Breck Bartholomew.

RECENT POPULATION CHANGES

Recent Population Changes provides an outlet for anecdotal or minimally documented information on local extinctions or regional population changes. These reports could be valuable historic indications that might enhance our understanding of very long term (>20 yrs) population trends and changes in distribution patterns.

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Factors In The Decline Of *Varanus indicus* On Guam, Mariana Islands

The mangrove monitor (*Varanus indicus*) is a large lizard (to 1.5 m total length on Guam) that has a range encompassing extreme northeastern Australia, New Guinea, and the Solomon, Palau, Caroline, Marshall, and Mariana Islands. Some of these populations may be either pre-historic (Mariana Islands) or historic (Marshall, Palau, and Caroline Islands) human-aided introductions (G. Rodda, pers. comm.; Uchida 1966). The only monitor species in the Mariana Islands is *V. indicus* and the best studied populations occur on Guam where reproductive ecology (Wikramanayake and Dryden 1988), behavior (McCoid and Hensley 1991), observations on reproduction (McCoid 1993a), natural history (McCoid and Hensley 1993), and food habits (Dryden 1965) have been described. A unique attribute of the Mariana Islands is that these are the only U.S.-flagged areas where monitors occur; Guam is a U.S. Territory and the Northern Mariana Islands (all islands north of Guam) is a Commonwealth (CNMI).

While we have no direct estimates of monitor populations in the past, Dryden (1965) inferred that relatively dense populations were present on Guam. Most of the 86 monitors killed in his study (September 1962 to April 1964) were from the Northwest Field area of Guam. Method of collection was to drive along the extensive abandoned runway systems and shoot visible monitors. Although accurate records were not kept, surveys in Northwest Field (1988 through early 1992) by various Guam Division of Aquatic and Wildlife Resource (DAWR) personnel did not reveal as many sightings as was inferred by Dryden's data. Our sightings of *V. indicus* on Northwest Field corroborate the DAWR sightings and indicate that *V. indicus* was far less common than in the early 1960s. Additional data suggesting an overall decline in monitor populations were the number of phone calls (between 1988 and early 1992) to DAWR reporting sightings of monitors by long-time residents of Guam. Most of these calls were prompted because these people had apparently not seen a monitor in a number of years. These two lines of evidence suggest that monitor populations have declined on Guam since the early 1960s. Monitors also appear to be missing from moderately to heavily urbanized areas and exhibit lowered densities in lightly urbanized areas.

A number of factors are probably contributing to the perceived decline in monitor densities on Guam. These include, but may not be limited to, changes in the prey base, effects of urbanization, and the effects of introduced species. In order to place this decline in perspective, two islands with differing pressures and conditions with respect to monitor populations were examined. We compared monitor populations on Guam to Rota, the southernmost island in the CNMI and Guam's closest neighbor. These two islands differ in size (540 km^2 vs. 85 km^2), human population (140,000 vs. 2500), and the number of automobiles (108,000+ vs. <1000).

Prey Base.—McCoid and Witteman (1993) examined changes in the prey base (arthopods, gastropods, and vertebrates) since the 1960's and found major shifts in the dominant prey categories. They found that although substantial changes had occurred, these shifts probably happened in parallel on both Guam and Rota.

Urbanization.—We surveyed on both Guam and Rota by recording localities of DOR individuals. DOR monitors were recorded over a two year period (September 1988 to October 1990) in southern Guam on a 20.2 km section of highway spanning both urban and non-urban regions. This section of highway was driven twice daily between 0700 and 0800 h and 1700 and 1800 h. DOR monitors were recorded on Rota between October 1989 and February 1991, but surveys were conducted at irregular intervals. A regular circuit was not driven and distances traveled were much less than the survey route on Guam. Despite these irregular survey techniques and a shorter sampling period (16 months vs. 25 months) 18 monitors were recorded on Rota, while 28 were recorded on Guam.

To view the effects of human populations on monitor distribution on Guam, we plotted, from our survey route, DOR *V. indicus* with respect to urban areas on Guam. Of the 28 monitors, 19 were associated with non-urban areas. An area was arbitrarily judged urbanized if there was a permanent human dwelling in the immediate vicinity or if substantial habitat alteration, such as a golf course, was present. Approximately half of the survey route was judged non-urban. This pattern was tested with an adjusted $X^2_{(.10[1])}$ test ($X^2_{adj} = 2.89$) and found significant at the 0.10 level. Because of the low human density on Rota, the relationship of monitors to urban areas there was not tested.

Although DOR data from the two islands are not statistically comparable with respect to human occupation, an index of vehicular impact can be generated. Vehicles from several villages along the Guam survey route (Inarajan, Malojloj, Talofofo, and Yona) represented the bulk of traffic. Populations in these villages totaled ca. 6000 people. Proportionately, there would be about 4600 automobiles associated with these villages and an estimated half would be involved in travel daily, yielding an overall kill ratio of 0.012 monitors/auto. On Rota, assuming that only half of the automobiles were involved in daily travel, the DOR ratio is 0.036 monitors/auto. Additionally, automobile traffic travels at much higher speeds on Guam (50 to 70 MPH vs. 30 to 50 MPH on Rota) (pers. obs.). Presumably, higher traffic speeds would cause more DORs. However, since we see proportionately fewer DORs on Guam (about 1/3 of Rota), we view this as evidence for a less dense population of monitors on Guam.

Beside human activities and automobile usage in urban areas, perhaps other effects of urbanization can be discerned on Guam. In the southern Mariana Islands, monitors are viewed as agricultural pests. Many farmers relate stories about predation by monitors on domesticated fowl (Fritts and McCoid 1991; Wiles et al. 1990). Because of this attitude, many people rely on trapping, shooting, and poisoning to eliminate monitors around their property. Additionally, there is a closet enterprise on Guam that supplies monitors to an ethnic group as a traditional food (Auffenberg 1988). Large (>1.2 m), live monitors can be sold to this group for as much as $100.00.

Introduced Species—The southern Mariana Islands have been plagued with a number of recent introductions that have irrevocably reshaped the faunal and floral face of the islands (see Muniappan et al. 1991). Introduced species that are known to have impacted or are suspected of impacting monitor populations are the brown tree snake (*Boiga irregularis*) and (poisonous) toad (*Bufo marinus*). Both Jackson (1962) and Dryden (1965) indicated that monitor populations had decreased on Guam after the introduction of toads. A similar pattern was noted on Palau (Thyssen 1988) and Pohnpei (Jackson 1962). Uchida (1966) mentioned that *B. marinus* had been considered for introduction to control monitor populations in the western Caroline Islands. All these authors noted that *V. indicus* would prey on these conspicuous toads. Populations of *B. marinus* occur in the southern Mariana Islands

(Rodda et al. 1991; McCoid 1993b). This species probably still plays a major role in limiting *V. indicus* as recent surveys indicated *B. marinus* densities as high as 35 adult toads/ha in non-urban areas (G. Rodda, pers. com.). Rodda et al. (1992) recorded snake densities as high as 100 per hectare on Guam, and Savidge (1988) recorded *V. indicus* as a prey item of *B. irregularis*. Larger snakes (> 1.5 m total length) are generally associated with urban areas on Guam (McCoid 1989) and may, because of size, be more likely to prey on monitor lizards, perhaps accounting for some of the lessened densities of monitors observed in urban situations. There is no established population of *B. irregularis* on Rota (McCoid and Stinson 1991).

Other introductions are feral mammals (dogs, cats, and pigs) that have reached substantial densities in the southern Mariana Islands. On Guam, the Department of Public Health and Social Services estimated that feral dogs had, at one time, reached a population of 30,000. Impacts on other vertebrates are poorly understood but there are reports of feral dogs killing domesticated fowl, deer, pigs, and monitors. There is no information on the number of feral dogs on Rota. Population estimates of feral cats for the southern Mariana Islands are not known but were frequently encountered on Guam and Rota. In other areas with feral cats, enormous damage to wildlife has been reported (Mitchell and Beck 1992). Conry (1989) noted that while feral pigs on Guam did consume reptiles, animal protein formed a relatively minor component of their diet. However, since 1980, feral pig populations on Guam have undergone a dramatic increase (Conry 1989). Feral pigs were not known from Rota until 1991 (C. Rice, pers. comm.).

It is likely that a suite of factors have contributed to the decline of monitors on Guam. Islandwide population declines may be attributable to the introduction of *B. marinus*. Other feral and introduced species have likely played lesser roles in widespread and localized declines of monitors on Guam. Local extirpations are probably due to the degree of urbanization.

While it is unlikely that *V. indicus* will be completely extirpated from Guam, it is likely that this species will experience further restriction of range to areas that are currently undeveloped, federally or territorially protected, or have little development potential. It is also likely that *V. indicus* will suffer decreasing population levels in all remaining areas of occurrence in the southern Mariana Islands.

Acknowledgements.—We thank Gordon Rodda (National Biological Survey) for his observations on toads and Cliff Rice (CNMI Dept. Natural Resources) for information on feral pigs on Rota. Robert Haddock kindly supplied data from the Guam Department of Public Health and Social Services. Demographic data were obtained from the offices of the U.S. Representatives to Congress, Rep. Underwood (Guam) and Rep. Babauta (CNMI). Robert Cruz, Mary Taylor (DAWR), and Estanislao Taisacan (CNMIDNR) aided in this study. Portions of this study were supported by the Endangered Species Conservation Program, Project E-4 to Guam.

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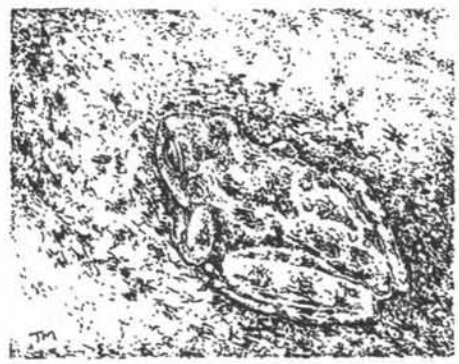
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Pseudacris cadaverina (California Treefrog). Illustration by Tim Manolis.

NATURAL HISTORY NOTES

Instructions for contributors to Natural History Notes appear in Volume 25, number 1.

CAUDATA

SIREN LACERTINA (Greater Siren). **DIET**. Although *Siren lacertina* is generally regarded as an opportunistic feeder on a variety of invertebrates, small fish, and plant matter, several authors have reported that mollusks are important in the diet. Hamilton (1950. Nat. Hist. Misc. 62:1–3) reported that "large individuals of *Siren* feed principally upon snails and insects" and that a "large *Siren lacertina* often contains a half pint of snails." Burch and Wood (1955. Copeia 1955:255–256) reported finding 138 mollusks of five species in the stomach of a single adult (369 mm SVL) *S. lacertina* from Virginia; 120 (87%) of these were of the sphaeriid clam *Musculium jayense*. Duellman and Schwartz (1958. Bull. Florida State Mus., Biol. Sci. 3:181–324) examined stomachs of 9 *S. lacertina* from southern Florida and found 18 insects, 2 crayfish, and 1 small fish, but they found no mollusks.

While electroshocking on 16 April 1992, personnel of the Florida Game and Fresh Water Fish Commission collected a moderate-sized (325 mm SVL, 481 cm TL; UF 86818) *S. lacertina* from Orange Lake, Alachua County, Florida. The abdomen of the specimen was obviously distended. Following several days in captivity, the siren passed shells from a total of 324 snails (323 *Planorbella scalare*, 1 *Physella pumila*) and 1 clam (*Musculium* sp.). The *P. scolare* varied in size from 4.5 to 9.1 mm in maximum diameter. In addition to the mollusks, the excreta included a pair of crayfish gastroliths. This report confirms earlier findings that some *Siren lacertina* may prey heavily on mollusks. However, this specimen had taken primarily snails, whereas the Virginia specimen reported by Burch and Wood had preyed predominantly on bivalves.

L. Mantini and R. A. Myers collected the siren and made it available. F. G. Thompson identified the mollusks.

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TARICHA TOROSA (California Newt). **DIET**. Adult California newts typically feed on earthworms, insects, snails, and other small invertebrates (Stebbins 1972. California Amphibians and Reptiles. Univ. of California Press, Berkeley, 152 pp.). Other studies have found that adult newts cannibalize egg masses and larvae (Kaplan and Sherman 1980. J. Herpetol. 14:183–185.; Kats et al. 1992. Herpetol. Rev. 23:7–8; Elliott, Kats, and Breeding, unpubl. data).

On 4 June 1993 we used water lavage to flush the stomach of a female newt (6.5 cm SVL, 9.8 g) captured in a small, first order stream in the Santa Monica Mountains (Los Angeles Co., California). The contents of the stomach of this relatively small adult included several insects: 2 coleopterans, 1 lepidopteran, and 1 plecopteran. In addition, we found 5 conspecific newt larvae (10–15 mm TL) in the stomach contents. The most conspicuous animal found in the newt's stomach was a nestling bird. The small bird (0.30 g) was fully intact, including clearly visible wings, legs, and head. We often see Anna's hummingbirds nesting over stream pools. We assume that the newt preyed on the small bird after it fell from a nest above the stream pool. We believe this is the first record of a bird being found in the diet of a newt.

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ANURA

BUFO PARACNEMIS (Sapo Rococo, Kururú Guazú, Sapo Buey). **MALE REPRODUCTIVE BEHAVIOR**. Wells (1977. Anim. Behav. 25:666–693) classified temporal patterns of anuran reproduction into two broad categories: prolonged breeding and explosive breeding. I observed a chorus of *Bufo paracnemis* in order to examine fidelity of males to chorus sites and patterns of spacing among individuals. A total of 50 male *B. paracnemis* were marked in a temporary pond during eight occasions between October and December 1988 at Finca San Javier, 8 km S Joaquin V. Gonzalez, Salta, Argentina. The size distribution of the males was unimodal, with a mean SVL of 180.2 mm (N = 50; SD = 30.84, range = 150–240). Observations of male-male encounters and positions of calling sites were made during the activity period which usually lasted from 1900–0100 h. The number of individuals in the chorus varied on a nightly basis from 2 to 15 (N = 8; mean = 8.25; SD = 4.2). Some individuals failed to appear while others appeared for the first time. There was no correlation between body size and the number of nights toads were present at the pond (N = 50; r = 0.016; P > 0.25). The number of times an individual appeared at the pond during the study varied between one and eight (N = 50; mean = 2.3; SD = 1.6). Calling sites of individual males changed among nights, but an individual always stayed at the same site during one night even after natural agonistic interactions with an intruder.

Wells (*op. cit.*) postulated that male-male aggression without site attachment should lead to maintenance of inter-individual distances in a breeding chorus. I observed 11 naturally occurring agonistic interactions between males. The distance between combating males was < 0.5 m on all occasions. A simple experiment was performed in the field. On four opportunities, males of similar size were placed on the site of a neighboring male to simulate invasion by an intruder. In all four cases the resident male forcefully expelled the intruder. The intruder then returned to his initial site. In conclusion, *B. paracnemis* at my study site exhibited the characteristics of a prolonged breeder: breeding choruses occurred for more than a month; males called from stationary positions on a given night; and minimum inter-male spacing was maintained at the breeding pond.

I thank L. A. Fitzgerald for encouraging me to carry out this work. M. L. Crump, F. B. Cruz, L. A. Fitzgerald, E. O. Lavilla, R. L. Laurent, and G. Scrocchi gave helpful comments.

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CROCODYLIA

CAIMAN LATIROSTRIS (Broad Snouted Caiman). **OMPHALOPAGUS TWINS**. Within the Crocodylia, monozygotic twins have been observed in *Crocodylus porosus* (Webb 1987. *In* Webb et al. (eds.), Wildlife Management: Crocodiles and Alligators, pp 417–422. Surrey Beatty and Sons, Sydney), *Crocodylus acutus* (Neill 1971. Alligators, Crocodiles and their Kin. Columbia University Press, New York. 486 pp), and *Alligator mississippiensis* (Reese 1906. Anat. Anzeigen Jena 28:229–231). We report three occurrences of omphalopagus twins (fused at the umbilicus) (Lewis et al. 1992. Herpetol. Rev. 23:69–70) of *Caiman latirostris*, and describe some macroscopic features of these fusions.

Case 1: A nest of 40 eggs was laid on 27 December 1991 at the Experimental Breeding Station, Ministerio de Agricultura y Ganaderia Argentina, Santa Fe, Santa Fe Province, Argentina. The egg containing twins was larger than typical (82 x 42 mm). After 78 days of incubation at 30°C and 95% humidity, 31 eggs hatched or were manually opened. The egg containing twins was manually opened. Both twins were well formed but one was dead.

Inside the egg, the twins were oriented in opposite directions. The live twin measured 18 cm TL and weighed 29 g, and the dead one was 17 cm TL and weighed 24 g. At age 10 mos the survivor was 30.5 cm TL and weighed 124 g, much smaller than average caimans of this age reared in captivity (mean TL = 43 cm, SD = 5.6 cm; mean mass = 325 g, SD = 151 g) (Larriera 1993. *In* Zoocria de los Crocodylia. Memorias de la I Reunion Regional del CSG de la IUCN. The World Conservation Union, Gland, Switzerland. ISBN 2-8317-01-47-3).

Case 2: A nest of 42 eggs was collected from the wild as part of the Monitoring and Restocking Program, Estancia el Lucero, San Cristobal District, Santa Fe Province, Argentina (29°55'S, 60°50'W) on 18 February 1992. After 20 days, 40 eggs hatched. One normal sized egg contained twins. One of the twins was well formed, alive, and measured 17 cm TL and weighed 33 g. A small malformed live embryo was attached, but not viable. It was surgically separated and died. Two days later the other twin died.

Case 3: A nest of 44 eggs was collected from the wild on 19 February 1992, and after 40 days, 36 eggs hatched. One normal sized egg contained twins. They were alive and completely formed, but small, measuring 15 cm TL each and weighing 18 and 20 g, respectively. They were surgically separated, but both died one day later.

In all three cases, twins shared the yolk and only one of the animals was still alive as of November 1993. The three cases of omphalopagus twins accounted for 0.26% of the total number of eggs (1166) collected during the 1991-92 season.

Submitted by **ALEJANDRO LARRIERA** and **ALBA IMHOF**, CONVENIO INTA/MAGIC/MUPCN, Bv. Pellegrini 3100, Santa Fe-3000, Argentina.

TESTUDINES

CARETTA CARETTA (Loggerhead Sea Turtle). **NESTING.** Nesting loggerhead sea turtles (*Caretta caretta*) with maimed or missing hindlimbs typically may make several attempts to dig egg chambers before aborting. When eggs are deposited, many are broken or exposed during nest closure. Occasionally, eggs are simply laid on a flat beach (Dodd 1988. Synopsis of the Biological Data on the Loggerhead Sea Turtle *Caretta caretta* (Linnaeus 1758). U.S. Fish Wild. Serv. Biol. Rept. 88(4). 110 pp.). Field workers have successfully excavated egg chambers for loggerheads with these deformities (LeBuff, pers. comm.). This note documents reproductive dysfunction of a loggerhead with anatomically intact but movement impaired hindlimbs.

A female turtle (tagged QQN 226, straight carapace length = 82.2 cm, width = 65.2 cm) with a deep t-shaped fracture on the left posterior portion of her carapace was observed on Key Island south of Naples, Florida. The short arm of the injury (10 cm) crossed her backbone diagonally while the longer portion (25 cm) paralleled her backbone on the left rear of her carapace. Vertebral scute 4 was fractured and pushed inward. The injury appeared boat related and impaired normal hindlimb movement.

QQN 226 was first seen on 19 May 1991 when she dug two shallow, ill-formed egg chambers before aborting. Between 20 and 23 May she made five false crawls. She nested on 26 May. Between 6 and 8 June, QQN 226 made four false crawls before nesting on 10 June. She nested once more on 26 June.

Loggerhead nesting behavior has been partitioned into 18 steps (Hailman and Elowson 1992. Herpetologica 48(1):1–29). Of these, QQN 226 completed only sand flicking and right and left posterior shift outward movements. She was able to dig and scoop sand with her right limb only to a depth of ca. 20 cm. She could dig with her left limb but could not curl it to scoop sand from the cavity. The repeated false crawls were probably the result of her inability to dig an egg chamber.

Staff augmented her nesting each time by removing sand from the depression whenever she shifted her carapace outward. In each case, laying eggs before the egg chambers were the normal depth, ca. 43 cm (LeBuff 1990. The Loggerhead Sea Turtle in the Eastern Gulf of Mexico. Caretta Research, Inc. Sanibel, Florida. 216 pp.). All the nests were too shallow and were relocated. While QQN 226's clutches were smaller than most loggerhead clutches (mean QQN 226 = 83, N = 3; mean all = 96, N = 168), hatching success was high (mean QQN 226 = 97.6%). Her ability to produce viable eggs was apparently not affected by the injury. This observation documents an indirect consequence, reproductive dysfunction, of human-caused injury which may be less conspicuous than direct mortality or reduced viability, but which has the same result.

My thanks to Michelle Conant, Stephanie Richardson, Doug Chaltry, and Tracy Darnell for their efforts during the 1991 nesting season.

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DERMOCHELYS CORIACEA (Leatherback Sea Turtle). **BILLFISH INTERACTION.** The occurrence of billfish such as marlin (*Makaira* spp.) and sailfish (*Istiophorus* spp.) bills broken off in loggerhead (*Caretta caretta*), green (*Chelonia mydas*), olive ridley (*Lepidochelys olivacea*), and leatherback (*Dermochelys coriacea*) sea turtles has recently been summarized by Frazier et al. (1994. Env. Biol. Fishes 39:85–96).

Here, we report one case of a marlin bill found in a leatherback sea turtle. On 5 May 1993, a female leatherback sea turtle (CCL = 153.0 cm) nesting on Sandy Point National Wildlife Refuge, St. Croix, U.S. Virgin Islands, was found to have the distal portion of the bill of a blue marlin (*Makaira nigricans*) protruding vertically from its carapace, 19 cm posterior to the left anterior tip. The broken end of the bill was exposed 1.5 cm and heavily fouled with algae (species unknown) and large gooseneck barnacles (*Lepas* sp.). The bill was easily extracted with a slight pull. A fibrous membrane had formed around the bill where it was encased in the body. The resulting hole in the carapace had healed around its circumference and there was no bleeding upon extraction. Width of the hole at the skin surface was 2 x 3 cm with a depth of 6 cm. The hole was directly over the left lung of the turtle, and a pink membrane could be seen at the bottom of the hole, expanding 1 cm into it as the turtle breathed. We do not know whether the bill had penetrated the dorsal surface of the lung and subsequently healed. Approximately 3.5 cm of the distal tip of the bill was worn away; it is impossible to know if this happened before or after its insertion in the turtle. Dimensions of the bill (3.0 x 5.0 x 1.75 cm) suggest that it was probably from a female blue marlin > 295 kg (Harry Fierstine, pers. comm.).

After removal of the bill the turtle returned to lay its fifth nest of the season on 15 May 1993. The wound was smaller at this time and appeared to be filling in.

Funding for the leatherback sea turtle research at Sandy Point National Wildlife Refuge comes from Earthwatch Expeditions, Inc., Hubbs-Sea World Research Institute, and the U.S. Fish and Wildlife Service (Endangered Species Cooperative Agreement with the U.S. Virgin Islands Division of Fish and Wildlife). The authors would like to thank Harry L. Fierstine of California Polytechnic State University for identification of the marlin bill, Jack Frazier of CINVESTAV for a copy of the manuscript on billfish attacks on sea turtles, and the Caribbean National Wildlife Refuge office for permission to conduct our studies at Sandy Point NWR.

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Diego, California 92109, USA, and **PETER DUTTON**, Department of Biology, Texas A&M University, College Station, Texas 77843, USA.

GOPHERUS POLYPHEMUS (Gopher Tortoise). **MAXIMUM SIZE**. The maximum size for *Gopherus polyphemus* is 38.1 cm (carapace straight-line measurement) (Conant and Collins. 1991. A Field Guide to Reptiles and Amphibians of Eastern North America, 3rd ed., Houghton Mifflin Co., Boston, Massachusetts. 450 pp.) from a tortoise captured near LaBelle, Hendry County, Florida in 1974 (P. C. H. Pritchard, pers. comm.). On 13 February 1992, William Stokes encountered a large tortoise (carapace straight-line measurement = 38.7 cm; weight = 10.7 kg) in sand pine scrub at Jonathan Dickinson State Park in Martin County, Florida. The short gular projection and shallow plastral concavity of this new record tortoise suggest it is a female, but since it is a giant we will not guarantee the gender. The turtle was photographed, marked, and released in the area of its capture. Literature on large *G. polyphemus* includes the following. Theodore Roosevelt (1917. Notes on Florida Turtles. Amer. Mus. Jour. 17:289–291) stated that gopher tortoises reached a shell length of 18 inches (over 45 cm) but this claim was discounted (Carr. 1952. Handbook of Turtles. Cornell Univ. Press, Ithaca, New York. 542 pp.). Ernst and Barbour (1972. Turtles of the United States. Univ. Press Kentucky, Lexington. 347 pp.), were reportedly shown photographs of a 40.6 cm, 13 kg male tortoise that came from the Brighton Indian Reservation (Glades Co., Florida). The specimen has never been available for examination. *Gopherus polyphemus* probably reaches a maximum length of about 40 cm. Caution must be taken when measuring large turtles because inaccurate (and longer) carapace measurements can be obtained by moving the calipers at angles to the mid-line of the carapace. We recommend measuring large, living specimens with calipers at least ten times and giving the result as an average of those measurements.

We gratefully acknowledge the contributions, advice, and encouragement of Peter C. H. Pritchard of the Florida Audubon Society.

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MACROCLEMYS TEMMINCKII (Alligator Snapping Turtle). **REPRODUCTION**. Evidence of natural reproduction by this species in the northern half of its range is lacking. Minton and Minton (1973, Giant Reptiles, Charles Scribner's Sons, New York, 345 pp.), suggested that the northernmost breeding population is in southern Illinois. This was based on the record supplied by E. C. Galbreath and published by Smith (1961, The Amphibians and Reptiles of Illinois, Illinois. Nat. Hist. Surv. Bull. 28:1–298) of "a female ready for oviposition" taken in Union County. Caldwell and Collins (1981, Turtles in Kansas, AMS Publ., Lawrence, 67 pp.) noted that *M. temminckii* mated in the Arkansas River in Kansas. On 22 June 1992, a small (maximum carapace length (CL) 51 mm, midline CL 46 mm, weight 35 g) *M. temminckii* was captured in a hoop trap by Laura Walker and John Koons from the east side of Kentucky Lake (impounded Tennessee River) at river km 89.3 (mi 55.5) in the bay fed by Tischel Creek, 10.3 river km (6.4 mi) S of the Tennessee/Kentucky border in Stewart County, Tennessee. The specimen was photographed (APSU 4738, color slide), weighed, measured, marked, and released at the capture site. This find represents the first documented case of successful natural reproduction by *M. temminckii* in any part of its range north of central Louisiana (Dobie 1971. Copeia 1971:645–658).

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TERRAPENE CAROLINA CAROLINA (Eastern Box Turtle). **REPRODUCTION**. Female *Terrapene carolina* containing oviductal eggs have been recorded in Virginia from 26 May to 25 July (Mitchell, *in press*. The Reptiles of Virginia. Smithsonian Inst. Press, Washington, D.C.). Other reports of reproduction in *Terrapene* (see list in Ernst and McBreen 1991. Cat. Amer. Amphib. Rept. 512.1–512.13) indicate that nesting occurs in late spring and early summer throughout its range.

On 9 October 1992, we found a road-killed, 121.5 mm plastron length, gravid female in Newport News City Park, Newport News, Virginia. Presumably she had been active following rains during the morning and previous night and was killed between 1330 and 1430 h EDT. A hatchling *Chelydra serpentina* covered in mud was also found on the road at that time. The female *T. carolina* contained three oviductal eggs, two of which were broken when she was crushed. The third measured 35.5 x 19.2 mm and weighed 7.9 g. Two vitellogenic follicles measuring 14.1 mm and 11.6 mm occurred on the right side and three smaller follicles, 5.2 mm diam, were present on the left side. The unbroken egg was incubated in the laboratory but development did not occur.

We are unaware of other reports of oviductal eggs in *Terrapene carolina* in the fall season. Three competing hypotheses account for this observation. (1) The female was a resident of the park seeking a nest site for oviposition. Consequently, if the eggs had survived, they would have overwintered in the nest. If true, then it is unlikely that embryonic development could have taken place after mid-October at this latitude. Thus, the eggs of this species may sometimes undergo embryonic diapause (Ewert 1985. *In* C. Gans et al. (eds), Biology of the Reptilia, Development A, Vol. 14, pp. 72–267, John Wiley & Sons, New York). (2) The eggs could have been retained in the resident female's oviducts without embryonic development and overwintered along with her. The eggs could then have been deposited the following spring. Egg retention in natural populations has been documented for periods of several weeks in emydids and kinosternids (Moll 1979. *In* Harless and Morlock (eds.), Turtles: Perspectives and Research, pp. 305–331, John Wiley & Sons, New York) but there are no reports of turtles retaining eggs over winter under natural conditions. (3) The female was a recently released captive that had retained her eggs throughout the summer and early fall. Turtles kept in captivity routinely retain eggs in the oviducts when nesting conditions are lacking and are occasionally discovered with eggs in the body cavity as long as several months after capture (Cagle and Tihen 1948. Copeia 1948:66). We were unable to determine whether any of the crushed eggs were in the female's body cavity. Thus, we cannot say for certain that the female was not a former captive that had been recently released in the park. The lack of abnormal wear patterns on the plastron and claws provides circumstantial evidence that she was at least not a long-term captive. Additional observations of naturally occurring ovigerous *T. carolina* in the fall season and of egg retention in captives would help to establish which of these hypotheses is valid.

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LACERTILIA

ANOLIS CAROLINENSIS (Green Anole). **INTERSPECIFIC BEHAVIOR**. Reptile interactions with birds generally involve predation of one group upon the other, but competitive interactions apparently have been rarely observed. The green anole is characterized as a diurnal, insectivorous lizard. Between 10 September and 29 October 1992, near a house in Edinburg, Hidalgo County, Texas, I frequently observed at least three (based on size and sex) *A. carolinensis* feeding in flower bracts of a group of ornamental plants with conspicuous red, trumpet-shaped flowers (identity unknown but locally called firecracker bush). No other plants were blooming during October. Feeding behavior consisted of deliberate licking of the stamens or the interiors of the flowers suggesting that lizards were feeding on pollen and nectar, and not insects associated with the flower bracts. Between 21 October and 29 October 1992, at least one female black-chinned hummingbird (*Archilochus alexandri*) also fed on these flower bracts. *Archilochus alexandri* is a migrant in south Texas during September and October (Peterson 1985. Birds of Texas and Adjacent States, Easton Press, Norwalk. 304 pp.). When the hummingbird was present, she repeatedly attacked and forced the *A. carolinensis* from flower bracts. About twenty attacks were noted. After displacing an *Anolis* from a flower bract, the hummingbird fed at that and other unoccupied bracts. Attacks consisted of repeated close, rapid, darting approaches with the tail feathers fanned. Other *A. carolinensis* conspicuously perched in the same plants, but not on flower bracts, were also attacked and forced to descend. At one time, an oddly folded leaf (which I mistook for a perched *Anolis*) was repeatedly attacked by this hummingbird. Unidentified large dipterans, honey bees, and bumble bees feeding on nectar or pollen were also attacked by the hummingbird. Earlier in the year, no interactions between *Anolis* and other species of hummingbirds were observed. Conversely, I did not observe nectar feeding in *Anolis* before September 1992.

These behaviors suggest that floral resources may be limiting at certain times of the year and contribute to the aggressive interactions between hummingbirds, anoles, and insects.

Helpful comments were supplied by Rebecca A. Hensley and logistic support supplied by Rosemary Hensley.

Submitted by **MICHAEL JAMES McCOID**, Caesar Kleberg Wildlife Research Institute, Texas A & M – Kingsville, Kingsville, Texas 78363, USA.

CNEMIDOPHORUS SEXLINEATUS (Six-lined Racerunner). **OOPHAGY**. Intraspecific oophagy by lizards, in general, is well documented. However, there are few reports for the genus *Cnemidophorus*. In *C. uniparens* three cases of oophagy in captivity by conspecifics have been reported (Crews et al. 1983. *In* Huey et al. (eds.), Lizard Ecology: Studies of a Model Organism, pp. 205–231. Harvard Univ. Press, Cambridge, Massachusetts.). Oophagy has been reported in captive, reproducing colonies of parthenogenetic whiptail lizards, but the species in question is unclear (Townsend 1979. Int. Zoo Yrbk. 19:80–86). In none of these cases did a lizard eat her own eggs.

In May 1992 we collected *C. sexlineatus* from northern Arkansas and brought them back to our laboratory in Wisconsin. The lizards were watered and fed crickets daily. Every third day crickets were dusted with Theralin Puppy Nutritional Powder. Lizards were housed in plastic rat cages containing sand and shelter with heat lamps and full spectrum fluorescent lights.

One cage contained a male and a gravid female. On 3 June 1992, the eighth day of acclimation, the male was eating a desiccated egg. The female bit off a piece protruding from the male's mouth. There were bits of yolk scattered on the sand. After a few minutes the empty shell was dropped. Although brought to their attention, a second desiccated egg was not eaten by either lizard during a 24-hour period. We placed a fresh *C. sexlineatus* egg, 0.94 g, which had been incubating for 4 days at 28°C in the cage. Within seconds the male approached, flicking his tongue, picked up the egg and ruptured it with the first bite. After about 28 min the male had consumed the contents of the egg and the shell.

Mitchell and Groves (pers. comm.) suggest several hypotheses to account for intraspecific oophagy. We did not explicitly test any of these. However, calcium deficiency seems unlikely, as the nutritional powder used to dust the crickets contains a minimum of 11.3% calcium by weight.

We thank Joseph C. Mitchell for his help with this paper, and Stanley E. Trauth for his assistance with the field work.

Submitted by **KENT A. HATCH** and **JOEL D. STEIN**, Department of Zoology, University of Wisconsin-Madison, Madison, Wisconsin 53706, USA.

DRACO VOLANS (Flying Dragon). **REPRODUCTION**. At 1100 h on 16 February 1993 at the Dallas Zoo (photoperiod = 10L:14D, temp. 32°C) an adult female *D. volans* (SVL 80 mm, TL 149 mm) constructed a nest by forcing her head into potting soil and repeatedly rotating her body in a clock-wise direction. This action produced a depression ca. 3 cm deep. Five eggs (mean size 11.6 X 7.7 mm, 0.4 g) were deposited in the depression. The female covered them by pushing soil over the eggs with her head. Vertical head bobbing motions were used to pack the soil solidly (as described by Magdefrau 1992. The Vivarium 4(1):14).

The female guarded the nest from staff members during the hour following oviposition. This aggression consisted of lunging, biting, and expansions of the patagium. Although the eggs were removed one hour after oviposition, the female remained on or near the nest site for ca. 24 h. No further nest guarding behavior was exhibited.

Five neonates hatched (mean SVL = 9 mm, TL = 21 mm, 0.3 g) after an incubation period of 32 days. Nothing is known regarding reproductive behavior of this species in the wild.

Submitted by **WINSTON C. CARD**, Department of Herpetology, Dallas Zoo, 621 East Clarendon Drive, Dallas, Texas 75203, USA.

PHRYNOSOMA CORNUTUM (Texas Horned Lizard). **ARBOREAL BEHAVIOR**. *Phrynosoma cornutum* is a ground-dwelling lizard that often burrows into the rocky, sandy, or loamy soils in which it is found (Smith 1946. Handbook of Lizards. Comstock Publ., Ithaca, New York, pp. 290-293.). This species has a broad geographic range and occupies a variety of open desert and grassland habitats, preferring sparsely vegetated areas (Price 1990. Cat. Amer. Amphib. Rep. 469:1–7). This note documents the climbing of, and roosting in, trees by *P. cornutum*, a behavior not previously reported in this species.

On 17 June 1992 at ca. 2300 h, two adult *P. cornutum* were discovered ca. 0.75–1.0 m up on the trunk of a blackjack oak (*Quercus marilandica*) about 6.4 km south of Harrah, Oklahoma County, Oklahoma. The habitat consisted of a stand of sparsely spaced blackjack oaks with surrounding grassland. There were no rocks in the immediate area and the soil was sandy. However, the ground was very wet from heavy rainfall earlier in the day. The lizards chose an oak about 2 m from an open, grassy area. Both individuals were sitting on the tree facing up with their eyes closed as if they were sleeping. By 0900 h the next day, both lizards were gone. In addition to this record, a local herpetologist reported *P. cornutum* climbing 1-2 m up sycamore trees (*Platanus occidentalis*) in riparian habitats in Noble County, Oklahoma after heavy rainfall.

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Horned lizards occasionally climb into low shrubs (ca. 0.5 m or less in height) during the hottest part of the day to escape the hot ground temperatures (Whitford and Bryant 1979. Ecology 60:686–694). However, they are not morphologically adapted for climbing. They possess relatively short legs and are slow and awkward (Pianka and Parker 1975. Copeia 1975:141–162). They do, however, possess relatively long, sharp nails on each toe that might facilitate climbing. Although sometimes found in moist soils, *P. cornutum* does not favor wet soil conditions. We believe that the climbing behavior documented here is a tactic in response to flooding or other saturation of their soil habitat.

Submitted by **STEVEN R. SHEFFIELD**, Department of Zoology, Oklahoma State University, Stillwater, Oklahoma 74078, USA, and **NEIL CARTER**, Department of Herpetology, Oklahoma City Zoo, Oklahoma City, Oklahoma 73111, USA.

PHRYNOSOMA MCALLII (Flat-tailed Horned Lizard). **PREDATION**. There are few published accounts of predators of *P. mcallii* (Funk 1965. Herpetologica 21:15–17; 1981. Cat. Amer. Amphib. Rept. 281:1–2; Ross 1989. Amphibians and Reptiles in the Diets of North American Raptors. Wisconsin Endangered Species Research Report 59, Wisconsin Dept. of Natural Resources, Madison, 33 pp.). We identified some avian and mammalian predators of *P. mcallii* by analyzing remains of carcasses in the field. This work was conducted March–July 1979, as part of an intensive survey to delineate the distribution of *P. mcallii* in California (Turner and Medica 1982. Copeia 1982:815–823). Additional data were collected from May–June 1980 in the Coachella Valley near Palm Springs, Riverside County, California. Remains of *P. mcallii* were identified using diagnostic characters for this species (Smith 1946. Handbook of Lizards, Comstock Press, New York, 557 pp.; Stebbins 1954. Amphibians and Reptiles of Western North America, McGraw-Hill Book Co., New York, 528 pp.).

Habitat where the *P. mcallii* remains were found was characteristic of Sonoran Desertscrub, Lower Colorado River Valley Subdivision, Creosotebush (*Larrea tridentata*)-White Bursage (*Ambrosia dumosa*) Association (Brown and Turner 1982. Sonoran Desertscrub, *In* D. E. Brown (ed.). Biotic Communities of the American Southwest—United States and Mexico, pp. 181–221. Desert Plants 4:1–342). Three remains were found in association with bird nests: 1) an American kestrel (*Falco sparverius*) nest in an abandoned building in the Yuha Basin west of Mount Signal, 15 km SW El Centro, Imperial County, California; 2) a common raven (*Corvus corax*) nest in the Superstition Mountains, on the National Parachute Test Range and Naval Air Facility, 28 km W Brawley, Imperial County California; and 3) a burrowing owl (*Athene cunicularia*) nest, 20 km SW El Centro, Imperial County, California. We also identified two partially eaten *P. mcallii* that were presumably the prey of loggerhead shrikes (*Lanius ludovicianus*); one was found impaled on a barb-wire fence at Brock Agricultural Research Center, 6 km E Midway Well, Imperial County, California, and another was found on the spine of a western honey mesquite (*Prosopis glandulosa* var. *torreyana*) near Bob Hope Drive, Palm Springs, Riverside County, California.

Avian predators of other *Phrynosoma* species include red-tailed hawk (*Buteo jamaicensis*), prairie falcon (*Falco mexicanus*), greater roadrunner (*Geococcyx californianus*), common raven (*Corvus corax*), thrashers (*Toxostoma* spp.), and other raptor species (Bryant 1911. Univ. California Publ. Zool. 9:1–84; Knowlton and Stanford 1942. Copeia 1942:186; Miller 1948. Copeia 1948:67; Munger 1986. Copeia 1986:820–824; Sherbrooke and Montanucci 1988. J. Arid Environ. 14:275–284; Ross 1989, *op. cit.*; Sherbrooke 1990. Wilson Bull. 102:171–174; W. C. Sherbrooke, pers. comm. 17 March 1992). Published accounts of reptilian flat-tailed horned lizard predators include the sidewinder (*Crotalus cerastes*; Funk 1965, *op. cit.*).

Kit fox (*Vulpes macrotis*) was the only mammalian predator of *P. mcallii* we identified. We located the remains of an uneaten, but chewed individual on the mound of an active kit fox den, ca. 10 km E of the Fish Creek Mountains, Imperial County, California. Kit fox are known lizard predators (Jameson and Peters 1988. California Mammals. Univ. California Press., Berkeley, 403 pp.), but to our knowledge there are no published reports of their predation on *P. mcallii*. Squirting blood from sinuses surrounding the eyes by *Phrynosoma* species has been described as an anti-canid defensive behavior, but blood squirting has not been documented in the flat-tailed horned lizard (Sherbrooke 1990, *op. cit.*; Sherbrooke 1991. Amer. Midl. Natur. 126:187–195; Middendorf and Sherbrooke 1992. Copeia 1992:519–527; Sherbrooke, pers. comm.). Other mammals, including coyote (*Canis latrans*) and grasshopper mouse (*Onychomys torridus*) are known horned lizard predators (Munger 1986, *op. cit.*; Sherbrooke, pers. comm.).

On 29 November 1993, the U.S. Fish and Wildlife Service proposed to list *P. mcalii* as a threatened species pursuant to the Endangered Species Act of 1973, as amended (Federal Register 58:62624–62629).

We thank the reviewers of our draft manuscript. This work was supported by contracts from USDI Bureau of Land Management, Riverside, California, U.S. Army Corps of Engineers, Los Angeles District, and U.S. Department of Energy, to Frederick B. Turner, while the authors were employed as research assistants to Dr. Turner through a cooperative education program with Prescott College, Prescott, Arizona. We also thank Margaret H. Fusari, our former advisor and mentor at Prescott College.

Submitted by **RUSSELL B. DUNCAN, TODD C. ESQUE**, and **KRISTI L. ECHOLS**, Prescott College, Prescott, Arizona 86301, USA. Present addresses are (RBD): Southwestern Field Biologists, 8230 E. Broadway Blvd., Suite W-8, Tucson, Arizona 85710, USA. (TCE): USDI, National Biological Survey, St. George Field Station, 225 N. Bluff St., St. George, Utah 84770, USA. (KLE): The Nature Conservancy, 212 E. Marcy St., Suite 200, Santa Fe, New Mexico, USA.

TARENTOLA MAURITANICA (Moorish Gecko). **BEHAVIOR**. *Tarentola mauritanica* is a small gekkonid lizard distributed throughout the Mediterranean Basin (Martínez-Rica 1974. P. Cent. pir. Biol. exp. 5:7–291; Mayol 1985. Rèptils i Amfibis de les Balears. Editorial Moll, Palma de Mallorca. 234 pp.). It is often the most abundant lizard at a site, showing marked anthropophilous behavior. Its activity is nocturnal, crepuscular, or both (Martínez-Rica 1974, *op cit.*; Rieppel 1981, *In* W. Böhme (ed.), Handbuch der Reptilien und Amphibien Europas, Echsen, Sauria I, Akademische Verlagsgesellschaft, Wiebaden, pp. 119–133). Nocturnal foraging activities center around artificial lights when available (Mayol 1985, *op cit.*, and pers. obs.), where this gecko captures mainly flying prey. *Tarentola mauritanica* is chiefly insectivorous (Rieppel 1981, *op cit.*), but small lizards are occasionally taken (Bauer 1990. Herpetol. Rev. 21(4):83–87; Salvador 1979. Doñana Acta Vert. 5:5–17).

During a survey of the herpetofauna of Minorca (Balearic Islands) in August 1988, we observed prey capture by *T. mauritanica*. Typical foraging behavior on the house walls near artificial lights involved a sequence of acts. First, the prey was detected from an ambush site where the gecko remained motionless. Second, the lizard approached slowly within 5 to 30 cm of the prey. Third, the attack typically was a charge (following Carpenter and Ferguson 1977, *In* C. Gans and D. W. Tinkle (eds.), Biology of the Reptilia, Vol. 7, Ecology and Behavior, pp. 335–403. Academic Press, New York.), a rapid rush towards the prey from a distance greater than the length of the lizard. We recorded 19 attacks from 19 different individuals of which 10 failed. In 15 attacks the lizards held their tails straight or only slightly turned to the side. These attacks were directed in all cases against small insects: moths (13 attacks),

alderflies (1 attack), and flies (1 attack). In the remaining four attacks, the lizards raised their tails during the slow approach, moving it laterally and sometimes with the distal portion of the tail slightly brought forward. The final charge was accompanied by increased vibration, shaking rapidly the tip of the tail. These four attacks were directed towards large moths; one was unsuccessful.

This is the first record of tail waving behavior as part of a prey capture tactic in gekkonid lizards (Salvador 1979, *op cit.*; Rieppel 1981, *op cit.*). Tail waving in general was described previously as precopulatory courtship behavior (Carpenter and Ferguson 1977, *op cit.*).

Within the context of prey capture, tail waving and vibration has been interpreted as a mechanism for distracting the prey's attention away from the lizard's head (Carpenter and Ferguson 1977, *op cit.*), or as caudal luring (Heatwole and Davison 1976. Herpetologica 32:332–336). Caudal luring has been described for several snake species and a pygopodid lizard. In some cases caudal luring is limited to juvenile individuals that possess brightly colored tails (Radcliffe et al. 1980. Bull. Maryland Herp. Soc. 16:19–22; Mushinsky 1987. *In* Seigel et al. (eds.), Snakes: Ecology and Evolutionary Biology, Macmillan Pub. Co., New York, pp. 302–334; Murray et al. 1991. Copeia 1991(2):509–516). Radcliffe et al. (1980, *op cit.*) proposed that caudal luring of *Boa constrictor* was a displacement activity. During slow motion approach, the inhibition of the tendency to move rapidly toward the prey is an important part of a successful prey capture and could result in a conflict that produces tail waving as a displacement activity (Radcliffe et al. 1980, *op. cit.*). The function of tail waving in *T. mauritanica* is unresolved and requires further observation.

These observations were made possible partially by grant PB90-0526-C02-01 from the Spanish Ministry of Science and Education.

Submitted by **VALENTÍN PÈREZ-MELLADO**, Department of Environmental Sciences and Natural Resources, University of Alicante, 03080- Alicante, Spain.

TROPIDURUS TORQUATUS (Collared Lizard). **DIET**. Lizards of the genus *Tropidurus* (Tropiduridae) prey on arthropods (Vanzolini et al. 1980. Rèpteis da Caatinga. Rio de Janeiro: Academia Brasileira de Ciências. 161 pp.). Although the genus *Tropidurus* is widespread (South America and the Galapagos Islands) and speciose (Rodrigues 1987. Arq. Zool., São Paulo 31(3):105–230), information on the diet of most species remains scarce, unknown, or is anecdotal and based on few individuals. *Tropidurus torquatus* is a diurnal lizard common to open areas of southeastern Brazil (Rodrigues 1987, *op. cit.*). Here we document the diet of 29 *T. torquatus* collected during August 1991, a month during the dry season. Field work was conducted at a "Restinga" (sandy habitats covered with herbaceous and shrubby vegetation that are common along the Brazilian coast) in the municipality of Linhares (19°18'S, 40°19'W) in the State of Espirito Santo, Brazil. We analyzed the stomach contents of 29 *T. torquatus* (range 34.0–81.0 mm SVL, mean = 61.1 mm ± 15.2), counted and estimated the volume of each prey item (following Schoener 1967. Science 155:474–477). *Tropidurus torquatus* has a generalized diet composed predominantly of arthropods, ants being the most frequent prey (Table 1). Lizards of the genus *Tropidurus* are sit-and-wait foragers (*sensu* Schoener 1971. Ann. Rev. Ecol. Syst. 2:369–404; Vanzolini et al. 1980, *op. cit.*). The diversity and high frequency of mobile prey in the diet of *T. torquatus* is consistent with such feeding behavior. Plant material (flowers only) in the stomachs of 38% of the lizards suggests that plants were not eaten by the lizard casually and may be an important food resource for *T. torquatus*.

We thank the Companhia Vale do Rio Doce for logistical support in the field and the CNPq for the grants (No. 84024089-9 to CFDR and No. 84023491-0 to HGB). Monique Van Sluys kindly revised the text.

TABLE 1. Number of items, volume (in mm^3) and frequency of each type of prey of *Tropidurus torquatus* in the restinga of the Reserva Florestal Vale do Rio Doce, Linhares, Espirito Santo (N = 29).

	No. of Items	(%)	Volume	(%)	Frequency
Plant material	18	(3.20)	1849.8	(21.40)	0.38
Hymenoptera	274	(48.90)	2324.3	(26.90)	0.72
Formicidae	258	(46.10)	1505.9	(17.40)	0.72
Others	16	(2.90)	818.4	(9.50)	0.24
Coleoptera	21	(3.80)	824.2	(9.60)	0.41
Lepidoptera	5	(0.90)	1294.4	(15.00)	0.14
Larvae	1	(0.20)	20.2	(0.20)	0.03
Adult	4	(0.70)	1274.2	(14.80)	0.14
Isoptera	209	(37.30)	1277.5	(14.80)	0.34
Orthoptera	3	(0.50)	534.0	(6.20)	0.10
Hemiptera	2	(0.40)	200.0	(2.30)	0.06
Homoptera	1	(0.20)	7.9	(0.09)	0.03
Neuroptera	1	(0.20)	10.0	(0.10)	0.03
Isopoda	3	(0.50)	72.0	(0.80)	0.03
Diptera	5	(0.90)	13.2	(0.15)	0.10
Larvae	1	(0.20)	4.0	(0.05)	0.03
Adult	4	(0.70)	9.2	(0.10)	0.10
Aranae	6	(1.10)	130.8	(1.50)	0.21
Acarina	12	(2.10)	11.5	(0.10)	0.17
Unidentified parts of arthropods			85.0	(1.00)	
Total	560		8634.7		

Submitted by **CARLOS FREDERICO DUARTE ROCHA** and **HELENA GODOY BERGALLO**, Setor de Ecologia, Instituto de Biologia. Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier. 524, Maracanã. 20550-011, Rio de Janeiro, RJ, Brazil.

SERPENTES

BOIGA IRREGULARIS (Brown Tree Snake). **REPRODUCTION**. Clutch size in *Boiga irregularis* is not well documented. Shine (1991. Copeia 1991:120–131) discussed two clutches from Australia. Zwinenberg (1978. Aquarien. Terrian. Z 31:177–179) also reported clutch size. Despite high densities of *B. irregularis* on Guam, (Rodda et al. 1992. Pac. Sci. 46:46–57), no clutches have been reported, although captive snakes have deposited eggs (unpubl. data). I herein report on the first clutch of eggs found and successfully incubated of *B. irregularis* on Guam. On 30 June 1990, a *B. irregularis* (1295 mm SVL) was captured (Mangilao Municipality: Adacao) and placed in a glass jar. Between 0000 and 0600 h, on 6 July, the snake deposited eight eggs and was donated the following day to Guam Division of Aquatic and Wildlife Resources (DAWR). Eggs were removed and incubated at ambient

temperatures (daily range 25–30°C) on moist paper towels in a loosely closed, opaque plastic jar. Eggs (mean length 43.36 mm, width 22.96 mm) were adherent and formed a mass weighing 110.12 g. On 24 July, one egg was discolored, separated, and preserved. On 9 October, two eggs pipped and one snake emerged. On 10 October, the remaining six eggs were opened, containing dead, full-term embryos (N = 7, mean SVL = 272.43 mm, SD 12.42; mean mass = 5.29 g, SD 0.58). Incubation period was 94 days. These data are not entirely inconsistent with those presented by Shine (1991, *op. cit.*). Snakes the size of these neonates/embryos have never been collected on Guam, but snakes 330 to 350 mm SVL possess prominent umbilical scars (pers. obs.). However, snakes of this latter size range comprise less than 1% of snakes collected or observed by DAWR on Guam (N = ca. 2300, pers. obs.).

Reproduction in *B. irregularis* on Guam may be aseasonal (Fig. 1). Two females were necropsied with shelled oviductal eggs in June and October. Females with 42-43 mm long secondary follicles (probably just prior to shelling) have been recorded in January. Enlarged (≥ 30 mm length) secondary follicles have also been recorded in February, April, June, and October. These data suggest that shelled eggs are produced year-long on Guam. Shine (*op. cit.*) reported a highly seasonal component to reproduction of *B. irregularis* in Australia. There is little seasonal variation in temperature on Guam, but a marked wet/dry season is evident (Fritts et al. 1987. The Snake 19:51–58). Factors other than seasonal weather patterns may influence reproduction of *B. irregularis* on Guam.

Rebecca Hensley reviewed a draft of this paper. Research was supported by the Endangered Species Conservation Program, Project E4.

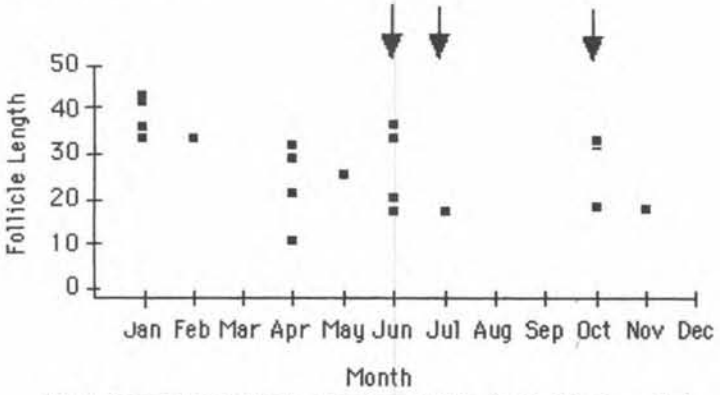


FIG. 1. Seasonal variation in secondary follicle size in *Boiga irregularis* from Guam. Data collected between 1984 and 1990. Arrows indicate months in which shelled eggs were found.

Submitted by **MICHAEL JAMES McCOID**, Division of Aquatic and Wildlife Resources, P.O. Box 2950, Agana, Guam 96910, USA. Present address: Caesar Kleberg Wildlife Research Institute, Texas A & M – Kingsville, Kingsville, Texas 78363, USA.

COLUBER CONSTRICTOR PRIAPUS (Southern Black Racer). **PREY**. On 29 July 1993 at 1750 h EST on a forest road near the eastern edge of the Apalachicola National Forest, Leon County, Florida, I was attracted by loud thrashing noises to a *Coluber constrictor priapus* (TL = 93 cm) actively manipulating its jaws around the head of a *Sistrurus miliarius barbouri* (TL = 41 cm). When I approached within 2 m, the racer attempted to retreat with its prey, which it subsequently dropped. Within 30 min the rattlesnake was responsive and looked as if it would recover fully.

Although *C. constrictor* is known to prey on many snakes including at least one pit viper, *Agkistrodon contortrix* (Fitch 1963. Univ. Kansas Publ. Mus. Nat. Hist. 15:351–468), this observation appears to be the first record of *C. constrictor* preying on *Sistrurus*.

I thank D. Bruce Means for his assistance and Dale R. Jackson for reviewing the manuscript.

Submitted by **DAVID J. PRINTISS**, Florida Natural Areas Inventory, 1018 Thomasville, Road, Suite 200-C, Tallahassee, Florida 32303, USA.

CROTALUS HORRIDUS (Timber Rattlesnake). **LONGEVITY**. On 6 October 1954, a young male *Crotalus horridus* (TL = 55.9 cm) was brought to the biology laboratory of Louisiana College. It was estimated to be 12–18 months old. Feedings were limited to three or four per year. From 1954 to 1990 he was fed 125 times and consumed 58 mice, 3 "leather-winged" bats, 20 hooded rats, 75 gray rats, 76 white rats, 3 moles (Talpidae), 10 newborn rabbits, and 20 gerbils. Always when swallowing his prey he began to rattle.

When disturbed, a rattlesnake may spray venom like a cobra, accomplishing this by exhaling a sudden blast of air from the glottis against the poison as it comes from the fangs (Barbour 1926. Reptiles and Amphibians, Houghton Mifflin Co., Boston, Massachusetts, p. 44). During the 36 years this snake was carefully watched, no spraying of venom was ever observed.

After the snake reached 25 years of age it was no longer able to kill its prey, and was subsequently fed pre-killed food. Often it took two or three days to complete a feeding of several food animals. On 2 June 1991, he was found dead. The rattlesnake measured 1.77 m TL. He was preserved and placed in a museum jar for display in the laboratory, having lived in captivity for 36 years, 7 months, and 27 days.

Submitted by **CHARLES J. CAVANAUGH**, Professor Emeritus, Department of Biology, Louisiana College, Pineville, Louisiana, 71360, USA.

MICROPECHIS IKAHEKA (Small-eyed or Ikaheka snake). **OPHIOPHAGY**. The New Guinea endemic, *Micropechis ikaheka*, is a little known elapid which reaches 2.5 m TL and adopts a secretive, nocturnal, and semi-fossorial existence. The species is fairly common on Kar Kar Island, an active volcanic island in the Bismarck Sea 17 km NE Madang, Papua New Guinea. This note reports a case of predation on a boid, *Candoia aspera*, by *M. ikaheka*. A *M. ikaheka* (SVL = 670, TL = 770 mm) was captured by a plantation worker on 27 January 1993. Investigation of the snake's stomach contents revealed a partially digested *Candoia aspera* (SVL = 300, TL = 320 mm) that was swallowed head first. If *M. Ikaheka* habitually preys on *C. aspera*, the large population of the latter and several other potential prey species could in part account for the especially large population of *M. ikaheka* on Kar Kar Island in comparison with similar plantation locations on the mainland. Both specimens will be deposited in the British Museum (Natural History).

I thank Roger, Rosa, and Ian Middleton, Ilaiah Bigilale (National Museum of Papua New Guinea), Iamo, Ila, and Mick Raga (DEC), M. Jebb (Christensen Research Institute), and John Cheung (Island Airways). This work was funded in part by the Nuffield Department of Clinical Medicine, John Radcliffe Hospital, Oxford, England.

Submitted by **MARK T. O'SHEA**, 46 Buckingham Road, Penn, Wolverhampton, WV4 5TJ, England.

MICROPECHIS IKAHEKA (Small-eyed or Ikaheka snake). **CANNIBALISM**. Cannibalism, as opposed to interspecific ophiophagy, has been recorded for a wide range of reptile species (Mitchell 1986. SSAR Herp. Circ. 15:1–37). This record follows Mitchell's recommendations for reporting cannibalism. Little is known of

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Herpetological Circular No. 23
Prepublication Announcement

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Nombres Científicos y Comunes en Ingles y Español de los Anfibios y los Reptiles de México

ERNEST A. LINER

with Spanish Translation by

José L. Camarillo R.

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the habits of *Micropechis ikaheka* other than it is nocturnal and frequents damp forest, swampy ground, and coconut plantations where it preys on lizards, small mammals, and snakes. During a five month period, I collected 15 live *M. ikaheka* on Kar Kar Island, Madang Province, Papua New Guinea. The snakes ranged in size from < 300 mm to 1500 mm SVL. They were housed at the University of Papua New Guinea in groups of three in spacious wooden cages measuring 1.2 x 0.6 x 0.3 m, and were fed laboratory mice. On the morning of 10 August 1990, a female measuring 910 mm SVL (TL = 1040 mm) had eaten another female measuring 875 mm SVL (TL = 965). All three snakes in this cage were fed mice some days previously and the cannibalistic female had fed particularly well. The cannibalized female appeared in good health the previous evening.

I thank Roger and Rosa Middleton, Matthew Jebb (CRI), Phil and Brenda Willmott-Sharp, James Menzies (UPNG), and Mick Raga (DEC). This work was funded in part by a Christensen Research Institute Fellowship and the Nuffield Department of Clinical Medicine, John Radcliffe Hospital, Oxford, England.

Submitted by **MARK T. O'SHEA**, 46 Buckingham Road, Penn, Wolverhampton, WV4 5TJ, England.

NERODIA RHOMBIFER (Diamondback Water Snake). **ALBINISM**. In the summers of 1988 and 1989, two albino *Nerodia rhombifer* were captured at Reelfoot Lake, Tennessee. The 1988 specimen (adult, TL ca. 930 mm) was killed by a fisherman near Samburg, Obion County, Tennessee, and given to David Haggard, naturalist at Reelfoot Lake Slate Park. The 1989 specimen (juvenile, TL ca. 350 mm) was captured in Lake County, Tennessee. A photo of this specimen appeared in Burkett and Huggins (1993. J. Tennessee Acad. Sci. 68(1):32).

Dyrkacz (1981. SSAR Herp. Circ. 11, 31 pp.) reviewed albinism in amphibians and reptiles and listed the degrees of albinism. The specimens from Reelfoot Lake are classified as partial albinos with xanthophores, since both had a light yellow ground color with a white pattern of chain-like markings and pink eyes. We previously reported five amelanistic (without melanin) juveniles born to one female of this species from the St. Francis River bottoms of Greene County, Arkansas, approximately 60 km SW Reelfoot Lake (Burkett and Huggins 1985. Herpetol. Rev. 16:56).

Dyrkacz (*op. cit.*) reported albinism in two closely related species, *N. fasciata* and *N. sipedon*, but the only known instances of albinism in *N. rhombifer* are the two reported herein. The occurrence of aberrant colors in these two adjacent populations suggests possible gene flow across the Mississippi River Valley and the possibility of finding other abnormally colored specimens from this geographic area.

We thank C. Norvell, Tennessee Department of Conservation, for informing us about the first specimen, and the naturalists at Reelfoot Lake State Park for allowing the second specimen to be examined and photographed.

Submitted by **RAY D. BURKETT**, Shelby State Community College, P.O. Box 40568, Memphis, Tennessee 38174-0568, USA, and **JAMES A. HUGGINS**, Baptist Memorial Hospital Campus, Union University, Memphis, Tennessee 38104, USA.

PYTHON MOLURUS BIVITTATUS (Burmese Python). **MOVEMENTS**. On 27 July 1992 in the village of Shui Hau, Lantau Island, Hong Kong, an old Chinese woman reported a "tai nam she" (literally "big belly snake," *P. m. bivittatus*) in her oven-sized, free-standing chicken coop. Apparently the snake had entered through a hole, eaten the two mature chickens within, and was unable to exit through the same hole. Extricated, the female python measured 2.7 m TL. The woman vigorously explained in Cantonese (though her pantomime was sufficient) that we could recover the chickens by holding the snake's head under water. Additional stimulus proved unnecessary; after it was removed from the coop the snake quickly regurgitated and the delighted old woman departed with the chickens.

On 31 July 1992, the snake was force-fed a L. L. Electronics two-stage transmitter (150 MHz) attached to a 1/4 wavelength antenna powered by a AA-sized lithium battery. We retained the snake overnight to ensure that the transmitter stayed inside and working. On 1 August at 1700 h the snake was released 170 m from the capture site east of the village.

The movements of the python were followed until 20 August from three stations to determine general position. On most days we directly approached the snake to examine the habitat occupied. In Fig. 1, the python's sequential positions are labeled with the number of days since capture. Snake locations were generally recorded during daylight hours (0600–2000 h) except a few positions which were recorded at night: 13b, 15a–c, and 17b (Fig. 1).

During the 24-day period the python's home range was 12.3 ha with a maximum linear dimension of 550 m (minimum convex

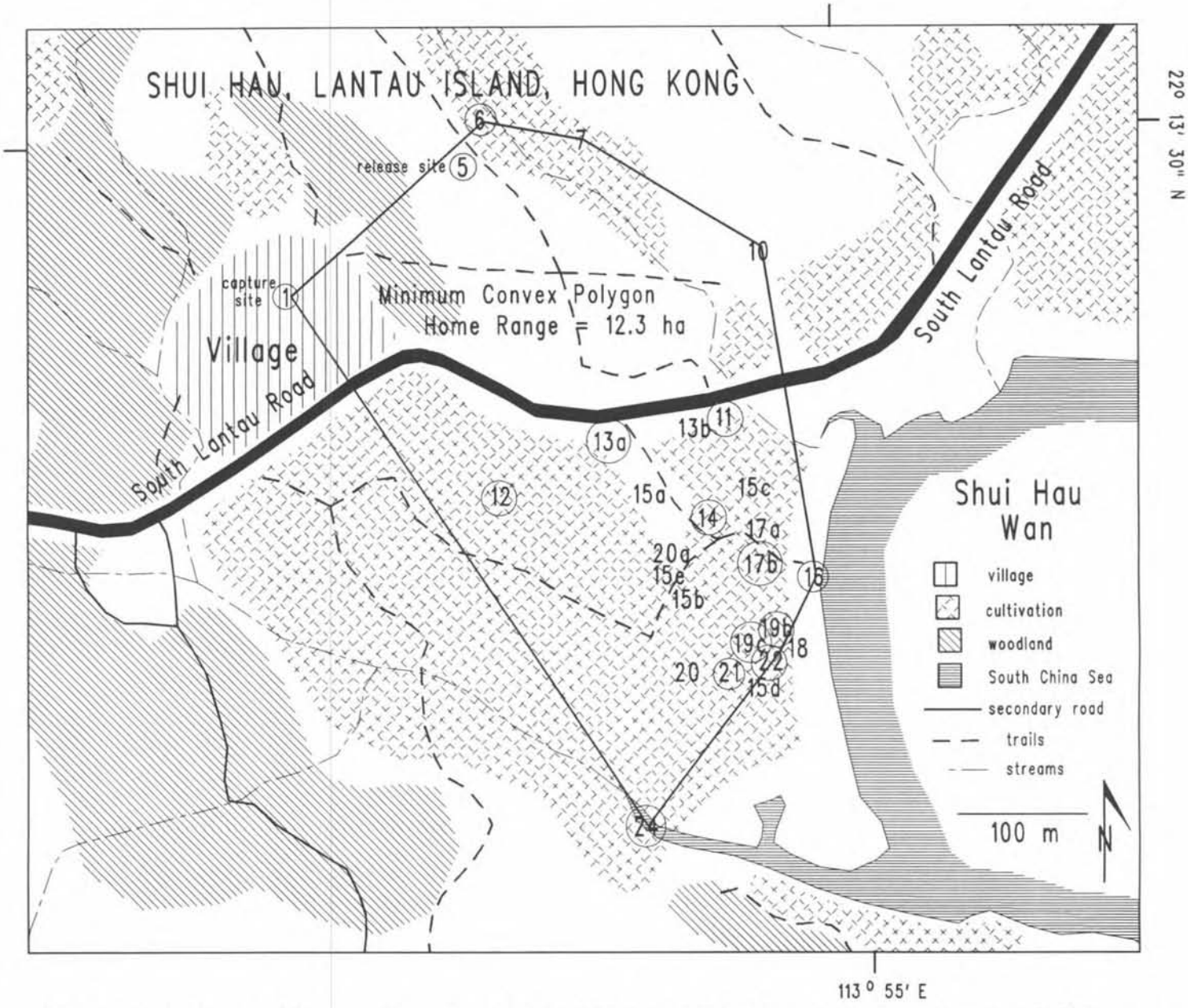


FIG. 1. MAP of the study area depicting sequential movements of a 2.7 m TL female *Python molurus bivittatus*. The polygon shows the snake's home range during the 20-day observation period. Unshaded areas represent scrubby vegetation or grassland. Numbers indicate the snake's sequential location by day of the study period. Letters indicate sequence of movements on a particular day. Circled positions were confirmed by direct approach and are accurate to within 10 m; uncircled positions were determined by telemetry fixes from three stations and are accurate to within 100 m.

polygon method; Mohr 1947. Amer. Midl. Nat. 37:223–249). On days 6 and 12, direct approach revealed the snake either completely or partly submerged in abandoned rice paddies. On three occasions (11, 13b, 14) daytime retreats were inside large rock piles or in vegetation near rock walls of cultivated fruit orchards. The snake spent the majority of tracking days (locations 16–22) near the beach in a dense *Pandanus* thicket.

Confirmed locations indicated that over the first few days after release (days 5–14), the snake ranged widely. We presume she was hungry on release as she had lost the meal of chickens from 27 July. On day 19, direct approach revealed the python had eaten something large. It made no long range movements until, between days 22 and 24, it moved southwest and passed the radiotag in a stream. The data suggest a cycle of wide ranging search for food, a period of limited movement during digestion, followed by elimination and a return to search behavior. Alternatively, the initial wide-ranging movements may have been an attempt to relocate portions of its home range because the snake was translocated on release.

Thanks to "chuk she lo" (snakecatchers) Glenn Mitchell, James Lazell, and James Conyers, and the radiotrackers and spotters: James Conyers, David Corsini, Daniel Freitas, Paul Gagne, III, Elizabeth Harris, Thomas Kinney, Bea Klepner, Timothy Loose, Richard Lutman, Glenn and Sally Mitchell, Betsy Olsen, John Rogers, Larry Ruotolo, Kerry Shered.

Submitted by **NUMI C. GOODYEAR**, Department of Zoology, University of Rhode Island, and The Conservation Agency, 97b Howland Avenue, Jamestown, Rhode Island 02835, USA.

SIMOPHIS RHINOSTOMA (NCN). **DIET**. The two species of the little known colubrid snake genus *Simophis* range from southeastern Brazil to Paraguay, in southeastern South America (Peters and

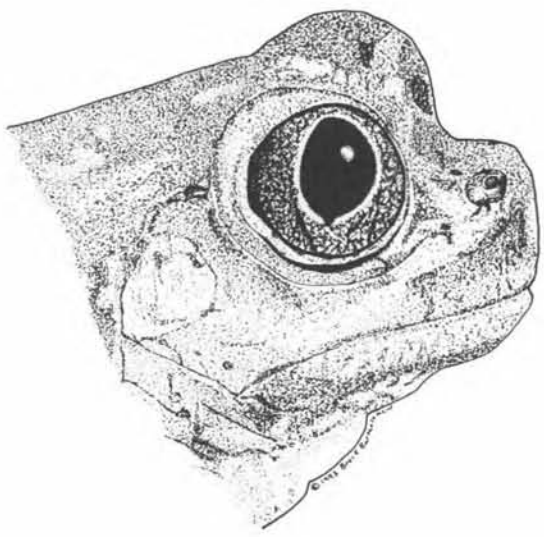
Orejas-Miranda 1970. Bull. U.S. Nat. Mus. 297:1–347). *Simophis rhinostoma* attains about 80 cm TL, is terrestrial and diurnal, and inhabits savannah-like areas and secondary disturbed forests (Sazima and Abe 1991. Stud. Neotrop. Fauna Environ. 26:159–164). Although reported to prey on "small rodents and other small animals" (Amaral 1976. Serpentes do Brasil, Melhoramentos, São Paulo, 246 pp.), no substantiated data on food of *S. rhinostoma* seem available (Sazima and Abe, *op. cit.*). Here we report on gut contents of 12 snakes from several localities in the State of São Paulo, SE Brazil, housed in the collection of the Instituto Butantan, São Paulo (IB).

We found five snakes (393–682 mm SVL) with identifiable prey, all of them frog remains. Three we ascribed to the small (ca. 30 mm SVL) leptodactylid frog *Physalaemus cuvieri*, and the others were bones of small leptodactylids the same size as *P. cuvieri*. Estimated prey/predator mass ratio for *S. rhinostoma* ranged from 0.1 to 0.2. Feeding on relatively small prey is common for most colubrid snakes (Greene 1983. Am. Zool. 23:431–441). Seven snakes had insect remains in the hindgut, a frequent finding for frog-eating snakes (pers. obs.). *Physalaemus cuvieri* is nocturnal and terrestrial, hiding by day under stones or pieces of wood, and in ground crevices or holes (Bokermann 1962. Rev. Brasil. Biol. 22:391–399; pers. obs.). The wedge-shaped snout profile of *S. rhinostoma* seems well suited to forage for frogs in such shelters.

We found no evidence that *S. rhinostoma* preys on rodents (Amaral 1976, *op. cit.*). Rodent-eating snakes generally are either heavy, constricting, or poisonous (Greene 1983, *op. cit.*; Shine and Schwaner 1985. Copeia 1985:1067–1071). *Simophis rhinostoma* is a slender, non-poisonous snake with short and feeble teeth (pers. obs.) suited for small and unarmed prey such as frogs.

We thank O. A. V. Marques for expert advice and reading the manuscript, G. Puorto for access to the IB snake collection, J. P. Pombal Jr. for confirmation of the identity of frog remains, and the CNPq for financial support.

Submitted by **ALESSANDRA F. BIZERRA, ROSANA S. JORDÃO**, Instituto de Biologia, Universidade de São Paulo, 01498-970 São Paulo, São Paulo, Brasil, and **IVAN SAZIMA**, Departamento de Zoologia, Universidade Estadual de Campinas, 13081-970 Campinas, São Paulo, Brasil.



Scaphiopus intermontanus (Great Basin Spadefoot). USA, Utah: Zion National Park. Illustration by Breck Bartholomew.

GEOGRAPHIC DISTRIBUTION

Instructions for contributors to Geographic Distribution appear in Volume 25, number 1.

CAUDATA

AMBYSTOMA TIGRINUM (Tiger Salamander). USA: WYOMING: Washakie Co: E 1/4 Sec. 11, T41N, R89W. 8 August 1992. Kris Harold Johnson. Verified by George T. Baxter. University of Wyoming Zoological Museum (UW 621). First county record (Baxter and Stone 1985, Amphibians and Reptiles of Wyoming. Wyoming Game and Fish Dept., 137 pp.).

Submitted by **KRIS HAROLD JOHNSON, GREGG L. KURZ**, and **RICHARD A. OLSON**, Department of Range Management, and **THOMAS D. WHITSON**, Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie, Wyoming 82071-3354, USA.

AMBYSTOMA TIGRINUM MELANOSTICTUM (Blotched Tiger Salamander). USA: WYOMING: Johnson Co: W 1/4 Sec. 3, T41N, R82W. 18 May 1993. Kris Harold Johnson. Verified by George T. Baxter. University of Wyoming Zoological Museum (UW 622). First township record; first county record south of Powder River (Baxter and Stone 1985, Amphibians and Reptiles of Wyoming. Wyoming Game and Fish Dept., 137 pp.).

Submitted by **KRIS HAROLD JOHNSON, GREGG L. KURZ**, and **RICHARD A. OLSON**, Department of Range Management, and **THOMAS D. WHITSON**, Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie, Wyoming 82071-3354, USA.

GYRINOPHILUS PALLEUCUS (Tennessee Cave Salamander). USA: TENNESSEE: Wilson Co: Cedars of Lebanon State Park, Jackson Cave, 36°05'10"N; 86°19"30"W, ca. 700 m into cave. 5 September 1993. Collected by local spelunker. Middle Tennessee State University (MTSU 128C). Verified by G. Murphy. A second specimen was located during a subsequent (14 September) search of the cave. County record (Redmond 1985, A Biogeographic Study of Amphibians in Tennessee, Doctoral Thesis, Univ. Tennessee, Knoxville. 290 pp.).

Submitted by **BRIAN T. MILLER** and **LEONARD WALTHER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS (Central Newt). USA: ILLINOIS: St. Clair Co: Brown's Pit (a cave). 1 July 1986. Charles Paine. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale Department of Zoology Collection (SIUC H-4519). Confirms unvouchered published report for county (Hurter 1893, Trans. St. Louis Acad. Sci. 6(11):251–261; Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **STEVEN J. TAYLOR** and **JEAN K. KREJCA**, Department of Zoology, Southern Illinois University at Carbondale, Carbondale, Illinois 62901, USA.

ANURA

BUFO AMERICANUS (American Toad). USA: ILLINOIS: Fayette Co: 8.05 km W of Rt. 128 on 3050 N and 3000 N. 31 March 1993. John E. Petzing. Verified by R. A. Brandon. Southern Illinois University at Carbondale (SIUC H-4473). County record; specimen found dead on blacktop road bordered on west by pasture and on east by oak-hickory forest.

Submitted by **JOHN E. PETZING**, Rural Route 1, P. O. Box 87, Beecher City, Illinois 62414, USA.

BUFO AMERICANUS (American Toad). USA: ILLINOIS: Madison Co: Poag, SE 1/4 NW 1/4 SE 1/4 Sec. 13, T4N, R9W. 5 July 1993. D. A. Landes. Verified by R. A. Brandon. Southern Illinois University at Carbondale (SIUC H-4506–08). Verifies old literature report by Hurter (1911, Herpetology of Missouri. St. Louis Acad. Sci. Trans. 20(5):59–274).

Submitted by **SCOTT R. BALLARD**, Illinois Department of Conservation, Division of Natural Heritage, 4521 Alton Commerce Parkway, Alton, Illinois 62002, USA, and **DAVID A. LANDES**, Biology Department, Belleville Area College, 2500 Carlyle Road, Belleville, Illinois 62221-5899, USA.

BUFO COGNATUS (Great Plains Toad). USA: WYOMING: Johnson Co: W 1/4 Sec. 3, T41N, R82W. 18 August 1993. Kris Harold Johnson. Verified by Joseph T. Collins. University of Wyoming Zoological Museum (UW 620). First county record; first record west of Powder River in Wyoming (Baxter and Stone 1985, Amphibians and Reptiles of Wyoming. Wyoming Game and Fish Dept., 137 pp.).

Submitted by **KRIS HAROLD JOHNSON, GREGG L. KURZ**, and **RICHARD A. OLSON**, Department of Range Management, and **THOMAS D. WHITSON**, Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie, Wyoming 80271-3354, USA.

BUFO WOODHOUSII FOWLERI (Fowler's Toad). USA: ILLINOIS: Madison Co; Poag, SE 1/4 NW 1/4 SE 1/4 Sec. 13, T4N, R9W. 5 July 1993. D. A. Landes. Verified by R. A. Brandon. Southern Illinois University at Carbondale (SIUC H-4509). County record; fills gap between Jersey, Macoupin, Montgomery, Bond, Clinton and St. Clair counties (Smith 1961, The Amphibians and Reptiles of Illinois. Bull. Illinois Nat. Hist. Surv. 28(1):1–298).

Submitted by **SCOTT R. BALLARD**, Illinois Department of Conservation, Division of Natural Heritage, 4521 Alton Commerce Parkway, Alton, Illinois 62002, USA, and **DAVID A. LANDES**, Biology Department, Belleville Area College, 2500 Carlyle Road, Belleville, Illinois 62221-5899, USA.

BUFO WOODHOUSII FOWLERI (Fowler's Toad). USA: NEW YORK: Suffolk Co: Fire Island Pines Marina, Harbor Walk. 14 June, 1993. Robert M. Price. RMP 35601. Adult male. Verified by Peter Warny, Long Island Science Museum. A total of 207 specimens were observed but not collected on the primary and secondary dunes of the Fire Island National Seashore between Water Island and Sunken Forest during the months of June, July, and August. The specimen collected was on private property, sitting under a harbor light at 2023 h, and had been noticed there on the previous evening. This is the first authenticated occurrence of the species on the Fire Island barrier beach in direct contact with salt spray. It is also the southernmost occurrence in Suffolk County. Based on the number of subadult toadlets observed and the calling males throughout the summer, it seems certain that the species is established and breeding in Fire Island Pines.

Submitted by **ROBERT M. PRICE**, Department of Biology, Nassau Community College, Garden City, New York 11530, USA.

ELEUTHERODACTYLUS NITIDUS (NCN). MÉXICO: QUERÉTARO: municipality of Cadereyta de Montes, El Arbolito, Mesa de León. 1960 m. elev. 4 December 1991. Arturo Gónzalez A., Juan Alfonso Delgadillo Espinosa, Carlos Camacho Alberto and Dionisio Saucedo Reséndiz. Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México (MZFC 6401, 3 specimens). Verified by John D. Lynch. First record for Querétaro, extending its range ca. 340 km N of Cuautla, Morelos (Dixon 1957, Texas J. Sci. 9:379–409) and partially fills a distributional gap of ca. 560 km between the Morelos record and another from Aguascalientes (McCranie and Wilson 1984, Herpetol. Rev. 15(1):22). Specimens were found under stones in an arid scrub vegetation in rocky soil near a temporary pond, which is similar to the collecting site near the Río San Juan as described by Dixon (*op. cit.*).

Submitted by **JUAN ALFONSO DELGADILLO ESPINOSA, OSCAR FLORES VILLELA, FERNANDO MENDOZA QUIJANO**, Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México, Apartado Postal 70-399. Distrito Federal 04510, México, and **CARLOS CAMACHO ALBERTO**, Laboratorio de Herpetología, Universidad Nacional Autonoma de México, Campus Iztacala Avenida de Los Barrios s/n Los Reyes, Iztacala, Tlanepaantla, Estado de México. C. P. 54900, México.

PHRYNOHYAS VENULOSA (NCN). MÉXICO: HIDALGO: Municipality of Huejutla de Reyes, Rancho Las Chacas, about 2.5 km NW downtown Huejutla (21°10'N, 98°24'W), 700 m elev. 21 June 1993. Juan Alfonso Delgadillo Espinosa. Museo de Zoología, Facultad de Ciencias, UNAM, MZFC 6034. Verified by Antonio Hernandez. Found at a temporal pond (where breeding takes place) in grassland 50 m near to a river, where riparian vegetation exists (*Taxodium mucronatum*). *Smilisca baudini, Bufo valliceps*, and *B. marinus* were collected in the same habitat which suggests syntopy. First record for the state of Hidalgo and a southern range extension 40 km SE of nearest records in San Luis Potosí (Tamazunchale), Duellman (1970, The Hylid Frogs of Middle America. Univ. Kansas Mus. Nat. Hist. Monog. 1:1–765).

Submitted by **JUAN ALFONSO DELGADILLO ESPINOSA, FERNANDO MENDOZA QUIJANO**, and **OSCAR FLORES VILLELA**, Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México, Apartado Postal 70-399, México, Distrito Federal 04510, México.

PSEUDACRIS TRISERIATA (Western Chorus Frog). USA: ILLINOIS: St. Clair Co: Dieciseis Tigrinum Pit (a cave). 22 June 1993. Jean K. Krejca and Steven J. Taylor. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale Department of Zoology Collection (SIUC H-4511). Confirms unvouchered published report (Hurter 1893, Trans. St. Louis Acad. Sci. 6(11):251–261; Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **STEVEN J. TAYLOR** and **JEAN K. KREJCA**, Department of Zoology, Southern Illinois University at Carbondale, Carbondale, Illinois 62901, USA.

PSEUDACRIS TRISERIATA MACULATA (Boreal Chorus Frog). USA: WYOMING: Johnson Co: W 1/4 Sec. 3, T41N, R82W. 19 August 1993. Kris Harold Johnson. Verified by George T. Baxter. University of Wyoming Zoological Museum (UW 623). First township record; first county record west of Powder River (Baxter and Stone 1985, Amphibians and Reptiles of Wyoming. Wyoming Game and Fish Dept., 137 pp.).

Submitted by **KRIS HAROLD JOHNSON, GREGG L. KURTZ**, and **RICHARD A. OLSON**, Department of Range Management, and **THOMAS D. WHITSON**, Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie, Wyoming 82071-3354, USA.

RANA CATESBIANA (Bullfrog). USA: ILLINOIS: St. Clair Co: Dieciseis Tigrinum Pit (a cave). 22 June 1993. Jean K. Krejca and Steven J. Taylor. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale Department of Zoology Collection (SIUC H-4510). County record (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **STEVEN J. TAYLOR** and **JEAN K. KREJCA**, Department of Zoology, Southern Illinois University at Carbondale, Carbondale, Illinois 62901, USA.

RANA PIPIENS (Northern Leopard Frog). USA: COLORADO: Las Animas Co: Salt Creek, 13 km N and 5 km W Trichera, Sec. 22, T33S, R60W. 5 September 1992. L. J. Livo. Verified by P. S. Corn. UCM Herpetology Color Slide 75. Extends range ca. 80 km E of nearest record for this species (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildl., Denver, 131 pp.). Specimen was one of several newly metamorphosed individuals along creek; surrounding area is occupied by *Rana blairi* (Hammerson, *op. cit.*), although none was seen at this locality.

Submitted by **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, Colorado 80219, USA.

RANA PSALTES (Harpist Frog). TAIWAN: NANTOU CO: Lienhwachih, ca. 6 km N Yuchih (23°55'32"N, 128°53'02"E). 26 August 1993. Wen-hao Chou. Verified by W. S. Huang. National Museum of Natural Science (NMNS 2369). First record for Taiwan (Lue et al. 1990, Wildlife Data Bank of Taiwan, (1) Amphibians (II). Ecol. Res. Report 8, Council of Agric., 157 pp.). This species was described by Kuramoto (1985, Herpetologica 41:150–158) from Yaeyama group of the Ryukyu Islands.

Submitted by **WEN-HAO CHOU**, Department of Zoology, Division of Collection and Research, National Museum of Natural Science, Taichung, Taiwan 40419, Republic of China.

SCINAX NASICA (NCN). ARGENTINA: PROVINCIA DE BUENOS AIRES: Baradero, Estancia "El Retoño" (33°48'S, 59°30'W). 20–22 March 1993. Verified by G. R. Carrizo. Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN 34612–18). First record for Province, 260 km SW from the southernmost record given by Gallardo (1982, Mus. Cs. Nats. Extra Nueva Serie 128:65–75).

Submitted by **JULIAN FAIVOVICH**, Division Herpetologia, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Casilla Postal 220, Sucursal 5, 14005 Buenos Aires, Argentina.

SPEA BOMBIFRONS (Plains Spadefoot). USA: WYOMING: Fremont Co: SW 1/4 Sec. 25, T3N, R5E. 29 May 1993. Kris Harold Johnson. Verified by Joseph T. Collins. University of Wyoming Zoological Museum (UW 624, color slide). Photographed and released. First township record and first record west of Wind River in Fremont County; most southwestern record for Wyoming (Baxter and Stone 1985, Amphibians and Reptiles of Wyoming. Wyoming Game and Fish Dept., 137 pp.).

Submitted by **KRIS HAROLD JOHNSON**, **GREGG L. KURTZ**, and **RICHARD A. OLSON**, Department of Range Management, and **THOMAS D. WHITSON**, Department of Plant, Soil, and Insect Sciences, University of Wyoming, Laramie, Wyoming 82071-3354, USA.

TESTUDINES

APALONE SPINIFERA (Spiny Softshell). USA: WISCONSIN: Brown Co: Suamico River, U.S. Rt. 41 crossing (Sec. 23, T25N, R20E). 7 July 1991. P. W. LaBarge. Milwaukee Public Museum (MPM P361). Adult female caught by angling with nightcrawler for bait; Duck Creek, Village of Howard. 30 July 1992. Collector unknown; specimen given to D. Hartman. Milwaukee Public Museum (MPM P414). Juvenile. Both specimens verified by G. S. Casper. Extend known distribution in the Green Bay system two drainages north from previously reported population in the Fox River (Cochran 1991, Herpetol. Rev. 22:64); suggest possibility that *A. spinifera* occurs along the intervening western shoreline of Green Bay proper.

Submitted by **PHILLIP A. COCHRAN**, Division of Natural Sciences, St. Norbert College, DePere, Wisconsin 54115, USA.

DERMATEMYS MAWEI (Central American River Turtle). BELIZE: ORANGE WALK DISTRICT: Blue Creek, ca. 12 km NW of Blue Creek Village. 10 September 1993. Steven G. Platt. Verified by Tony Garel. Nine turtles (7 females, 2 males) taken alive in trammel net. Two males deposited in Belize Zoo. Voucher photographs deposited in Clemson University Vertebrate Collection (CUSC 1069, 1070). First record for Rio Bravo Headwaters (Moll 1986, Biol. Conserv. 35:87–96); extends range ca. 25 km from the New River Basin.

Submitted by **STEVEN G. PLATT**, Department of Biological Sciences, Clemson University, Clemson, South Carolina, 29634-1903, USA.

MACROCLEMYS TEMMINCKII (Alligator Snapping Turtle). USA: LOUISIANA: East Baton Rouge Parish: Bayou Duplantier, ca. 1.0 km E of Stanford Avenue. 24 January 1988 and 7 August 1988. Verified by Stanlee Miller. Shells and skeletal material deposited in Clemson University Vertebrate Collection (CUSC 964, 769). New parish record; fills hiatus between adjacent parishes (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State Univ. Press, Baton Rouge. 300 pp.; Pritchard 1989, The Alligator Snapping Turtle: Biology and Conservation. Milwaukee Pub. Mus. 104 pp.).

Submitted by **STEVEN G. PLATT** and **LANCE W. FONTENOT**, Department of Biological Sciences, Clemson University, Clemson, South Carolina 29634-1903, USA.

STERNOTHERUS ODORATUS (Common Musk Turtle). USA: ILLINOIS: Kane Co: Max McGraw Wildlife Foundation, 1.05 km W of Rt 25 & 2.5 km S of Rt 72 (42 4'36"N, 88 16'12"W). 21 October 1993. V. J. Santucci and A. K. Wilson. Verified by R. A. Brandon. Southern Illinois University at Carbondale (SIUC R-2580). Smith (1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298) shows a literature record but no voucher for this species in the county; new county record.

Submitted by **ALLAN K. WILSON**, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA.

TRACHEMYS SCRIPTA (Slider). TEXAS: Hamilton Co: jct Rt. 281 and Leo River. 7 March 1992. Kelly J. Irwin, Travis W. Taggart, and Adam Sweetman. Verified by Joseph T. Collins. KU 221256. County record (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M Univ. Press, College Station, Texas, 434 pp.). Collected under Texas Parks and Wildlife Permit SPR-0691-414.

Submitted by **KELLY J. IRWIN**, 2218 West Second Street, Topeka, Kansas 66606, USA, **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA, and **ADAM SWEETMAN**, 220 Rainbow Lake Road, Wichita, Kansas 67235, USA.

LACERTILIA

CALOTES VERSICOLOR (Indian Tree Lizard). SINGAPORE: KENT RIDGE: National University campus. 13 May 1988, K. L. Yeo. Verified by Kelvin Lim. Zoological Reference Collection, National University of Singapore (ZRC 2.3393). New locality record. Geographic range previously reported as India across to southern China and down to northern states of West Malaysia (Boulenger 1890, Fauna of British India, Taylor and Francis, London, 541 pp.; 1912, Vertebrate Fauna of the Malay Peninsula: Reptilia & Batrachia. Taylor and Francis, London, 294 pp.).

Boulenger (1912, *op. cit.*) and Smith (1935, Fauna of British India. Reptilia and Amphibia. Vol. 2. Sauria. Taylor and Francis, London, 440 pp.) maintained that the species was absent from the southern states of West Malaysia. Apart from an isolated record from Sumatra (de Rooij 1915, Reptiles of the Indo-Australian Archipelago. Vol. 1. E. J. Brill, Leiden, 384 pp.) based on a badly damaged specimen, no other records existed to suggest that the geographic range extended further south than the upper region of West Malaysia. Obviously introduced, the species has established

itself rapidly in landscaped and open grounds throughout Singapore.

Submitted by **L. M. CHOU**, Department of Zoology, National University of Singapore, 10 Kent Ridge Crescent, Singapore 0511.

CNEMIDOPHORUS SEXLINEATUS (Six-lined Racerunner). USA: ILLINOIS: Madison Co: Poag, SE 1/4 NW 1/4 SE 1/4 Sec. 13, T4N, R9W. 19 May 1993. D. A. Landes. Verified by R. A. Brandon. Southern Illinois University at Carbondale (SIUC R-2598). County record (Smith 1961, The Amphibians and Reptiles of Illinois. Bull. Illinois Nat. Hist. Surv. 28(1):1–298).

Submitted by **SCOTT R. BALLARD**, Illinois Department of Conservation, Division of Natural Heritage, 4521 Alton Commerce Parkway, Alton, Illinois 62002, USA, and **DAVID A. LANDES**, Biology Department, Belleville Area College, 2500 Carlyle Road, Belleville, Illinois 62221-5899, USA.

CNEMIDOPHORUS SEXLINEATUS (Six-lined Racerunner). USA: INDIANA: Knox Co: Oaktown Quadrangle, SW 1/4 Sec. 24, T5N, R10W, abandoned sand and gravel pit with moderate ground cover. 6 June 1993. Verified by Sherman A. Minton. Indiana State Museum 71.7.324. Although there are historic records for Knox and Posey counties (Burt 1931, A Study of the Teiid Lizards of the Genus *Cnemidophorus* with Special Reference to their Phylogenetic Relationships. U.S. Natl. Mus. Bull. 154:1–286) to the best of our knowledge these represent the first recent specimens collected in southwestern Indiana.

Submitted by **DENNIS R. BROWN**, 8439 Trotter Road, Camby, Indiana 46113, USA, and **JARROD HARVEY**, 208 North Gillespie Street, Greencastle, Indiana 46105, USA.

CROTAPHYTUS COLLARIS (Collared Lizard). USA: ILLINOIS: Johnson Co., Ferne Clyffe State Park. New state record. A juvenile (SIUC R-2491) was captured on 22 October 1992 by Eric Johns, and a basking adult female was photographed by one of us (AKW) on 20 August 1993; a photographic print is catalogued as SIUC R-2597. Two adults had been sighted at the same locality by SIUC graduate students on 26 June 1993. Because none had been found previously despite much field work in the bluffs of southwestern Illinois, the possibility that this population may have been introduced cannot be ruled out. Smith (1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28(1):1–298) postulated they might occur in Monroe County, and they are known from three bordering counties in Missouri (Johnson 1989, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.; Powell et al. 1993, Missouri Herpetol. Assoc. Newsl. 6:7–26).

Submitted by **RONALD A. BRANDON** and **ALLAN K. WILSON**, Department of Zoology, Southern Illinois University at Carbondale, Carbondale, Illinois 62901, USA.

EUMECES OBSOLETUS (Great Plains Skink). TEXAS: McMullen Co: 9 mi S Tilden. 11 March 1992. Kelly J. Irwin, Travis W. Taggart, and Adam Sweetman. Verified by Joseph T. Collins. KU 221252. County record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A&M Univ. Press, College Station, Texas, 434 pp.). Collected under Texas Parks and Wildlife Permit SPR-0691-414.

Submitted by **ADAM SWEETMAN**, 220 Rainbow Lake Road, Wichita, Kansas 67235, USA, **KELLY J. IRWIN**, 2218 West Second Street, Topeka, Kansas 66606, USA, and **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

SCELOPORUS OLIVACEUS (Texas Spiny Lizard). USA: TEXAS: Jones Co: Lueders, Lueders City Park. 24 March 1985. L. A. Fitzgerald. UNM 44566–7. Verified by Allan Landwer. First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M Press. 434 pp.).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado, 80309-0334, and **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA.

SCINCELLA LATERALIS (Ground Skink). USA: MISSOURI: Franklin Co: Meramec State Park. 16 June 1950. Collected by Milton Weller. Dallas Museum of Natural History Reptile Collection (DMNH 1867). Verified by Tom R. Johnson. New county record; partly fills in northeastern Missouri range (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **THOMAS VANCE**, Biology Department, Navarro College, Corsicana, Texas 75110, USA.

SCINCELLA LATERALIS (Ground Skink). TEXAS: Webb Co: 4 mi W Bruni. 9 March 1992. Kelly J. Irwin, Travis W. Taggart, and Adam Sweetman. Verified by Joseph T. Collins. KU 221253. County record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A&M Univ. Press, College Station, Texas, 434 pp.). Collected under Texas Parks and Wildlife Permit SPR-0691-414.

Submitted by **ADAM SWEETMAN**, 220 Rainbow Lake Road, Wichita, Kansas 67235, USA, **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA, **KELLY J. IRWIN**, 2218 West Second Street, Topeka, Kansas 66606, USA.

SERPENTES

BOTHROPS MOOJENI (Brazilian Lancehead). BRAZIL: MATO GROSSO: 2 km N Porto Jofre on Rodovia Transpantaneira. 16 September 1993. Wolfgang Wüster and Stephen Pierini. Verified by Miguel Trefaut Rodrigues. Instituto Butantan (IB 55112). First record from Poconé and confirms predication (Campbell and Lamar 1989, Venomous Reptiles of Latin America. Comstock, Ithaca, New York. 425 pp.) of its presence within the Pantanal. Specimen was found DOR in a zone of permanently dry higher ground with cerrado vegetation.

Submitted by **WOLFGANG WÜSTER**, Department of Zoology, University of Aberdeen, Tillydrone Avenue, Aberdeen AB9 2TN, Scotland, United Kingdom, **STEPHEN PIERINI**, 93 Putnoe Lane, Bedford, MK41 9AH, England, United Kingdom, and **GIUSEPPE PUORTO**, Laboratório de Herpetologia, Instituto Butantan, Avenida Vital Brasil 1500, CEP 05503-900 São Paulo - SP, Brazil.

CROTALUS VIRIDIS CERBERUS (Arizona Black Rattlesnake). USA: COLORADO: Arapahoe Co: ca. Sec. 30, T4S, R64W. 6 October 1993, Ivan Littlejohn. Verified by H. M. Smith. UCM Zoology Color Slides 78–79. Specimen represents an escapee or introduction near the fringe of an urban area. Another rattlesnake collected at the same site was a normal *Crotalus viridis viridis*, the subspecies native to the area (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.).

Submitted by **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, Colorado 80219, USA, and **DAVID CHISZAR**, Department of Psychology, Campus Box 345, University of Colorado, Boulder, Colorado 80309, USA.

FARANCIA ABACURA REINWARDTII (Western Mud Snake). USA: LOUISIANA: Red River Parish: 16 km S Coushata on US Rt. 84. 3 June 1978. Collected by Terry L. Hibbitts. Dallas Museum of Natural History (DMNH 4975). Verified by Harold A. Dundee. County record (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State Univ. Press, Baton Rouge. 300 pp.).

Submitted by **THOMAS VANCE**, Biology Department, Navarro College, Corsicana, Texas 75110, USA.

GYALOPION QUADRANGULARE (Desert Hooknose Snake). USA: ARIZONA: La Paz Co: crossing paved road late in the evening near Salome (ca. 33°42'30"N, 113°30'W). 12 July 1993. Joseph Casada, Jose Rosado, and Eugene Trescott, Jr. (UAZ 52001, photographs by Manny Rubio). Verified by Howard Lawler. New county record; extends range ca. 250 km from vicinity of Nogales, Santa Cruz County.

Submitted by **EUGENE TRESCOTT, JR.**, Natural History Associates, P. O. Box 1477, Inverness, Florida 34451-1477, USA.

LAMPROPELTIS TRIANGULUM AMAURA (Louisiana Milk Snake). USA: TEXAS: Ellis Co: DOR, Walker Creek Road N FMR 85 and E Ennis. 6 May 1992. Collected by Nancy Davis. Preserved specimen collection at Navarro College (NC 1992. 5. 6. 1S). Verified by Pat Johnson. New county record; partly fills hiatus in north central Texas range (Dixon 1987, Amphibians and Reptiles of Texas. 434 pp.; Williams 1988, Systematics and Natural History of the American Milk Snake, *Lampropeltis triangulum*. Milwaukee Publ. Mus. 176 pp.).

Submitted by **THOMAS VANCE**, Biology Department, Navarro College, Corsicana, Texas 75110, USA.

LIOCHLOROPHIS VERNALIS BLANCHARDI (Smooth Green Snake). USA: COLORADO: Teller Co: Rampart Range Road at East Plum Creek, 2.4 km (airline) S Douglas County line, 0.5 km (airline) E El Paso County line. Early July 1979. Russell P. DeFusco. Verified by Richard L. Holland. UCM Color Slide 77. County record (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Denver. 131 pp.).

Submitted by **RUSSELL P. DeFUSCO**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA, **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado, 80309-0345, USA, **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

MASTICOPHIS TAENIATUS TAENIATUS (Desert Striped Whipsnake). USA: COLORADO: Moffat Co: Dinosaur National Monument, 15 km N Zenobia Peak (Sec. 16, T9N, R102W). 1 September 1991. L. J. Livo. Verified by P. S. Corn. UCM Herp. Color Slide 64; Dinosaur National Monument, Pot Creek along bank of Green River. 12 June 1982. D. E. Wilson and S. J. Martin. Verified by P. S. Corn. (U. S. Fish and Wildlife Service Biological Survey Collection, Ft. Collins, Colorado, BS/FC 2007). Specimens extend range ca. 13 and 24 km N of previous records in Colorado (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildl., Denver, 131 pp.).

Submitted by **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, Colorado 80219, USA.

OPHEODRYS VERNALIS (Smooth Green Snake). USA: WISCONSIN: Door Co: Chambers Island, within 80 m of NE shoreline. 6 September 1993. J. F. Blahnik. Verified by G. S. Casper. Milwaukee Public Museum (MPM P413). New county record (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Publ. Mus. 205 pp.); first record from any Lake Michigan island (Long 1993, Bull. Chicago Herpetol. Soc. 28:214–218). That this specimen was not an isolated waif is suggested by a sighting three years previously (M. Blahnik, pers. comm.).

Submitted by **JAMES F. BLAHNIK** and **PHILLIP A. COCHRAN**, Division of Natural Sciences, St. Norbert College, DePere, Wisconsin 54115, USA.

SALVADORA GRAHAMIAE (Mountain Patchnose Snake). TEXAS: Hamilton Co: just SE jct Rt. 281 and Bosque River. 7 March 1992. Kelly J. Irwin, Travis W. Taggart, and Adam Sweetman. KU 221254; McMullen Co: 22 mi S Tilden. 8 March 1992. Kelly J. Irwin, Travis W. Taggart, and Adam Sweetman. KU 221257. Both verified by Joseph T. Collins. County records (Dixon 1987, Amphibians and Reptiles of Texas. Texas A&M Univ. Press, College Station, Texas, 434 pp.). Collected under Texas Parks and Wildlife Permit SPR-0691-414.

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA, **KELLY J. IRWIN**, 2218 West Second Street, Topeka, Kansas 66606, USA, **ADAM SWEETMAN**, 220 Rainbow Lake Road, Wichita, Kansas 67235, USA.

SISTRURUS MILIARIUS STRECKERI (Western Pigmy Rattlesnake). USA: LOUISIANA: De Soto Parish: Dolet Hills, 8 km SE Mansfield. October 1973. Collected by Terry L. Hibbitts. Dallas Museum of Natural History (DMNH 4418) Verified by Harold Dundee. New county record; partly fills hiatus in western Louisiana range (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State Univ. Press, Baton Rouge. 300 pp.) and confirms earlier claim of expected occurence in De Soto Parish (Strecker and Frierson 1926, Contrib. Baylor Univ. Mus. 5:1–10).

Submitted by **THOMAS VANCE**, Biology Department, Navarro College, Corsicana, Texas 75110, USA.

STORERIA DEKAYI (Brown Snake). TEXAS: McMullen Co: S Tilden on Rt. 16 at Nueces River. 8 March 1992. Kelly J. Irwin, Travis W. Taggart, and Adam Sweetman. Verified by Joseph T. Collins. KU 221255. County record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A&M Univ. Press, College Station, Texas, 434 pp.). Collected under Texas Parks and Wildlife Permit SPR-0691-414.

Submitted by **KELLY J. IRWIN**, 2218 West Second Street, Topeka, Kansas 66606, USA, **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA, **ADAM SWEETMAN**, 220 Rainbow Lake Road, Wichita, Kansas 67235, USA.

Two Anoles New To Broward County, Florida

Since 1987, we have been aware of a release site for several exotic reptiles in Broward County, Florida. This site, now a horse stable, was formerly a reptile importer's warehouse. Here we report on two species of anoles that have become established at this location. Vouchers were collected by the authors, verified by C. Guyer, and deposited in the Auburn University Museum (AUM), as follows:

ANOLIS CHLOROCYANUS (NCN). Broward Co: Parkland, N of Holmberg Road. 14 September 1991. Seven individuals were observed and two were collected (AUM 33672–73). First United States record (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third ed., Houghton Mifflin Co., Boston, Massachusetts. 450 pp.; Wilson and Porras 1983, The Ecological Impact of Man on the South Florida Herpetofauna. Univ. Kansas Mus. Nat. Hist. Spec. Publ. 9, 89 pp.).

CTENONOTUS (ANOLIS) CYBOTES (Largehead Anole). Broward Co: Parkland, N of Holmberg Road. 14 September 1991. More than 50 individuals were observed and four were collected (AUM 33674–77). New county record (Conant and Collins, *op. cit.*; Wilson and Porras, *op. cit.*).

Both species of lizards appeared to be restricted to an area no greater than 5 ha. *Ctenonotus cybotes* greatly outnumbered *A. chlorocyanus* and utilized a wider array of perch types than did *A. chloracyanus*. *Anolis chlorocyanus* was found only on smooth barked trees and buildings while *C. cybotes* perched on different types of trees, buildings, piles of lumber, and fence posts.

Submitted by **BRIAN P. BUTTERFIELD**, Department of Zoology and Wildlife Science, 331 Funchess Hall, Auburn University, Alabama 36489-5414, USA, **WALTER E. MESHAKA, JR.**, Archbold Biological Station, P. O. Box 2057, Lake Placid, Florida 33852, USA, and **ROGER L. KILHEFNER**, 9050 NW 28 Street, Apt. 109, Coral Springs, Florida 33065, USA.

County Records For Florida Amphibians And Reptiles

A review of Florida specimens of amphibians and reptiles in the Louisiana State University Museum of Natural Science (LSUMZ) has revealed a number of county records for that state. These records are based on comparisons with distributional data presented by Ashton and Ashton (1988a, 1988b, 1991) and records subsequently published in the Geographical Distribution section of Herpetological Review. Identity of all specimens was verified by either Douglas A. Rossman, David A. Good, or Anna L. Bass.

PSEUDOBRANCHUS STRIATUS (Broad-striped Dwarf Siren). Bradford Co: U.S. Rt. 301 at Santa Fe River Swamp. 27 October 1991. P. Moler. LSUMZ 54370, 54371.

SIREN LACERTINA (Greater Siren). Pasco Co: ca. 4.8 km E New Port Richey. 7 August 1970. W. Neill, L. Hope, R. Thomas. LSUMZ 22009-22015.

AMPHIUMA MEANS (Two-toed Amphiuma). Madison Co: I-10 at Hixtown Swamp, 9.9 km E U.S. Rt. 221. August 1991. P. Moler, B. Mansell, C. Abercrombie. LSUMZ 54227. Washington Co: U.S. Rt. 90, 7.7 km E Choctawatchee River. 24 September 1991. P. Moler. LSUMZ 54224.

NOTOPHTHALMUS VIRIDESCENS (Eastern Newt). Bay Co: Pine Log State Forest, Sec. 18, T1S, R16W. 19 September 1991. J. Palis. LSUMZ 54215-54223. Bradford Co: U.S. Rt. 301 at Santa Fe River Swamp. 27 October 1991. P. Moler. LSUMZ 54374. Lake Co: Fla. Rt. 50, ca. 2.2 km E Sumter County line. 28 March 1991. P. Moler, B. Mansell. LSUMZ 53226-53228. Madison Co: I-10, ca. 9.6 km E U.S. Rt. 221. 14 April 1991. P. Moler, C. Schwalbe, H. Adams. LSUMZ 53245-53247. Sumter Co: Sec. 10, T20S, R22E and Sec. 34, T19S, R22E. March 1991. D. Stevenson, D. Crowe. LSUMZ 53213-53225.

AMBYSTOMA OPACUM (Marbled Salamander). Gulf Co: 4.8 km ENE Wewahitchka. 4 May 1967. R. Blaney, K. Relyea. LSUMZ 25219, 25220.

EURYCEA QUADRIDIGITATA (Dwarf Salamander). Holmes Co: Wright's Creek, 9.6 km S jct. Fla. Rt. 2 on Fla. Rt. 79. 6 May 1967. R. Blaney, K. Relyea. LSUMZ 52143.

HYLA AVIVOCA (Bird-voiced Treefrog). Gulf Co: Dead Lakes region near Wewahitchka. March 1968. L. Wilson. LSUMZ 41338.

HYLA FEMORALIS (Pine Woods Treefrog). Holmes Co: 4.8 km E Bonifay. 2 September 1950. G. Lowrey, Jr. LSUMZ 1847-1851.

HYLA SQUIRELLA (Squirrel Treefrog). Osceola Co: 28.8 km S St. Cloud on Fla. Rt. 523. 3 May 1970. L. Wilson. LSUMZ 29317.

PSEUDACRIS CRUCIFER (Spring Peeper). Escambia Co: Brushy Creek, 3.4 km W end of Rt. 97, Enon. 6 February 1967. R. Blaney, K. Relyea. LSUMZ 15869.

ALLIGATOR MISSISSIPPIENSIS (American Alligator). Leon Co: ca. 3.2 km W Iamonia Tall Timbers Research Station. 3 June 1967. Boettcher and Buskirk. LSUMZ 18947.

CHELYDRA SERPENTINA (Snapping Turtle). Pasco Co: New Port Richey. 20 August 1970. R. Thomas. LSUMZ 22016.

KINOSTERNON BAURII (Striped Mud Turtle). Pasco Co: ca. 6.4 km NW Hudson. 15 August 1970. R. Thomas. LSUMZ 22004.

KINOSTERNON ODORATUM (Common Musk Turtle). Pasco Co: ca. 8 km NE New Port Richey. 13 September 1968. R. Thomas. LSUMZ 27992.

KINOSTERNON SUBRUBRUM (Eastern Mud Turtle). Wakulla Co: St. Marks Wildlife Refuge. 18 April 1959. D. Rossman. LSUMZ 9146.

PSEUDEMYS FLORIDANA (Cooter). Gulf Co: FL 71, 14.1 km S Wewahitchka. 4 May 1967. R. Blaney, K. Relyea. LSUMZ 24787.

GOPHERUS POLYPHEMUS (Gopher Tortoise). Charlotte Co: no further data. 1961. C. Harper. LSUMZ 43344.
APALONE FEROX (Florida Softshell). Liberty Co: Owl Creek. 27 July 1952. R. Beter. LSUMZ 6175.

OPHISAURUS ATTENUATUS (Slender Glass Lizard). Levy Co: 16 km NE Lebanon Station. 8 June 1960. M. Fouquette, D. Rossman. LSUMZ 13674. 14.4 km NE Lebanon Station. 8 June 1960. D. and N. Rossman. LSUMZ 33928.

OPHISAURUS COMPRESSUS (Island Glass Lizard). Franklin Co: St. George Island, 4.3 km W Bridge. 30 March 1968. R. Blaney. LSUMZ 21827. Osceola Co: 15.8 km N Yeehaw Jct. 9 April 1959. D. Rossman. LSUMZ 6587.

OPHISAURUS VENTRALIS (Eastern Glass Lizard). Duval Co: Jacksonville, ca. 9.6 km W St. Johns River. 1 April 1985. R. Lawson, B. Mansell, P. Frank, J. Cole. LSUMZ 44911, 44912. Holmes Co: Bonifay. Fall 1952. D. Grant. LSUMZ 5906. Orange Co: Orlando. 10 November 1968. L. Wilson. LSUMZ 42181.

DIADOPHIS PUNCTATUS (Ringneck Snake). Pasco Co: Anclote River at Rt. 54. 7 April 1985. R. Lawson, P. Frank, J. Cole. LSUMZ 44891. Rt. 44 at Pasco-Pinellas county line. 7 April 1985. R. Lawson, P. Frank, J. Cole. LSUMZ 44892. Anclote River at Rt. 44. 1 December 1985. R. Lawson, P. Frank. 45774, 45775. Pinellas Co: ca. 0.8 km S St. Petersburg airport. 26 November 1983. R. Lawson, P. Frank. LSUMZ 43445-43449. Toytown dump, Clearwater. 1 December 1985. R. Lawson, P. Frank. LSUMZ 45764.

ELAPHE GUTTATA (Corn Snake). Holmes Co: Bonifay. Fall 1952. D. Grant. LSUMZ 5905. Bonifay. Spring 1954. D. Grant. LSUMZ 6503.

ELAPHE OBSOLETA (Rat Snake). Bay Co: N of Panama City. July 1972. J. McLean. LSUMZ 24789.

FARANCIA ERYTROGRAMMA (Rainbow Snake). Washington Co: Ebro. April 1967. D. Sebolt. LSUMZ 18117.

HETERODON PLATIRHINOS (Eastern Hognose Snake). Holmes Co: Bonifay. Fall 1952. D. Grant. LSUMZ 5902, 5904. Bonifay. Spring 1954. D. Grant. LSUMZ 6506.

HETERODON SIMUS (Southern Hognose Snake). Holmes Co: Bonifay. Fall 1952. D. Grant. LSUMZ 5901, 5903. Bonifay. Spring 1954. D. Grant. LSUMZ 6504.

LAMPROPELTIS CALLIGASTER (Mole Kingsnake). Escambia Co: vicinity of Pensacola. May 1982. R. Lawson, P. Frank. LSUMZ 40944.

LAMPROPELTIS TRIANGULUM (Milk Snake). Sumter Co: 2.4 km S Fla. Rt. 48 on County Road 575. 7 May 1984. P. Frank. LSUMZ 45358.

NERODIA FASCIATA (Southern Water Snake). Sumter Co: 3.0 km S Fla. Rt. 48 on County Rd 575. 5 June 1985. P. Frank, P. Chilson. LSUMZ 45377.

NERODIA FLORIDANA (Florida Green Water Snake). Pinellas Co: Clearwater. February 1981. LSUMZ 39967.

NERODIA TAXISPILOTA (Brown Water Snake). Citrus Co: ca. 3.2 km NW Rutland. 8 August 1980. R. Lawson, P. Frank. LSUMZ 39159. Withlacoochee River, ca. 8 km NW Rutland. 8 August 1980. R. Lawson, P. Frank. LSUMZ 39779-39781. Lake Tsala Apopka at Inverness. 30 May 1982. R. Lawson, P. Frank. LSUMZ 40912, 40913. ca. 8 km NW Rutland in Withlacoochee River. 8 August 1980. R. Lawson, P. Frank. LSUMZ 43454, 43455. Escambia Co: Pensacola. July 1981. T. Picheo. LSUMZ 40308.

PITUOPHIS MELANOLEUCUS (Pine Snake). Gilchrist Co: Fla. Rt. 26, 1.6 km E Trenton. 10 April 1966. P. Hollander. LSUMZ 18112.

REGINA RIGIDA (Glossy Crayfish Snake). Jackson Co: no further data. 18 April 1981. A. Meier, Jr. LSUMZ 40503.

RHADINAEA FLAVILATA (Pine Woods Snake). Pasco Co: Rt. 54 at Anclote River. 23 March 1985. P. Frank. LSUMZ 45385, 45386.

STORERIA DEKAYI (Brown Snake). Pasco Co: Fla. Rt. 52, ca. 8 km E Crowers Corner. 9 August 1970. R. Thomas. LSUMZ 22001.

STORERIA OCCIPITOMACULATA (Redbelly snake). Calhoun Co: U.S. Rt. 71, 4.8 km N Blountstown. 31 March 1965. L. Wilson. LSUMZ 34135.

THAMNOPHIS SAURITUS (Eastern Ribbon Snake). Hernando Co: Rt. 19, 0.4 km S Weekie Watchee. 2 March 1984. P. Frank. LSUMZ 44103. Brooksville. February 1985. P. Frank. LSUMZ 44865, 44866. Rt. 476. 1985. P. Frank. LSUMZ 44885. Rt. 476, 3.2 km E Rt. 98. 30 March 1985. R. Lawson, P. Frank, J. Cole. LSUMZ 44886.

THAMNOPHIS SIRTALIS (Common Garter Snake). Bay Co: Panama City Beach. 1981. LSUMZ 40037, 40120. Gadsden Co: Fla. Rt. 62, 4.8 km N Quincy. June 1965. D. Smith. LSUMZ 18975.

VIRGINIA STRIATULA (Rough Earth Snake). Holmes Co: Bonifay. Spring 1954. D. Grant. LSUMZ 6502.

MICRURUS FULVIUS (Eastern Coral Snake). Jefferson Co: U.S. Rt. 98, 0.3 km E St. Marks River. 29 May 1975. LSUMZ 25170.

AGKISTRODON PISCIVORUS (Cottonmouth). Calhoun Co: 17.6 km NE Wewahitchka. 4 May 1967. R. Blaney, K. Relyea. LSUMZ 46889. Pasco Co: between Odessa and Elfers. Fall 1968 or Spring 1969. R. Thomas. LSUMZ 22050.

CROTALUS ADAMANTEUS (Eastern Diamondback Rattlesnake). Escambia Co: vicinity of Pensacola. R. Blaney. LSUMZ 38494.

SISTRURUS MILIARIUS (Pigmy Rattlesnake). Bay Co: U.S. Rt. 231, 1.6 km SW Youngstown. 30 May 1970. L. Wilson. LSUMZ 28835. Pasco Co: Port Richey, N side of Pithlachascotee River. 20 August 1970. R. Thomas. LSUMZ 22018. dirt road off Rt. 44, 0.8 km N Pinellas County line. 1 December 1985. R. Lawson, P. Frank. LSUMZ 45768.

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Noteworthy Distributional Records For Some Snakes From Jersey And Madison Counties, Illinois

Specimens documenting the following distributional records were all obtained DOR by the author along Illinois Route 100, and were deposited at the Illinois Natural History Survey (INHS). Identifications were confirmed by L. E. Brown, Department of Biological Sciences, Illinois State University.

ELAPHE VULPINA VULPINA (Western Fox Snake). Jersey Co: NW 1/4 Sec. 13, T6N, R12W, 3.2 km NW Elsah Road. 7 October 1993. INHS 11006; NE 1/4 Sec. 26, T6N, R11W, 1.1 km NW Piasa Creek. 7 October 1993. INHS 11007; NW 1/4 Sec. 20, T6N, R11W, at Elsah Road. 16 October 1993. INHS 11009; SW 1/4 Sec. 21, T6N, R11W, 2.2 km SE Elsah Road. 22 October 1993. INHS 11010. Madison Co: SE 1/4 Sec. 4, T5N, R10W, at Hop Hollow. 8 October 1993. INHS 11008. New county records. Previously reported from Jerseyville, Jersey Co., by Smith (1961) based on a single specimen (INHS 1317) collected in 1936. Specimens reported here from Jersey and Madison counties extend range a total of 27 km S of Jerseyville record. They further confirm the existence of disjunct populations in southern Illinois and indicate that they occupy a considerable geographic area.

LAMPROPELTIS GETULA HOLBROOKI (Speckled Kingsnake). Jersey Co: S 1/2 Sec. 12, T6N, R13W, at Deer Plain Ferry. 8 October 1993. INHS 11000. New county record and extends range 94 km WSW from closest Illinois record (Smith 1961).

NERODIA ERYTHROGASTER FLAVIGASTER (Yellowbelly Water Snake). Madison Co: SE 1/4 Sec. 4, T5N, R10W, 3.2 km SE Clifton Terrace Road. 8 October 1993. INHS 11103; NW 1/4 Sec. 4, T5N, R10W, 2.4 km SE Clifton Terrace Road. 6 October 1993. INHS 11104; NW 1/4 Sec. 31, T6N, R10W, 1.6 km NW Clifton Terrace Road. 8 October 1993. INHS 11100; NW 1/4 Sec. 32, T6N, R10W, 0.3 km SE Clifton Terrace Road. 7 October 1993. INHS 11099; NW 1/4 Sec. 32, T6N R10W, 0.8 km SE Clifton Terrace Road. 7 October 1993. INHS 11098 and INHS 11105; NW 1/4 Sec. 4, T5N, R10W, 2.6 km SE Clifton Terrace Road. 17 October 1993. INHS 11108. New county record.

NERODIA RHOMBIFER RHOMBIFER (Diamondback Water Snake). Madison Co: NE 1/4 Sec. 31, T6N, R10W, 0.3 km NW Clifton Terrace Road. 7 October 1993. INHS 11056. Confirms county record not documented by specimens reported by Hurter (1911).

*NERODIA SIPEDON SIPEDON (Northern Wate*r Snake). Madison Co: NW 1/4 Sec. 31, T6N, R10W, 1.1 km NW Clifton Terrace Road. 8 October 1993. INHS 11071 and INHS 11072; NW 1/4 Sec. 32, T6N, R10W, 0.2 km SE Clifton Terrace Road. 8 October 1993. INHS 11075; NW 1/4 Sec. 32, T6N, R10W, at Clifton Terrace Road. 21 October 1993. INHS 11089. NW 1/4 Sec. 10, T5N, R10W, 4.2 km SE Clifton Terrace Road. 17 October 1993. INHS 11091. New county record.

PITUOPHIS MELANOLEUCUS SAYI (Bullsnake). Madison Co: NW 1/4 Sec. 4, T5N, R10W, 1.9 km SE Clifton Terrace Road. 22 October 1993. INHS 11001. Confirms county record not documented by specimens reported by Stull (1940) and indicates that disjunct populations in southwestern Illinois noted by Smith (1961) are still extant.

REGINA GRAHAMII (Graham's Crayfish Snake). Madison Co: SE 1/4 Sec. 4, T5N, R10W, 3.1 km SE Clifton Terrace Road. 8 October 1993. INHS 11046; SE1/4 Sec. 4, T5N, R10W, at Hop Hollow. 16 October 1993. INHS 11051; SE1/4 Sec. 32, T6N, R10W, 1.4 km SE Clifton Terrace Road. 17 October 1993. INHS 11054. Confirms county record not documented by specimens reported by Hurter (1911). Jersey Co: NE 1/4 Sec. 13, T6N, R12W, at Chautauqua Road. 7 October 1993. INHS 11043; NE 1/4 Sec. 15, T6N, R12W, 0.2 km E Grafton. 7 October 1993. INHS 11044; S1/2 Sec. 12, T6N, R13W, at Deer Plain Ferry. 8 October 1993. INHS 11045; NE1/4 Sec. 27, T6N, R11W, 5.4 km NW Clifton Terrace Road. 16 October 1993. INHS 11047-11048; NE1/4 Sec. 26, T6N, R11W, 5.8 km SE Elsah Road. 16 October 1993. INHS 11049; NE1/4 Sec. 28, T6N, R11W, 2.4 km SE Elsah Road. 16 October 1993. INHS 11050; NW 1/4 Sec. 25, T6N, R11W, 0.3 km SE Piasa Creek. 16 October 1993. INHS 11052; SE1/4 Sec. 20, T6N, R11W, 0.5 km SE Elsah Road. 21 October 1993. INHS 11053; SE1/4 Sec. 18, T6N, R11W, 4.8 km SE Grafton. 17 October 1993. INHS 11055. Previously reported by Smith (1961) from a single specimen (INHS 1751) collected in 1942. Jersey Co. records reported here confirm continued existence of species in this now highly developed area.

THAMNOPHIS PROXIMUS PROXIMUS (Western Ribbon Snake). Jersey Co: NW 1/4 Sec. 27, T6N, R11W, 3.7 km SE Elsah Road. 24 October 1993. INHS 10999. Confirms county record not documented by specimens reported by Garman (1892).

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Hemidactylus mabouia As An Established Member Of The Florida Herpetofauna

In the United States, *Hemidactylus mabouia* is known from the southeastern region of mainland Florida (Butterfield et al. 1993) where it is common on buildings and nearby trees. In the keys, *H. mabouia* has been reported from Crawl Key (Lawson et al. 1991) and Bahia Honda (Gunther et al. 1993). Here, we report eight new records of *H. mabouia* in the Florida Keys and comment on its presence and establishment in Florida. All specimens will be deposited in the United States National Museum (USNM).

Monroe Co: Key West, corner of South and Elizabeth Streets. 21 September 1993. USNM 217879. Female, 60 mm. Collected on lit wall of hotel. Six additional specimens were collected on the walls of lit buildings in town.

Monroe Co: Stock Island, Moose lodge. 23 September 1993. USNM 217895. Female, 61 mm. Collected on lit wall of building. Fourteen additional specimens collected on lit buildings.

Monroe Co: Middle Torch Key. 22 September 1993. USNM 217880. Male, 59 mm. USNM 217881. Immature, 41 mm. Collected on lit buildings. Other individuals observed but not collected.

Monroe Co: Sunshine Key. 21 September 1993. USNM 217878. Male, 58 mm. Collected on lit building. Other individuals observed but not collected.

Monroe Co: Lower Sugar Loaf Key, West Circle. 21 September 1993. USNM 217875. Male, 67 mm. USNM 217876. Male, 46 mm. Collected on lit buildings. Other individuals observed but not collected.

Monroe Co: Big Pine Key, Visitor Center. 21 September 1993. USNM 217877. Male, 67 mm. Collected on lit building. Other individuals observed but not collected.

Monroe Co: Fat Deer Key, Key Colony Beach. 21 September 1993. USNM 217882. Female, 62 mm. Collected on lit building. Six additional specimens collected on nearby lit buildings. Other individuals observed but not collected.

Monroe Co: Plantation Key, Audubon Building. 21 September 1993. USNM 217889. Immature, 41 mm. Three additional specimens collected on the lit building. Other individuals observed but not collected.

The above records are suggestive of continuous distribution through the chain of keys. At our collecting sites, we counted between three and twenty individuals on buildings. Hatchlings were present at nearly all sites and, at some sites they were numerous (5–10).

Based on the ubiquity and widespread distribution of this species in southern Florida, we believe that *Hemidactylus mabouia* should be considered a firmly established member of the Florida herpetofauna. Key West and Miami were two locations which illustrated the strong colonization ability of *H. mabouia* under favorable conditions. During our evening searches on Key west, we found only one *H. turcicus* and three *H. garnotii*. At the time of Duellman and Schwartz's (1958) study, *H. garnotii* was unknown in Key West, however, *H. turcicus* was well established although not nearly as abundant as we have found *H. mabouia* (W. E. Duellman, pers. comm., 20 October 1993). The near absence of the once common *H. turcicus* was in stark contrast to the large number of *H. mabouia*, a close relative and a possible ecomorph of *H. turcicus*. This observation is suggestive of species displacement or, for unknown reasons, species replacement by *H. mabouia* and represents succession in exotic herpetofauna.

Unlike Key West, Duellman and Schwartz (1958) found few *Hemidactylus turcicus* in Miami. We were unable to find any *H. turcicus* in Miami, but *H. mabouia* was well established and at some sites very numerous and in syntopy with *H. garnotii*.

Presently, *H. mabouia* is the most successful of the three introduced hemidactylines known to occur on the Florida Keys and is rapidly dispersing throughout southern mainland Florida.

The sudden appearance of numerous thriving colonies suggests to us that this species was established much earlier than first detected by Lawson and colleagues (1991) and/or was recently introduced to multiple sites. Because we found this species to be abundant within its continuous range but spotty at northernmost locations, we suggest that both occurred. Introductions especially to Miami and the Florida Keys are quite probable from the agriculture and foliage trade of Brazil and Puerto Rico where *H. mabouia* is also an established exotic (Schwartz and Henderson 1985). Indeed, our most populated site is along the port of Miami near Miami International Airport. In this likely scenario, multiple introductions have been taking place and will continue to do so over time and at more than one location thereby increasing the probability of successful colonization and perhaps recolonization. If this is true, the Bahamian to Crawl Key connection suggested by Lawson and colleagues (1991) could also be attributed with other known target areas in the Caribbean and, in some instances, easily go the other way.

Acknowledgments.— We thank Joseph T. Collins for his comments regarding this ms.

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Two Turtles New To The Florida Keys

While trapping *Kinosternon baurii* on Stock Island, we collected two species of emydid turtles previously unreported from the lower Florida keys (Lazell 1989; Wilson and Porras 1983). The turtles were collected in a roadside ditch with wire basket traps. Specimens were verified by James L. Dobie and deposited in the Auburn University Museum (AUM). Collections were made under Florida Game and Fresh Water Fish Commission permit WX93162 issued to J. B. Hauge. The records are:

DEIROCHELYS RETICULARIA CHRYSEA (Florida Chicken Turtle). Monroe Co: Stock Island Junior College Road. 23 September 1989. AUM 33633.

TRACHEMYS SCRIPTA ELEGANS (Red-eared Slider). Monroe Co: Stock Island, Jr. College Road. 24 September 1993. AUM 33634.

These records most probably are the result of pet turtles being intentionally released or escaping from their owners. Several people in the Key West area have an interest in turtles and are known to keep them as pets (R. W. Ehrig, pers. comm.). At present, we are unable to determine if breeding populations of either species occur at this site because only one individual of each species was collected. No other individuals of either species were observed at this site by us. Because we have no evidence of breeding populations of either species at this site, we suggest that other investigators use the records with caution when assessing the geographic distribution of these turtles.

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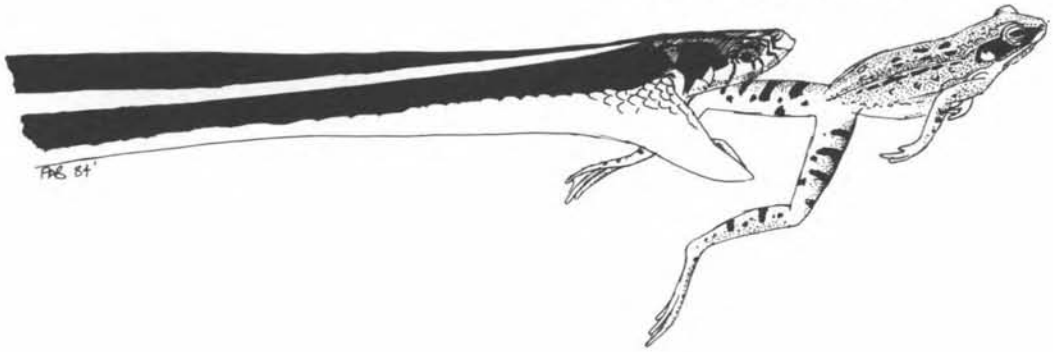
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BOOK REVIEWS

Biology of the Pitvipers. Edited by Jonathan A. Campbell and Edmund D. Brodie, Jr. 1992. Selva, P.O. Box 5213, Tyler, Texas 75712, USA. 467 pages, Hardcover. US $75.00. ISBN: 0-9630537-0-1.

There is, of course, no phenomenon such as carrying capacity in knowledge, but in *Biology of the Pitvipers* one can see more diverse approaches to the study of the biology of these snakes than ever before, more elegant solutions to an increasing number of problems, and the rise of new and fascinating questions. This book is the outcome of the Symposium on Pitviper Biology at the University of Texas at Arlington, 17–19 November 1989. The 30 papers by 50 herpetologists range from 5 to 30 pages in length. Twelve of the papers focus on single species, four are on the generic level, twelve on the whole subfamily Crotalinae, and two deal with the entire family Viperidae. The book covers a number of different subjects such as systematics, evolution, natural history, behavior, snakebite, and conservation.

Well corroborated phylogenies of Neotropical pitvipers are presented by Crother and co-workers and by Werman. Besides minor printing errors, Crother et al. do an excellent job of reconstructing the phylogenetic systematics and biogeographic history of the palm-pitvipers, genus *Bothriechis*. Werman is likewise convincing in his treatment of the phylogeny of the genus *Bothrops*, and partly resolves the relationships in this "old" group which now includes taxa referred to *Bothrops, Bothriechis, Porthidium, Atropoides* (and *Cerrophidion* Campbell and Lamar 1992). This is one of very few papers in the entire volume that focuses on South American taxa.

The phylogenetic study by John Cadle treats the entire family Viperidae (although the Viperinae is not well represented in the taxa sampled). This preliminary assessment of albumin evolution in vipers presents some surprising (and exciting) results including the position of *Azemiops* as the sister taxon to Crotalinae (or parts thereof). As emphasized by Cadle, care must be taken when making phylogenetic interpretations due to the generally conservative nature of viperid albumins. Cadle questions the recent generic splitting of *Bothrops* in the absence of comprehensive phylogenetic studies. To some extent such phylogenies have been presented by Crother et al. and Werman in this volume.

Sherman Minton uses radial immunodiffusion of albumins in an attempt to resolve relationships within the Crotalinae. There seems to be a pattern of hidden evolutionary species within *Crotalus* that should be further resolved. The ID (Index of Deviation) used demonstrated differences approaching species level between *Crotalus v. viridis* and *C. v. concolor* (the latter also having a high toxicity with neurotoxic components in its venom: Rael et al., this volume). As demonstrated by other studies in this volume the patterns of relationship between New and Old World *Agkistrodon* are still not fully resolved. The degree of difference of *Calloselasma* serum albumin is pronounced, approaching plasma of some non-viperid snakes, and is worthy of additional studies. The phylogenetic divergence of *Calloselasma* is also demonstrated by Densmore and Rael (this volume).

Another unresolved problem is *Sistrurus*, which Minton finds to be an unnatural group. However, Lillywhite and Smits (this volume) report that "the vast majority of blood flow perfusing the anterior tracheal lung may come from either left or right branches of the pulmonary artery (right in . . . *Agkistrodon*, mostly left in *Crotalus*, mixed in *Sistrurus*)." If "mixed" here means from both left and right side there are definitely interesting phylogenetic implications.

The fragmentary distribution and supposed unnatural taxonomy of *Crotalus lepidus* is further demonstrated by Rael and co-workers. This species shows a taxonomic pattern similar to the European *Vipera ammodytes*, with a number of "substratum races" and several more or less generally accepted subspecies. For practical reasons we need a practical taxonomy which may come into conflict with certain species concepts (e.g., cladistic species; see Otte and Endler 1989). External morphology yields a phenetic taxonomy which is available to anyone, while phylogenetic methods reveal evolutionary history. Additional approaches, like this one on venoms, may help to solve this dilemma. The viperine snake *Echis carinatus* (sensu lato), surprised researchers by its variable venom that showed both intra- and inter-population differences (e.g., Latifi 1978). Although not properly resolved, "*E. carinatus* s.l." seems to be composed of several sympatric or parapatric species (Cherlin 1990; Gasparetti 1988; Joger 1984; Leviton et al. 1992).

According to Knight et al., *Agkistrodon bilineatus taylori* is the sister taxon to *A. contortrix*, and the eastern and western populations of *A. piscivorous* are differentiated near the species level. *Agkistrodon* seems to be polyphyletic which again raises the question of whether *Gloydius* should be recognized for Asian *Agkistrodon*. The authors take no definite stand on this matter.

Additional phylogenetic and biogeographic papers include a study by Dorcas on *Crotalus lepidus* and *C. triseriatus* that elegantly resolves the systematic position of *C. t. aquilus* and one by Barker presenting a convincing reconstruction of the phylogeny of the evolutionary lineages within *C. willardi*, based on cladistic analyses of both morphological and allozyme data.

The study by Harry Greene on the ecological and behavioral context for pitviper evolution is an interesting and unconventional approach to the evolution of pitvipers that relies on the reconstruction of past phenotypes and adaptive scenarios. Behavioral and adaptive strategies of the Viperidae as a whole are examined with the aim of explaining the rise of pitvipers. Great insight is demonstrated in various aspects of viper biology although details for some taxa can be added, e.g., the sidewinding locomotion used by *Vipera latastii* in the sand dunes of southern Spain; the exclusively orthopteran feeding behavior by most *V. ursinii*; the presence of brightcolored ventral tail tips in almost all *Vipera*; the existence of a new aquatic, fish-feeding *Agkistrodon* in Mongolia (N. Orlov, pers. comm.). I like this kind of approach as a complement to more traditional analyses of evolutionary history. The supposed shared derived feature of tail vibration for *Azemiops feae* and crotalines supports the phylogenetic results of Cadle. Patterns of reproductive systems could be used in a more substantial way (e.g., Schuett, this volume) to analyze evolutionary history. Greene is of the opinion that the first crotalines were small, terrestrial snakes. Perhaps fossils, important clues as mentioned in his introductory section, could have been used for verifying size of early crotalines.

Several papers focus on pitviper morphology and physiology. Alan Savitzky describes the development of maxillary and prefrontal bones in crotalines, and their role in the placement of the pit organs, the important synapomorphy that characterizes pitvipers. The cardiovascular physiology of viperid snakes in general and Crotalinae in particular is discussed by Lillywhite and Smits. In particular the small heart, low blood pressure, and heavy body of these snakes prohibit upright posture, and affect resource utilization in viperid snakes. Arboreality is given as an example, a limitation also pointed out by Greene in his evolutionary approach. In this otherwise excellent description of viperid anatomy the authors have introduced a few errors: the statement that *Vipera palaestinae* is a pitviper (p. 147) is a lapsus, and the statement that the saccual lung terminates at the posterior margin of the kidneys in *Vipera* is incorrect. In *Vipera berus* (pers. obs.) and *V. aspis* (Lecuru-Renous and Platel 1970), for example, it ends cranial to the anterior margin of kidney.

A number of reproductive strategies and traits that have evolved in the Viperidae have been brought into focus by Schuett, Duvall

et al., and others. One aspect of pitviper reproduction is the capacity for sperm storage and its role in the timing of courtship and internal fertilization. A good part of Schuett's work deals with the categorization of spermatogenic and follicular cycles and mating periods in temperate vipers. Type III spermatogenesis (vernal) is common in Viperinae but rare in Crotalinae (except in *Crotalus r. ruber* and *C. viridis oreganus*). Schuett suggests that long term sperm storage might be plesiomorphic within the Crotalinae, a hypothesis that has yet to be demonstrated conclusively. Also unresolved are the reproductive patterns of tropical pitvipers. Do they exhibit sperm storage? What triggers ovulation? Is the time for ovulation fixed (as in temperate Viperidae)? The limited observations by Schuett on *Agkistrodon bilineatus* do not provide a clear answer. An adequate explanation for type I reproductive cycles and long term sperm storage also remains elusive. Hypotheses relating mating in summer (when males are dispersed and require a long time to search for mates) to type II follicular yolking cycles in *C. viridis*, seem plausible. A similar pattern can be seen in the European *Vipera berus*, with its type III (vernal) spermatogenic cycle and spring mating (post-shedding), where yolking takes place during the spring (type I). A question that is raised is whether yolking is correlated with feeding. In *V. berus* it is dependent on past feeding (correlated with fat-body maxima). Schuett correctly stresses the importance of long-term studies to solve the questions surrounding sperm storage, potentially multiple matings, etc.

Most papers on pitviper biology are based on temperate species. However, Sazima describes the natural history of the tropical *Bothrops jararaca*. It is not clear from his study how the data were collected (no "methods" section), how many snakes were used, or how many search hours were spent under different conditions. During the 2.5 years of investigation, 122 specimens were used in the seasonal activity analysis, but only 91 in the daily activity analysis. In the latter group only seven animals were observed during daytime, yet 28 animals were observed basking, etc. Still Sazima presents much interesting information, but several questions arise. Does the long pregnancy period also include female sperm storage? What factors trigger ovulation? To what extent has man affected population density by supporting additional prey species (*Rattus norvegicus* and *Mus musculus*)? To what degree can man utilize the jararaca as a controller of such pests? Unfortunately, the black and white photos accompanying this paper are far too small to adequately display their information content effectively.

For obvious reasons natural history studies may be of two kinds. If there is already a large body of knowledge available the author can penetrate rather deeply into the subject. The studies of *Crotalus horridus* are of this kind, and thus put a number of specific questions into focus. The other type of natural history work deals with taxa, perhaps rare or occurring in some remote region, for which little, often anecdotal information is available. The study by C. J. McCoy and Ellen Censky on the biology of *Porthidium yucatanicum* is clearly of this kind. This is a preliminary but very informative study about a taxon for which virtually no biological data were previously available. Similarly, Campbell and Solorzano provide a detailed and informative analysis of the biology of *Porthidium godmani*. The feeding biology is compared not only to size, seasonal variation, and habitat, but also between the two distribution areas of this taxon: Guatemala/El Salvador and Costa Rica/Panama. The high percentage of arthropods as prey is unusual in adult vipers but also occurs in *Vipera ursinii* and *V. latastii*. With respect to reproductive behavior, this species exhibits some features (e.g., male bites the female) that are more reminiscent of colubrids than temperate viperids. The obvious difference in morphology between southern and northern populations is interesting. The authors attribute this to the more frequent appearance of plesiomorphic character states at the periphery of the species' range, but the pattern of differences in prey utilization, female reproductive potential, and birth dates between Isthmian and Nuclear Central American samples, also demonstrated by the authors, suggests that additional studies are necessary.

The autecology of a few species has been studied in more detail and *Crotalus horridus* has been the main target in two such papers. The works of William Brown and William Martin are impressive for their long-term approaches. In general these kind of studies are very important for conservation purposes, in revealing hibernacula, summer areas, movements, home ranges, etc. Brown's studies on *C. horridus* have revealed a number of similarities with European *Vipera berus*. Differences are later emergence and higher number of females observed in the spring and more males observed in late summer. These can certainly be referred to the different reproductive systems in pitvipers and most viperines, with type I male cycle and associated Type II FY female cycle (Schuett, this volume) in *C. horridus* (late summer-autumn mating period) and the IIB male cycle in *V. berus* (spring mating). Martin comes to essentially the same conclusions in his impressive field study of *C. horridus*, with a slight delay of fall ingress dates. Martin has used a large number of snakes (N = 5926) in a truly longterm study (17 years), and with conservation in his mind ("sampling was nondestructive"). Although parts of his large volume of data could be somewhat condensed, it makes fascinating reading. Sixty percent of the juveniles survive the first winter but only 39% survive the first year. Martin believes that this results from failure to find adequate hibernacula, or from predation. But, of 333 observations in fall at hibernacula, 140 (42%) were young-of-the-year, whereas only 52 (3.3%) of 1566 spring observations were newborns. Thus, juvenile death in the hibernacula could be another factor. The application of telemetric and chemical ecological approaches to this well-studied population would be very rewarding.

The single largest paper in this volume concerns *Crotalus cerastes*. Timothy Brown and Harvey Lillywhite undertake a detailed behavioral study of individual specimens. It is an informative analysis although too lengthy, and the long, detailed, time-controlled behavior of a single snake becomes difficult to interpret when the clock suddenly goes backwards (p. 290). The paper was obviously planned to be published long ago, as evidenced by the lack of more recent references. The field work was performed during 1967–1969, and only three references (2.8%) are from the ten years prior to publication. Much has happened, especially in reproductive biology theory in recent years (e.g. Duvall et al. and Schuett in this volume). Interestingly, the noted increase in activity prior to rain is a phenomenon that also occurs in many Eurasian vipers (e.g., *Vipera dinniki* in the Caucasus, pers. obs.). However, the comment that European adders (*Vipera*) defend territories (p. 306) is probably a misunderstanding somewhere along the line. Adders defend only reproductive females and combat is frequent and a normal part of the reproductive behavior. Combat may perhaps function as a spacing mechanism between male sidewinders as mentioned by the authors, but the presence of a reproductive female definitely counteracts this. In *Vipera berus* spacing takes place after the mating period, not during it.

A comparison with the study by Secor (this volume) of the same species from the same area raises some interesting points. The movement distances reported are about equal in the two papers (monthly mean trackway length in July was 126.8 m according to Brown and Lillywhite; 128.3 as a combined mean during the activity season according to Secor) even though some variation between sexes and seasons in the two studies can be noted. But in size of the home range the two studies differ dramatically. According to Brown and Lillywhite home range sizes are 25–100 ha; according to Secor 14.7 ha.

Weldon et al. review the chemical ecology literature of crotaline snakes, and focus on four issues: the importance of skin lipids in water balance; the wide spectrum of pheromone use, in particular

juvenile scent trailing and mate attraction; chemicals in predator-prey interactions and in combination with body-bridging (a phenomenon characteristic of the Crotalinae but not verified in the Viperinae); and the secretions of the paired cloacal scent glands. It is an interesting approach that raises a number of questions. Field experiments are necessary for verifying theoretical assumptions as concluded by Duvall and co-workers in their paper "Pitviper mating systems: Ecological potential, sexual selection and microevolution." This is a theoretical approach to patterns of sexual selection in pitvipers in general, based on empirical studies of *Crotalus viridis*. In contrast to *Vipera berus*, *C. viridis* has a prolonged mate-searching polygyny system, characterized by late summer/autumn mating period and dispersed females, with sexual selection apparently acting on males. In the adder, females wait out the frequent male combats before giving access to the dominant (largest) male in the established hierarchy. Three important forces act in sexual selection on male rattlesnakes: (a) increased mate persuasion efficacy, (b) increased length of the mating season, and (c) decreased average mate cycling time. In the adder (b) is rather short, (c) may be long due to combats and female waiting behavior. The adder is involved in intensive combats during mating. According to Duvall et al. multiple matings and multiple paternity is expected to reduce the intensity of sexual selection on males, with less pronounced male-male competition. I share the opinion that multiple paternity is normally a rare phenomenon in the adder.

Hibernation biology is the focus in several studies, including the work Sexton et al. who conclude that soil thermal reversals dictate the denning behavior. The 38th north parallel appears to separate snakes using underground, communal dens from those using temporal refugia or having more or less active winter behavior. Their work raises a number of additional questions worth considering. How do the different reproductive strategies (spring mating as in European Viperinae or late summer-autumn mating as in North American Crotalinae) fit into this behavior? Are there methods other than scent tracking for snakes to locate suitable dens at distance? The proposed long distance heat sensing hypothesis is an interesting idea.

Barbara Savitsky examines piscivory in captive cottonmouths and found an ontogenetic shift from feeding on live fish in the young to carrion feeding in adults. The cottonmouth is one of a few very well-studied species of viperids and is therefore suitable for testing such hypotheses. The laboratory study is well performed and available field observations (although sometimes anecdotal) seem to support her results, but experimental studies in the lab should be supported by experimental field studies.

By statistically analyzing the relationship between rate of tongue-flicking and strikes versus nonstrikes in successful prey location Chiszar and co-workers found it possible to separate ambushers from chasers. The cottonmouth is shown to have more of a chasing behavior, in line with the study by Savitsky on feeding behavior (this volume). This is a continuation of an impressive series of work within the same field that Chiszar and associates have produced during a number of years (it is also Hobart Smith's 1,000th paper!). Empirical studies are often necessary in unknown fields, but when an experimental approach can be added a deeper understanding can be achieved. The studies of Chiszar and coauthors are excellent examples of simple but relevant experiments and tests within this field, and this paper is largely a synopsis of several of these studies.

Venoms and their effects have been studied from different perspectives and for different purposes. Hayes and co-workers investigated the mass of venom injected by prairie rattlesnakes. Among other results, LD 50 tests have shown that the prairie rattler injects 320 times the lethal dose into rodent prey. About 32% of available venom is injected at one strike. It would have been interesting to know the amount of venom their series of rattlers had expended in defensive strikes.

The sidewinder is an excellent target species for evaluating movement and home range size because movement patterns are revealed by trackways in the sand. Secor's paper together with the review of telemetric methods by Reinert, in which home range estimation methods are also evaluated, provides a good introduction to this subject. Our current telemetric studies within the Viperinae (*Macrovipera lebetina* complex) have benefited much from studies based on its North American ecological equivalents amongst *Crotalus*.

Dart et al. present an illuminating review of pitviper envenomation that makes dramatic and instructive reading. The authors claim that a snake that has been handled before it strikes exhibits more aggressive biting behavior and injects more venom, although this is not clearly demonstrated. For snake bites there are a number of household remedies employed around the globe that are more or less effective for "curing" snake bites. Hardy reviews some more current first aid measures that are in use against venomous snakes including pitvipers. He evaluates and accepts the efficacy of the Extractor vacuum pump but not the stun gun electroshock method. He further dismisses incision, constricting bands or tourniquets, cooling, and compression wrapping. It seems that nothing should be done except resting until reaching a hospital. However, first aid treatment is obviously important if properly performed, as illustrated in the chapter by Dart et al. (above). Although perhaps peripheral to the focus of the paper, I would like to have seen an evaluation of cortisone, antihistamine, and adrenaline as field equipment. These have been used against bites of vipers in Eurasia with good results. Shock is considered as a great threat and an adrenalin inhalator in the field kit could save lives.

Jacobsen and Gaskin review the problems of paramyxoviral infections and stress the risk of spreading infections to rare local taxa from captive-bred releases, as exemplified by the Aruba Island rattlesnake propagation program.

Our knowledge of pitvipers, as evidenced in this volume, is highly skewed towards certain taxa. *Crotalus horridus* is the subject of the discussion on 67 different pages whereas 54 taxa are only mentioned on pages 421–422 in the "The future of pitvipers" by Greene and Campbell. Many of these are Asian forms of which we have almost no knowledge for estimating threats or conservation needs. The future of pitvipers is of course of great concern and the time lag between scientific knowledge and practical conservation steps is problematic. The only *Bothriechis* presently included in CITES is *B. schlegelii*, the first-described and most wide ranging of the seven species, a situation that is also true for Eurasian vipers. Further, the authors stress problems with the non-biological aspects of traditional taxonomic approaches (biological versus evolutionary species concepts), which is sometimes a result of conflicts between taxonomists. A complaint is made that many attractive species are still not on CITES. I fully agree with this complaint, but it must be kept in mind that it is the researchers of these snakes who must first demonstrate the conservation need and, at least to some extent have the responsibility to bring the issue to the attention of regional or national officials in charge. Greene and Campbell identify 80 pitviper species as vulnerable and point out the need for additional scientific studies as vitally important in their conservation.

Comparatively little work has focused on Asian and South American pitvipers. This is a rather natural bias as the symposium was held in United States, and most participants were Americans studying the biology of American pitvipers. The symposium has resulted in an excellent publication focusing on American pitviper biology, touching briefly on the Eurasian representatives on its way. This publication answers many of the questions raised regarding pitviper biology, and demonstrates that there are many more to be dealt with in the future, even in North America.

During a comparatively short period three weighty volumes dealing with pitvipers have appeared (*Snakes of the Agkistrodon*

Complex by Gloyd and Conant; *The Venomous Reptiles of Latin America* by Campbell and Lamar; and the symposium volume under review here). The first will stand as a key reference for a certain group within the pitvipers and the second for a certain geographical region. This book will definitely serve as the focal reference in pitviper evolutionary biology in its broad sense and as such it should have lasting value.

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Iguanas: A Guide to Their Biology and Captive Care, by Fredric L. Frye, B.Sc., D.V.M., M.Sc., CBiol, FIBiol, Fellow, Royal Society of Medicine, and Wendy Townsend. 1993. Krieger Publishing Company, Krieger Drive, Malabar, Florida, 32950, USA. ISBN 0-89464-695-8, 145 pp. US $28.50.

Of late, iguanas have captured the imagination of the pet buying public. Trade in live iguanas has increased at least tenfold over the last decade and the green iguana (*Iguana iguana*) now ranks behind only the red-eared slider (*Trachemys scripta*) among wild terrestrial vertebrates in international commerce. No wild bird or mammal species is traded in numbers of this magnitude (A. Gaski, pers. comm.). About 90% of the more than 300,000 iguanas marketed each year are destined for the US (Fig. 1). What effect this trade has on wild stocks of iguanas is unknown. Perhaps the demand for iguanas would be lessened if survivorship of the captives was prolonged through knowledgeable caretaking. Frye and Townsend have produced a handbook on care of captive iguanas.

Despite the title, this book will not appeal to biologists. This is a book for pet owners. The first twelve pages describe the biology of wild and captive iguanas. Fifty pages of husbandry suggestions follow, augmented by thirty pages of descriptions of diseases that warrant the attention of a veterinarian. The concluding chapter consists of endearing anecdotes about the junior author's personal menagerie.

There are several valuable features of this handbook. The menu lists will be useful for all iguana owners. The lesson on how to grow sprouts in jars could be new information for some readers. Townsend's anecdotes about the difficulties she has had maintaining strongly territorial animals in her home drives the message home in a singularly effective manner. The layout and binding are pleasant.

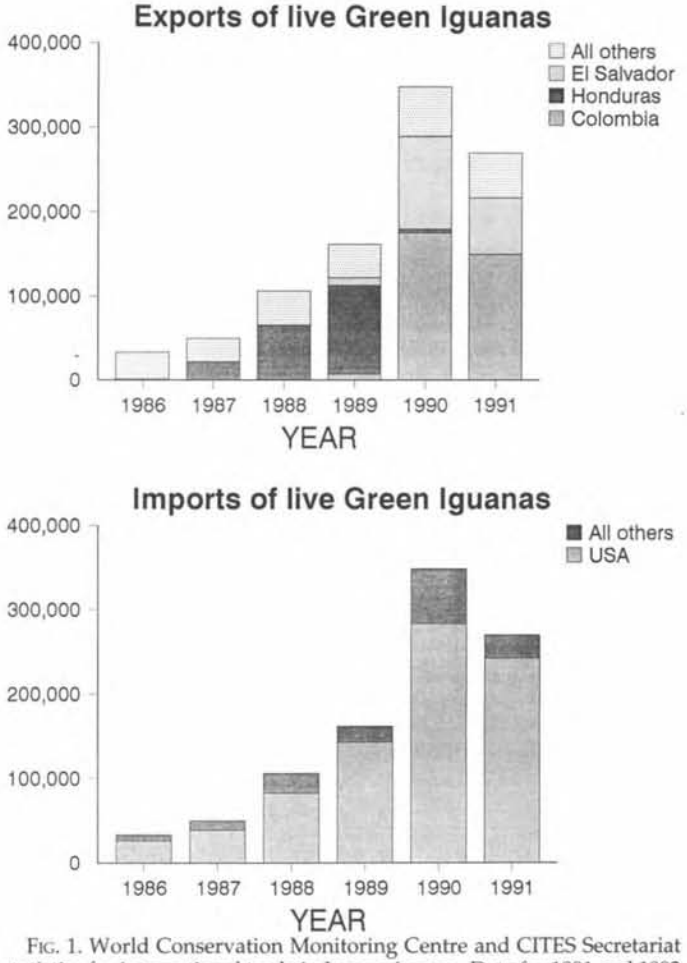


Fig. 1. World Conservation Monitoring Centre and CITES Secretariat statistics for international trade in Iguana iguana. Data for 1991 and 1992 are incomplete at this time, but indicate further increases in exports from Colombia and imports into the US.

Although the book is liberally endowed with Townsend's beautiful if occasionally fanciful drawings of a diversity of iguanines, the focus is narrower. Thirty-four of the thirty-six photographs are of *Iguana iguana*, as is virtually all of the text. For example, the statement, "Six or eight weeks prior to and during courtship, male iguanas acquire bright gold or orange coloring over much of the body, as well as a whitened head," describes only *Iguana iguana* and should be restricted to selected populations of that species (Rodda 1992). The emphasis on green iguanas is appropriate from a conservation standpoint, as few of the other iguanines have wild populations capable of withstanding commercial exploitation (Burghardt and Rand 1982). Unfortunately, concern for this problem is never stated, other than the recognition that several species are "not available in the pet trade."

A potential strength of this book is that the two authors provide very different perspectives. Unfortunately, little was done to integrate their efforts. For example, on at least two occasions virtually identical paragraphs appear within a few pages. The transition between authors is jarring, as the folksy familiarity of Townsend's prose contrasts with the stiff and disjointed jargon of Frye's contributions.

A pet owner is likely to find much of Frye's writing inscrutable. For example, Frye uses a contrasting font to highlight the importance of the obscure phrase "amphigonia retardata," when most readers would be satisfied with calling it sperm storage. Frye doesn't seem to have reached a decision as to his target audience. For example, he gives dosages of a prescription drug for treatment

of herpes, a disease that the pet owner is incapable of diagnosing, but coyly refuses to give information on the appropriate dose of kaopectate to use for iguanas with diarrhea, a readily diagnosable ailment (usually corrected through diet, however).

It appears that neither authors nor editors concerned themselves with the details of manuscript preparation. Within the taxonomic index over half of the scientific names are not italicized, whereas others, even those in the same genus, are. The text refers to Fig. 3 for a view of femoral pores, but these structures do not appear in either Fig. 3 or Fig. 4. I sought help from the index, but information in figures is not indexed. Eventually I stumbled across the pores in Fig. 7. Egg dimensions are captioned as being in cm, but the values given (e.g., 40 x 80) must be in mm. In a throwback to Wynne-Edwards (1962), Frye informs us that "Territoriality . . . serves to preserve each species in its most vigorous state." We are informed that "tall cages must have more than one door . . . Fig. 11," but there is only one door in Fig. 11. Some of the photos (e.g., Figs. 12a, 12b) are pointless, some are too poorly reproduced to detect the item of interest (Fig. 14b), and others are redundant (there are five color photographs to show that regrown tails may be imperfect). Photographs of females mutilated by frustrated territorial males (Figs. 20a, 20b) are labeled as if such mutilation were normal. For a list of toxic plants, the reader is referred to Table 3, which is the list of preferred foods. Some iguanas do well on "toxic" foods (Auffenberg 1982), a consideration omitted from this work.

There is a conspicuous lack of scholarship in the tabulation of data. For example, the table intended to summarize what is known about egg development cites a few anecdotal captive observations for *Iguana iguana*, but neglects a number of significant captive studies (Bagh 1962; Braunwalder 1979 and references therein; Enderlein 1963), including several that are in the recommended readings (Miller 1987; Pütz 1982; Van Aperen 1969). More significantly, the authors completely overlook all data from systematic studies of *Iguana iguana* egg development (e.g., Bock et al. 1989; Licht and Moberly 1965; Müller 1972; Phillips et al. 1990; Rand 1968, 1972; Rand and Dugan 1980; Ricklefs and Cullen 1973; Swanson 1950; Werner 1988; Werner and Miller 1984). One of the table sources, Boylan (1963), does not appear in the literature cited (it is a personal communication cited in another work).

The authors appear insensitive to the unnaturalness of some behaviors seen in captivity. For example, on the basis of captive anecdotes they assure us that iguanas themselves consider homosexual behavior normal. I don't know what opinions iguanas have on the subject, but homosexual mounting is transitory and rare in wild green iguanas (Dugan 1982; Rodda 1992).

I was annoyed by the incessant promotion of business for veterinarians. Frye overly enthuses about the "cadre of well-trained veterinarians" who have an "armamentarium of highly effective" treatments that are available for whatever ails an iguana. The pet owner needs to know when an ailment is serious enough to require professional care, but not all veterinarians are well equipped to deal with exotic pets, and it is arguable that "any unusual lump, or bump, swelling, discoloration, or 'sore' " requires professional veterinary attention. Frye spends most of a page warning readers that untreated flatulence may kill their iguana. He warns that if post-ovipositional females are "depressed" they should be taken to a veterinarian at once. (Post-ovipositional females are probably more in need of a good meal, as they may not have eaten for several months.) He warns readers that "overly large, misshapen, or decomposed eggs with normal shells, infection, or low blood calcium levels are conditions which require immediate veterinary care." I do not know how a pet owner is expected to identify these conditions in the gravid female, nor is any guidance offered.

The book provides a valuable service through the numerous color photographs of iguanas with metabolic bone disease. These photographs will no doubt motivate readers to supply their pet with a nutritional diet. The authors include numerous warnings about the importance of appropriate calcium phosphorus ratios. Unfortunately, they fail to specify what ratio is needed. Their generally useful dietary advice is offset by their inclusion of the grossly erroneous myth that juvenile green iguanas are carnivorous. Although carrion feeding has been observed once in adult green iguanas (Loftin and Tyson 1965), and a single anecdote has been published of a juvenile eating a caterpillar in the wild (Hirth 1963), all other data from wild green iguanas indicates that they are herbivorous at all sizes (Barbour 1932; Iverson 1980, 1982; Rand et al. 1990; Troyer 1982, 1984; Van Devender 1982). Frye and Townsend's Table 2 notwithstanding, insects, arachnids, and eggs are not usual food items for green iguanas. This book makes the controversial declaration that digestive tracts of baby iguanas must be inoculated with unspecified microorganisms, but no information is given as to how this might be accomplished. Elsewhere they specify that coprophagy should be discouraged.

Among the more difficult problems presented to the keeper of pet iguanas is that of reproduction. In my experience, the reproductive cycles of captives are often poorly synchronized, with hormonally excited males attempting to mate or fight with cagemates that are not in breeding condition. This problem is not discussed, nor are any suggestions given for providing the captives with a synchronizing environment. The authors state that females cease feeding 2–3.5 months after copulation. This may be an artifact of reproductive asynchrony; wild iguanas in the llanos of Venezuela cease feeding coincident with copulation (Rodda 1992). Natural reproduction is erroneously characterized in a variety of other ways as well. For example, they state that iguana males mark their females with femoral pore secretions. They may in some areas, but this has not been observed in wild green iguanas (Dugan 1982; Rodda 1992). Contrary to the information given, some iguanines are reported to guard nests (Wiewandt 1982). The authors state that significant embryonic growth does not occur in the several months during which oviducal eggs are retained in iguanas; Licht and Moberly (1965) observed limb buds and a functioning heart at oviposition in *Iguana*. The authors ambiguously state that maturity occurs at age 2 or 3 years depending on whether the iguanas were raised in captivity (which is which?). The available data for wild green iguanas (Zug and Rand 1987) exhibit a mode of five years. The book makes the perhaps ghoulish comment that females "should be healthy and possess excellent flesh" prior to mating. This strikes me like those yellow "child in car" warning labels seen in some cars driven in the U.S. Does this mean a pet owner should not strive to take care of their charges at other times?

While the care recommendations given in this book are generally sound, there are a few that should be refined. For example, there are redundant warnings that pet iguanas may harbor malaria, but the authors fail to note that iguana malarias are not among the malarias that affect humans and are not transmissible to humans. The advice to force feed an iguana if it fails to eat after two weeks must be tempered by the recognition that newly hatched individuals, breeding males, and gravid females normally fail to eat. Newly acquired individuals may need to be maintained in opaque cages for them to begin feeding (Troyer, pers. comm.). There are repeated warnings that cages must be sprayed or animals given water to drink. Pet owners should not become alarmed if their pets fail to drink standing water. Wild green iguanas have been seen to drink only when they are not feeding during the breeding season (Rodda 1992). However, captive iguanas typically suffer from insufficient humidity; spraying the animals and their cages is a useful but often incomplete cure for this problem.

The directions given in this book with regard to humidity are unreasonable. On the one hand they recommend including powerful ventilation fans on cages; on the other they specify 85–95% humidity for tropical iguanas. In my experience, maintaining 85–

95% humidity in cages in typical modern houses is simply impossible even if the ventilation is omitted. Furthermore, if such a high humidity level is attained, mold and pathogens will propagate uncontrollably. The alfalfa pellet substrate that they recommend will rapidly absorb moisture and become unusable in a high humidity environment.

The book's final chapter by Townsend is a delight to read, even if the hijinks reported (e.g., sleeping with "Goober" and "Peanut," smuggling iguanas aboard commercial aircraft in socks pinned to undergarments) provide unfortunate role models. Townsend indicates a willingness to assume that iguanas are capable of assuming human roles: "As [a hatchling] is beginning to get used to the human face, in his eyes, the expression of fear is almost completely replaced by what one might call wonder." Perhaps, but if this leads to animal welfare requirements for daily clean sheets and a mint on their pillow, we will have erred.

Remarkably enough, for a book oozing with affection for iguanas, no effort is made to promote the welfare of wild iguanas. The epilogue vaguely promises that keeping iguanas will somehow help save the rainforest. It will do so only if the display of captives results in effort or at least funds being channeled to rainforest preservation activities. Showing off a pet may simply generate more demand for sales of wild animals. The authors include an appendix listing herpetoculture organizations, but they fail to promote iguana conservation in any meaningful way. Many island iguanines are desperately in need of help. Responsible pet owners will want to support the conservation activities of groups like The Nature Conservancy's International Program or the International Iguana Society. Pet stores and iguana owners should be encouraged to tithe a percentage of their earnings to such efforts.

If you are looking for a book on the biology of iguanas, there is yet no volume to surpass Burghardt and Rand (1982). If you are looking for a book on the pet trade in iguanas, it remains to be written. If you are looking for a guide to care of green iguanas, pick up Beltz (1989) or de Vosjoli (1992). These booklets provide more authoritative information in a more comprehensible form, at a fraction of the price.

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The Reptiles and Amphibians of South Australia, by Edgar R. Waite. 1929. Introduction by Michael J. Tyler and Mark Hutchinson. Facsimile Reprints in Herpetology, Society for the Study of Amphibians and Reptiles, Oxford, Ohio, USA. 282 pp., color plate, portrait, 192 text figures including numerous photographs. Clothbound. $35.00 US. ISBN: 0-916984-30-3.

This is a handsomely bound facsimile of Waite's classical treatment of the herpetofauna of South Australia. Tyler and Hutchinson have, in characteristic style, clearly and succinctly summarized the importance of Waite's handbook (". . . the first and only complete treatment of the herpetofauna of any Australian state"), painstakingly matched Waite's scientific names with current nomenclature (including footnotes to clarify errors in the original text), and assembled a list of his herpetological publications. Phillip Jones assisted in compiling the Introduction, by locating biographical details from Waite's diaries. The Introduction is beautifully edited, with no typographical errors to my knowledge, and is followed by a faithful reproduction of Waite's entire handbook with original illustrations. The high quality and reasonable price of this truly historical edition, as well as a generally high regard for Australian fauna, should attract the interest of herpetologists and naturalists, alike.

It is both befitting and appropriate that this facsimile volume commemorate the 2nd World Congress of Herpetology, held in Adelaide, South Australia, 29 December 1993 to 6 January 1994. It is befitting because of its parochial significance, and appropriate as a symbol of the ponderously slow pace of herpetological advancement in this vast, but largely unpopulated continent. The fact that Waite's book is still used as a reference is largely due to his many compilations of (sometimes) original observations on natural history of the herpetofauna which, unlike the taxonomy of the group, are largely inviolate. More recent books offer additional natural history notes, as well as outstanding color plates and comprehensive (artificial) keys with current nomenclature. However, close scrutiny of these newer texts reveals that for many groups Waite's observations are repeated and much of the taxonomy consists of identifying a few new species and shifting existing species into and out of different genera, with little or no phylogenetic reconstruction. One formal classification is still as unstable as another, and the present situation for many groups (for example, the elapid snakes) is not much better than in Waite's day. However, phylogenetics is the task of a professional systematist and natural history is often the interest of keen amateur naturalists.

One has to live in South Australia to appreciate the fact that most people in a state larger than Texas are clustered in a few widely scattered cities along the coast. The "outback" is virtually at their doorstep, but few roads allow access to it and many people are reluctant to venture into the place. Moreover, much of the rich reptile life of this vast area is nocturnal or crepuscular, retreating by day to the safety of burrows, rock crevices, deep sand or leaf litter under dry shrubs, to escape the heat and dryness. There are usually only one or two Curators of Herpetology per state, and perhaps that number of professional herpetologists in each of the colleges and universities. Budgets are extremely slim, although there is some support for individuals with clear objectives, innovative ideas, and the patience of Job. Keen amateur herpetologists make up the bulk of the collecting force, but their ranks are effectively thinned by a passion for keeping live specimens (often including venomous snakes and rare pythons), which (in part) contributes to continuous battles with state and federal authorities over collecting permits. Curators and other professionals who intercede on behalf of these collectors are sometimes caught in a vicious triad, and spend a lot of time trying to appease both groups. So, today, the task of revising previous studies is left to a few well-organized and well-positioned workers who, understandably, guard their turf. It must have been simpler in Waite's day, when communications were by occasional letter and visits even less frequent, but with the publication of this book I am reminded that little seems to have changed.

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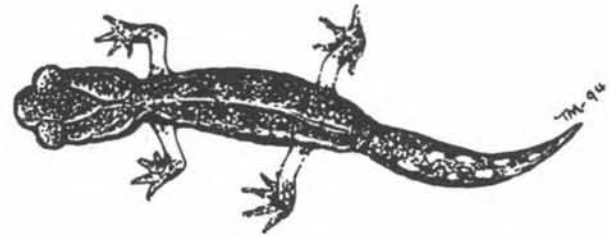
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Ecology of Red Maple Swamps in the Glaciated Northeast: A Community Profile. Francis C. Golet, Aram J.K. Calhoun, William R. DeRagon, Dennis J. Lowry, and Arthur J. Gold. 1993. U.S. Fish and Wildlife Service Biological Report 12, xi + 151 pp. Available at no charge from *Publications Unit, National Biological Survey, 1849 C Street, N.W., Mail Stop 130, Webb Bldg, Washington, D.C. 20240, USA.* Individuals wishing to receive announcements concerning similar scientific publications should send their requests to: *Publications Coordinator, Office of Information Transfer, National Biological Survey, 1201 Oak Ridge Drive, Suite 200, Fort Collins, Colorado 80525, USA.*

This report is part of a series of profiles on the ecology of wetland and deepwater habitats. Red maple swamp is a dominant wetland type in the glaciated northeastern United States, and comprises 60–80% of all inland wetlands in southern New England and northern New Jersey. The information pertaining to amphibians and reptiles is limited to about two pages and briefly summarizes previous ecological studies from the northeastern U.S.

Interpretive Atlas of Texas Lizards, by Ralph W. Axtell. 1986-1993, *et seq.* Privately published by and available from the author (Ralph W. Axtell, 2814 Rock Hill Road, East Alton, Illinois 62024, USA). Individual accounts available separately.

Three newly-published accounts for *Cnemidophorus sexlineatus*, *C. inornatus*, and *C. "laredoensis"* augment twelve accounts issued earlier (see *HR* 24(2):76 for further details). These newest accounts total 56 pages and include an extremely detailed range map for all three taxa.



Ensatina eschscholtzii platensis (Sierra Nevada Ensatina, juvenile). USA: California: Butte Co., Concow Reservoir. Illustration by Tim Manolis.

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Authors should submit an original and two copies of manuscripts. Manuscripts should be typewritten, double-spaced, on 21.5 x 28 cm (8.5 x 11 inch) white paper. Refer to this issue of ***HR*** for style and format information, including correct format for literature citations. More detailed information for submissions to Geographic Distribution, Natural History Notes, and Recent Population Changes appear in a recent issue of ***HR*** under their respective headings.

Originals of illustrative material (e.g., tables, photographs, or diagrams) should be submitted with the text, with appropriate precautions taken to ensure delivery without damage. Illustrations should be discussed in the text and numbered sequentially with Arabic numbers. References to illustrations should be placed in parentheses at the end of sentences. Original photographs should be submitted as black and white glossy prints.

For further guidelines, authors should consult the *CBE Style Manual* (5th edition, 1983, Council of Biology Editors, Inc., 9650 Rockville Pike, Bethesda, Maryland 20814, USA).

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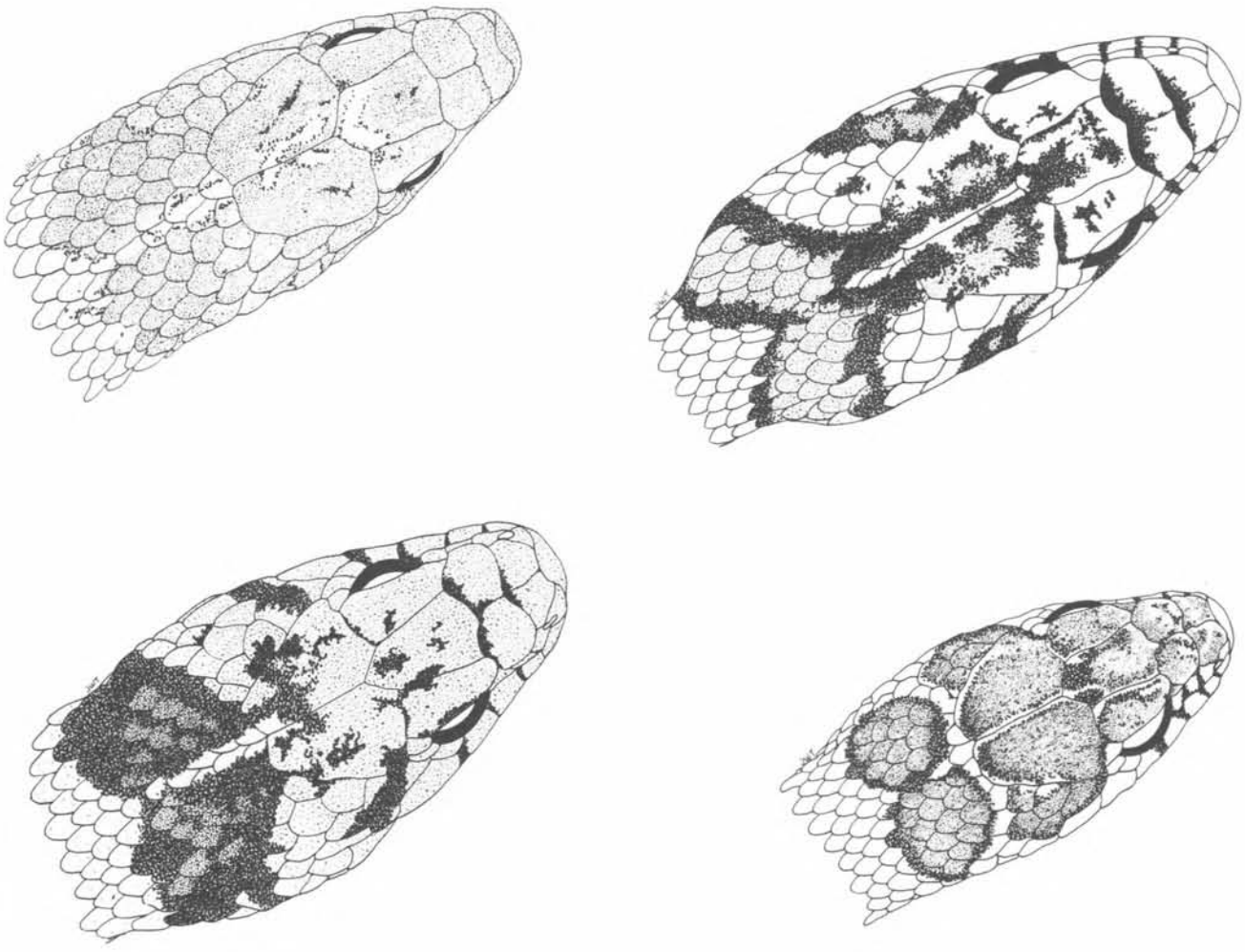
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About the Cover.—The cover illustrations were executed by Jeffrey W. Tamplin, Department of Zoology & Physiology, Louisiana State University, Baton Rouge. Clockwise, from upper left: *Thamnophis exsul* (USNM 166423, holotype: Coahuila); *Thamnophis sumichrasti* (USNM 7079a: Veracruz); *Thamnophis scalaris* (MVZ 144489: Veracruz); *Thamnophis mendax* (LSUMZ 35340: Tamaulipas). Readers interested in the systematics of this group of Mexican garter snakes are referred to the following publication: D. A. Rossman. 1992. Taxonomic status and relationships of the Tamaulipan montane garter snake, *Thamnophis mendax* Walker, 1955. Proc. Louisiana Acad. Sci. 55:1–14.

INSTITUTIONAL PROFILE

Herpetology At The University of Georgia

The University of Georgia is located in the Classic City of Athens, a friendly college town of approximately 90,000 persons (including students) surrounded by a semi-metropolitan to rural area with a population of 160,000. A progressive town with an assortment of interesting restaurants and shops in a pleasant pedestrian-oriented downtown area at the very edge of campus, Athens is recognized world-wide as the Mecca of New Wave music and the downtown is the center of lively clubs, coffee houses, and other entertainment establishments after dark. The city is known for its fine examples of early 19th century antebellum architecture. It boasts two modern hospitals and an assortment of shopping complexes. Bus transportation is readily available throughout the community and on campus. Open rolling hills and forests, with streams and lakes for swimming, canoeing, and fishing are only minutes from town. The University is home to the Georgia Museum of Art and the State Botanical Garden as well as an array of recreation and sports facilities including tennis, golf, racquetball, pools, and intramural fields. Athens is only an hour from Atlanta, host city for the 1996 Olympics, and a major shopping and entertainment center that boasts the fine new Fernbank Museum of Natural History, the Atlanta Zoo, Six Flags, and more. Within a modest drive are the Great Smoky Mountains, the Okefenokee Swamp, and Georgia's Golden Isles, the barrier islands.



Piedmont oak-pine forest

History of Herpetology at the University of Georgia

The University of Georgia is the nation's oldest Land Grant institution, incorporated in 1785. The first modern natural historian associated with the University of Georgia was Eugene Odum, the father of modern ecology. Although Gene's early work focused primarily on birds and mammals, and later, of course, on ecology, several of his students, notably John Crenshaw and Robert Gordon, specialized in herps. Herpetology began in earnest with the arrival of Bernard Martof in the early 1950's. Martof was most noted for his work on salamanders and frogs and his 1956 *Guide to the Reptiles and Amphibians of Georgia*. Martof, along with Don Scott and their students, such as Robert Humphries, were active in developing the significant herpetological collections now associated with the Museum of Natural History. With the arrival of Whit Gibbons at the Savannah River Ecology Laboratory, a unit of the University of Georgia located at the Savannah River Site near Aiken, South Carolina, in 1967, and later Justin Congdon, the Savannah River Ecology Laboratory and the University of Georgia became an acknowledged



PIT-tagging a common kingsnake at SREL

center of herpetological research. Throughout the past 15 years the Savannah River Ecology Laboratory has been recognized for its research in population dynamics and ecology of reptiles and amphibians. Numerous students and postdoctoral research associates who have gone on to careers in herpetology include Harold W. Avery, Miriam Benabib, Laura A. Brandt, Janalee P. Caldwell, David B. Clarke, James O. Farlow, Bruce W. Grant, Trip Lamb, Jeff Lovich, Mary T. Mendonca, Stephen J. Morreale, David H. Nelson, Robert R. Parmenter, Richard A. Seigel, Raymond D. Semlitsch, Edward A. Standora, Anton D. Tucker, and Laurie J. Vitt.

Facilities

The University of Georgia boasts a number of facilities and resources attractive to students and researchers with interests in herpetology. The Savannah River Ecology Laboratory is a permanent research facility with resident faculty of the University of Georgia. Herpetological research facilities include experimental ponds, terrestrial enclosures, holding tanks, electrophoretic and molecular genetics laboratories, reptile and amphibian animal

care facilities, and approximately 300 square miles of protected field sites.

The Institute of Ecology is a multidisciplinary research unit with modern laboratory and computer facilities housed in the Ecology Building on campus. Other significant facilities include the Marine Institute on Sapelo Island, Skidaway Institute of Oceanography, Coweeta Forestry Experiment Station in North Carolina, and the Horseshoe Bend Research Site in Athens. The University is an active participant in the Organization of Tropical Studies in Costa Rica and Highlands Biological Station in Highlands, North Carolina. The University of Georgia Museum of Natural History is a major repository maintaining extensive research collections in numerous areas including approximately 25,000 herps from Georgia and the Southeast. Specific requests for information are welcome at any time. Admission to the collection is by appointment only; attendees of the SSAR/HL 1994 meeting wishing to visit the collection must schedule a time in advance. For more information please contact the Collections Manager, Elizabeth McGhee (tel. 706-542-3940). A listing of the Museum's herpetology holdings can be found on the University of Georgia's Gopher computer, which can be used by any computer that has Internet access (gopher.uga.edu). The University of Georgia Library, with more than 3 million books, is one of the largest in the nation, and subscribes to 96% of all biological and chemical publications covered in *Current Contents*. On-line computer services provide the capacity to search over 500 data bases from any computer on campus. Other University facilities include a CDC Cyberplus 960 and IBM mainframe 3090, Center for Advanced Ultrastructural Research, Molecular Genetics Instrumentation Facility, and Biological Sequence/Structure Computation Facility, among others.



Experimental ponds at SREL

Academic Programs

The Biological Sciences are particularly well represented at the University of Georgia. Departments offering undergraduate and advanced degrees include Biochemistry, Botany, Entomology, Genetics, Microbiology, and Zoology, as well as the School of Ecology and the School of Forest Resources. The majority of students and faculty with an interest in herpetology have been associated with either the Department of Zoology, the Institute of Ecology, or the Savannah River Ecology Laboratory. Traditionally, academic degrees have been awarded through Zoology (M.S. and Ph.D.) or the Graduate Program in Ecology (Ph.D.). As a result of recent recognition of the Institute of Ecology as the School of Ecology and its reorganization as an academic unit, most of the ecological, organismal, and systematics teaching and research programs associated with the former Department of Zoology have now been transferred to the School of Ecology. Researchers and students here have broad interests in population and community ecology, conservation biology, marine, freshwater and thermal ecology, tropical and temperate forest ecology, as well as traditional areas of organismal and systematic biology.



Rushing stream at Highlands Biological Station.

University Faculty Research Programs

John Avise (Professor, Department of Genetics)—John's interests include the evolutionary genetics and ecology of natural populations, especially the processes governing the distribution of genetic variability within and among species. His approach is largely empirical and utilizes information obtained from morphology, protein variation, and especially mitochondrial DNA heterogeneity. His research topics range from microevolutionary problems of population structure analysis to macroevolutionary concerns relating to speciation and phylogenetic reconstruction. While John's work encompasses a variety of vertebrate and invertebrate groups, many of his papers have focused on amphibians and reptiles.

Brian R. Chapman (Assistant Professor, School of Forest Resources)—Most of Brian's recent research has focused on the ecology of both birds and mammals, but he has also conducted status surveys for threatened and endangered amphibians in several states. He has several current projects involving the effects of forest management practices on reptiles and amphibians in Georgia.

Justin Congdon (Senior Research Ecologist, SREL)—Justin's interests are in the broad area of evolutionary ecology. His research focuses on physiological and bioenergetic processes



Eastern glass lizard and eggs.

that shape life history traits and, in addition, on the population biology of long-lived organisms.

Nat B. Frazer (Associate Director, SREL)—Nat's early research focused on the ecology and demography of loggerhead turtles and eventually moved to modeling life history patterns of other sea turtles. At SREL he has been primarily involved in the demography and basic ecology of freshwater turtles, including the preparation of life tables using long-term data bases.

J. Whitfield Gibbons (Professor of Ecology, SREL)—Whit's research interests center around studies on life history, demography, and ecology of reptiles and amphibians, especially freshwater turtles; these include studies on longevity and aging phenomena in reptiles, patterns of herpetofaunal biodiversity, and responses of herpetofauna to stress phenomena associated with energy technologies and industrial activities.

Chester Karwoski (Professor, Department of Psychology)—Chet specializes in cellular physiology in amphibians and reptiles in response to environmental stimuli. His work encompasses circadian rhythm in *Anolis carolinensis* in response to light, retinal cell physiology of *Rana*, and intercellular physiological studies in *Necturus*.

Joshua Laerm (Director, Museum of Natural History)—Although most of Josh's recent work has been with mammals he retains an interest in herps and is presently involved in broad ranging surveys of amphibians in the mountain provinces of Georgia.

Jim Richardson (Adjunct Research Professor, Institute of Ecology)—Jim is widely recognized for his work on marine turtles. His particular research interests are in population ecology and management of turtle populations both regionally and worldwide. Jim has developed long term data bases from nesting records at a number of sites which are critical for long term population monitoring and conservation.

Robert J. Warren (Professor, School of Forest Resources)—Although Bob is widely recognized for his research on deer physiology and reproduction, wildlife contraception, and the effects of predator reintroductions, he is also involved in studies of the impacts of predators and scavengers on the reproductive success of endangered sea turtles.

Graduate Student Research Programs

The research activities of numerous graduate students at the University of Georgia and SREL focus on herpetological questions, including projects by Kathleen Barker (distribution and habitat preferences of montane salamanders in NE Georgia), Kurt Buhlmann (population ecology and conservation genetics of turtles), Vincent Burke (terrestrial activities of freshwater turtles), Robert Fischer (behavior, morphology, and physiology of reptiles), Frank Hensley (energetics of tadpoles), Chris Hudson (genetics and ecology of amphibians), Mark Komoroski (amphibian egg lipid energetics in relation to life history), John Krenz (population genetics and ecology of salamanders), John Lee (winter behavior and ecology of cottonmouths), Mark Mills (ecology of reptiles and amphibians in response to natural and human-caused fires), Joe Pechmann (aquatic and terrestrial density-dependence and long term population dynamics in amphibians), Mary Ratnaswamy (raccoon ecology and depredation of loggerhead and green sea turtle nests), David Scott (life history, demographics, and ecology of salamanders), DeEtte Walker (geographic variation in the mud turtle), Mark Wilson (amphibian retinas), Brian Wunschl (amphibian retinas), Rebecca Yeomans (orientation and homing ability of turtles), Huaiyuan Yu (amphibian retinas).



Common snapping turtles hatching.

JOSHUA LAERM
Museum of Natural History
University of Georgia
Athens, Georgia 30602-1882, USA

and
J. WHITFIELD GIBBONS
Savannah River Ecology Laboratory
P.O. Drawer E
Aiken, South Carolina 29802, USA.

SSAR/HL Meeting Highlights

Dates: 27 July–1 August 1994
Place: The University of Georgia, Athens, Georgia

Keynote Lecture: "The Evolution of Reptilian Viviparity Revisited," by Richard Shine (University of Sydney).

Forum: "Issues in Conservation: Point-Counterpoint." *Moderator*: Robert Jaeger. *Speakers*: Henry Wilbur and S. Bradley Shaffer.

Symposium: "Field and Behavioral Endocrinology." *Organizer*: Diana Hews. *Participants:* Dale DeNardo, Kent Dunlap, Tyrone Hayes, Lynne D. Houck, Rosemary Knapp, Catherine A. Marler, Robert T. Mason, Mary Mendonça, Catherine Propper, Matthew Rand, and Thane Wibbels.

Symposium: "Interfaces Among Inter-individual Variation, Life Histories, and Population Dynamics of Reptiles and Amphibians." *Organizer:* Arthur E. Dunham. *Participants not yet finalized.*

Symposium: "West Indian Herpetology: A Symposium in Memory of Albert Schwartz." *Organizers:* Robert W. Henderson and Robert Powell. *Participants (tentative)*: Karen Anderson, Karen A. Bjorndal, Alan B. Bolten, Hans E. A. Boos, Ellen J. Censky, Brian I. Crother, Mark L. Day, C. Kenneth Dodd, Jr., Karen L. Eckert, Alberto R. Estrada, Richard Franz, Mary Garvin, Carla A. Hass, S. Blair Hedges, Duncan Irschick, Thomas A. Jenssen, Hinrich Kaiser, James D. Lazell, Julian C. Lee, Allen R. Lewis, Jonathan B. Losos, Walter E. Meshaka, Jr., José A. Ottenwalder, Octavio Pérez-Beato, G. Larry Powell, Douglas P. Reagan, Jonathan Roughgarden, Anthony P. Russell, Andreas Schubert, Sharoni Shafir, Margaret M. Stewart, Richard Thomas, Roger S. Thorpe, Peter J. Tolson, Daniel S. Townsend, and Peter Vogel.

Colloquium: "Turtle Biogeography and Phylogeography." *Organizer:* Brian Bowen. *Participants:* Eugene S. Gaffney, S. Bradley Shaffer, Scott Davis, Edward O. Moll, Fredric J. Janzen, DeEtte Walker, Sandra Encalada, Peter Dutton, and Anna Bass.

Herpetological Travelogue Slide Shows: Profusely-illustrated lectures of exotic herps and their habitats.

Multimedia Presentations: "Herps of the West," and "Amphibians of the Appalachians," by David Dennis and Eric Juterbock; "Namesakes of North American Amphibians and Reptiles" (new) by Kraig Adler and David Dennis.

Oral and Poster Sessions: Several concurrent sessions each day.

Student Paper Awards: Seibert Prizes (SSAR) to be awarded to the two best student-presented papers at the meeting ($250 first prize, $150 second prize). The Herpetologists' League Award for Graduate Research is for the best student-authored manuscript; winner receives $500 and ten years back issues of *Herpetologica*.

"The Great Reprint Scavenge" (for students only!). Professionals are asked to clear unwanted duplicate reprints out of their offices (and receive free raffle tickets as a "thank you").

Social Activities: Welcoming Social, the SSAR Annual Auction, Barbecue Picnic, Graduate Student Program ("Graduate School: The Greatest Pit-fall Trap of All") & Social, local tours.

Field Trips: Zoo Atlanta, Savannah River Ecology Lab, Highlands Biological Station, Okefenokee Swamp, and Sapelo Island.

Art Exhibit: Featuring art with a herptile focus. $100 cash award for the art work judged unique and interesting.

Live Exhibit: Featuring herps of the region. Sponsored by Savannah River Ecology Lab.

Costs: Registration $80 student, $115 regular; $160 late registration fee after 20 June. Lodging at Residence Hall (air-conditioned dorms): $13 person/day (double occupancy) and $19 person/day (single occupancy). Lodging at Georgia Center (meeting location) or local Hotel: $45-$51/day (single occupancy) and $52-$55/day (double occupancy).

Further Details: See December 1993 issue of *Herpetological Review* (pages 117–119). Meeting Announcement/Call for Papers will be mailed to all North American members of SSAR and HL in March 1994, or on request from *Amy Edwards, Program Coordinator, Museum of Natural History, University of Georgia, Athens, Georgia 30602, USA (telephone 706-542-4137; FAX 706-542-3920; email AEDWARDS@ZOOKEEPER.ZOO.UGA.EDU).*

SSAR BUSINESS

SSAR Election Results

Results of the recent SSAR election are as follows:

President-elect (to serve as President for 1995): Alan H. Savitzky.

Secretary: J. Eric Juterbock (unopposed).

Treasurer: Karen L. Toepfer (unopposed).

Directors: Janalee P. Caldwell, Paul E. Moler.

Donations Needed For SSAR Symposium

"West Indian Herpetology: A Symposium in Memory of Albert Schwartz," is to be held at the 1994 SSAR/HL meeting. Several of the invited participants living in the West Indies require assistance with travel expenses in order to attend the symposium. Donations are being sought from individuals and institutions to help defray travel costs.

All donations are tax-deductible, and may be made payable to "SSAR–Albert Schwartz Symposium," and mailed to *Dr. Robert Powell, Department of Natural Sciences, Avila College, 11901 Wornall Road, Kansas City, Missouri 64145, USA (tel. 816-942-8400 ext. 2352; fax 816-942-3362).* All contributors will be acknowledged in the symposium program and in any publications emanating from the symposium.

SSAR Symposium Organizers

Individuals organizing symposia for the 1995 or 1996 annual meeting should contact the SSAR Meeting Events Coordinator for guidelines. Please send inquiries to: *Don C. Forester, Biological Sciences, Towson State University, Towson, Maryland 21204, USA. e-mail: In%"E7BFOR@toe.towson.edu", Tel. (410) 830-2385, Fax (410) 830-2604.*

"HERPETOLOGY OF CHINA" *Date of Publication*

Because knowledge of the precise date of publication is important for taxonomic works, we wish to record that our book, "Herpetology of China," was issued on 29 November 1993. Due to unforeseen delays in printing and binding, publication was delayed one month from the date printed in the book.

ER-MI ZHAO
KRAIG ADLER

(For details about price and ordering, see the September 1993 issue of *Herpetological Review*, vol. 24, no. 3, p. 78.—Ed.)

A NEW JOURNAL

Russian Journal of Herpetology

(in English)

Russian Journal of Herpetology is an international, multidisciplinary journal and publishes articles covering both basic and applied research on recent and fossil amphibians and reptiles. All aspects of herpetology including systematics, distribution, speciation, phylogeny, morphology as well as behaviour, ecology, and toxinology of amphibians and reptiles will be presented.

Of particular emphasis is the conservation of species of amphibians and reptiles, their associations and habitats. Although much attention is given to fundamental research, papers devoted to breeding in captivity and propagation of amphibians and reptiles will be welcomed and presented in the special part of the journal.

The ultimate aim of the journal is to provide an effective medium for communication of the latest and best scientific information from the expanding, interdisciplinary, and international scientific community focusing on new methods and ideas in progress and to promote cooperation between Russian and foreign scientific and commercial organizations.

Types of Contributions

- original papers
- invited or contributed reviews on specific topics
- short communications on topics of immediate interest, new methods and ideas in progress
- notices of meetings, symposia and short courses
- book reviews

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Subscription Information

One volume per year, in 2 issues.

Subscription price for 1994:

US$ 80 (for libraries)
US$ 40 (for individuals)
US$ 200 (for promoters).

The single issue price:

US$ 50 (for libraries)
US$ 25 (for individuals).

All inquiries about subscriptions should be addressed to

Folium Publishing Company

58, Dmitrovskoe shosse, Moscow 127238, Russia
Fax (7) (095) 482-5647
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E-mail RJH@FOLIUM.MSK.SU

NEWSNOTES

Southwestern Research Station Volunteer Program

Approximately 20 volunteer positions are open in 1994 at the American Museum of Natural History's Southwestern Research Station in Portal, Arizona. The volunteer program is run annually and offers students in biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging are provided to volunteers in exchange for 24 hours per week of routine chores, with the remaining time available for research activities.

The program is open to both undergraduate and graduate students; the latter may pursue their own research projects. Faculty knowing of promising students should alert them to this opportunity for professional experience toward, development of, and evaluation of their career goals.

Volunteers are needed between 15 March and 1 November. Appointments are for part of this period, with a minimum appointment of six weeks. Applicants for spring positions (March–May) should submit applications by 15 February, summer volunteers (June–August) by 1 April, and fall volunteers (September–November) may apply any time.

For applications, write: *Dr. Wade C. Sherbrooke, Director, Southwestern Research Station, American Museum of Natural History, Portal, Arizona 85632, USA; Tel. (602) 558-2396.*

New Publication

Dumerilia is a new herpetological series published by the Association des Amis du Laboratoire des Reptiles et Amphibiens du Muséum, Paris (AALRAM). The first volume, "Liste bibliographie des Reptiles actuels. I. Chéloniens" (128 pp. by Patrick David) will appear by the end of 1993. Subsequent volumes will cover all reptiles. Each volume in this series of checklists contains: 1) a list of all taxa (species and subspecies) currently recognized as valid within the group covered, by scientific name (with author and date) and English and French common names; 2) a list of selected references for each taxon to direct the reader to the major references; 3) a bibliography for all publications mentioned and a full citation for each publication.

The turtle volume may be purchased for $26 (individuals) and $52 (institutions) from the *AALRAM c/o Patricia B. Zug, Division of Amphibians & Reptiles/mrc 162, National Museum of Natural History, Washington, DC 20560.* Please make checks payable to ALLRAM. Subsequent volumes of *Dumerilia* will be offered at a discounted prepublication price.

Vial Retires As DAPTF Coordinator

Dr. James L. Vial, IUCN/SSC Declining Amphibian Populations Task Force Coordinator since its inception in 1991, has announced his retirement effective 31 December 1993. From a start-up working group of 12 persons, the Task Force now numbers over 1200 collaborators in 91 countries or regions.

The herpetological community is indebted to Jim Vial for his efforts in developing the DAPTF program and helping to establish numerous working groups. Persons interested in obtaining additional information about the DAPTF or its newsletter, *Froglog*, should contact: *Coordinator, DAPTF, EPA Environmental Research Laboratory, 200 SW 35th Street, Corvallis, Oregon 97333, USA. Tel. (503) 754-4798.*

New Turtle Journal

The inaugural issue of *Chelonian Conservation and Biology*, the new scientific Journal of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group and International Bulletin of Chelonian Research, was published in November, 1993. The journal is published by Chelonian Research Foundation with support from Conservation International, Chelonia Institute, NYZS/The Wildlife Conservation Society, Florida Audubon Society, and IUCN (The World Conservation Union) - Species Survival Commission. The journal is co-edited by John L. Behler, Peter C.H. Pritchard, and Anders G.J. Rhodin, with the Editorial Review Board comprising several well-known turtle biologists and conservationists: Indraneil Das, C. Kenneth Dodd, Jr., Arthur Georges, J. Whitfield Gibbons, John B. Iverson, Michael W. Klemens, Jeffrey E. Lovich, Russell A. Mittermeier, Edward O. Moll, David J. Morafka, Ian R. Swingland, Bern W. Tryon, and George R. Zug.

Manuscripts are welcome from any individuals, and are not limited to members of the Specialist Group. Manuscripts may cover any aspects of turtle and tortoise research with an emphasis on conservation or biology. Studies on freshwater turtles and tortoises are of primary interest, but articles on marine turtles are also welcome. Manuscripts dealing with conservation biology, systematic relationships, chelonian diversity, geographic distribution, natural history, ecology, reproduction, morphology and natural variation, population status, and human exploitation or conservation management issues are of special interest. Either full-length original research articles or shorter notes and field reports are welcome. English translations of foreign language articles are potentially of interest. Newsnotes and announcements of interest to the turtle conservation and research community are also welcome. All manuscripts will be submitted for review by the Editorial Staff and selected members of the Editorial Review Board, as well as independent outside peer-review as necessary. Manuscripts should be submitted in triplicate to A.G.J. Rhodin at the address below, preferably accompanied by a computer disk in either Macintosh or IBM format.

Subscription rates are for a full volume of four published issues, with two issues planned per year. Subscription rates are US$ 25 for individuals and US$ 50 for institutions, with a US$ 20 surcharge for Air Mail to foreign addresses. Make checks or money orders payable to Chelonian Research Foundation and remit to: *Anders G.J. Rhodin, Chelonian Research Foundation, 168 Goodrich Street, Lunenburg, Massachusetts 01462, USA.*

Gopher Tortoise Council Research Award

In honor of his numerous contributions to the biology of the gopher tortoise and its sandhill community, the Gopher Tortoise Council has named its student research award the J. Larry Landers Student Research Award. Those wishing to contribute to the fund should send their contributions to Brian Bearwood, Treasurer, Gopher Tortoise Council, P.O. Box 13, Mariana, Florida 32447, USA.

The J. Larry Landers Student Research Award is presented annually to the best student research project concerning the biology of the gopher tortoise, *Gopherus polyphemus*, or any aspects of its sandhill community. Recent awards have averaged $400. Deadline for receipt of proposals to be considered for the 1994 award is 31 August 1994. Students interested in applying should submit a concise description of their project with a detailed budget and a brief curriculum vita to: *Bob Herrington, Research Advisory Committee, Department of Biology, Georgia Southwestern College, Americus, Georgia 31709, USA.*

Summer Course In Larval Amphibian Biology

The Highlands Biological Station, located in the Blue Ridge Mountains of southwestern North Carolina, is offering a course in Larval Amphibian Biology, to be taught by Dr. Richard J. Wassersug of Dalhousie University and guest instructors. This is a lecture, laboratory, and field course addressing a variety of topics on the biology of amphibian larvae. Among the topics to be covered are: the identification of local larvae, the evolution of complex life cycles and metamorphosis, and the feeding behavior of tadpoles and salamander larvae. Assorted aspects of the morphology, ecology, behavior, and population genetics of amphibian larvae that reflect the special interests and expertise of the instructors will be emphasized. Students will conduct individual projects of their own design and execution. Course dates are 6–17 June 1994.

The course is designed for advanced undergraduate and graduate students. Course credit is available from either Western Carolina University or the University of North Carolina at Chapel Hill. For further information and application form contact: *Highlands Biological Station, P.O. Box 580, Highlands, North Carolina 28741, USA. Tel. (704) 526-2602.*

Summer Course In Tropical Diversity

The Organization for Tropical Studies (OTS) will be offering *Tropical Diversity and Conservation* in Costa Rica, 1–23 August 1994. This course is designed to be an intensive, field-oriented introduction to tropical diversity in rainforest, seasonally dry forest, and cloud forest ecosystems. The program consists of orientation walks, faculty-led field research projects, discussions, and lectures. The course will be held in Costa Rica at the OTS-operated field stations in lowland rainforest (La Selva) and seasonally dry forest (Palo Verde), and at a mid-elevation site, Volcán Cacao, in Guanacaste National Park. After one day of orientation and introductory lectures in San José, the class will operate entirely in the field spending one week at each site. The coordinator is Dr. Maureen Donnelly, University of Miami. Enrollment is limited to 22 persons. Past participants have ranged from advanced undergraduates to established biology faculty seeking an introduction to tropical biology. The application deadline is 15 April 1994, with selection announcements to be made by 15 May 1994. For further information, including costs and other admission criteria, or to apply, contact: *Organization for Tropical Studies, Box 90630, Durham, North Carolina 27708-0630, USA. Tel. (919) 684-5774, Fax (919) 684-5661.*

MEETINGS

Aquatic Fauna In Peril: The Southeastern Perspective

The Tennessee Aquarium is sponsoring a conference to be held 31 March–1 April 1994 in Chattanooga, Tennessee. The purpose of this two-day meeting is to focus on the problems facing the imperiled aquatic fauna of the southeastern United States. It will provide a thorough historical review of the imperiled aquatic animals of the Southeast as well as a review of the management efforts aimed at conserving and restoring these faunas. Presentations will also address the management of aquatic ecosystems in the Southeast, the roles of government and the public in aquatic conservation, and the formulation of a unified practice of resource management. Sessions are scheduled that specifically address imperiled amphibians and reptiles and their management. For further information contact: *Tennessee Aquarium, Attn. Janet Allen, P.O. Box 11048, Chattanooga, Tennessee 37401, USA. Tel. (800) 262–0695; FAX (615) 267–3561.*

17th Annual AFHC

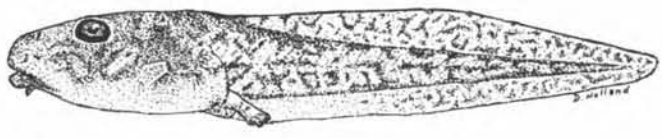
The All Florida Herpetology Conference will be held 9 April 1994 at the University of Florida in Gainesville. The Florida Museum of Natural History and Gainesville Herpetological Society are co-sponsors. Morning talks are devoted to conservation and natural history, with afternoon talks concerning captive breeding of amphibians and reptiles. Two disease prevention workshops, as well as a young herpetologists' workshop, wil be held concurrently. "Maintaining Collection Security" will be the topic of the late afternoon talks and panel discussion. An evening barbecue will be held at the museum. To pre-register, call or write to *Dr. David L. Auth, Division of Herpetology, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA. Tel. (904) 392-1721.*

Wildlife Water Development Symposium

The Water for Wildlife Foundation is sponsoring the second Wildlife Water Development Symposium to be held at the University of Wyoming, 27–29 April 1994. The primary focus of the workshop will be to provide a forum for discussion and presentation of work and ideas regarding the state of the art of wildlife water developments. Topics to be covered in the workshop will include: Recent Developments in the Field of Wildlife Water Development; Developing Low Maintenance Water for Wildlife; Developing Wetlands and Riparian Areas to Provide Water to Wildlife; Management of Water Developments for Wildlife; Maximizing Multiple Use Options; Optimizing Habitat Values in Association with Water Developments; Utilizing Produced Water from Industry and Agriculture for Water Developments for Wildlife. For further information contact: *Susan Powell, School of Extended Studies & Public Service, University of Wyoming, P.O. Box 3972, Laramie, Wyoming 82071-3972, USA. Tel. (800) 448–7801.*

Herpetology Weekend

The U.S. Forest Service, Kentucky State Parks, and Kentucky Department of Fish & Wildlife Resources are sponsoring a Herpetology Weekend, 8–10 April 1994 at Natural Bridge State Park in Slade, Kentucky. Presentations will be made by Jim Harrison (Miami Valley Serpentarium), Dave Dennis (Ohio State University), and Sherman Minton (Indiana University). Activities will include field trips, night hikes, photo opportunities, and a tour of the Miami Valley Serpentarium. Programs start at 8:00 p.m. on Friday, 8 April at the Activities Center at Natural Bridge State Resort Park. For additional information contact: *Natural Bridge State Park, tel. (606) 663-2214 or (800) 325-1710, or the Stanton Ranger District, tel. (606) 663-2852.*



IN MEMORIAM

Howard Kirke Swann (1919–1993) Bookseller Extraordinaire

Wheldon and Wesley Ltd., the largest dealer specializing in natural history books, celebrated its 150th anniversary in 1990. The company has had a longstanding and well-deserved reputation for integrity and service to an international clientele, a stature that was personified by the company's chairman, H. K. Swann, who died at the age of 74 on 27 October 1993. Howard was known to several generations of herpetologists throughout the world for his careful attention to their library-building needs and he was a generous host to those who visited Wheldon and Wesley's establishment, which since 1957 has been located in the rolling English countryside north of London, almost halfway to Cambridge. Besides bookselling, Howard was involved in book publishing, including reprints of scarce classical works such as Boulenger's British Museum catalogues, the herpetological volume in Anderson's "Zoology of Egypt" series, and Jan and Sordelli's great atlas of snake illustrations. Howard was also the editor for the revised edition of Pitman's "Snakes of Uganda," which was published by Wheldon and Wesley in 1974.



Howard had a boyhood interest in natural history, particularly birds, and although he qualified for entry at Oxford to read classics, he soon entered the army, was captured by German troops shortly before Dunkirk, and spent five years as a prisoner of war. The latter gave him the opportunity to learn German well; indeed, he had a particular facility with foreign languages, including Japanese which he decided to learn quite late in life. After the war, together with his older brother, C. K. Swann, he joined Wheldon and Wesley, a firm that their father had entered in 1904. Howard's amateur interest in natural history was a convenient entrée to the company's line of business and he maintained that interest throughout his life. Among other posts, he held offices in the Hawk and Owl Trust and the Society for the History of Natural History.

Howard's knowledge of books and authors was encyclopedic. Searching through the company's storerooms I often found interesting but incomplete fragments of books—often just a few pages or plates—for which Howard invariably knew all the details about author and title at a moment's glance (and which I could then check later against complete copies). On other occasions I appealed to Howard for help in completing the new introductions to volumes in the SSAR *Facsimile Reprints in Herpetology* series or for biographies in the book "Contributions to the History of Herpetology." Sometimes this involved obscure bibliographic details that are simply unavailable in any existing reference books. Howard's replies were always prompt (he relished the challenge) and often were accompanied by relevant original material that he ferreted out of the enormous accumulated stocks at Wheldon and Wesley's. This scholarly interest in the business is unusual in booksellers today and, together with his friendly nature, will be greatly missed by me and the many others who were privileged to know him.

KRAIG ADLER
Cornell University
Division of Biological Sciences
Ithaca, New York 14853, USA.

ARTICLES

Body Color Polymorphism In The Snake *Trimeresurus flavoviridis* On Okinawa Island, Japan

Some snake species show intrapopulation variation in pattern type or body color, but there are few studies that describe color frequencies (Camin and Ehrlich 1958; King 1987) or that analyze the mechanisms of color determination (Zweifel 1981). On Okinawa Island, the habu, *Trimeresurus flavoviridis* (Viperidae), exhibits a polymorphism in dorsal body color (Takara 1962). Most have a yellow ground color, although a few are white. In this paper we quantify the frequencies of the two morphs in mother/offspring groups and present evidence on the mechanism of color determination.

Two-hundred forty hatchlings and 67 full-term embryos were obtained from eggs laid by 55 females collected on Okinawa Island from 1981 to 1992. The eggs of most hatchlings were incubated at a fluctuating temperature in individual containers. The snakes were classified as yellow or white, with the exception of three adults that were intermediate in color.

Yellow individuals were most common: 49 of 55 adults (89%) were yellow, three adults (5.5%) were intermediate, and three adults (5.5%) were white. We obtained no clutches containing only white offspring. Five clutches included both white and yellow young; 49 clutches included only yellow progeny; and the single yellow offspring of a white female could have represented either condition (and is excluded from further consideration). There appeared to be an association between maternal and offspring color: 47 of 49 clutches (96%) of yellow mothers were all yellow, as were 2 of 3 clutches (67%) of intermediate mothers, and 0 of 2 clutches of white mothers. The other five clutches included both white and yellow offspring, with approximately equal numbers of each color in each clutch (Table 1).

TABLE 1. Composition of clutches containing both white and yellow offspring.

Maternal color	Clutch size*	Number of Individuals	
		Yellow	White
Yellow	7	4	3
Yellow	5	2	3
Intermediate	9	4	5
White	9	3	6
White	5**	2	2
Total	35	15	19

* Number of fertilized eggs.
** One embryo died early in development.

TABLE 2. Observed and expected color frequencies in the progeny under two hypotheses of genotypic color determination.

Condition	Frequency	Observed (%)	Hypothesized Dominant	
			White Expected (%)	Yellow Expected (%)
Yellow mother: mixed clutches/ all clutches	2/49	4.1	5.8	17.9**
white hatchlings/ all hatchlings in mixed clutches	6/12	50.0	50.7	28.4*
White mother: mixed clutches/ all clutches	2/2	100.0	100.0	42.8*
white hatchlings/ all hatchlings in mixed clutches	8/13	61.5	54.0	56.8

* $P = 0.1$;
** $P < 0.05$ (Fisher's exact test); other expected frequencies were not significantly different from the observed ($P > 0.1$).

The frequency of white individuals in the maternal generation was 5.8% (excluding intermediates from the sample). If body color is determined genotypically at a single locus, and the white allele is dominant, the white allele frequency in the maternal sample would have been about 2.9% (half the alleles in the white mothers). If body color is genotypically determined at a single locus, but the white allele is recessive, the frequency of the white allele would have been about 24% (all alleles in white specimens and half of the alleles in presumed heterozygotes). The observed color frequencies in the progeny closely conform to the values expected under the dominant white allele model (Table 2). Thus, ground color in *T. flavoviridis* in Okinawa may be determined by a single locus, with a relatively rare (about 3%) dominant white allele.

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POINTS OF VIEW

Iguanians And The Cladistic Party Line

Frost and Etheridge (1993) have mistaken what is "the most controversial aspect of cladistics," or at least the most important difference between cladistics and evolutionary systematics. That aspect or difference is in how we perceive and understand relationship. For Hennig (1950), relationship was absolutely and unequivocally nothing more than the inverse of relative lineage age: time, and time alone, distances relationship. Thus, if one can construct a dendrogram of the temporal sequence of lineage branching events, that would—for Hennig and the cladists—be a precise picture of relationship. Hennig's "relationship" is a property of organismal lineages precisely equal to the inverse of lineage age.

For the evolutionary systematist, relationship is ever-so-much more complex. We hope for a system that codifies evolution, and we immediately see that evolutionary rates and roles are enormously variable in time. I would go so far as to say that no two lineages evolve at the same rate during any given period of time, and that no single lineage evolves at the same rate during all of its earthly tenure.

Thus, while an accurate dendrogram of the temporal sequence of branching events would be a very useful component of relationship assessment, it could never—for the evolutionary systematist—be the whole picture.

The origin of higher taxa is a problem for all systematists. All valid genera, for example, must originate as single species. During their tenure in monotypy, then, novel genera do enjoy the same objective reality as other biological species. As soon as a genus becomes polytypic, however, it becomes an abstraction: a word, not a thing.

The cladistic form of taxon definition, "*Novogenus* consists of *N. primus* and all of its descendents," confronts all systematists (not just cladists) with the uncomfortable fact that *Novogenus primus* was, in very real and meaningful ways, more closely related to its immediate ancestors in *Oldogenus*, and probably some other species in *Oldogenus*, than it is or will be to some of its descendents. The cladistic solution is to elevate every member of *Oldogenus* to the rank of an independent, new genus at the instant any one of them becomes differentiated enough to merit such status.

How does this inform us of relationships? How is the relationship of species A to species B altered by evolutionary events—no matter how major—in independent lineage C?

Cladistic methodology is no more objective than that of qualified, educated, evolutionary systematists. The cladist selects characters subjectively, decrees their polarity subjectively, and subjectively assigns them weight or value (most irrationally when all are decreed precisely equal).

Frost and Etheridge (1993) state that "leading systematists" cleave to the cladistic party line. Maybe so, but that begs many questions: leading in what sense? Number of new names coined for old taxa? Number of pages published divided by number of new facts presented (ah, but division by zero is impossible). Whom do they lead? Where do the followers get led to in terms of understanding evolution?

I love cladograms. I think they are sometimes a great help in trying to understand relationships. I often, however, suspect they are far more invented than "recovered." I note that different sets of characters almost invariably produce different cladograms (because different sorts of characters evolve at different rates within and between lineages, of course). I acknowledge that,

given X different cladograms for a group, X-1 of them *Have to be wrong*. I question that making consensus cladograms out of X-1 certainly wrong trees and maybe one right one has much to do with science or reality. . . .

What has all this to do with the Iguania? Practically nothing. Frost and Etheridge did not produce an unequivocal, compelling iguanian cladogram. The characters they used were mostly just modal differences or features demonstrably plastic and variable. Even if the groups they proposed really were based on a correct understanding of the temporal sequence of events, that would not necessitate giving them formal nomenclatural status as families.

Chaos has been generated and, sadly, will long reign.

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In Response To Bringsøe On The Inclusion Of *Dendrobates* And *Phyllobates* In Appendix II Of CITES

Bringsøe (1992) described what he viewed as the total lack of logic behind adopting all members of the genera *Dendrobates* and *Phyllobates* into CITES Appendix II. He argued that this is "unjustified" and it "impugns the reputation of the Convention." He continued to state that the only possible course of action to correct this embarrassing issue was to remove both genera from CITES immediately arguing that no species of Dendrobatidae is considered threatened or endangered.

Arguing for the removal of any taxon from CITES II because there are no threatened populations is entirely circular. CITES II taxa are defined as "all species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in order to avoid utilization incompatible with their survival" and "other species which must be subject to regulation in order that trade in specimens of certain species . . . may be brought under effective control." CITES I is for taxa that are presently endangered or threatened.

Bringsøe argues that inclusion of the entire genus into Appendix II is unnecessary as most species can be readily recognized and confusion should be rare. Although I have little experience with specimens of *Dendrobates* and *Phyllobates* in captivity, I have dealt with many different species of Boidae, *Iguana, Phelsuma, Cordylus, Varanus*, and Chamaeleonidae, all of which are protected under CITES Appendix II and most of which can be readily distinguished from congeners. The only exception noted for these taxa is that some species are CITES I; again, those taxa are readily recognized. Nevertheless, their trade is regulated under Appendix II to help curtail endangerment of species in the future. Yet, they are still imported as are *Dendrobates* and *Phyllobates*. It seems to be customary for CITES to list a higher taxon, such as an entire genus, under Appendix II if there is a high demand for trade in members of that taxon, such as *Phelsuma* in the pet trade, or *Varanus* in the skin trade. To insist upon the removal of any taxon from Appendix II when there is a clear trade market for that taxon is questionable. Bringsøe points out that dendrobatids are locally quite abundant in parts of the New World tropics. Yet it seems that the removal of any taxon from CITES II on the basis of local abundance is shortsighted. While no dendrobatid is currently listed as endangered or threatened, the habitat in which they occur could easily be listed as such and continued trade could put unnecessary pressure on those populations.

Bringsøe points out there is no evidence of range contractions in historic times for dendrobatids. However, in recent years *Dendrobates* have increased in popularity in the live animal trade (Bertram 1989). This increase in trade has almost certainly created a new pressure for existing populations. Therefore, the lack of evidence of range contraction in historic times seems to be a moot point. The question is, could trade lead to range contractions in the future?

Lastly, Bringsøe states that Charles Myers (American Museum of Natural History) collected 7600 *Dendrobates histrionicus* from a single population over a four-year period with no detrimental effects seen in the population. Bringsøe uses this study as an example of the resilience of dendrobatids. Furthermore, he states that the number of specimens Myers collected greatly exceeds the number of *Dendrobates* imported into the U.S. during 1985. However, the data are not available to support this claim. *Dendrobates* and *Phyllobates* were not listed on CITES until 22 October 1987. Therefore, the exact number of dart frogs imported during 1985 is not known by the U.S. Fish and Wildlife Service Office of Management Authority. Nevertheless, since these genera were listed, the number of live individuals imported has steadily increased with a peak of 1405 individuals in 1989 (55 of which were captive born in the Netherlands). Between 1987 and 1991 a total of 2372 (95 captive born) individual dendrobatids were legally imported. Whether the number imported in 1985 was less than 7600 cannot be verified. Having the family listed under CITES has at least made determining the number of specimens imported annually a simplified matter.

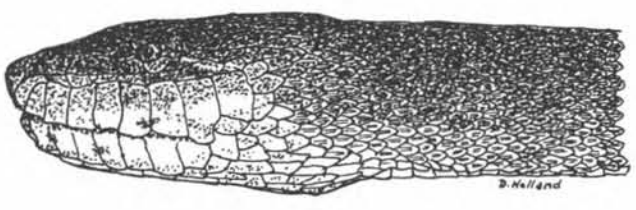
In short, I see nothing wrong with listing all species of *Dendrobates* and *Phyllobates* in CITES Appendix II so long as there continues to be a demand for them in the live animal trade. If such a time should come when they are no longer in demand, then perhaps a reduction in CITES status would be warranted. However, at present, removing *Dendrobates* and *Phyllobates* from CITES Appendix II would be counter-productive.

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TECHNIQUES

Nonlethal Blood And Muscle Tissue Collection From Redbelly Turtles For Genetic Studies

There is increased interest in the development of nonlethal procedures for collecting blood and muscle tissue samples from fish and wildlife populations for genetic studies, particularly for endangered species (Smith et al. 1976). A variety of nonlethal blood collection techniques have been described for turtles (see Dessauer 1970; Frye 1991), ranging from relatively invasive cardiac puncture (Maxell 1979; Stephens and Creekmore 1982) to less invasive venapuncture of surface veins such as jugular (Jacobson et al. 1992), scapular (Avery and Vitt 1984), ventral caudal (Powell and Knesel 1992), and dorsal coccygeal (Samour et al. 1984). Collection techniques for muscle and other tissue samples from turtles range from killing the animal to taking samples from toe and tail clips. Because of their unique anatomy, turtles present challenges in both sample collection and restraint. Unlike birds and mammals, visualizing and stabilizing surface veins of turtles is difficult. It also often requires two handlers to collect a blood sample and/or mechanical restraint devices (Powell and Knesel 1992). While these techniques work well in laboratory or clinical situations, they are sometimes difficult to apply under field conditions, particularly when only one researcher is available. We present an alternate restraint technique that is easily used in the field and requires only one individual to both restrain the turtle and collect samples. We also discuss collecting blood from the dorsal coccygeal vein at a specific location, and a standard surgical procedure for taking muscle biopsies. These techniques were developed on redbelly turtles (*Pseudemys rubriventris*), but should be applicable to other freshwater turtle species.

Restraint.—To restrain redbelly turtles, we used four small rags (or paper towels) and one standard sized bath towel. Small rags were rolled into balls and placed into the cavities formed behind each leg when they are in complete flexion (i.e., withdrawn into the shell); rags were slightly larger than the size of the cavity. The pressure provided by these rags replaced digital pressure that would ordinarily be supplied by a second handler. We loosely wrapped the bath towel around the front half of the turtle to prevent visual stimulus, leaving the back half exposed. Both techniques resulted in passivity. To have both hands free to collect blood and muscle tissue samples, we placed the turtle between our legs with its head facing downward and carapace directed away from the handler's body. The turtle's head was then forced into its shell by gently placing it against a hard surface, such as the ground. With the turtle firmly grasped between our legs in this manner, both hands were left free—one to hold the tail and one to collect the samples.

Blood Collection.—After restraining the turtle, we collected blood by firmly grasping the turtle's tail with a gauze sponge for traction, pulling the tail out in straight-line extension, and flexing it over the plastron at a 90° angle. With the tail in this position, the turtle offered little resistence. We then collected a 1–3 ml blood sample from the dorsal coccygeal vein directly into syringes that were coated with sodium heparin (USP 1000 units/ml; ELKINS-SINN, INC.); however, lithium heparin is currently the recommended anticoagulant for reptiles (Jacobson et al. 1992). For small (<100 mm greater carapace length) turtles (N=60) we used a 1 ml syringe with a beveled 23 or 25 gauge needle; for large (>100 mm greater carapace length) turtles (N=140) we used a 3 ml syringe with a 21 gauge beveled needle. When a 3 ml syringe was used on small turtles, too much suction was created and the vein collapsed.

We discovered certain landmarks and positions that facilitated locating the dorsal coccygeal vein. First, the needle was inserted slightly to the right (or left) of the spinous process of the first or second caudal vertebrae at a 45° angle. Second, the tail must be fully extended before flexing it over the plastron and the vertebral spinous processes should be symmetrical. Finally, the needle should just touch the spinous process and then be backed off very slightly. Once blood appears, gentle suction that mimics the pulsating flow of the venous sinus should be applied for the duration of blood collection.

Muscle Plug Collection.—Before taking the muscle biopsy, we always instituted a local anesthetic nerve block at a site about 2 cm distal to the base of the tail midway between the spinous and transverse vertebral processes. Approximately 0.03 ml of a 0.1% lidocaine HCl solution (Burns Vet. Supply, Oakland, California) was injected into the muscle at five places to form a circle around the biopsy site. We tested whether anesthesia was present by pinching the site with forceps; if the turtle reacted, we injected additional lidocaine.

We followed standard aseptic surgical techniques (Knescht et al. 1981) by scrubbing the tail with betadine scrub and then liberally applying betadine solution (Purdue Frederick Co., Norwalk, Connecticut), followed by ethyl alcohol. The skin was picked up with forceps, and a longitudinal 1 cm incision was made through the skin using straight-straight scissors. The exposed flexor caudae lateralis muscle was then lifted up with the forceps, and a 1–2 mm longitudinal wedge was cut. After taking the muscle sample, the biopsy site was lavaged with 10% betadine solution and the skin sutured with 4-0 monofilament nylon (ETHICON) in an interupted pattern (Knescht et al. 1981). This standard surgical technique offers a safer approach than using a scalpel by reducing the possibility of cutting the muscle too deeply or severing a blood vessel.

After sample collection, all turtles were returned to their respective ponds of capture with the exception of turtles that were biopsied. These turtles were held overnight to ensure no systemic anesthetic effects before release.

We collected 200 blood and 40 muscle tissue samples from Massachusetts and New Jersey redbelly turtles for genetic studies during June and August, 1991. We observed no mortalities as a result of sample collection. Further, in August we recaptured two New Jersey turtles that had biopsies taken in June; both turtles' incision sites were completely healed with no observable signs of infection. Currently, we are using these same techniques to collect samples from spotted turtles (*Clemmys guttata*) for genetic studies.

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Suggestions For Handling Museum Specimens Of *Phrynosoma* (Iguania, Phrynosomatidae)

Horned lizards, genus *Phrynosoma*, are among the most unusual of desert lizards because of their peculiar squat habitus and spiny armament. The cephalic horns vary in number, size, and orientation among several species, and therefore are diagnostically important. Also, geographic variation in horn size is apparent among populations of some species (e.g., *Phrynosoma douglasi*). Further studies of the cephalic horns of these lizards may reveal interesting information about ontogenetic and clinal (altitudinal and latitudinal) patterns of variation.

Museum specimens of horned lizards have been utilized extensively for systematic and ecological studies over the past few decades. Inevitably, preserved specimens have sustained some damage during handling. The tips of the occipital and temporal horns are especially susceptible to breakage when a specimen is placed (ventral side up) on the hard surface of a laboratory table during dissection or to take measurements. In a sample of 158 specimens known to have been used in previous studies, 71 (45%) sustained damage to the horns. The damage was more severe in specimens which had been dissected compared to those which had not. Unfortunately, such damage renders the specimen less useful (or useless) for studies of ontogenetic, geographic, and clinal variation in the length of the cephalic horns. I offer several suggestions to minimize the damage to *Phrynosoma* specimens during study and routine handling for packing and shipping.

A specimen selected for dissection, measurement, or study of the ventral squamation should be placed on a small Styrofoam platform (Fig. 1). The horns of the specimen will pierce the Styrofoam and the platform will support the specimen without damage to the horns. In order to be effective, however, the thickness of the Styrofoam must exceed the length of the horns. The most problematic species are large *Phrynosoma asio* and *P. cornutum* because their horns are quite long and have an upright orientation. In any case, I have found that a thickness of 17 mm (11/16 inch) is more than adequate for even the largest horned lizard. I routinely use a platform when taking measurements or studying preserved specimens under a dissecting microscope. A shallow, covered tray containing alcohol can be used to periodically moisten specimens during study. Live horned lizards used for simple surgical procedures in the laboratory, or field collected for taking snout-vent and tail length measurements, can also be placed on Styrofoam. I have found this material to be safe and effective during restraint of the lizard. A Styrofoam platform can be fashioned from the walls of a Styrofoam cooler, or obtained from insulated shipping containers. The latter often have square or rectangular pieces of suitable size.

Museum specimens packed for shipment are typically wrapped in cheesecloth, rolled, soaked in alcohol, and placed in plastic bags. Damage to the specimens during this process can be minimized by laying the specimens ventral side down on the cheesecloth. When the specimens are rolled into a bundle on the table top, the horns of the lizards will face inward and are less likely to contact the hard surface of the table, thereby avoiding potential damage. A series of specimens rolled in such a manner is also less likely to puncture the plastic bag and cause leakage of alcohol. Specimens of similar size should be bundled together as this will more effectively protect the horns than if specimens of mixed sizes are wrapped together.

Finally, the horns of preserved *Phrynosoma* can be damaged when the specimens are removed and returned to museum storage jars. They should, accordingly, be removed and replaced with care. Specimens which are situated against the glass sides of the jar are more susceptible to damage than those in the center. They should be oriented so that the ventral surface, rather than the spiny dorsal surface, is against the glass.



FIG. 1. A Styrofoam platform (19.5 x 19.5 x 1.7 cm) used to support *Phrynosoma* specimens during morphological study. Photograph courtesy of David H. Lewis.

Specimens in museum collections are an important resource for scientific research and public education. Museum specimens are becoming increasingly difficult to replace as more biological populations are lost through habitat destruction, and the enactment of protective legislation restricts the further collecting of threatened and endangered taxa. These considerations should be kept in mind when borrowing specimens for study.

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An "Easy" Method To Remove Common Snapping Turtles (*Chelydra serpentina*) From Legler Hoop Traps

The Legler hoop trap (Legler 1960) is widely used to trap aquatic turtles. This trap and modifications of it utilize narrow openings ("throats") that can be fixed in size by tying off the throat loop which allows standardization of trap throat size. Once set, the throats cannot be easily untied to remove turtles. Consequently, turtles can only be removed by pulling them back through the narrow throat opening. With turtles of the genera *Chrysemys, Trachemys, Kinosternon*, etc., this is a simple task. However, clearing a trap can become difficult, dangerous, and time consuming with large specimens of the common snapping turtle (*Chelydra serpentina*). These large turtles defend themselves with alacrity and strike at any moving object, including the researcher or other turtles inside the trap at the time. A single bite can cause death or serious injury to smaller turtles caught along with the *C. serpentina*.

During the 1992 field season, I had much practice removing these animals from Legler hoop traps and a method evolved which made this task much easier and safer to accomplish. I have not seen this method in use anywhere else nor have I seen it described in the literature. Because this method makes removing *C. serpentina* from traps quicker, easier, and safer for the researcher and the other occupants of the trap it is described here.

After recovering and collapsing the hoop trap, it should be placed so that one of the throats is on the substrate and the other is on top of the resulting pile of hoops and turtles. The researcher then reaches through the upper throat and grasps the tail and posterior edge of the carapace of the first *C. serpentina* to be removed. The turtle is then upended with the head of the turtle down and with the plastron facing the researcher. With the turtle in this vertical orientation, it should be slowly pressed down upon the substrate (the ground if ashore, the bottom if in shallow water, or the deck if in a boat). In this manner, the head of the turtle is forced to withdraw into the carapace. Once the anterior part of the shell is flush with the substrate, the hind limbs of the turtle should be grasped with one hand so that the claws of each foot face one another. The researcher's other hand can then easily work the throat over the back of the carapace and down to the anterior portion of the carapace until all but the anteriormost part of the carapace is free of the netting. At this point, the turtle with the plastron facing the researcher is lifted free of the substrate. Because the turtle extends its head and neck out and towards the researcher at this point, the turtle is completely freed of the net except for the forelimbs. These can then be shaken loose from the netting. If more than one *C. serpentina* is in the trap, the carapace of the individual being removed should be rotated so that the carapace faces any other *C. serpentina* in the trap. Not only does this shield the researcher from the attentions of other *C. serpentina* but it protects the individual being removed from injuries inflicted by strikes of the other *C. serpentina* in the trap. Using this method, *C. serpentina* can be rapidly removed from traps with little risk of injury to the researcher or to the other turtles in the trap.

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Tracking Small Animals With Thread Bobbins

Identifying the specific pathways of animal movements may be useful when trying to determine microhabitat and resource use (Dodd 1992), behavioral responses to habitat structure, and/or nesting sites of secretive animals. A technique that has been used to follow the direct routes taken by animals in the field is the spool-and-line tracking method (e.g., Broughton and Dickman 1991; Miles et al. 1981). Previously, this technique incorporated a rotating spool of thread that was attached to the animal on a trailing device which allowed the spool to unwind as the animal moved (Miles 1976). The method was improved by using a quilting cocoon of thread (cocoon bobbins) which allowed the thread to unwind from the center of the spool rather than rotate off the outside of the spool (Miles et al. 1981). Researchers using spool-and-line tracking enclose the thread bobbins in some type of container, such as plastic tubing. This type of encapsulation of the thread bobbin adds considerable weight and bulk which may overburden or hinder free movement of small animals. Also, it has been difficult to find a readily available source for obtaining the bobbins in the U.S.

Here, I provide the address of a U.S. company that currently manufactures thread bobbins and information on a quick and easy method of encapsulating them that adds very little weight or bulk. Bobbins can be purchased from Culver Textiles, P.O. Box 360, West New York, New Jersey 07093, USA (tel. 800-526-7188 or 201-866-6200 in New Jersey). Currently, two sizes of thread bobbins are available from Culver Textiles: a small bobbin that is 4 cm long and 1 cm wide and weighs approximately 1.8 g uncoated and 2.3 g coated; and a large bobbin that is 5 cm long and 1.5 cm wide and weighs approximately 4.5 g uncoated and 5.3 g coated. I encapsulate the thread bobbins in the following way: (1) I pull about a meter of thread from the center of the bobbin to ensure that the thread line is free-moving. (2) I wrap the bobbin in clear plastic wrap (e.g., Saran Wrap™), twist it at the bottom of the bobbin, and tape it to the side of the bobbin (Fig. 1). (3) Using forceps, I hold the protruding plastic wrap from the thread end of the bobbin and dip the bobbin in plastic dip (Plasti Dip™, used for dipping tools, is available in several colors in most local hardware stores). (4) I place the coated bobbin on a piece of waxed paper and allow it to dry. The flat surface that is formed while the bobbin is drying facilitates attachment of the bobbin to the animal (especially turtles). I have used this technique successfully in tracking striped mud turtles, *Kinosternon baurii*, to their nesting sites.

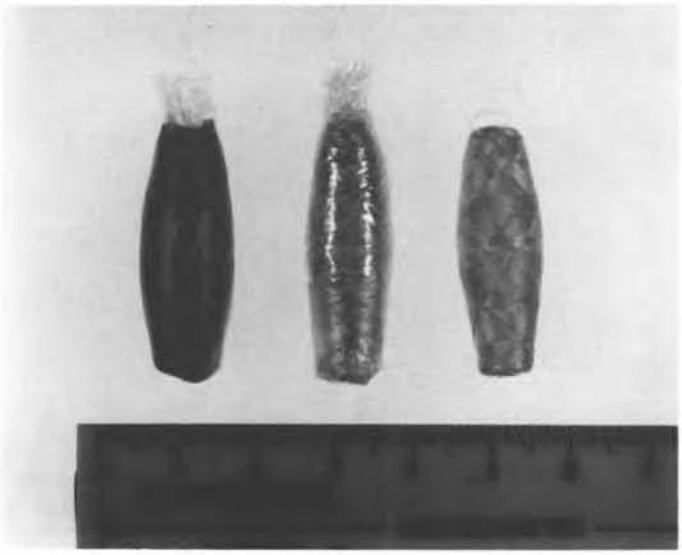


FIG. 1. Cocoon bobbin: plain (right), wrapped, and dipped.

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A Method For The Restraint And Transport Of Crocodilians

Devices for restraining and transporting crocodilians include cargo netting, ropes, squeeze cages, and planks to which the animals are tied (Fowler 1978). None of these devices are without drawbacks in working with American alligators (*Alligator mississippiensis*) in the wild. Our specific concerns are to reduce further stress to an animal after the stress of capture, protect it from the direct heat of the sun, keep it immobile to prevent injury to the animal or its handlers, and allow for ease of collecting data (e.g., taking measurements, ascertaining sex, attaching tags, collecting blood from the cervical or caudal regions). A technique was developed to address these concerns that is similar in concept to the method developed by Murphy (1971) for restraining snakes within acrylic tubing.

We utilized a white PVC pipe (50 pound plastic irrigation pipe) to contain the alligator and ropes to secure and maneuver the anterior and posterior portions of the body. The pipe had an inside diameter of 0.31 m, a wall thickness of 0.32 cm, and was cut to 3.0 m in length. Holes of a diameter sufficient to allow the passage of a rope without binding were drilled along the length of the pipe at intervals of 15.2 cm. The dimensions given for the pipe are suitable for adult American alligators up to 3.0 m in total length and other similarly-sized crocodilians. If smaller species/individuals are to be dealt with, a smaller size diameter and length of pipe would be desirable to increase maneuverability and reduce the space surrounding the animal while it is in the pipe. Conversely, with extremely large individuals, a pipe of greater diameter and length would be appropriate.

The procedure begins by noosing the crocodilian around the neck with a rope (Fig. 1a), either as a form of capture or after being captured by another means such as a snare trap (Murphy and Fendley 1974). The end of the noose rope is passed through the pipe (Fig. 1a), and the pipe is guided over the animal's head. Once the head is inside the pipe, constant tension is applied to the rope to hold the pipe in position, and the pipe is rotated so that the holes are on the top. The forelimbs are folded back against the body by the pipe, as the animal is pulled into its lumen until the back legs come even with its end (Fig. 1b). A second rope is then tied immediately anterior to the back legs (Fig. 1b). By pulling on the anterior or posterior rope the animal can be positioned exactly within the pipe, or so that the head or caudal region extends from an end of the pipe for a desired distance. If access is required to the head region, a rubber bicycle inner tube is tied around the snout to keep the jaws closed (Fig. 1c). Once the animal is positioned, each rope can be secured through a nearby hole and tied in a knot (Fig. 1d). The tension on the ropes should restrict forward or backward movement within the pipe but allow enough freedom so that the animal can move its head up and down to prevent regurgitated stomach contents from blocking the glottis. The procedure can be accomplished with two people. However, additional personnel may be needed for lifting the crocodilian into a vehicle for transport.

The regularly-spaced holes in the pipe can aid in measuring total and snout-vent lengths, as well as providing places to secure the ropes. The holes allow the snout and tail tips to be seen; thus a tape measure can be placed on top of the pipe to get an accurate measure of total length. Moreover, if the tip of the snout is positioned at the exact end of the pipe, much of the measurement can be calculated without the use of a tape measure, by knowing and/or marking on the pipe the distance between holes. Snout-vent length can be determined by lining up the end of the cloaca with the end of the pipe and measuring forward.

To release the animal, the rope near the tail is removed first (Fig. 2a). The animal is then pulled to the front of the pipe, until the rope on the neck can be released (Fig. 2b). The inner tube securing the jaws is removed by pulling it off with a snake hook rather than untying it (Fig. 2b), and then the pipe is tipped upward and/or jerked backwards/upwards, until the animal is induced to leave it (Fig. 2c).

This technique has been used successfully on American alligators in the wild at Brazos Bend State Park, Ft. Bend Co., Texas since 1990. We believe it has significantly reduced post-capture stress to the animals and has increased safety to both the animals and their handlers. The animal cannot hurt itself once restrained in the pipe, and because the legs are folded back rather than tied there is not the potential problem of restricting circulation to the limbs. It is not necessary to cover the animal's eyes while it is in the pipe, but we do drape a cloth over the eyes if we have the head positioned outside the pipe. The only difficulty that we have encountered with the technique is that some individuals begin to roll after they are noosed and this makes it somewhat difficult to get them started into the pipe. However, once the head is inside the pipe it is not a problem to pull the rest of the body inside.

The pipe diameter and length that we utilized was chosen to accommodate a varying size range of adult alligators. However,

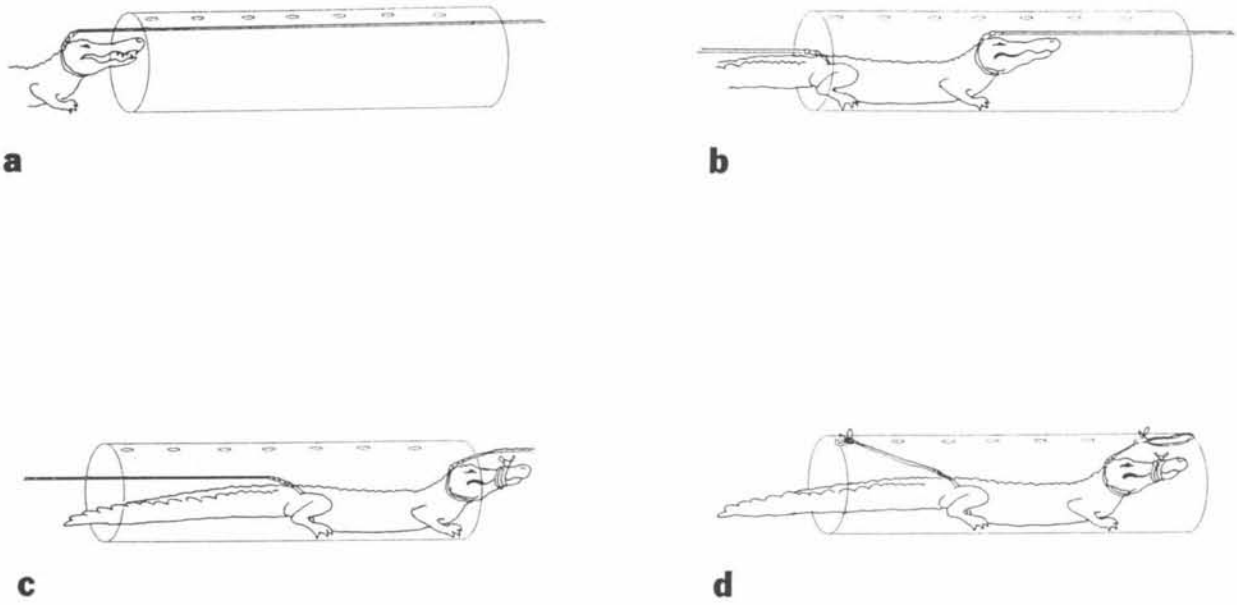


FIG. 1. Restraining the crocodilian in the pipe. (a) Pulling the noosed crocodilian into the pipe. (b) Attaching a rope in front of the hind legs. (c) Positioning the crocodilian within the pipe. (d) Securing the ropes.

if smaller crocodilians were to be handled exclusively, then a shorter pipe with a smaller diameter would be preferable to reduce the weight and increase maneuverability. Because PVC plastic deteriorates from extended exposure to UV light, the pipe should be stored out of direct sunlight.

Although the technique has not been tested on crocodilians in captivity, we believe it could be applied to farm or zoo settings as well. Since preparing the initial draft of this manuscript, we have been made aware of two instances where pipe has been used as a restraint and transport device for crocodilians. In the early 1980's some crocodiles were shipped to the U.S. inside PVC pipes (L. Brandt, pers. comm.). Also, a photograph in Alderton (1991) shows a juvenile alligator being placed into a corrugated drain pipe with a caption stating that the pipe was filled with young alligators to transport them safely.

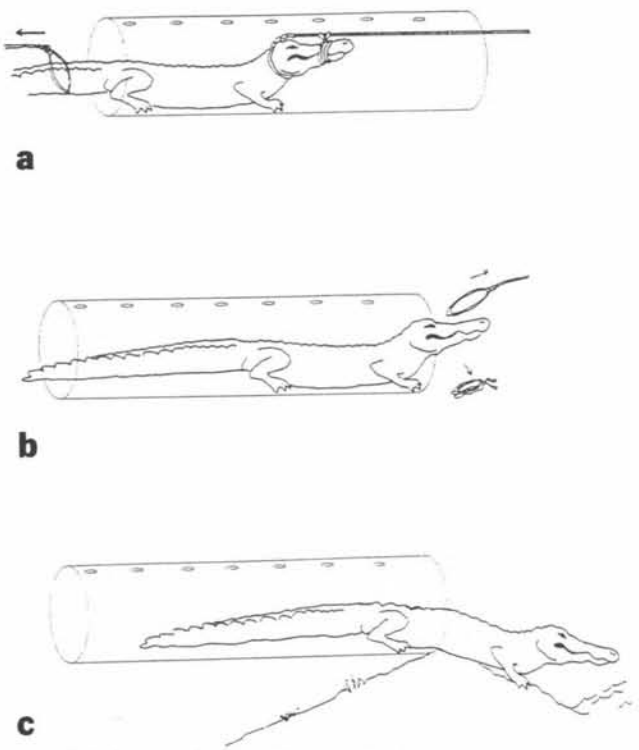


FIG. 2. Releasing the crocodilian from the pipe. (a) Removing the posterior rope. (b) Removing the rope from the neck and the inner tube from the jaws. (c) Tilting the pipe to induce the crocodilian to leave.

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The Use Of Leverage To Facilitate The Search For The Hellbender

During September 1991, we searched for hellbenders (*Cryptobranchus alleganiensis alleganiensis*) in the New York portion of the Susquehanna River drainage. The purpose of this survey was to attempt to verify previous records (Bishop 1941; Bothner 1981; Breisch 1990) and to find new localities and potential habitat.

Many methods have been tried to locate hellbenders including visually searching, electroshocking, and rock-lifting (Williams et al. 1981). We tried visually searching both day and night and electroshocking with a Smith-Root model 11-A (Smith-Root Inc., 14014 N.E. Salmon Creek Ave., Vancouver, Washington 98665, USA) with no hellbenders being located using those methods. We tried to trap hellbenders using 0.6 m by 0.6 m by 0.2 m high wire mesh traps baited with chicken livers with the same results. This left us with only the rock lifting method to try.

As hellbenders are normally found under large rocks in riverine situations, a technique was devised to enable two people to quickly lift large rocks with as little back strain as possible and without destroying the habitat. Anyone who has ever looked for hellbenders should be able to appreciate the difficulty of bending over or kneeling to hand lift large rocks in 10-15°C water.

A device available in forestry supply catalogs (e.g., Forestry Suppliers Inc., P.O. Box 8397, Jackson, Mississippi 39284-8397, USA) called a peavey was used to lift the chosen rocks. As the peavey is normally used to roll heavy logs in the 0.3–0.75 m diameter range we thought that this device would be both inexpensive and sturdy enough to safely lift large rocks. One person using a single peavey was able to lift rocks measuring up to 1.25 m by 1.85 m by 0.25 m thick. The hook on the peavey was caught on the underside of the rock or on any irregularity on the side of the rock. The person doing the lifting would then hold the end of the 1.3 m handle, bend at the knees, and then lift with a straight back. The second person would then probe under the rock with a long-handled dipnet to attempt to dislodge any hellbender that might be hiding under the rock. Rocks were lifted upward from the downstream edge just far enough to allow a dipnet to be passed under the rock. No attempt was made to flip the rocks completely over as it was desirable to have as little effect on the habitat as possible. In most cases the upper edge of the rock just barely broke the surface of the water. As this survey was done during the hellbender nesting season we choose to lift the rocks from the downstream edge in order to minimize effects on any nests that might be present. At other times of the year lifting the rocks from the upstream edge will allow the current to quickly clear disturbed sediment and make locating hellbenders easier.

Another advantage of using the peavey is that searching in relatively cold deep water is possible. We were able to lift rocks and verify the presence of hellbenders in water depths of up to 1 m without getting anything more than our chestwaders and hands wet. This method can be used during any season of the year without undue discomfort on the part of the users. One must be cautious during the nesting season to minimize nest disturbance.

The peavey is inexpensive ($49.95 Forestry Suppliers) and much safer to use than electroshocking. Electroshocking equipment can cost over $2000 and requires safety gear to be worn. A word of caution is in order. Do not try this method by yourself. It is estimated that many of the rocks we lifted weighed 275–450 kg We used two people (one netting and one lifting) and found that in some cases that was not enough. In one case a hellbender escaped to the left while the netter was to the right and the lifter attempted to pursue the hellbender while pushing away a rock in the 350-450 kg range. The best way to utilize the peavey is with a crew of at least three persons. One person lifts the rock and does not pursue anything while the others attempt to capture hellbenders either by dipnet or seine.

This method was successfully used to move many thousands of kg of rocks over six days of searching and resulted in the location of 33 hellbenders and five hellbender nests. Many old sites were verified and almost 50 km of river were added to the known range of *C. alleganiensis* in New York. A big advantage of the peavey was the relative ease in which rocks could be lifted in a controlled manner. This enabled us to put all nests discovered back together (with eggs and attending male). Only one animal discovered using the peavey technique was injured and this injury was a scraped front foot that should heal quickly.

This method was further put to the test during a one-day search for hellbenders on 17 November 1992 during which it snowed almost constantly with an air and water temperature of 2°C. One hellbender was located. This search was hampered by both the weather and high water conditions. Without the peavey it would have been very difficult to locate any hellbenders.

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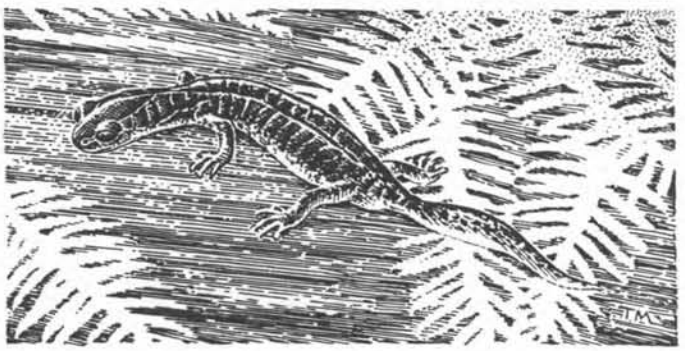
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Ensatina eschscholtzii. USA: California: Del Norte Co., Ruby Van Deventer County Park, Smith River. Illustration by Tim Manolis.

HERPETOLOGICAL HUSBANDRY

Cannibalism In A Captive West African Bush Viper (*Atheris chloroechis*)

On 28 September 1992 at the Audubon Zoological Garden, an adult male West African bush viper (*Atheris chloroechis*) was introduced into a large exhibit containing two adult female conspecifics. The exhibit measured 152 x 91 x 91 cm, and was furnished with climbing branches and a gravel substrate. All specimens were healthy, long-term captives and had previously been together from 3 December 1991, through 28 January 1992, without incident. On 9 October 1992, the male was missing, and it was presumed that he had been consumed by a female whose body was distended almost its entire length. The female had a SVL of 66 cm, and weighed 161 g. Each snake had been accepting live three-week old mice (*Mus musculus*) on a weekly basis, and there were no food items in the enclosure at the time of the incident.

Cannibalism in arboreal vipers has been reported in captive *Atheris squamiger* (Wallach 1980), and *A. superciliaris* (Broadley 1983), as well as *Trimeresurus wagleri* and *Bothriechis schlegelii* (Bridegam et al. 1990). Previous accounts of cannibalism or ophiophagy in captive *A. chloroechis* have not been reported.

Wild *A. chloroechis* are opportunistic feeders, preying upon birds, small rodents, lizards and frogs (Cansdale 1961), but are not known to include snakes in their diet. Typically, these snakes ambush prey while hanging concealed amid branches, with the head often lower than the prehensile tail. As is typical with this species, the prey is bitten and held until dead before swallowing.

This occurrence of cannibalism may be interpreted as aberrant behavior; however, caution should be exercised during introductions with *A. chloroechis* or any of its congeners.

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A Radiographic Sexing Technique For *Heloderma suspectum*

Sexual dimorphism is not at all apparent in *Heloderma suspectum* despite Laszlo's (1975) and Tinkham's (1971) description of differences in head size and scalation. Methods currently utilized for sexing *H. suspectum*, such as probing (Laszlo 1975; Wagner et al. 1976), are inconclusive. Visualizing sex organs with a fiberoptic laparoscope, although reliable, involves invasive procedures. The method of injecting saline solution into the hemipenial area to promote eversion has proven somewhat successful, but requires anesthesia (L. DeNardo, pers. comm.). Captive reproduction of this species has occurred at several institutions (Lamont 1987; Peterson 1982; Wagner et al. 1976), but a reliable method of sex determination was not mentioned in those reports. In this note we describe a non-invasive osteometric method to determine sex by revealing gender differences in ischial length and width. Intraspecific structural variation occurs

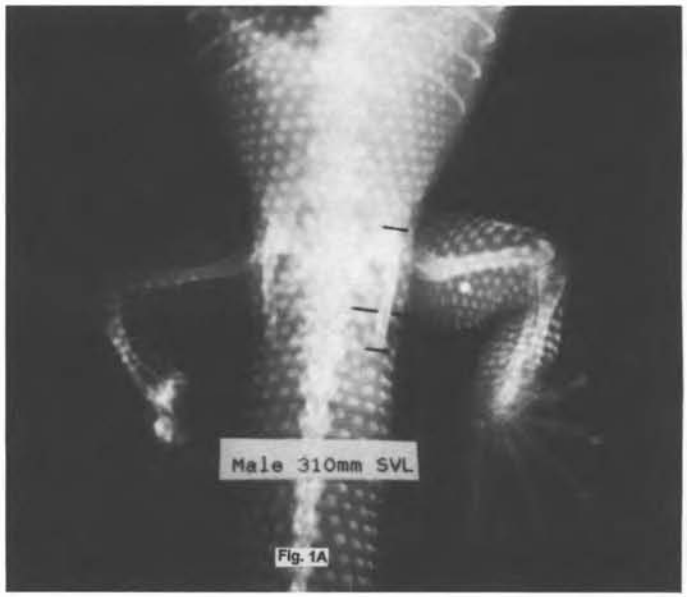




FIG. 1. Radiographs of (A) male and (B) female *Heloderma suspectum* indicating measurements for length and width.

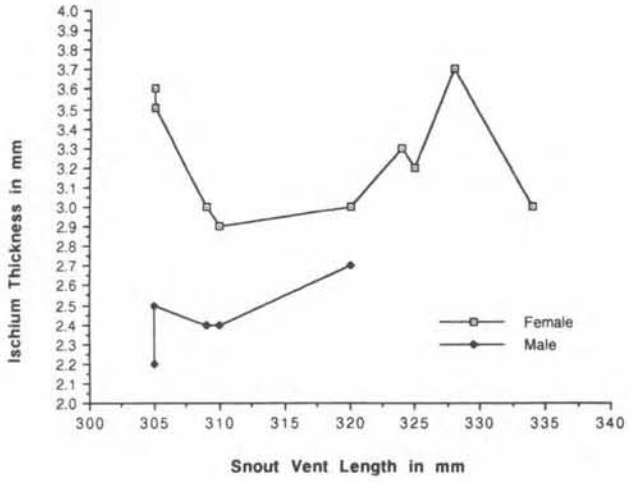


Fig. 2A

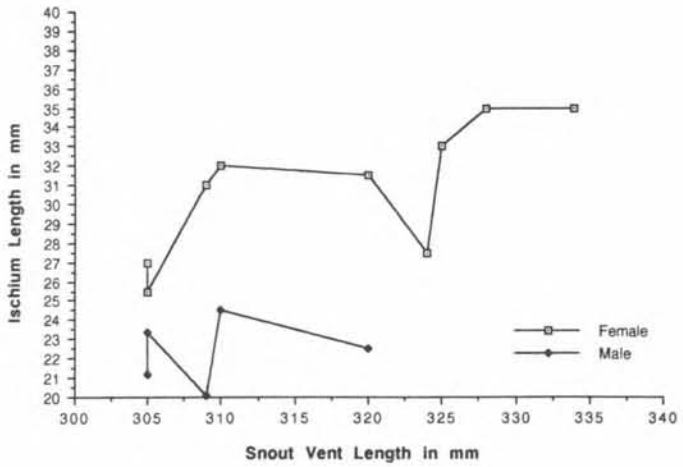


Fig. 2B

FIG. 2. Graphs showing separation of sexes by (A) ischium thickness and (B) ischium length.

in the pelvis of certain mammals (Becker 1954; Cornwall 1956; Dunmire 1955; Gardner 1936; Guilday 1951; Krogman 1962; Taber 1956), but has not been documented for other groups of vertebrates.

Radiographs from seven live specimens of *H. suspectum* were examined. Radiograph dosages were KVP 40, mass 75 @ 1/60 of a second (3M standard veterinary x-ray film). Seven skeletal preparations of known sex were also examined to substantiate data from radiographs (see Appendix 1). All measurements were made to the nearest 0.1 mm using dial calipers. Only the ischial arm could be accurately measured from radiographs. The magnification of the radiographic image was assumed to be minimal since the film was placed directly under the pelvic region.

Two measurements were made: the length from the posterior angle to the anterior angle of the ischium, and maximum thickness of the ischium (Figs. 1a, 1b). By plotting the first measurement against snout-vent length (SVL), and the second measurement against SVL for both sexes (Figs. 2a, 2b), males were clearly differentiated from females. Student t-tests were used to determine the statistical significance of the gender differences (for thickness, $t=5.53$, $df=12$, $P<0.01$; for length, $t=3.45$, $df=12$, $P<0.01$).

To determine pelvic girdle differentiation during ontogeny, a radiographic record of a group of 3 sub-adult *H. suspectum* was made. These specimens were radiographed at 2 weeks, 24 weeks, and 36 weeks post hatching. At 36 weeks, gender differentiation in these individuals becomes discernible in both measures (Table 1).

TABLE 1. Radiographic history of sub-adult *Heloderma suspectum*.

Specimen No.	Sex	SVL	Ischium Length	Ischium Thickness
2 wks				
304	?	92	6.2	1.5
309	?	102	7.0	0.9
307	?	90	7.5	1.4
12 wks				
304	?	145	8.1	1.6
309	?	152	11.0	1.2
307	?	146	10.7	1.7
36 wks				
304	M	215	13.9	1.7
309	F	209	18.6	2.1
307	F	198	17.2	2.0

Specimens of similar size should be used when making comparisons, as differentiation in ischium length is not apparent between large males (>450 mm SVL) and small females (<250 mm SVL). However, ischium thickness is closer to being unequivocal for sex determination. This character is greater in females than in males, provided that animals are at least 300 mm SVL.

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APPENDIX 1

Referred specimens of *H. suspectum*. (L=Live, P=Preserved). One male and six females (P). University of Michigan Museum of Zoology 181640, 173549, 183546, 181641, 181639, 183802, 181150. One female (L). Department of Herpetology, Central Florida Zoological Park, Lake Monroe, Florida. Five males and four females (L). Dallas Zoo.

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Symptoms Of Gas-bubble Trauma In Two Species Of Turtles, *Chelydra serpentina* And *Apalone spinifera*

Gas supersaturation in aquaculture systems can be caused by any one of a variety of situations. These include entry of air into the suction side of a pump (Marsh and Gorham 1905), photosynthesis (Renfro 1963; Woodbury 1941), and use of well or spring water (Gorham 1901; Weitkamp and Katz 1980).

Heating of gas-saturated water has also been shown to cause gas-supersaturated water in aquaria (Marsh and Gorham 1905), culture tanks (Lightner et al. 1974), cooling-water outfalls of power plants (DeMont and Miller 1971; Marcello and Strawn 1972), fish hatcheries (Rucker and Hodgeboom 1953), and salmonid hatching containers (Zirges and Curtis 1975). Malouf et al. (1972) observed gas supersaturation resulting from heating cold seawater in closed heat exchangers.

Gas-bubble trauma (GBT) has long been recognized as a problem for fish (e.g., Gorham 1901; Marsh 1903). Gas supersaturation has also produced symptoms in shrimp (Lightner et al. 1974), crabs (Johnson 1976), and other gill-breathing invertebrates (Malouf et al. 1972; Nebeker 1976). Amphibians are also susceptible to gas-bubble trauma (Colt et al. 1984a; Colt et al. 1984b).

Symptoms of GBT include erosion of fins due to bubble formation in capillaries, exophthalmia, subcutaneous emphysema of the head, inability to remain submerged (Colt et al. 1984a), bubble formation in the epidermis and viscera, hemorrhage (Weitkamp and Katz 1980), equilibria disturbance, cessation of feeding, hemostasis, and death.

I am unaware of reports of reptilian species exhibiting symptoms of GBT. In this paper, I report symptoms of GBT in two species of turtles, the common snapping turtle (*Chelydra serpentina*) and soft-shelled turtle (*Apalone spinifera*).

Approximately sixty, one-year-old common snapping turtles were held in an indoor culture system supplied with city water. The system consisted of six plastic trays (91.44 cm x 182.88 cm x 15.24 cm) with a flow-through water supply. Turtles were held in plastic containers (50 cm x 35 cm x 22 cm) within these trays. The containers had four 0.95 cm holes drilled into the bottom and were suspended above the tray bottom on sections of 1/2" (21 mm od) PVC pipe.

Approximately 7.5 cm of water was maintained in the containers by a central standpipe in each tray. City water (22°C) heated to 29°C with a commercial water heater was supplied continuously to the individual containers. The turtles did not have access to dry substrate and were unable to leave the water.

Symptoms appeared approximately one week after turtles were introduced into the system. Gaseous lesions developed under the skin of the feet and neck causing the animals to float (Fig. 1). The feet became grossly distended and many of the affected animals eventually lost their claws. This was apparently due to loss of blood supply and subsequent soft-tissue necrosis. Lesions were also prominent around the cloacal opening, causing distention and hemorrhaging. Several of the turtles eventually died.

Animals exhibiting pathology were sent to the Louisiana State University School of Veterinary Medicine for examination. Dead and live turtles exhibiting pathology were analyzed. Bacterial analyses were performed with only *Citrobacter freundii* and *Proteus vulgaris* being identified. These two species have not been shown to be gas producers.

All of the one-year-old common snapping turtles were removed from the culture system and placed into a fiberglass holding tank which was raised at one end. Ambient city water (22°C) was introduced into the lower end of the tank, leaving sufficient space to allow the turtles to leave the water. Within 48 h, all symptoms had disappeared. The turtles resumed normal behavior and began feeding. Schiewe (1974) showed that recovery of fish from sublethal exposure to gas supersaturated water can be rapid.

Subsequently, hatchling common snapping turtles (315) were stocked into the flow-through culture system for a feeding trial. Within four days, over 50% of the hatchlings exhibited GBT-related pathology. These turtles were removed from the culture system and placed into a plastic tub with approximately 1.27 cm of water. Within 24 h, all symptoms disappeared and the hatchlings resumed feeding.



FIG. 1. Common snapping turtles exhibiting symptoms of gas-bubble trauma. Note involuntary floating and distended limbs and neck. Unaffected turtle can be seen submerged on lower left.

Tropidophis semicinctus Gundlach and Peters, 1865



74. *Tropidophis semicinctus* (Photo by Vlad T. Jirouhek)

Type-locality: Cuba.
Syntypes: ZMB 5076.
Description: Maximum total length about 460 mm; habitus slender; dorsal scale rows at midbody 21, 23, or 25; dorsal scales smooth or slightly keeled; ventrals 203-214 in males, 201-213 in females; supralabials 8-11; infralabials 9-12; subcaudals 34-39 in males, 34-40 in females; preoculars 1/1; postoculars 3/3.

The head is chestnut brown, and the dorsal ground color is yellow to orange. The body blotches are dark brown to black, 19-29 in number, in two discrete series (with a tendency to fuse on the neck). The dorsal pattern gives the impression of alternating pale and dark bands. An orange to brownish vertebral stripe (5-6 scales wide) is often present. The supralabials and throat are yellowish. The tail has 3-9 blotches. The venter is immaculate.
Distribution: Western and central Cuba; Pinar del Rio Prov. (Rancho Mundito; Soroa) east to Sancti Spiritus Prov. (northwest of Trinidad; Casilda), north to Matanzas Prov., and to near Sagua la Grande, Villa Clara Prov., in the northeast.
Natural History:
Habitat - Mesophilic; Darlington (1927) collected two under a rock with *Anolis*.
Reproductive notes - Petzold (1969) reported newborn *T. semicinctus* with total lengths of about 160 mm and body masses of 1.5 g.
Remarks: Defensive behavior includes rolling into a ball with the head tucked away, autohemorrhaging (Darlington, 1927), and expulsion of an offensive anal secretion (Barbour and Ramsden, 1919).

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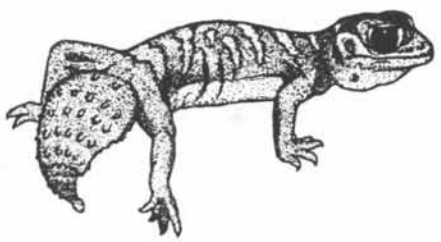
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Similarly, hatchling soft-shelled turtles were placed into one of the flow-through containers and symptoms of GBT appeared within 24 h. Large bubbles emerged from the feet and neck as with the snapping turtles. Large bubbles also arose from around the eyes and carapace causing inflammation to the surrounding tissue. All soft-shelled turtles exhibiting these symptoms died within 36-48 h.

Heating of water in closed systems has been shown to cause gas supersaturation in fish culture systems. In the situation described in the present study, it could be assumed that the incoming water was saturated with gases before entering the water heater. With the increase in water temperature and the inability of dissolved gases to come out of solution in the water lines, it follows that the heated water introduced into the turtle containers was supersaturated with dissolved gases. These dissolved gases produced the symptoms observed in the turtles.

To remedy the problem, the culture system was modified by tilting the containers, allowing a small amount of water to collect in the lower third of the plastic container. This modification allowed access to dry areas in the container. The system was further modified by the addition of a timer and an electronically-actuated valve to control the water supply. Heated city water was added to the containers for five minutes at eight-hour intervals with this timing system. Water in the lower third of the container was flushed out with the incoming fresh water and exited through holes in the container bottoms. Following these modifications, no further gas-bubble pathology has been observed in more than 10 months of continual use.

Investigations to fully describe the effects of gas-bubble trauma on aquatic reptiles are under consideration. These findings would be especially important to the emerging aquaculture industries for these animals.

Acknowledgements.—I wish to thank the Louisiana Agricultural Experiment Station for the support of the facilities required. I also thank Dudley D. Culley, Jr., Robert C. Reigh, and Terrence R. Tiersch for their critical review of this manuscript.

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CAUDATA

RHYACOSIREDON LEORAE (NCN). **SIZE.** Taylor (1943. Univ. Kans. Sci. Bull. 29:343–361) reported maximum body size for a female *R. leorae* as 98 mm SVL and 207 mm total length. On 12 August 1993 we captured a female *R. leorae* (JLE00307) in a small stream near Río Frio, México, México at 3210 m elevation. The salamander was in a shallow pool (10 cm deep x 1 m wide) with slow circular movement and a water temperature of 13.2°C. Upon preservation, the salamander measured 103 mm SVL (to medium point of cloaca or 100 mm SVL to anterior point), 233 mm total length, and 62.0 g live wet body mass.

Submitted by **JULIO LEMOS-ESPINAL**, Laboratorie de Investigacion en Ecologia, CyMA, UIICSE, ENEP Iztacala, UNAM, Apartado Postal 314, Tlalnepantla, Edo. de Mex., México, and **ROYCE E. BALLINGER**, School of Biological Sciences, University of Nebraska-Lincoln, Lincoln, Nebraska 68588, USA.

TESTUDINES

APALONE FEROX (Florida Softshell). **DIET.** *Apalone ferox* is the largest North American softshell, with a maximum reported size of 29.48 kg (Allen 1982. Herpetol. Rev. 13:49). Dalrymple (1977. J. Herpetol. 11:255–285) examined digestive tracts from 96 *A. ferox* and found the diet was comprised predominantly of snails, insects, and fish. Wright and Funkhouser (1915. Proc. Acad. Nat. Sci. Phila. 67:107–192) reported that "according to the natives the larger specimens devour also such water fowl as are unfortunate enough to be taken unaware by these reptiles." Dalrymple (*op. cit.*) found that one small male had eaten "a moderate sized passerine bird," but it is not known whether the bird had been captured or scavenged.

In the early afternoon of 24 July 1987, one of us (MBE) observed a large Florida softshell take a juvenile tricolor heron (*Hydranassa tricolor*) at Guana River Wildlife Management Area, Saint Johns County, Florida. The bird was in obvious distress when first seen standing in shallow water at the edge of a ditch, and it soon became apparent that a large softshell was holding it by the lower leg and attempting to pull it to deeper water. The water was too shallow to allow the turtle to pull the bird under, and a struggle continued for ca. 20 min (Fig. 1). Finally, a second large softshell joined the fray. The bird finally drowned when its head was submerged by one of the turtles. The total period of observation was ca. 30 min. This is the first unequivocal documentation of predation by *A. ferox* on birds. We can only speculate on the method used to catch the bird initially, but softshells frequently lie buried in the sand in shallow water, and the bird may have been ambushed when it stepped in front of a buried softshell.



FIG. 1. *Apalone ferox* struggling with a tricolored heron. The carapace of the turtle is visible to the left. The light "?" in the center is the white venter of the bird's neck. The bird is attempting to spear the turtle with its bill.

Submitted by **PAUL E. MOLER**, Florida Game and Fresh Water Fish Commission, 4005 S. Main Street, Gainesville, Florida 32601, USA, and **MARC B. EPSTEIN**, Florida Game and Fresh Water Fish Commission, 1239 S.W. 10th Street, Ocala, Florida 34474, USA.

APALONE SPINIFERA (Spiny Softshell). **EXTREME KYPHOSIS.** An adult female *Apalone spinifera* was captured by a local fisherman on approximately 22 June 1993 while it was crossing Moon Lake Road, between Michigan Center Lake and Little Olcott Lake, in Jackson County, Michigan. Although normal in most respects (CL=241 mm, mid body CW=229 mm), the turtle exhibited extreme kyphosis (maximum total height= 127 mm, Fig. 1). It otherwise appeared to be in good health. I unsuccessfully attempted to induce oviposition using oxytocin on 9 July 1993. However, a clutch of hard-shelled eggs was laid on 10 July 1993, but unfortunately they were oviposited in water and destroyed. It was not possible to determine exactly how many eggs were laid or if they were fertile. The animal was later released at the capture site. Photographs and radiographs were deposited at the UMMZ.

Radiographs confirm external observations that the vertebral column was dramatically arched and directly underlies the carapace throughout the deformity. There were no organs or other defined tissues visible within the hump.

Extreme kyphosis has been previously documented in at least three Trionychidae species (two *A. spinifera* and one *A. mutica*: Smith 1947. Univ. Kansas Pub. Mus. Nat. Hist. 1:117–124; one *Lissemys punctata*: Duda and Gupta 1977. Herpetol. Rev. 8:119–120).

I thank Tom Hodgson of the Dahlem Nature Center for bringing this turtle to my attention. Doug Nelson generously contributed his time for the radiographs.



FIG. 1. Adult female *Apalone spinifera* exhibiting extreme kyphosis.

Submitted by **RUSSELL L. BURKE**, Museum of Zoology and Department of Biology, University of Michigan, Ann Arbor, Michigan 48109, USA.

CARETTA CARETTA (Loggerhead). **GROWTH and PELAGIC MOVEMENT.** Carr (1986. BioScience 36:92–100) proposed that loggerhead hatchlings from the southeastern U.S. nesting beaches become incorporated in oceanic gyres and are carried to the eastern Atlantic. The hypothesized path of travel passes through the Azores, Madeira, Canary Islands, and, possibly, the Cape Verde Islands, and then back to the western Atlantic. The movement of a juvenile loggerhead on one portion of this path—from Madeira to the Canary Islands—has been documented. The loggerhead was one of many sea turtles tagged in the eastern Atlantic by a joint project of the University of Florida and the International Fund for Animal Welfare. On 29 June 1990, the crew of the *R/V Song of the Whale* placed two plastic tags (Jumbo-Roto tags, Dalton Ltd., Oxfordshire, England) on a loggerhead captured in the waters near Madeira (34°05'N, 17°21'W). The turtle had a curved carapace length (CCL) of 40.5 cm. On 4 February 1993, the turtle was captured on a longline of a Spanish vessel in the waters around the Canary Islands (29°46'N, 13°05'W). Both tags were still in place. The turtle was taken to Algeciras Bay, Spain, where an observer from the Centro Oceanográfico de Málaga recorded its straight carapace length (SCL measured from nuchal notch to posterior tip) as 46.0 cm. The turtle was held for two weeks, but did not feed. It was released alive but in poor condition in Algeciras Bay.

During the 950 days at large, the turtle moved a minimum distance of 610 km. To determine growth rate, 40.5 cm CCL was converted to 37.0 cm SCL as in Bolten et al. (1992. Herpetol. Rev. 23:116), yielding a growth rate of 3.5 cm/yr. This rate is slower than the 3.7 cm/yr rate reported for a smaller pelagic loggerhead in the eastern Atlantic (Bolten et al., *op. cit.*), but growth in carapace length usually decreases with increasing length (Bjorndal and Bolten 1988. Copeia 1988:555–564). The logistic and von Bertalanffy growth models developed for Florida loggerheads by Frazer and Ehrhart (1985. Copeia 1985:73–79) predict growth rates of 3.3 cm/yr and 6.4 cm/yr, respectively, for the size interval of loggerheads reported here. The measured growth rates are closer to those predicted by the logistic model for both our observation and for that of Bolten et al. (*op. cit.*). These slow growth rates suggest that the pelagic, juvenile stage of Atlantic loggerheads may span many years.

We thank José Carlos Santana (Centro Oceanográfico de Canarias, Instituto Español de Oceanografía) for his assistance. This work is supported by the Marine Entanglement Research Program of the U.S. National Marine Fisheries Service and by the International Fund for Animal Welfare.

Submitted by **KAREN A. BJORNDAL** and **ALAN B. BOLTEN,** Center for Sea Turtle Research, University of Florida, Gainesville, Florida 32611, USA, **JONATHAN GORDON**, International Fund for Animal Welfare and Wildlife Conservation Research Unit, Department of Zoology, Oxford University, Oxford, England, and **JUAN A. CAMIÑAS** Centro Oceanográfico de Málaga, Instituto Español de Oceanografía, 29640 Fuengirola, Spain.

ERETMOCHELYS IMBRICATA (Hawksbill). **REPRODUCTION**. On 20 June 1992 at Ostional National Wildlife Refuge, Santa Cruz, Guanacaste, Costa Rica, we observed a female *Eretmochelys imbricata* come ashore at 1615 h. This locality is known as the El Rayo sector of beach (10°00'N, 85°43'W), and is 2 km north of the main beach utilized for nesting by Pacific ridleys (*Lepidochelys olivacea*).

The female hawksbill measured 82 x 70 cm curved carapace length and width, and 60 x 53 cm curved plastron length and width. There was no evidence that this turtle had been previously tagged. She crawled to 25 m above the tide limit to the border of vegetation dominated by *Bromelia pinguin*, and selected a nesting site only after moving and presumbly smelling the substrate along a distance of 23.4 m parallel to the vegetation. She also attempted to move into the vegetation. Nest construction followed and 120 eggs were laid. Times noted for nesting activities were as follows: active search for nesting site, 60 min; nest cavity construction, 9 min; egg-laying, 12 min; filling-in the nest cavity, 10 min, for a total of 91 min.

The nest was subsequently protected by a wire cage measuring 40 x 40 x 25 cm. While installing the cage, we discovered another *E. imbricata* nest containing eggs in an advanced embryonic stage. Species determination was made by examination of an embryo. This second nest was reburied and left unprotected. It was preyed upon by dogs ten days later. The incubation period in the protected nest lasted 60 days, with 89 hatchlings found, yielding a hatching success of 74.2%. This is the first report of nesting for *E. imbricata* at this site.

Submitted by **MARTA ARAÚZ ALMENGOR**, Programa Regional en Manejo de Vida Silvestre, Universidad Nacional–Heredia, Apdo 1350–3000, Heredia, Costa Rica, **CIBELES SOMARRIBA**, Apdo 332, La Chorrera, Panamá, Rep. de Panamá, and **JUAN CARLOS CASTRO**, P.O. Box 1378A 28th Avenue, San Francisco, California 94122, USA.

MACROCLEMYS TEMMINCKII (Alligator Snapping Turtle) and ***CHELYDRA SERPENTINA*** (Common Snapping Turtle). **AGONISTIC BEHAVIOR**. In July 1991, we observed two *C. serpentina* that had emerged from a partially submerged brush pile in Onion Creek, Montgomery County, Kansas. The turtles, both probably juveniles (Bury 1979, *In* M. Harless and H. Morlock (eds.), Turtles: Perspectives and Research, pp. 571–602. John Wiley & Sons, New York) were found one day apart with bites presumably inflicted by a 24.7 kg female *M. temminckii* that was the subject of a biotelemetry study (Shipman 1993. Unpubl. M.S. Thesis, Emporia St. Univ., Emporia, Kansas. 90 pp.).

The first *C. serpentina* was found lying on the bank of the creek opposite the brush pile at 2000 h on 8 July. The inferred interaction was not directly observed, however a blood trail from the *C. serpentina* led to the location of the *M. temminckii* in the brush pile 10 m away. One of us (DB) had passed this site less than one hour earlier, and the *C. serpentina* was not there at that time. The second turtle was found at approximately the same time and location on the following day. Pattern and size of both bite marks matched those of a museum specimen *M. temminckii* skull of like proportions to that of the alligator snapping turtle in the creek. The bites were also similar in their location on the left posterior margin of the carapace (Fig. 1).

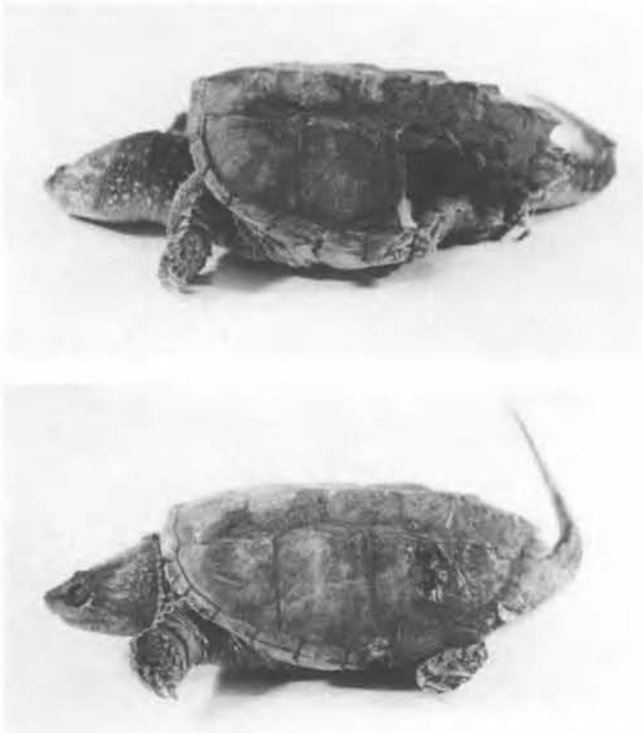


FIG. 1. Common snapping turtles presumably bitten by alligator snapping turtle, Montgomery County, Kansas. Carapace length = 155 mm straight-line maximum, postmortem weight = 670 g (top). Carapace length = 178 mm straight-line maximum, postmortem weight = 975 g (bottom).

Alligator snapping turtles in captivity have been observed to stalk and eat live turtles of the genera *Deirochelys*, *Kinosternon*, *Graptemys*, *Chrysemys*, and *Chelydra* (Allen and Neill 1950. Spec. Publ. No. 4, Ross Allen's Reptile Institute; Ernst and Barbour 1989. Turtles of the United States. Smithsonian Inst. Press, Washington, D.C. 313 pp.; Pritchard 1989. The Alligator Snapping Turtle: Biology and Conservation. Milwaukee Publ. Mus., Milwaukee, Wisconsin. 104 pp.). Our observation is the first such interaction noted in the field. Ernst and Barbour (*op. cit.*) reported that *M. temminckii* does not occupy the same habitat as *C. serpentina*, but prefers a more sedentary existence in deeper waters. Our

observations of its interaction with *C. serpentina* cast doubt on the universality of this claim. Further, we captured six *C. serpentina* in turtle traps set in areas used by the alligator snapping turtle in Onion Creek.

It is impossible to determine if our observations represent predation attempts or agonistic territorial behavior. Our observations suggest *M. temminckii* and *C. serpentina* may utilize similar habitats on occasion.

These observations were made possible in part by the Kansas Department of Wildlife and Parks' Kansas Nongame Wildlife Improvement Fund (Chickadee Checkoff) and Emporia State University via a Faculty Research and Creativity Grant.

Submitted by **PAUL A. SHIPMAN, DAVID R. EDDS**, Division of Biological Sciences, Box 4050, Emporia State University, Emporia, Kansas 66801, USA, and **DOUG BLEX**, Elk City State Park, Kansas Department of Wildlife and Parks, P.O. Box 945, Independence, Kansas 67301, USA.

PLATEMYS SPIXI (Grooved Sideneck Turtle). **PARASITISM.** During a study of aquatic reptiles in a reservoir in the region of Américo Brasiliense, São Paulo, southeastern Brazil (21°45'S, 48°08'W), we collected two female and one male *Platemys spixi* (female #1: CLC = 192 mm; PL = 153 mm; W = 620 g; female #2: CLC = 190 mm; PL = 156 mm; W = 650 g; male #1: CLC = 157 mm; PL = 119 mm; W = 325 g). Numerous leeches of the family Hirudidae (probably *Glossiphonia*) were found on the turtles (female #1 had 244 leeches; female #2 and male #1 only 26 each). The leeches were concentrated in the skin folds on the axillary and inguinal regions of the turtles. Leeches on female #1 spread evenly over the surface of the carapace after a period of exposure to sunlight and warming.

All leeches on female #1 were removed, and the turtle was returned to the reservoir for 24 h, after which we found 11 new leeches on the turtle s inguinal region. Afterward, female #1 was kept in captivity for six months. During this period, the leeches remained on the turtle.

Leeches have been reported on *Kinosternon sonoriense*, but were observed only on the carapace (Hulse 1976. J. Herpetol. 10:45–48). In *P. spixi* the leeches occur in the inguinal and axillary regions, probably because the folds of these regions are protected by the carapace, providing the leeches with highly vascularized tissues for feeding.

We are grateful to Nelson da S Cordeiro for identification of the leeches, to Aricio Xavier Linhares, Ivan Sazima, Johannes Kempers, Karin D. Kempers, Keith S. Brown, and Randy D. Jennings for reading and making suggestions to the manuscript and to the "Clube Nautico Araraquara" for supporting the study on aquatic reptiles.

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PSEUDEMYS CONCINNA (Cooter). **MAXIMUM SIZE.** Conant and Collins (1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.) give maximum sizes for several races of *Pseudemys concinna*, showing a maximum of 17 1/4 in. (438 mm) (straight-line carapacial length; CL) for *P. c. suwanniensis* but no more than 14 3/4 in. (375 mm) for any other race. An extensive area of intergradation involving *P. c. concinna*, *P. c. suwanniensis*, *P. c. hieroglyphica*, and *P. c. metteri* was depicted by Ward (1984. Spec. Publ. Mus. Texas Tech. Univ. [21]:1–50); Conant and Collins (*op. cit.*) show a gap belween the range of *P. c. suwanniensis* and the intergrade area and other races. From that intergradation zone the Tulane University Museum of Natural History collection contains TUMNH 29861, a female measuring 15 1/8 in. (383 mm) CL collected from Gulf County, Florida, 4 mi. N of Wewahitchka at the bridge by the Chipola Dam on the Chipola River (forming Dead Lake) by Joseph T. Willis and Felix Famularo on 10 June 1963. Another specimen, TUMNH 29861, also a female measuring 383 mm CL, was collected in Gulf Co., Florida, 3 mi. E of Wewahitchka in the Chipola River on 12 June 1966 by a Tulane University environmental biology class led by R. D. Suttkus. Whatever genetic or environmental influences that have resulted in *P.c suwanniensis* reaching substantially larger size than the other races of *P. concinna* apparently persist in the intergradation zone.

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PSEUDEMYS TEXANA (Texas River Cooter). **NESTING INTERFERENCE**. The exotic red fire ant, *Solenopsis invicta*, has been reported to have an adverse affect on both invertebrates (Porter 1990. Ecology 71:2095–2106) and vertebrates (Mount et al. 1981. J. Alabama Acad. Sci. 52:71–78). In the case of turtles, Mount et al. (*op. cit.*) report several instances of hatchling turtle mortality due to fire ants; however, fire ants have not been reported to interfere with adult turtles during nest construction.

During a herpetofaunal survey of Camp Mabry in Austin, Texas (11 June 1993), a *Pseudemys texana* was discovered in the initial stages of nest excavation. The turtle was discovered at ca. 1115 h, and probably had been digging for less than 1 h. At that time the turtle was covered with ca. 150-200 fire ants. These ants were probably from two colonies located about 3 m away. Observer interference was kept to a minimum by periodically checking the turtle from a distance using binoculars. After 45 min the turtle ceased nest excavation, and returned to the nearest pond ca. 100 m away. The irritation caused by the fire ants presumably prevented the *P. texana* from completing the nesting process.

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LACERTILIA

CALOTES VERSICOLOR (Oriental Garden Lizard). **CANNIBALISM and DIET**. Cannibalism or intraspecific predation refers to the killing and consumption of an individual of the same species at any stage of its life cycle. This behavior occurs in over 1000 species of animals (Polis 1981. Ann. Rev. Ecol. Syst. 12:225–251; Elgar and Crespi 1992. Cannibalism: Ecology and Evolution Among Diverse Taxa). In reptiles, cannibalism has been observed in both captive (Frye 1991. Biomedical and Surgical Aspects of Captive Reptile Husbandry, Vol. 1:67) and wild populations (Fox 1975. Ann. Rev. Ecol. Syst. 6:87–106; Rocha 1992. Herpetol. Rev. 23(2):60; Rootes and Chabreck 1993. Herpetologica 49(1):99–107) and may involve adults cannibalizing juveniles or subadults, adults cannibalizing eggs, and juveniles cannibalizing juveniles in a descending order of size (Polis and Myer 1985. J. Herpetol. 19:99–107).

During a study on food habits and gastrointestinal parasites of *Calotes versicolor* in 1992, I examined stomach contents of 124 adult lizards (SVL 74-122 mm) collected from two urban parks in Singapore (1°09'N, 103°38'E; 1°29'N, 104°06'E) and found two

positive cases of cannibalism. The stomach of one lizard (SVL 104 mm, TL 342 mm, mass = 38.92 g), collected on 12 August 1992, had one slightly digested conspecific juvenile of SVL 35 mm, ants, beetle larva, and plant materials, while that of the other cannibalistic lizard (SVL 110 mm, TL 394 mm, mass = 44.15 g), collected on 18 September 1992, contained an undigested conspecific juvenile of SVL 41 mm, a cockroach, beetles, and ants. In both cases, the juvenile lizards were swallowed whole, easily identifiable, and had only a few teeth marks on the midbody skin. The orientation of the preys' head in the distal end of the predators' stomachs indicates that the juvenile conspecifics were eaten head first.

Calotes versicolor feeds primarily on insects, but adults occasionally prey on small birds, nestlings, frogs, and geckos (Rao 1975. British. J. Herpetol. 5(4):467–470; Sharma 1989. J. Bombay Nat. Hist. Soc. 88:459). The first record of intraspecific predation in *C. versicolor* was an anecdotal report of a sighting of an adult lizard (TL 330 mm, sex unknown) attacking and swallowing a subadult conspecific (Sharma 1991. J. Bombay Nat. Hist. Soc 88(2):290–291). The findings of conspecific individuals in the stomach contents, a first record for the species, confirms cannibalistic behavior in this species. The low incidence (1.6%) of cannibalism indicates that intraspecific predation is incidental and probably represents opportunistic carnivory. *Calotes versicolor* is sexually dimorphic; males are larger than females. The observation that both cannibalistic lizards were males further supports the hypothesis that sexual differences in frequency of cannibalism could be related to the larger size of males (Rocha, *op. cit.*) The study was supported by a research grant SIBiol RP10/92 from the Singapore Institute of Biology.

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CTENOSAURA PECTINATA (Mexican Spiny-tailed Iguana). **PREDATION**. Ramirez-Bautista and Uribe (1992. Herpetol. Rev. 23:82) reported ingestion of *C. pectinata* by the snake *Trimorphodon biscutatus* in Jalisco, México. Here we report predation on this species by another snake, *Boa constrictor imperator*.

On 3 July 1993 while collecting in a tropical deciduous forest near Km 186 (México Highway 95, México-Acapulco) at 650 m elevation, we observed a *B. constrictor imperator* to fall from an *Acacia* sp. tree (2 m high). The snake was constricting a female *Ctenosaura pectinata* that had some acacia leaves in its mouth. The snake constricted the lizard at its abdominal region and was biting the lizard's right shoulder. The snake took 15 min to kill the lizard after which we collected it to prevent ingestion. The lizard (JLE00240) measured 340 mm in SVL and 1030 mm in total length. The snake measured 1600 mm total length. We released the snake at the site of capture. This is the first record of predation on *C. pectinata* by *Boa constrictor*.

We thank Susana Sanoja-Sarabia for field assistance.

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EUMECES LONGIROSTRIS (Bermuda Rock Lizard or Skink) **PREDATION**. On 5 August 1993, on Castle Island, Bermuda, we observed an adult male of the introduced Jamaican anole, *Anolis grahami* (SVL ca. 70 mm), consuming a recent hatchling of *Eumeces longirostris*, estimated SVL ca. 30-35 mm. The anole was on top of a stone wall, swallowing the skink head first, with the jaws of the anole at the level of the anterior limbs of the skink. After 2-3 minutes, the previously immobile skink writhed weakly, and was then ingested further. After the skink had been consumed to the level of the hind limbs (with feet and tail base protruding from the mouth of the anole), the anole ran from the top of the wall and was lost from view. The tail of the skink had been autotomized prior to our observations and was not found after the anole departed.

This is the first observation of reptile predation upon *E. longirostris*. It is also the first record of *Anolis* eating a skink. *Anolis grahami* is known to consume other anoles, but its diet in Bermuda consists primarily of hemipteran and hymenopteran insects (Schwartz and Henderson 1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. Univ. Florida Press, Gainesville, 720 pp.).

Anolis grahami was introduced to Bermuda from Jamaica in 1905 (Wingate 1966. Herpetologica 21:202–218). It occurs throughout Bermuda, and almost completely overlaps the range of *E. longirostris*, which is the only terrestrial vertebrate native to Bermuda, and which remains common only in a few localities, notably on the islands of Castle Harbour. Hatchling skinks appear in late July to mid-August, and even if they are uncommon prey items of *A. grahami*, predation by the anole may be a serious threat to this declining species, which is also killed by feral and domestic cats, introduced kiskadee flycatchers (Aves: Tyrannidae: *Pitangus sulphuratus*), and recently reintroduced yellow-crowned night-herons (*Nyctanassa violacea*) (Wingate, pers. obs.). A larger introduced species of *Anolis* (*A. leachi*) is well-established in Bermuda and could also be considered as a potential predator of *E. longirostris*.

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GAMBELIA SILA (Bluntnose Leopard Lizard). **CANNIBALISM**. *Gambelia sila* is a large predacious lizard of the San Joaquin Valley in California and often is the most conspicuous and behaviorally dominant local lizard species. Its chief prey by number are insects, especially orthopterans, although small lizards can account for a large portion of the mass of their diet (Montanucci 1965. Herpetologica 21:270–283). Adult *G. sila* are twice the length of conspecific hatchlings and weigh ten times more. Although the most common lizard prey are *Uta stansburiana*, *G. sila* are known to eat small conspecifics (Montanucci, *op. cit.*). However, no specific instances of cannibalism have been recorded. Here we report on two observations of adult *G. sila* eating hatchling conspecifics.

On the morning of 4 August 1991, we were censusing one of our plots on the Elkhorn Plain, San Luis Obispo Co., California, used to study the long-term demographics of *G. sila*. While walking the plot, we spotted an adult male (107 mm SVL, 35 g) in the open, about 100 cm from clumps of snakeweed (*Gutierrezia californica*) on a small berm of a dirt road. As we approached, it quickly snatched at the ground as a small lizard ran by. The male caught the small lizard and swallowed it, with only the tail of the captured lizard visible after a few seconds. The tail of the captured lizard extending from the mouth of the adult male was markedly banded, which is a positive identification of a hatchling *G. sila*. Tails of the other two lizards found at this site are either plain brown (*U. stansburiana*) or bright blue (hatchling *Cnemidophorus tigris*).

The second instance of cannibalism was noted on 11 August 1993, and also occurred on the Elkhorn Plain. An adult female *G. sila* (99 mm SVL, 28 g), found during surveying, had the rear legs and tail of a hatchling *G. sila* sticking out of its mouth. We use PIT tags to permanently mark *G. sila* (Germano and Williams 1993. Herpetol. Rev. 24:54–56.), and both lizards had PIT tags. The

hatchling was 53 mm SVL and 4.2 g when first marked 8 August 1993. We kept the female in captivity until it passed the PIT tag of the hatchling, which occurred 15 August 1993.

Peak activity periods of adult and hatchling *G. sila* usually are temporally separated. The greatest activity of yearlings and adults occurs from April to June, and some activity may occur until September (Tollestrup 1982. Am. Midl. Nat. 108:1–20; Germano and Williams, unpubl. data). Yet, only a small percentage of the adult population of *G. sila* remains active past July on the Elkhorn Plain, and this has occurred three times in 6 yr (Germano and Williams, unpubl. data). In contrast, *G. sila* usually hatch in late July or early August and remain active until October or early November (Tollestrup, *op.cit.*; Germano and Williams, unpubl. data). By the time hatchlings emerge from winter torpor the following spring, they are sufficiently large to escape predation by larger conspecifics. This separation of activity periods effectively minimizes impact to the hatchling population by adults, and also makes the observation of cannibalism by researchers unusual.

We thank Walter Tordoff III, Corey Cates, Terry Trasatti, Jr., and Damien Germano for help with censuses when these observations were made.

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SCELOPORUS MUCRONATUS MUCRONATUS (NCN). **PREDATION**. This species is distributed in parts of the Mexican states of Veracruz, Hidalgo, México, Tlaxcala, Puebla, and D.F. (Alvarez and Huerta 1973. An. Esc. Nac. Cienc. Biol. Mex. 20:177–184) at high elevations where rocky outcrops or lava deposits provide crevice microhabitats. Natural history observations are limited to reproduction (Mendez-de la Cruz et al. 1988. J. Herpetol. 22:1–12) and diet (Mendez-de la Cruz et al. 1992. Southwest. Nat. 37:349–355).

On 25 July 1993 while collecting reptiles near km 24.5 on the Ajusco-Tianguistenco highway (Mex. Highway 892, D.F.) at an elevation of 3500 m, we collected a female *Barisia imbricata imbricata* (JLE00293, wet mass 10.0 g, SVL 98 mm) that had eaten a young *S. m. mucronatus* (SVL 30 mm). Previously we reported *S. m. mucronatus* to eat young *Barisia* at this site (Lemos-Espinal and Ballinger 1992. Herpetol. Rev. 23:117). This is an interesting and rarely recorded situation where syntopic lizards are mutual predators rather than competitors. Adults of *S. m. mucronatus* were common on basaltic rocks and lava at this site, whereas young were more commonly observed at the edge of basaltic rocks and areas of grass (*Festuca amolisma*) where *B. i. imbricata* was quite common (N = 57 observed). This is the first account of predation on *S. m. mucronatus* by *B. i. imbricata*.

Preserved specimen JLE00293 will be deposited in the Museum of Natural History, University of Kansas. Susana Sanoja-Sarabia kindly provided field assistance.

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SCELOPORUS SPINOSUS SPINOSUS (NCN). **BEHAVIOR**. On different occasions during a three-year study of cactus wren (*Campylorhynchus brunneicapillus*) ecology in the southwestern United States and México, one of us (GHF) observed reptiles (including an unidentified colubrid snake and an unidentified iguanid lizard) using unoccupied nests of this bird species as diurnal refugia. The nests are large (average 19.5 cm x 16.0 cm), thick-walled, enclosed structures made primarily of grass, and frequently are maintained and used year-round as nighttime roosts. Nests are typically placed in hard-to-reach locations in spinescent vegetation. On 2 July 1991 (ca. 1530 h) in eastern Guanajuato, México, GHF observed a *Sceloporus spinosus spinosus* in a cactus wren nest located 1.5 m above ground in a 1.8-m tall cholla cactus (*Opuntia* sp.), in a sandy wash with scattered cholla, prickly pear (*Opuntia* sp.), and columnar cacti (*Cereus* sp.). The lizard, estimated to be ca. 120 mm SVL, was completely concealed inside the nest and was not collected. There was no precipitation falling at the time of this observation, but the surrounding area had received frequent rain for several weeks. Portions of the study site were flooded, and slowly moving water was observed in areas that were dry during March 1991. These observations indicate that reptile species use the arboreal nests of the cactus wren for shelter. *S. spinosus spinosus* evidently uses these nests as refugia during flooding, and nests may also provide suitable microclimates and potentially allow for predator avoidance at other times.

We thank Hobart M. Smith for encouraging us to publish this record and for identifying the *S. spinosus spinosus* from a photograph.

Submitted by **GREG H. FARLEY** and **JAMES N. STUART**, Department of Biology and Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA.

SCELOPORUS UNDULATUS CONSOBRINUS (Southern Prairie Lizard). **PREDATION**. On 27 July 1992, while conducting a survey of lizards of the genus *Sceloporus*, we collected an adult male *S. undulatus consobrinus* (MZFC 5337-3, 53.9 mm SVL, 121 mm TL) on a Joshua tree (*Yucca* sp.) in xerophytic habitat, 1 km SE Castaños, near Monclova, Coahuila, México, elevation 969 m. Examination of the stomach contents revealed a small portion of indeterminable material, and the head and neck of a hatchling *Cnemidophorus inornatus*, 4.6 mm head width, with the color pattern typical for this species. The anterior dorsal portion of head, which was ingested first, was crushed from snout to interparietal area, and did not show scales or skin.

Smith (1946. Handbook of Lizards. Comstock Publishing Associates, Ithaca, New York. 557 pp.) reported that *S. u. consobrinus* consumed beetles, ants, grasshoppers, and fragments of vegetable matter. Groves (1971. J. Herpetol. 5(3-4):205) reported cannibalism and predation on other non-sceloporine lizards by *S. undulatus hyacinthinus*.

Predation on teiid lizards by sceloporines was reported by Vitt and Ohmart (1974. Herpetologica 30(4):413); who found that *S. magister* preyed on juvenile *C. tigris*.

Ferguson et al. (1983. *In* R. B. Huey et al. (eds), Lizard Ecology, Studies of a Model Organism, pp. 134–148. Harvard Univ. Press., Cambridge, Massachusetts) suggested that in *S. u. garmani* aggressive behavior is due to reproductive activity associated with territoriality. We think this phenomenon is also likely for the case reported here, as the enlarged testes of the *S. u. consobrinus* suggested it was sexually active.

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SERPENTES

ALSOPHIS VUDII VUDII (Brown Runner). **DIET and GROWTH**. An adult female (84.0 cm SVL, 116.7 cm TL, 196.0 g [mass minus prey item]) was caught on 14 July 1993 on the ESE side of Raleigh Beach on the north end of Waderick Wells Cay, Exuma Cays Land and Sea Park, Exuma Islands, Bahamas. This snake exceeds the maximum SVL (76.5 cm) reported by Schwartz and Henderson (1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. University of Florida Press, Gainesville, xvi + 720 pp). The snake showed an obvious body bulge indicating it had fed recently. The prey, which we palped from the body, was a large male *Ameiva auberi* (10.5 cm SVL, 34.4 cm TL, 34.5 g). The lizard had been ingested head first and showed no signs of digestion. It represented 29% and 18%, respectively, of the total length and weight of the snake. The snake was collected at 1655 h (EST) as it moved from a sandy beach dominated by palms where *Ameiva* lizards were plentiful to an adjoining limestone ridge with coppice vegetation. The *Alsophis* (marked #124 by scale clipping) was originally captured on 17 March 1992 in a palm thicket on the NE side of Powerful Beach, approximately 185 m from the recapture site. Between captures (484 days), the snake increased 1.5 cm in SVL, 4.2 cm in TL, and 21.0 g in weight. Schwartz and Henderson (*op. cit.*) listed frogs, lizards, snakes, mice, and birds in the diet of this species. They found that *Ameiva* accounted for only 4.1% of the 49 food items identified from *A. vudii*.

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CHIRONIUS BICARINATUS (NCN). **FORAGING BEHAVIOR**. An adult male *Chironius bicarinatus* (preserved SVL 717 mm, TL 414 mm) was observed on 7 May 1982 hunting in *Viresia gigantea, V. saundersii, V. bituminosa,* and *Neoregelia compacta* (all are species of Bromeliaceae) in a garden at São Conrado, Rio de Janeiro, RJ, Brasil, adjacent to the Tijuca Forest National Park. The snake elevated the anterior part of its body and systematically dove into each axil of the bromeliads, until finding a *Scinax trapicheiroi* (Hylidae) that was promptly swallowed. At the same location, another *C. bicarinatus* was observed trying to cross a streamlet to reach a bromeliad. The animal repeatedly attempted to extend its body over the water at several different points, until finding a dry path. It is well known that bromeliads provide habitat for a rather diverse fauna of invertebrates and small vertebrates, especially anurans, and these observations lead us to speculate that *C. bicarinatus* is an active forager of bromeliad-inhabiting anurans. This report also supports Weist's [1978. Revision of the Neotropical Snake Genus *Chironius* Fitzinger (Serpentes, Colubridae). Ph.D. Thesis, Texas A&M University] findings that this species is stenophagous, feeding only on anurans. The first specimen was deposited in the collection of the Biology Institute of the Federal University of Rio de Janeiro (SPCS 86).

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CROTALUS HORRIDUS (Timber Rattlesnake). **COLORATION**. An essentially striped specimen (Tulane Museum of Natural History TU 28514) was obtained 3 April 1981 on the Tulane University F. Edward Hebert Center located about 5 km NE of Belle Chasse, Plaquemines Parish, Louisiana. A striped specimen from Pennsylvania was described by Gloyd (1934. Pap. Michigan Acad. Sci., Arts Lett. 20:661–668), and Nickerson and Mays (1968. Wasmann J. Biol. 26:125131) reported two striped specimens from close proximity in extreme northern Illinois. Nickerson and Mays included a photograph and a drawing of the skin of one of the Illinois specimens.

The present specimen is a male 109.5 cm SVL plus 8.2 cm to base of rattle. The anterior third of the body shows two abortive chevrons. Otherwise, on either side of the middorsal yellow band a disrupted dark stripe, usually one scale wide, runs along scale rows 3-4 from the middorsal line. Another disrupted dark stripe, 1/2 scale wide, runs on each side along scale rows 5-6 from the ventral scutes. Between each of the lower disrupted stripes a dark blotch reaching to the 4th scale row above the ventrals is present.

The scale counts of 169 ventrals, 27 single plus one divided subcaudals, 25 rows at midbody, 14-14 supralabials, and 15-17 infralabials fall very close to the averages for southern specimens (often referred to as *Crotalus horridus atricaudatus*) as reported by Klauber (1956. The Rattlesnakes. University of California Press, Berkeley and Los Angeles. 2 vols.).

The present specimen demonstrates that a striped mutation can occur at widely disparate parts of the range.

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MASTICOPHIS FLAGELLUM (Western Coachwhip). **FORAGING BEHAVIOR**. Intrasubordinal predation is not uncommon in snakes. Kingsnakes (*Lampropeltis* spp.), coral snakes (*Micrurus* spp.), and indigo snakes (*Drymarchon*) have long been known to prey on other snakes (Conant 1958. A Field Guide to Reptiles and Amphibians, Houghton Mifflin Co., Boston Massachusetts. 366 pp.).

On 26 June 1991, approximately 3 km W of Barstow on State Hwy 247, San Bernardino Co., California, we observed an adult *Masticophis flagellum piceus* moving quickly with its head raised approximately 15 cm above the ground and carrying a dead glossy snake (*Arizona elegans*) in its mouth. Upon our approach the *Masticophis* dropped the snake and retreated. The glossy snake was dorso-ventrally flattened apparently as a result of being run over by an automobile. After we retreated several meters, the *M. flagellum* immediately returned to the glossy snake, retrieved it, and continued on its way.

Cowles (1946. Herpetologica 3:121–122) reported carrion-eating behavior (a bird carcass) by *M. flagellum* in Riverside Co., California. Our observation documents a second incidence of carrion consumption by *M. flagellum*. To our knowledge, this is the first observation of *M. flagellum* using snake carrion and exploiting a "road kill" as a food source.

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NERODIA RHOMBIFER RHOMBIFER (Diamondback Water Snake). **REPRODUCTION**. *Nerodia rhombifer* reaches the northern limit of its range in central Illinois (Conant and Collins 1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.; Smith 1961. The Amphibians and Reptiles of Illinois. Illinois. Nat. Hist. Surv. Bull. 28:1–298), where it is restricted to habitats bordering the Illinois and Mississippi Rivers (Smith, *op. cit.*).

We collected two gravid females from Calhoun Co., Illinois, on 26 July 1992. One female, found dead from unknown causes, contained 34 embryos (INHS 10911, female and embryos). A second female was caught on 29 July 1992, near the location where the dead female had been found. This animal was kept in an aquarium and fed living centrarchid fishes until the birth of the litter on 16 September 1992.

The second female had 40 offspring; all were born alive and emerged from fetal membranes unassisted. Eighteen were males and 22 were females, making a male to female ratio of 0.82, not statistically distinguishable from unity ($X^2 = 0.40$, $p > 0.05$). Birth began at about 1900 h and was completed by 2300 h. Mass, snout-vent length (SVL), and total tail length (TTL) of the female and young were measured. Neonates were weighed (nearest 0.01 g) and measured (nearest mm) between 0400 and 0600 h on 17 September. Gender of the neonatal snakes was determined by the method described by Gregory (1983. Herpetol. Rev. 14:42–43). The female was also weighed (to the nearest 1 g) and measured (to the nearest mm) on 17 September. The adult female weighed 625 g and measured 900 mm SVL and 100 mm TTL. The female and all young were released on 21 September 1992.

We estimated relative clutch mass (RCM) by dividing offspring mass by the sum of the female mass after parturition plus the offspring mass (Seigel and Fitch 1984. Oecologia (Berlin) 61:293–301; 1985. J. Anim. Ecol. 54:497–505; Seigel et al. 1986. Herpetologica 42(2):179–185). The estimate therefore does not include the mass attributable to birth fluids and embryo membranes. We calculated a RCM of 0.370.

The mean mass of neonates was 9.14 g for males (range = 8.29–9.80 g; SD = 0.43) and 9.19 g for females (range = 7.99–9.76 g; SD = 0.44). The means do not differ significantly ($t = -0.349$, $p > 0.05$).

Mean SVL for males was 211.2 mm (range = 200–220 mm, SD = 5.77), and mean TTL males was 72.6 mm (range = 66–80 mm, SD = 3.52). Mean SVL for females was 213.2 mm (range = 203–225 mm, SD = 5.45), and the mean TTL for females was 66.3 mm (range = 58–71 mm, SD = 3.43). SVL did not differ significantly between male and female neonates ($t = -1.0977$, $p > 0.05$). However, TTL was significantly shorter for females than males ($t = 5.498$, $p < 0.0001$).

Little is known about reproduction of *N. rhombifer* in Illinois. Smith (*op. cit.*) reported litters of 23 and 32 from specimens collected in Illinois. Anderson (1965. The Reptiles of Missouri. University of Missouri Press, Columbia, Missouri, xxiii + 330 pp.) reported mean litter size of 47.3 (N = 22) based on dissection of gravid females and on counts of live-born litters from Missouri. In Indiana, Minton (1972. Amphibians and Reptiles of Indiana. Ind. Acad. Sci. Monogr. 3:1–346) documented 15 embryos from a single gravid specimen.

There are no previous reports of measurements of lengths and weights of entire litters of this species. In their review, Seigel and Fitch (*op. cit.*) found no published reports of RCM for *N. rhombifer* but they used unpublished data to calculate an RCM of 0.289 for the species. We observed a much higher value (0.370) in the single litter for which it could be measured. Compared to RCM values reported for other natricines, the RCM that we determined for *N. rhombifer* is closer to that reported by Seigel and Fitch for *Clonophis kirtlandii* (0.396 from Conant 1943. Am. Midl. Nat. 29(2):313–341; 0.386 from Tucker 1976. J. Herpetol. 10(1):53–54); we determined a somewhat lower RCM value (0.337) for *C. kirtlandii* based on data reported by Powell and Parmerlee (1991. Bull. Chicago Herpetol. Soc. 26(2):32). The large range in RCMs for natricines suggests that many more data are needed before natural variability in this important life history trait can be adequately described.

We thank Mack Sitzes for assistance in capturing the female. John Nelson helped with statistics. Charles Theiling also assisted with statistical evaluations of the data. John P. Ballenot, Carie Nixon, Eric Ratcliff, Chuck Theiling, and Glendy Vanderah made comments on the manuscript. Lee A. Fitzgerald made several helpful suggestions on the manuscript.

Submitted by **JOHN K. TUCKER** and **JAMES B. CAMERER**, Illinois Natural History Survey, Long Term Resource Monitoring Program Pool 26, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

NERODIA SIPEDON (Northern Water Snake). **FATALITY**. Plastic debris has been implicated in the deaths of numerous aquatic and marine vertebrates, including fish, birds, mammals, and turtles (e.g., Committee on Sea Turtle Conservation 1990. Decline of the Sea Turtles: Causes and Prevention. National Academy Press, Washington, DC, 259 pp.). Here we report on mortality to *Nerodia sipedon* caused by entanglement in Bird-X™, a flexible plastic netting used to control bird damage in gardens and orchards.

On 22 June 1992, a female *Nerodia sipedon* (Denison University Vertebrate Collection A0063: 718 mm SVL, 941 mm TL) was found dead, entangled in Bird-X™ used to exclude small rodents from a plant ecology experiment in progress at Mountain Lake Biological Station (MLBS), Giles County, Virginia. The snake had lacerations to the upper thoracic region and prominent constrictions to the mid-tracheal and anterior lung region. Apparently the snake either strangled or perished from thermal stress, as it had been restrained in full sunlight on a warm afternoon. On 17 August 1993, another female *N. sipedon* (DUVC A0075: 595 mm SVL, 771 mm TL) was found entrapped in a snarl of Bird-X™ (a 170 mm fragment discarded from the above experiment), grass, and sedge. It was writhing upside-down when encountered, and the netting had already inflicted multiple lacerations, including an upper-thoracic wound that almost completely severed the ventral and lateral musculature. The wounds were too severe to treat, so the snake was euthanized.

At least three additional snakes were ensnared in plastic netting from 1991-1993 at MLBS, including another *N. sipedon*, a black rat snake (*Elaphe obsoleta*), and a timber rattlesnake (*Crotalus horridus*). The two nonvenomous snakes were released unharmed, but the rattlesnake was already dead when it was discovered. Large, heavy-bodied snakes appear particularly vulnerable to entrapment because their scales snag the flexible netting when they reverse direction. Smaller snakes probably encounter plastic netting frequently but are able to maneuver through the mesh easily. Because they are active hunters that forage along ecotones where trash often accumulates, water snakes appear particularly vulnerable to such accidental fatalities (e.g., Herrington 1985. Herpetol. Rev. 16(4):113).

Submitted by **JOHN E. FAUTH** and **STEPHANIE M. WELTER**, Department of Biology, Denison University, Granville, Ohio 43023, USA.

STORERIA OCCIPITOMACULATA OCCIPITOMACULATA (Northern Red-bellied Snake). **PREDATION**. On 1 July 1992, a 25 cm *Storeria occipitomaculata occipitomaculata* (sex unknown) was found in an American kestrel (*Falco sparverius*) nest box located on a 50% dead tree in the middle of a fallow field on Ile Perrot, Quebec (lat. 45°22'30"N, long. 73°55'00"W). The snake's spinal cord was severed at the base of the head and it was presumed it would soon become food for the three 3-week old *F. sparverius* chicks within the box. According to Sherrod (1978. Raptor Research 12(3/4):49–121), *S. occipitomaculata* has not been recorded previously in the diet of *F. sparverius*. *Falco sparverius* feeds on a variety of reptiles and amphibians, but it is unusual to find *S. occipitomaculata* in the diet due to this snake's habit of residing

under logs, stones, or other cover during most of the day (Froom 1972. The Snakes of Canada, McClelland and Stewart Ltd., Toronto.).

Submitted by **GLENN C. BARRETT***, and **MORRIS R. VILLARROUL,** Avian Science and Conservation Centre, Macdonald Campus, McGill University, 21111 Lakeshore, Ste-Anne-de-Bellevue, Quebec, Canada, H9X 3V9.

* Present address for GCB: 2429 Lakeshore Road, Burlington, Ontario, Canada, L7R.

THAMNOPHIS SIRTALIS SIRTALIS (Eastern Garter Snake). **ALBINISM.** Reports of albinistic and leucistic individuals of this species are not uncommon. Dyrkacz (1981. SSAR Herpetol. Circ. 11) reported 11 instances from throughout its range. However, no reports of albinistic *T. sirtalis* from Virginia have been published (Mitchell, *in press*. The Reptiles of Virginia. Smithsonian Inst. Press, Washington, D.C.). A leucistic, approximately 600 mm total length, adult female *T. s. sirtalis* was found on 2 July 1992 near a small stream on the Clifton Farm, 7 km north of Warrenton, Fauquier County, Virginia. The snake's eyes were normally pigmented, but the skin was uniformly white with only the barest traces of pattern visible (Fig. 1).

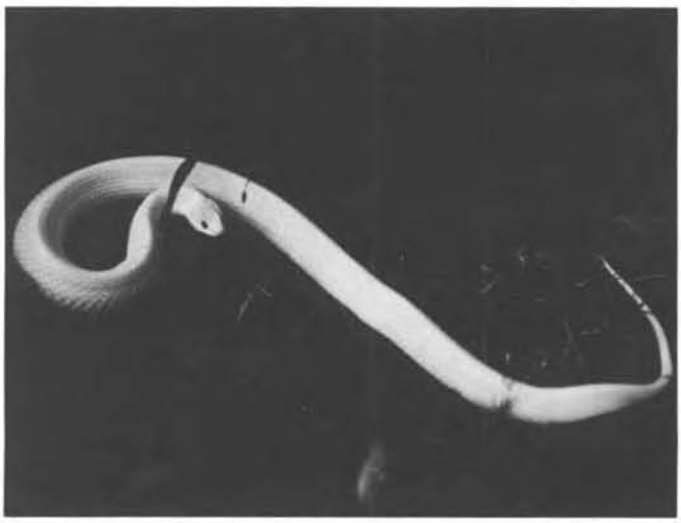


FIG. 1. Leucistic *Thamnophis s. sirtalis* from Fauquier Co., Virginia.

The snake was kept in captivity where it refused food (ranid frogs). On 19 September, it gave birth to 30 neonates, all of which were normally pigmented and patterned. Five of the neonates were either stillborn or died shortly after birth. The female and surviving young were released on 21 September. However, on the following day the female was found at the release site weak and emaciated, and was recaptured. She died on 30 September after regurgitating a force-fed frog. Dissection of the snake revealed one additional, somewhat decomposed neonate, also normally pigmented and patterned. The lack of leucistic neonates in this female suggests that albinism in this species may follow Mendelian inheritance patterns.

Submitted by **STEPHEN H. SHIVELY**, Louisiana Natural Heritage Program, Louisiana Department of Wildlife and Fisheries, P.O. Box 98000, Baton Rouge, Louisiana 70898-9000, USA, and **JOSEPH C. MITCHELL**, Department of Biology, University of Richmond, Richmond, Virginia 23173, USA.

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of a species' range, and thereby permit a more significant interpretation of its biology.

These geographic distribution records will be accepted in a **standard format** only, and all authors *must* adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in Collins, 1990, *Standard Common and Current Scientific Names for North American Amphibians and Reptiles, Third Edition*, Herp. Circ. 19:1–41), LOCALITY (use metric for distances and give precise locality data), DATE (day-month-year), COLLECTOR, VERIFIED BY (*cannot* be verified by an author — curator at an institutional collection is preferred), PLACE OF DEPOSITION (where applicable, use standardized collection designations as they appear in Leviton et al., 1985, *Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology*, Copeia 1985(3):802–832) and CATALOG NUMBER (required), COMMENTS (brief), CITATIONS (brief), SUBMITTED BY (give name and address in full — spell out state names — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged; institutional collection records will receive precedence in case of conflict). A good quality color slide or photograph may substitute for a preserved specimen *only* when the live specimen could not be collected for the following reasons: it was a protected species, it was found in a protected area, or the logistics of preservation were prohibitive (such as large turtles or crocodilians). Color slides and photographs *must* be deposited in a university or museum collection along with complete locality data, and the color slide catalog number(s) must be included in the same manner as a preserved record. Before you submit a manuscript to us, check Censky (1988, *Index to Geographic Distribution Records in Herpetological Review: 1967–1986*) to make sure you are not duplicating a previously published record.

Please submit any geographic distribution records in the **standard format only** to the Section Co-editors, Joseph T. Collins (USA & Canadian records only), Museum of Natural History—Dyche Hall, The University of Kansas, Lawrence, Kansas 66045–2454, USA, or Jerry D. Johnson (the rest of the world), Department of Biology, El Paso Community College, P.O. Box 20500, El Paso, Texas 79998-0500, USA. Short manuscripts are strongly discouraged, and are only acceptable when data cannot be presented adequately in the standard format.

Recommended citation for new distribution records appearing in this section is: Painter, C. W., and C. M. Milensky. 1993. Geographic Distribution. *Crotalus tigris*. Herpetol. Rev. 24:155-156.

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). USA: TENNESSEE: Humphrys Co: adjacent small creek near jct. Bodine Loop and Cuba Landing Roads. 28 March 1993. M. Varner and B. T. Miller. Middle Tennessee State University (MTSU 84C–85C). Verified by B. T. Miller. New county record (Redmond 1985, A Biogeographic Study of Amphibians in Tennessee, Doctoral Thesis, Univ. Tennessee, Knoxville. 290 pp.).

Submitted by **MURLIN E. VARNER, JR.**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

AMBYSTOMA OPACUM (Marbled Salamander). USA: ILLINOIS: Shelby Co: 2 km W Towerhill & 4 km S Rt. 16 (39°20'53"N, 88°59'30"W). 10 April 1993. Tony Glick. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale (SIUC H-

4451). New county record; extends range ca. 55 km WNW of nearest known locality in Cumberland County (Smith 1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **ALLAN K. WILSON**, Max McGraw Wildlife Foundation, P.O. Box 9, East Dundee, Illinois 60118, USA.

ANEIDES AENEUS (Green Salamander). USA: INDIANA: Crawford Co: see below. 24 August 1993. R. F. Madej. Verified by A. R. Resetar. FMNH 251486. Adult female. This is the first occurence for Indiana. Frozen tissue samples are also stored at the Field Museum of Natural History. Other individuals (adult and juvenile) observed and photographed at site. Precise locality data have been withheld because this species has been recommended for legal protection under the Indiana Nongame and Endangered Species Conservation Act (IC 14-2-8.5).

Submitted by **ROBERT F. MADEJ**, Indiana Department of Natural Resources, Division of Fish and Wildlife, Nongame and Endangered Wildlife Program, 300 West First Street, Bloomington, Indiana 47403, USA.

CRYPTOBRANCHUS ALLEGANIENSIS (Hellbender). USA: ILLINOIS: White Co: Wabash River at Maunie. 8 August 1990. Captured by commercial fishermen, obtained by a fish market in McLeansboro, and given to Saint Louis Zoo where it was displayed until it died in 1993. The frozen specimen was given to the Southern Illinois University at Carbondale Department of Zoology where it was preserved and deposited (SIUC H-4462). Verified by Ron Goellner. Previously considered extirpated from state but, on the basis of this specimen, the Department of Conservation is adding the Hellbender to the list of Illinois endangered species. The most recently documented specimens were from Cave In Rock, Hardin County (1956) and Metropolis, Massac County (1956), both from the Ohio River (Stein and Smith 1959, Copeia 1959:178–179). These specimens, previously reported to be at Southern Illinois University, are now INHS 9669 and 9670, respectively. Stein and Smith (*op. cit.*) mentioned a specimen collected in 1947 near Maunie. Klimstra and Hutchison (1965, Trans. Illinois St. Acad. Sci. 58:151–156) reported a specimen from the Ohio River near Joppa, Massac County, but it is undocumented.

Submitted by **RONALD A. BRANDON**, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA, and **SCOTT R. BALLARD**, Illinois Department of Conservation, Division of Natural Heritage, 4521 Alton Commerce Parkway, Alton, Illinois 62002, USA.

DICAMPTODON TENEBROSUS (Pacific Giant Salamander). USA: WASHINGTON: Pacific Co: tributary of Willapa River, ca. 1.6 km E of Willapa Harbor Airport, NW 1/4 Sec. 15, T14N, R9W. 5 September 1993. W. P. Leonard and D. Doherty. Verified by R. A. Nussbaum. University of Michigan Museum of Zoology, Ann Arbor, Michigan (RAN 31885). First coastal record N of the Willapa River. Extends range ca. 24 km N of only other county record (Jones and Atkinson 1989, Northwest. Nat. 70:40–42.).

Submitted by **WILLIAM P. LEONARD**, Washington Department of Ecology, P. O. Box 47600, Olympia, Washington 98504-7600, USA, and **DEIRDRE DOHERTY**, P. O. Box 319, Bridgeton, New Jersey 08302, USA.

NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS (Central Newt). USA: ALABAMA: Mobile Co: Dauphin Island, Gorgas Swamp. 12 November 1993. T. A. Sinclair. Verified by James D. Lazell. MCZ A11825. New island record; extends range in Alabama W of the Alabama River ca. 117 km S of Greene County locality and ca. 35 km S of Mobile County literature record (Mount 1975, The Reptiles and Amphibians of Alabama. Auburn Univ. Agric. Exp. Sta., Auburn, Alabama. 347 pp.). Salamanders are absent or rare on barrier islands. This increases to three the number found on Dauphin Island (Mount, *op. cit.*).

Submitted by **THOMAS A. SINCLAIR**, The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835, USA.

PLETHODON WEHRLEI (Wehrle's Salamander). USA: NORTH CAROLINA: Alleghany Co: 6.8 km and 6.9 km SSE Edmonds, Saddle Mountain. 14 November 1993. J. C. Beane, J. R. Everhart, and A. B. Somers. NCSM 34832–34833; Surry Co: 5.8 km WSW Low Gap, Saddle Mountain. 16 October 1993. J. C. Beane, C. K. Cheshire, S. K. Eanes, J. R. Everhart, and A. B. Somers. NCSM 34825; 6.0 km WSW Low Gap, Saddle Mountain. 13 November 1993. J. C. Beane and C. K. Chesire. NCSM 34831. All verified by Alvin L. Braswell. A total of eighteen additional specimens from contiguous populations were observed but not collected on 16 October, 22 October, and 13–14 November 1993 at these localities. New county records; second locality for North Carolina. Extends range ca. 70 km S of nearest records in Patrick and Grayson counties, Virginia, and ca. 60 km W of nearest records in Stokes County, North Carolina (Highton 1987, Cat. Amer. Amph. Rept. 402.1–402.3). Only two specimens had been known from North Carolina, and the exact locality and specific collection data for those specimens have apparently not been previously reported. Both are from Hanging Rock State Park in Stokes County. One (NCSM 32093, formerly DU A14806) on 16 April 1978 by J. R. Bailey et al. Highton (1962, Bull. Florida State Mus. 6(3):235–367) noted that Whitetop Mountain in Grayson County, Virginia, was the only site where *P. wehrlei* was sympatric with *P. yonahlossee*. The two species are also sympatric at this new locality.

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 29555, Raleigh, North Carolina 27626-0555, USA, and **ANN BERRY SOMERS**, Department of Biology, University of North Carolina at Greensboro, Greensboro, North Carolina 27412-5001, USA.

ANURA

ASCAPHUS TRUEI (Tailed Frog). USA: WASHINGTON: Okanogan Co: Williams Creek (tributary to Twisp River), 0.3 km SW of Twisp River, SW 1/4 Sec. 34, T34N, R19E. 25 September 1993. D. Visalli and W. P. Leonard. Verified by L. L. C. Jones. University of Washington Burke Museum, Seattle, Washington (UWBM 2218). New county record; fills ca. 180 km distributional gap between Chelan County, Washington, and British Columbia along E slope of Cascade Mountains (Nussbaum et al. 1983, Amphibians and Reptiles of the Pacific Northwest. Univ. of Idaho Press, Moscow. 332 pp.).

Submitted by **DANA VISALLI**, P. O. Box 175, Winthrop, Washington 98862, USA, and **WILLIAM P. LEONARD**, Washington Department of Ecology, P. O. Box 47600, Olympia, Washington 98504-7600, USA.

ASCAPHUS TRUEI (Tailed Frog). USA: WASHINGTON: Wahkiakum Co: tributary to Elochoman River, ca. 21 km N of Town of Cathlamet, NW 1/4 Sec. 3, T10N, R5W. 29 April 1993. S. W. Manlow. Verified by L. L. C. Jones. University of Washington Burke Museum, Seattle, Washington (UWBM 2216). New county record; extends range ca. 30 km SW in Willapa Hills (Adams 1993, Herpetol. Rev. 24(2): 64). Found in stream with sympatric populations of *Dicamptodon copei*, *D. tenebrosus*, and *Rhyacotriton kezeri*.

Submitted by **STEVEN W. MANLOW**, Washington Department of Wildlife, 11203 NE 96th Street, Vancouver, Washington 98662, USA.

BUFO AMERICANUS (American Toad). USA: ILLINOIS: Fayette Co: Sec. 28, T7N, R3E, junction of Brickyard Branch of South Fork Creek with County Road 2000N, 0.25 km W of St. Elmo. 17 April 1993. J. K. Tucker. Verified by K. Cummings. Illinois Natural History Survey (INHS 10957–10959). Three males. New county record (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298); extends range 24 km S of nearest Illinois record and confirms Smith's hypothesis that species occurs in the county.

Submitted by **JOHN K. TUCKER**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

BUFO AMERICANUS AMERICANUS (Eastern American Toad). USA: ILLINOIS: Kane Co: 1 km W Rt. 25 and 1.8 km S Rt. 72 (42°5'17"N, 88°15'55"W). 1 September 1993. A. K. Wilson. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale (SIUC H-4473). New county record; Smith (1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298) shows literature record but no voucher for the county.

Submitted by **ALLAN K. WILSON**, Max McGraw Wildlife Foundation, P. O. Box 9, East Dundee, Illinois 60118, USA.

BUFO MICROSCAPHUS MICROSCAPHUS (Arizona Toad). USA: ARIZONA: Gila Co: Pinto Creek at U.S. Forest Service Road 287, Sec. 2, T1N, R13E. 19 April 1993. S. G. Seim. Verified by B. K. Sullivan. Arizona State University Lower Vertebrate Collection (ASU 28812). One calling male observed 60 km southwest of nearest record (Sullivan, Great Basin Nat. *in press*). Not previously known to occur on south side of Lake Roosevelt.

Submitted by **SHARON G. SEIM**, Arizona Game and Fish Department, Nongame Branch, 2221 West Greenway Road, Phoenix, Arizona 85023, USA.

BUFO WOODHOUSII FOWLERI (Fowler's Toad). USA: MISSOURI: St. Charles Co: NE 1/4 Sec. 26, T48N, R7E, Ellis Island, Riverlands Road. 2 April 1993. J. Tucker. Verified by L. Page, Illinois Natural History Survey (INHS 10981-10986). Six adults taken AOR. New county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Publ. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **JOHN K. TUCKER** and **CHARLES H. THEILING**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

RANA CATESBEIANA (Bullfrog). USA: ILLINOIS: Peoria Co: Peoria, Teton & N. University Avenue, Sec. 8, T9N, R8E, DOR. 11 July 1993. F. T. Burbrink. Verified by Kevin S. Cummings. Illinois Natural History Survey, Champaign, Illinois (INHS 10973). (Smith 1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298) shows a published record but no voucher for this species in the county; new county record.

Submitted by **FRANK T. BURBRINK**, Center for Wildlife Ecology, Illinois Natural History Survey, Natural Resources Building, 607 East Peabody Drive, Champaign, Illinois 61820, USA.

SCAPHIOPUS HOLBROOKII HURTERII (Hurter's Spadefoot). USA: TEXAS: Grayson Co: 4.8 km SE Denison. 29 April 1993. J. D. Camper. TCWC 70375. Verified by James R. Dixon. County record; fills substantial gap between Denton and Red River counties at western portion of range (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station, Texas. 434 pp.). Adult taken (2030 h) at breeding pond in lowland area of red-sandy soil about 8 km S Red River.

Submitted by **JEFFREY D. CAMPER**, Department of Biology, Austin College, Sherman, Texas 75091-1177, USA.

SYRRHOPHUS CYSTIGNATHOIDES (Rio Grande Chirping Frog), USA: TEXAS: Tarrant Co: jct. Daggett and Sunset Terrace. 18 September 1993. M. T. Dixon, L. K. Ammerman and L. S. McGown. Verified by James R. Dixon. TCWC 70873–70874. Northernmost record for the species (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station, Texas. 434 pp.). Introduced into the San Antonio and Houston area via the plant nursery trade, and possibly arrived in Fort Worth in a similar manner. The frogs have established themselves in rocky areas along a two mile stretch on the bluff of the Clear Fork of the Trinity River.

Submitted by **LAURINE S. McGOWN, MICHAEL T. DIXON**, and **LOREN K. AMMERMAN**. Department of Biology, Texas Wesleyan University, 1201 Wesleyan, Fort Worth, Texas 76105, USA.

TESTUDINES

APALONE SPINIFERA ASPERA (Gulf Coast Spiny Softshell). USA: NORTH CAROLINA: Montgomery Co: 5.9 km WSW Pekin in Little River. 20 June 1993. J. C. Beane, S. L. Alford, and J. Hurley. Verified by W. M. Palmer. NCSM color slides JCB 93-1172. New county record (NCSM files).

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 29555, Raleigh, North Carolina 27626-0555, USA, and **STANLEY L. ALFORD**, North Carolina Zoological Park, Route 4, Box 83, Asheboro, North Carolina 27203, USA.

CHELYDRA SERPENTINA (Snapping Turtle). USA: ILLINOIS: Kane Co: 1 km W of Rt. 25 & 1.9 km S of Rt. 72 (42°5'15"N, 88°15'56"W). 15 June 1993. L. A. Fray and A. K. Wilson. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale (SIUC R-2500). New county record; (Smith 1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298) shows a literature record but no voucher for the county.

Submitted by **ALLAN K. WILSON**, Max McGraw Wildlife Foundation, P. O. Box 9, East Dundee, Illinois 60118, USA.

MELANOCHELYS TRICARINATA (Tricarinate Hill Turtle). INDIA: UTTAR PRADESH: Dehradun: Chandrabani, on Wildlife Institute of India campus. 10 August 1993. Stephen D. Busack. Verified by S. Bhupathy. One live individual, represented by four transparencies (CM Acc. 35560.1–35560.4) and at least ten additional specimens living in the area and individually marked by S. Bhupathy. These turtles may represent a previously unreported and disjunct population 1000 km NW of available records (Tikader and Sharma 1985, Handbook Indian Testudines, Zool. Surv. India, Calcutta, 156 pp.), or an introduction attempt that may be successful.

Submitted by **STEPHEN D. BUSACK**, National Fish and Wildlife Forensic Laboratory, 1490 East Main Street, Ashland, Oregon 97520, USA.

STERNOTHERUS ODORATUS (Common Musk Turtle). USA: MISSOURI: St. Charles Co: NE 1/4 Sec. 26, T48N, R7E, Ellis Island, Riverlands Road. 8 July 1993. J. Tucker. Verified by L. Page, Illinois Natural History Survey (INHS 10987). Adult taken AOR. New county record and second record north of Missouri River for the species (Johnson 1987, The Amphibians and Reptiles of Missouri. Publ. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **JOHN K. TUCKER** and **CHARLES H. THEILING**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

TRACHEMYS SCRIPTA (Slider). USA: KANSAS: Riley Co: Fort Riley Military Reservation, Vinton Pond, SE 1/4, NE 1/4 Sec. 35, T10S, R5E. 11 September 1993. J. R. Parmelee. Verified by Joseph T. Collins. KU 221248. Caught in turtle trap; new county record (Collins 1993, Amphibians and Reptiles in Kansas. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Series 13: 1–397).

Submitted by **JEFFREY R. PARMELEE**, Museum of Natural History and Department of Systematics and Ecology, The University of Kansas, Lawrence, Kansas 66045-2454, USA.

TRACHEMYS SCRIPTA ELEGANS (Red-eared Slider). USA: ILLINOIS: Kane Co: Max McGraw Wildlife Foundation, 1.05 km W Rt. 25 & 2.5 km S Rt. 72 (42°4'29"N, 88°16'8"W). 16 July 1993. A. K. Wilson. Verified by R. A. Brandon. Southern Illinois University at Carbondale (SIUC R-2485). Other sightings in area possibly indicate breeding has occurred; new county record (Smith 1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **ALLAN K. WILSON**, Max McGraw Wildlife Foundation, P.O. Box 9, East Dundee, Illinois 60118, USA.

LACERTILIA

ANOLIS SAGREI (Brown Anole). USA: LOUISIANA: East Baton Rouge Parish: Baton Rouge, greenhouse on Sottle Drive, ca. 2 km NE jct. Interstate 10 and Highland Road. 8 October 1993. Mike Leggio. Verified by Richard R. Montanucci. Vertebrate Collection, Department of Biological Sciences, Clemson University (CUSC 792). Single specimen collected. At least five additional individuals observed in greenhouse with *Anolis carolinensis*. Nearest reported populations are in Orleans and Jefferson Parishes, Louisiana (Thomas et al. 1990, Herpetol. Rev. 21:22). Extends range ca. 115 km northeast. Greenhouse may provide thermal refuge from occasional low winter temperatures; it is likely that *A. sagrei* is established at this site. Probably introduced in shipments of houseplants originating from Florida.

Submitted by **STEVEN G. PLATT** and **LANCE W. FONTENOT**, Department of Biological Sciences, Clemson University, Clemson, South Carolina 29634-1903, USA.

CNEMIDOPHORUS DEPPEI DEPPEI (Lagartija Rayada). NICARAGUA: ZELAYA: Puerto Cabezas. 18 May 1970. Jaime D. Villa. KU 174105–8. Verified by Joseph T. Collins; Krukira, ca. 40 km S Puerto Cabezas. 20 December 1991. J. D. Villa, E. J. Petuch, R. Solórzano. Three uncatalogued specimens to be deposited at the University of Florida. First records on the Caribbean versant of Nicaragua, extending distribution beyond the map given by Wright (*In* Wright and Vitt 1993, Biology of Whiptail Lizards [Genus *Cnemidophorus*], pp. 27-81. Publ. Oklahoma Mus. Nat. Hist., Norman, Oklahoma). Extends known range ca. 165 km SSE Tancín, Departamento de Gracias a Dios, the nearest known locality in Honduras (Meyer and Wilson 1973, Los Angeles Co. Mus. Contrib. Sci. 244:1-39), and 320 km NNW of the Ciudad Darío-Sébaco area (Departamento de Matagalpa), the nearest Nicaraguan localities (KU 86066–67, 103270–76). The Tancín specimens (LACM 48023–25, LSUMZ 21628–31), as well as one from Puerto Castillo, Colón (LSUMZ 22482), are also outside the range as depicted in Wright (*op. cit.*).

Submitted by **JAIME D. VILLA**, Department of Biological Sciences, Florida Atlantic University, Boca Raton, Florida 33431-0991, USA.

OPHISAURUS ATTENUATUS (Western Slender Glass Lizard). USA: KANSAS: Saline Co: DOR, 1.5 km SSE Bridgeport, NE 1/4 Sec. 36, T16S, R3W. 21 May 1993. Jerry D. Johnson and Travis J. LaDuc. Verified by Robert G. Webb. University of Texas at El Paso (UTEP 15298). First county record (Collins 1993, Amphibians and Reptiles of Kansas. Third ed. Univ. Kansas Mus. Nat. Hist. Publ. Ed. Ser. 13:1–397.).

Submitted by **JERRY D. JOHNSON**, Biology Department, El Paso Community College, El Paso, Texas 79998-0500 and Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas 79968-0519, USA, and **TRAVIS J. LaDUC**, Department of Biological Sciences, The University of Texas at El Paso, El Paso, Texas, 19968-0519, USA.

PODARCIS MURALIS (Common Wall Lizard). USA: KENTUCKY: Campbell Co: Ft. Thomas, along Clover Ridge Avenue, 39°05'30"N, 84°27'25"W. 22 September 1993. Matthew and Dana Draud. Verified by Rafe M. Brown. Cincinnati Museum of Natural History (CMNH 3897). State record and collected from a large breeding population. Common across the Ohio River in Cincinnati (Hedeen 1984, Herpetol. Rev. 15:70–71).

Submitted by **MATTHEW DRAUD**, Chandler #17, Behavioral and Evolutionary Sciences, Lehigh University, Bethlehem, Pennsylvania 18018, USA and **JOHN FERNER**, Department of Biology, Thomas More College, Crestview Hills, Kentucky 41017, USA.

SCINCELLA LATERALIS (Ground Skink). USA: NORTH CAROLINA. Surry Co: 6.5 km NNW Mountain Park along Mitchell River. 11 September 1993. J. C. Beane and A. B. Somers. Verified by W. M. Palmer. NCSM 34711. New county record; extends range ca. 75 km WNW of nearest record in Forsyth County (NCSM files) and partially fills the range hiatus as shown in Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third ed. Houghton Mifflin, Boston, Massachusetts, 450 pp.). Another specimen was observed but not collected 0.8 km SSW Dobson on 3 October 1993.

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 29555, Raleigh, North Carolina 27626-0555, USA, and **ANN BERRY SOMERS**, Department of Biology, University of North Carolina at Greensboro, Greensboro, North Carolina 27412-5001, USA.

SERPENTES

CLONOPHIS KIRTLANDII (Kirtland's Snake). USA: OHIO: Greene Co: Belbrook, Spring Lakes. 17 September 1993. Michael Bernhard. Verified by J. T. Collins. Animal photographed and released. KU Color Slide 11044. Adult male found near water during daylight hours. The species is considered threatened in the state of Ohio and is thought to be restricted to a few southern counties. This individual could represent a previously unknown population and is likely the first record of this species in Greene County (Wynne, unpubl. ms.).

Submitted by **GREGORY J. WATKINS-COLWELL**, Department of Biological Sciences, Ohio University, Athens, Ohio 45701, USA.

CROTALUS HORRIDUS (Timber Rattlesnake). USA: LOUISIANA: Beauregard Parish: DOR on U. S. Rt. 190, 5.6 km SW Merryville. 6 October 1972. R. D. Suttkus. Verified by D. A. Rossman. Tulane University Museum of Natural History (TU 28888). New parish record. This is only a short distance (ca. 30 km) from a Newton County, Texas record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A&M University Press, College Station, Texas. xii + 434 pp.), but equidistant from the two closest localities in Louisiana (111 km west, 111 km south) (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State University Press, Baton Rouge, Louisiana. xi + 300 pp.). The species is rare in pinelands of Louisiana, occurring

primarily in bottomlands or hardwood forests. The Merryville record is in bottomland forest near the Sabine River.

Submitted by **HAROLD A. DUNDEE**, Department of EEO Biology, Tulane University, New Orleans, Louisiana 70118-5698, USA.

ELAPHE EMORYI (Great Plains Rat Snake). USA: NEBRASKA: Richardson Co: gravel road through center of Sec. 15, T2N, R13E. 31 July 1993. C. Bridgewater and T. Leonard. University of Nebraska at Lincoln (UNL 15399). Verified by John D. Lynch. New county record; easternmost occurrence of the species in Nebraska (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **T. LEONARD**, 5006 South 36th Avenue, Omaha, Nebraska 68107, USA.

NERODIA RHOMBIFER RHOMBIFER (Diamondback Water Snake). USA: ILLINOIS: Calhoun Co: mouth of Swan Lake, Illinois River mile 5.0. 26 July 1992. J. K. Tucker and J. Nelson. Verified by K. S. Cummings. Illinois Natural History Survey (INHS 10911). New county record; extends range 4.9 km SW of nearest Illinois record in Jersey County (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **JOHN K. TUCKER** and **JAMES B. CAMERER**, Illinois Natural History Survey, Long Term Resource Monitoring Program Pool 26, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

RAMPHOTYPHLOPS BRAMINUS (Braminy Blind Snake). MEXICO: OAXACA: municipality of Cuicatlan, trail station Cuicatlan (17°26'N, 96°13'W), 600 m elev. 28 July 1993. Dan G. Mink. Verified by Oscar Flores-Villela. Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México (MZFC 6009, two specimens). First record for the state and a southwestern range extension of 178 km (airline) from Playa Mocambo, Veracruz, on the Gulf Coast (Mendoza-Quijano et al. 1993, Herpetol. Rev. 24(3):110). Previously reported introductions are in Baja California Sur (Murphy and Ottley 1979, Herpetol. Rev. 10(4):119), Jalisco (Dundee and Flores-Villela 1991, Herpetol. Rev. 22(1):26), Sinaloa, Michoacan, and Guerrero on the Pacific Coast, and inland from Queretaro and Morelos (Dixon and Hendricks 1979, Zool. Verhandelingen 173:1–39).

Submitted by **FERNANDO MENDOZA QUIJANO** and **ALEJANDRA RENDON ROJAS**, Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México, Apartado Postal 70-399, México D. F. 04510, México, and **DANIEL G. MINK**, Department of Zoology, Brigham Young University, Provo, Utah 84602, USA.

RAMPHOTYPHLOPS BRAMINUS (Braminy Blind Snake). USA: FLORIDA: Highlands Co: Lake Placid at residence in Placid Lakes subdivision. 26 June 1993. W. E. Meshaka, Jr. Verified by H. R. Mushinsky. Vertebrate collection, Archbold Biological Station (ABS 1177). New county record and northernmost locality in Florida; extends inland range ca. 100 km NW of Palm Beach County record (DeLorey and Mushinsky 1987, Herpetol. Rev. 18(3):56) and ca. 90 km NE of Lee County record (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third Ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.). Like *Anolis sagrei* (Godley et al. 1981, Herpetol. Rev. 12(3):84–86), presence of the species on the central ridge is likely the result of introduction of ornamental plants in such human-modified habitats as subdivisions, from which this individual was collected.

Submitted by **WALTER E. MESHAKA, JR.**, Archbold Biological Station, P.O. Box 2057, Lake Placid, Florida 33852, USA.

RHAMPHOTYPHLOPS BRAMINUS (Braminy Blind Snake). USA: LOUISIANA: Orleans Parish: Mid-City area of New Orleans. 11 November 1993. Richard Lopicallo. Verified by Douglas A. Rossman. LSUMZ 56317. New state record (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State University Press, Baton Rouge. 300 pp). Found under a board on a slab in a city lot that had been used as a storage site for nursery products. Specimen presumably arrived in a potted plant. Other introduced species found in the area are *Eleutherodactylus planirostris*, *Anolis sagrei*, and *Hemidactylus turcicus*.

Submitted by **ROBERT A. THOMAS**, Society for Environmental Education and University of New Orleans, New Orleans, Louisiana 70187-6010.

RHADINAEA FLAVILATA (Pine Woods Snake). USA: ALABAMA: Mobile Co: Mobile, Hillcrest Road near Cottage Hill Road. 23 October 1974. James Harden. University of South Alabama (USA 2163); Scoutshire Woods (Girl Scout Camp), 21.6 km SE Citronelle. 8 May 1982. F. A. Harrington and D. H. Nelson. USA 2306; Mobile, 1255 Dauphin Street. 18 May 1993. J. D. Cochran and C. G. Drew. USA 2409. All specimens verified by Craig Guyer. Substantiates an early literature record from near Mobile (Mount 1975, Reptiles and Amphibians of Alabama. Auburn Univ. Agric. Exp. Stat., Auburn, Alabama. 347 pp.). A previous record (USA 1403), also mentioned by Mount (*op. cit.*), was first reported by Jackson and Jackson (1970, Quart. J. Florida Acad. Sci. 33:281–287).

Submitted by **DAVID H. NELSON**, Department of Biology, University of South Alabama, Mobile, Alabama 36688, USA, and **JUSTIN D. COCHRAN**, **CORBERT G. DREW**, and **TERRY D. SCHWANER**, Alabama School of Mathematics and Science, 1255 Dauphin Street, Mobile, Alabama 36604, USA.

RHADINAEA MARCELLAE (NCN). MEXICO: HIDALGO: municipality of Tlanchinol, 5.3 km E Tlanchinol, Arroyo de Apantlazol (21°00'N 98°35'W), 1550 m elev. 28 March 1991. Efraín Hernández García. Verified by Oscar Flores Villela. Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México (MZFC 5868, female). Found crushed on road by potrero surrounded by cloud forest. First record for the state and a southern range extension ca. 60 km SE of nearby record in Xilitla Region, San Luis Potosí (Taylor 1949, Univ. Kansas Sci. Bull. 23(2):169–215); second known specimen of the species. Specimen agrees fully with descriptions of *R. marcellae* (Taylor 1949, *op. cit.* Myers 1974, Bull. Amer. Mus. Nat. Hist. 153(1):88–89) except for the presence of an incomplete neck collar and a high number of ventral scales (137 versus 128 in holotype).

Submitted by **EFRAIN HERNANDEZ GARCIA** and **FERNANDO MENDOZA QUIJANO**, Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de Mexico, Apartado Postal 70-399, D. F. 04510, México.

SALVADORA HEXALEPIS (Western Patchnose Snake). USA: CALIFORNIA: Kern Co: west side of San Joaquin Valley, 6.5 map km NNW McKittrick (T29S, R22E, NW 1/4 of Sec. 19), ca. 152 m elev. 4 May 1992. Scott Cameron. LACM PC 1255 (photo voucher). Verified by R. L. Bezy. The collection site consists of generally flat terrain occasionally dissected by arroyos; the vegetation is saltbush scrub characterized by *Atriplex polycarpa*, *A. spinifera*, and non-native annual grasses. This is the first record of *Salvadora* from the west side of the San Joaquin Valley and bridges a gap in an otherwise enigmatic distribution pattern. *Salvadora* previously has been recorded from the Carrizo Plain to the west (San Luis Obispo County) and from the southeastern margin of the San Joaquin Valley (from near Bakersfield to 2 mi. N of Grapevine Station, Kern County). Despite considerable field work in central California following Bogert's studies of patchnose snakes

(1939, Publ. Univ. California Los Angeles Biol. Sci. 1:177–236; 1945, Amer. Mus. Nov. 1285:1–14), remarkably few specimens have been collected in the southern San Joaquin Valley and adjacent Carrizo Plain, and *S. hexalepis* remains a rare snake at the western margin of its range (Hansen, unpubl.). The San Joaquin Valley population has been referred to the Mojave Desert subspecies *S. h. mojavensis* while specimens from the Carrizo Plain southward belong to the subspecies *S. h. virgultea* (Bogert 1945, *op. cit.*; Stebbins 1985, A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston, Massachusetts. 336 pp.). Because the present specimen was released after being photographed in the field, we are unable to make any allocation to subspecies. However, its occurrence in the San Joaquin Valley suggests placement within *S. h. mojavensis*; thus, this record extends the range of that subspecies 61 map km W from Bakersfield, Kern County.

Submitted by **SCOTT CAMERON**, Michael Brandman Associates, 7676 Hazard Center Drive, Suite 400, San Diego, California 92108, USA, and **ROBERT W. HANSEN**, 16333 Deer Path Lane, Clovis, California 93611, USA.

STORERIA DEKAYI (Brown Snake). USA: ILLINOIS: Fayette Co: 8.9 km W Rt. 128 on 3050N and 3000N. 7 August 1993. John E. Petzing. Verified by Ronald A. Brandon. Southern Illinois University at Carbondale (R-2484). County record; original specimen was a live female found early June 1993. Gave birth to eleven juveniles on 7 August 1993, two of which died and were used as the voucher specimens. Found on gravel road bordered by hardwood forest on west, pasture on east, and 0.3 km S of Lorton's Bridge (Kaskaskia River).

Submitted by **JOHN E. PETZING**, Rural Route 1, Box 87, Beecher City, Illinois 62414, USA.

STORERIA DEKAYI WRIGHTORUM (Midland Brown Snake). USA: ILLINOIS: Fayette Co: SW 1/4 Sec. 26, T5N, R1W, 8 km WSW Shobonier. 21 November 1993. J. B. Hatcher. Verified by C. Phillips. Illinois Natural History Survey (INHS 11110–11111). Adult male and subadult female found in flooded subimpoundment area of Carlyle Lake. New county record (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **JOHN K. TUCKER, JAMES B. HATCHER**, and **DIRK W. SOERGEL**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

STORERIA DEKAYI WRIGHTORUM (Midland Brown Snake). USA: MISSOURI: St. Charles Co: NE 1/4 Sec. 26, T48N, R7E, Ellis Island, Riverlands Road. 26 May 1993. J. Tucker. Verified by L. Page. Illinois Natural History Survey (INHS 10990). Adult taken DOR; new county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Publ. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **JOHN K. TUCKER** and **CHARLES H. THEILING**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

STORERIA OCCIPITOMACULATA OCCIPITOMACULATA (Northern Redbelly Snake). USA: ILLINOIS: Jersey Co: SE 1/4 Sec. 9, T6N, R13W, Pere Marquette State Park. 14 July 1993. R. Maher. Verified by L. Page. Illinois Natural History Survey (INHS 10989). Adult taken DOR. County record; extends documented range 103.2 km WNW from closest Illinois record (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298) in Bond County (INHS 8655-8658).

Submitted by **JOHN K. TUCKER, ROBERT J. MAHER**, and **JAMES B. HATCHER**, Illinois Natural History Survey, Long Term Resource Monitoring Program, 1005 Edwardsville Road, Wood River, Illinois 62095, USA.

STORERIA OCCIPITOMACULATA OCCIPITOMACULATA (Northern Redbelly Snake). USA: ILLINOIS: Kane Co: Max McGraw Wildlife Foundation, 1.02 km W Rt. 25 and 1.6 km S Rt. 72 (42°5'34"N, 88°16'1"W). 3 October 1993. F. T. Burbrink and A. K. Wilson. Verified by Lawrence M. Page. Illinois Natural History Survey (INHS 10974). New county record (Smith 1961, The Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **FRANK T. BURBRINK** and **ALLAN K. WILSON**, Max McGraw Wildlife Foundation, P. O. Box 9, East Dundee, Illinois 60118, USA.

THAMNOPHIS PROXIMUS (Western Ribbon Snake). USA: NEBRASKA: Richardson Co: NE corner of Sec. 31, T2N, R18E in abandoned quarry on E side of road. 29 May 1993. C. Bridgewater, T. Leonard, J. Lokke, and J. Young. University of Nebraska at Omaha (UNO 350). Verified by James D. Fawcett. New county record; southernmost occurrence of the species in Nebraska and helps fill in a large gap between populations occurring around the mouth of the Platte River in Nebraska and those to the south in Doniphan County, Kansas (Collins 1993, Amphibians and Reptiles in Kansas. Third ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 13:1–397; Lynch 1985, Trans. Nebraska Acad. Sci. 13:33-57.).

Submitted by **T. LEONARD**, 5006 South 36th Avenue, Omaha, Nebraska 68107, USA.

TROPIDOCLONION LINEATUM (Lined Snake). USA: COLORADO: Elbert Co: 100 m S County Road 194, 1 km W jct County Road 29. 19 September 1993. Hobart M. Smith, David Chiszar and Adam Chiszar. Verified by Richard L. Holland. UCM 56849. First county record (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Denver. 131 pp.).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA, and **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 90309-0345, USA.

New County Records Of Amphibians And Reptiles From Northeastern Texas

Dixon (1987 Amphibians and Reptiles of Texas. Texas A & M Univ. Press, College Station, Texas. 434 pp.) updated the distribution maps for all Texas amphibians and reptiles. However, documentation for many species common to northeastern Texas is still lacking from various counties within the region.

From 30 April to 2 May 1993, the Texas Herpetological Society held its annual Spring Field Meet on the Caddo National Grasslands north of Bonham, Fannin County, Texas. The purpose of this gathering was to provide the U.S. Forest Service with a list of species occurring on the grasslands. During this meet, ten new county records were documented. In addition, seven records for northeastern Texas were also collected incidentally from 1987 until 1993. Voucher specimens for all species were deposited in the University of Texas at Arlington Collection of Vertebrates (UTACV), and are reported herein.

We herein document seventeen new county records for northeastern Texas and fill distributional gaps for sixteen species of reptiles and amphibians. Specimens from Fannin County were collected by us and other members of the Texas Herpetological Society during the course of the field meet. Records from other counties were collected by or donated to us. Verification of specimen identification was by Jonathan A. Campbell.

ANURA

Gastrophryne carolinensis (Eastern Narrowmouth Toad). Fannin Co: Coffeemill Lake, Caddo National Grasslands. 30 April 1993. UTA-A 40288–40291.

Rana areolata (Crawfish Frog). Hunt Co: 1.3 km SW jct FM 1565 on Grande Verde Road. 13 June 1987. UTA-A 32847.

Rana palustris (Pickerel Frog). Fannin Co: Coffeemill Lake, Caddo National Grasslands. 1 May 1993. UTA-A 40293.

Scaphiopus holbrookii (Eastern Spadefoot). Fannin Co: Coffeemill Lake, Caddo National Grasslands. 1 May 1993. UTA-A 40292.

TESTUDINES

Pseudemys concinna (River Cooter). Fannin Co: Lake Fannin, Caddo National Grasslands. 1 May 1993. UTA-R 34942.

Terrapene carolina (Eastern Box Turtle). Franklin Co: 13.2 km N of Mt. Vernon on SH 37. 9 May 1993. UTA-R 34939.

LACERTILIA

Anolis carolinensis (Green Anole). Fannin Co: Coffeemill Lake, Caddo National Grasslands. 30 April 1993. UTA-R 34932.

Eumeces laticeps (Broadhead Skink). Fannin Co: Lake Fannin, Caddo National Grasslands. 1 May 1993. UTA-R 34933.

Ophisaurus attenuatus (Slender Glass Lizard). Fannin Co: 2.6 km E jct FM 100 on FM 409, Caddo National Grasslands. 30 April 1993. UTA-R 34931.

SERPENTES

Diadophis punctatus (Ringneck Snake). Collin Co: Brockdale Park, Lake Lavon. 25 April 1987. UTA-R 28890; Fannin Co: Lake Fannin, Caddo National Grasslands. 1 May 1993. UTA-R 34795.

Heterodon platirhinos (Eastern Hognose Snake). Red River Co: 1.5 km E jct SH 37 on FM 1159. 18 April 1993. UTA-R 34930.

Nerodia fasciata (Southern Water Snake). Fannin Co: Coffeemill Lake, Caddo National Grasslands. 1 May 1993. UTA-R 34936, 34937.

Regina grahamii (Graham's Crayfish Snake). Delta Co: jct FM 1531 on SH 24. 8 May 1993. UTA-R 34938.

Storeria dekayi (Brown Snake). Collin Co: 4.8 km E of Wylie on Stone Rd., Beaver Creek Estates. 5 August 1992. UTA-R 33784.

Tantilla gracilis (Flathead Snake). Fannin Co: Lake Fannin, Caddo National Grasslands. 1 May 1993. UTA-R 34934, 34935.

Thamnophis sirtalis (Common Garter Snake). Lamar Co: Patonville. 1 September 1991. UTA-R 34929.

Acknowledgments.—We thank Texas Herpetological Society members Terry Hibbitts, Robert Hibbitts, Robert Lang, Charles Swift, Gary Ferguson, and Lynzie Herman for specimens donated. We also thank Jerry Shaffer and Jason Francis for the donation of the specimens of *Storeria* and *Thamnophis*, respectively. Travel expenses were, in part, paid from a grant from the University of Texas at Arlington chapter of Phi Sigma. Collections made on the Caddo National Grasslands were under the authority of a Temporary Special Use Permit granted by the U.S. Forest Service and authorized by District Ranger Ben T. Harbour.

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Thirty-Five New Herpetological County Records For Texas

A review of some of the herpetological material in the West Texas A & M University Museum (WTAMU) has revealed several new county records supplementary to those in Dixon (1987, Amphibians and Reptiles of Texas. Texas A & M Univ. Press, College Station, Texas. 434 pp.) and in more recent entries in *Herpetological Review*. We here report new records for one species of anuran, three of lizards, and ten species and subspecies of snakes. All identifications were verified by Flavius C. Killebrew.

ANURA

Gastrophryne olivacea (Great Plains Narrowmouth Toad). Lamar Co: Blackwater River Park. 9 June 1983. T. James. WTAMU 8994; Randall Co: 19.2 km E Canyon, Rt. 217. 1 July 1987. John Sellers. WTAMU 12494 and southern Amarillo. 23 April 1981. Stacey Foster. WTAMU 14527; Stephens Co: Rt. 717, 11.3 km NNW Rt. 180. 3 May 1969. R. McKown. WTAMU 2374-6. The Randall County records extend the known range of the species about 55 km northwest of the nearest previous records in Briscoe (Dixon 1987) and Donley [Schafer and Kasper 1989, Texas J. Sci. 41(3):337–338] counties.

LACERTILIA

Crotaphytus c. collaris (Eastern Collared Lizard). Deaf Smith Co: 3.2 km E Hereford, Rt. 60. 22 April 1979. S. Grimsley. WTAMU 5006; Gray Co: Pampa city dump. 5 July 1970. A. Clark. WTAMU 1066; Sun Oil Camp, 11.3 km W Lefors. 17 June 1987. Jason Whatley. WTAMU 12358; Grayson Co: Lake Texoma. 25 September 1986. J. Vines. WTAMU 9958; Walker Co: Sam Houston National Forest. 18 March 1972. B. Benson. WTAMU 2516. The Gray and Walker county records extend the known range of the species eastward, the former ca. 40 km, the latter ca. 100 km (Dixon 1987).

Eumeces obsoletus (Great Plains Skink). Carson Co: Skellytown, Skelly golf course. 6 June 1966. Mary Burcham. WTAMU 46; Rt. 60, 8 km E Panhandle. 27 April 1987. Mark and Renae Haiduk, Don Roark. WTAMU 10570-3.

Scincella lateralis (Ground Skink). Karnes Co: Rt. 239, Choate. 16 May 1982. Jay Long. WTAMU 8731; Mills Co: P. K. Caraway Ranch, 6 km E jct Rts. 16 and 3023. 21-23 April 1977. Jeff Bertl, R. Brantley, P. Chance, Janice Geffhen T. Morris, Becky Norton, R. Richardson. WTAMU 2999, 3066, 3196, 3341-2, 3416-7, 3464, 3530; Pecos Co: Rt. 349 near Pecos River. 24 April 1977. T. Ellerbrook. WTAMU 3285. The latter record extends the range of the species in Texas westward from the adjacent county (Crockett) on the east (Dixon 1987).

SERPENTES

Diadophis punctatus arnyi (Prairie Ringneck Snake). Armstrong Co: Methodist Church Camp, Ceta Canyon. 10 October 1978. Burgi Lehmann. WTAMU 5317; Carson Co: Groom, McCoy Farm. 4 May 1985. Jay Vines. WTAMU 13983; Dallam Co: Seagraves ranch, 32 km S Texline. 1 June 1985. M. and J. Smith. WTAMU 13984, 14246; Hansford Co: Gibner ranch, 16.3 km N Spearman, Palo Duro Creek. 21 August 1976, 12 August 1978. Flavius C. Killebrew. WTAMU 5512, 5684; Mills Co: J. M. Wrinkle, Jr. ranch, Rt. 84, 14 km E jct Rts. 16 and 3023. 22 April 1977. M. Tucker. WTAMU 3120; Potter Co: Bishop Hills, off Rt. 1061. 28 September 1973. M. Meriage. WTAMU 2450; Canadian River, 24.1 km N Amarillo. 3 October 1985. B. Loving, G. McDonald. WTAMU 13767; Rt. 1061, 8.7 km W Rt. 66, then 1.25 km N. 15 April 1979. Ken Brewer. WTAMU 5879; Lake Meredith Plum Creek Recreation Area. 21 May 1983. Jim and Jay Vines. WTAMU 14293-4 and Lake Meredith, McBride Canyon, Rt. 136. 28 April

1987. M. Willis. WTAMU 10654; Wheeler Co: Camp M. K. Brown, Rt. 3182, 8.5 km N Rt. 152. 3 and 10 October 1981. T. Green, T Quezada. WTAMU 6823-4.

Diadophis punctatus stictogenys (Mississippi Ringneck Snake). Gonzales Co: Ottine. 10 August 1987. John Ingle. WTAMU 12589. Extends known range of the subspecies southwest ca. 80 km from the nearest previous record in Colorado County (Dixon 1987: 240) and about an equal distance from the nearest records for *D. p. arnyi* in Bexar and Hays counties. (Dixon, *loc. cit.*). The specimen clearly represents *D. p. stictogenys*, having 15 anterior dorsal scale rows and most ventral spots paired. It does not appear to be an intergrade.

Heterodon n. nasicus (Plains Hognose Snake). Foard Co: 3.2 km W Crowell, Rt. 70. 23 October 1983. Tom Adams. WTAMU 9427; Hemphill Co: 16.3 km E Canadian, Forgey ranch. 11 June 1973. Miles Rhea. WTAMU 5272; 6.5 km N Glazier, Rt. 305. 28 October 1981. Jeff Bertl. WTAMU 7954; Lipscomb Co: 8 km E and 1.6 km N Follett. 14 July 1986. Joel Babitzke. WTAMU 10536; Moore Co: Albates Park, 8 km S Fritch. 2 September 1981. T. D. Giovanni. WTAMU 7195; Ochitree Co: 8 km E Perryton. 1 October 1979. William May. WTAMU 6018.

Heterodon platirhinos (Eastern Hognose Snake). Childress Co: 26 km E Memphis, Rt. 256. 19 September 1981. Jay Long. WTAMU 6956; Floyd Co: 16.2 km SW Quitaque, Rt. 1065. 22 October 1985. Clinton Pigg. WTAMU 11595; Karnes Co: 9.4 km W Choate, Rt. 239. 9 October 1982. Jay Long. WTAMU 8780; Moore Co: Lake Meredith, Plum Creek. 8 November 1986. Rod Goodwin. WTAMU 10669.

Lampropeltis getula holbrooki (Speckled Kingsnake). Lee Co: Rt. 21, 6.5 km S Old Dime Box. 6 June 1982. Jay Long. WTAMU 8777. Although the locality lies within the intergrade area (as depicted by Dixon 1987:253) between *L. g. holbrooki* and *L. g. splendida*, this particular specimen agrees fully with the former subspecies.

Lampropeltis getula splendida (Desert Kingsnake). Briscoe Co: Quitaque. 1 November 1981. D. Brooks. WTAMU 7428.

Rhinocheilus lecontei tessellatus (Texas Longnose Snake). Reagan Co: jct and Rt. 137. 20 June 1970. B. Cox. WTAMU 742.

Sonora semiannulata (Ground Snake). Collin Co: western Plano. 5 June 1988. D. Porter. WTAMU 13717. The locality lies on the eastern edge of the range of the species (Dixon 1987:269).

Storeria dekayi texana (Texas Brown Snake). Oldham Co: Boys Ranch, at Elementary School and Junior High Gym. 27-29 July 1991. Eddie Taylor. WTAMU 14417-8; Randall Co: Cleta, Palo Duro Canyon. 24 August 1979. Jeff Bertl. WTAMU 6478. These specimens extend the known range of the species westward in northwestern Texas ca. 150 km, and indicate that the records for Lubbock and Crosby counties, questioned by Dixon (1987:270), may well be valid. We suggest that the range of the species in the area indicated follows major river valleys and does not include much if any of the intervening territory.

Tantilla nigriceps (Plains Blackhead Snake). Carson Co: Brooks ranch, 8 km S Skellytown. 5 April 1985. M. Smith and J. Smith. WTAMU 14267.

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BOOK REVIEWS

Synopsis of the Herpetofauna of Mexico, Volume VII, by Hobart M. Smith and Rozella B. Smith. University Press of Colorado (P.O. Box 849, Niwot, Colorado 80544, USA), 1993, 1089 pp, cloth bound. US $50. ISBN 0-87081-284-x.

The taxonomic and ecological diversity of amphibians and reptiles in the Republic of México is perhaps unequaled in the world, and those herpetofaunal riches have been a major preoccupation of North American, and lately Mexican biologists. In the scant 60+ years since Edward H. Taylor and Hobart M. Smith began to reveal the wonders of Mexican amphibians and reptiles to the herpetological community, there has been continuous and ever increasing study of that marvelous fauna. One result of this massive application of attention from herpetologists, both native and foreign, is a massive literature. The literature on amphibians and reptiles of México is so vast that it seems beyond belief that it could be compiled, much less organized and indexed. But Hobart and Rozella Smith accepted the challenge, and Volume VII of the *Synopsis of the Herpetofauna of Mexico* concludes the most ambitious herpetological bibliography project ever undertaken.

This terminal volume consists of two parts: the fourth addendum to the base bibliography, and taxonomic indices to bibliographic addenda II through IV. The bibliographic addendum lists an additional 6606 titles pertinent to Mexican herpetology, bringing the total of titles compiled to 17,771. The coverage is exhaustive. Many titles are from the "gray literature," works not published in the technical sense of the word. In this category are abstracts of papers presented at meetings, internal research reports of government agencies, and theses and dissertations. It can be argued that these usually inaccessible "publications" should not be listed. However, they can provide clues to the existence of research in progress or completed but not published. The extensive listings of theses from Mexican institutions and titles from relatively obscure Mexican journals is a potentially valuable resource. The bibliography includes literature from 1979 (some 1979 references were included in addendum III) through May, 1991.

Each of the eight order-group taxa of amphibians and reptiles that occurs in México has a separate index chapter. Each of these chapters consists of an introduction, a taxonomic index, and a synonym list. The introduction to each chapter reviews taxonomic innovations in the group since the appearance of the last index in the series (Volume IV, 1976), and states the author's position on them. These positions are varied—from rigid conservatism to ready acceptance of controversial proposals. For example, on the conservative side Smith prefers to retain the genera *Tomodactylus* and *Syrrhophus*; however, he embraces the concept of removing *Pseudacris cadaverina*, *P. crucifer*, and *P. regilla* from *Hyla*. Nevertheless, the introductions are interesting reading. They reveal the thought processes of the author as he views modern taxonomic work on Mexican amphibians and reptiles from the perspective of a long-time major practitioner of the art. But most of the decisions are logically defended, and unreasoned support of the status quo is minimal.

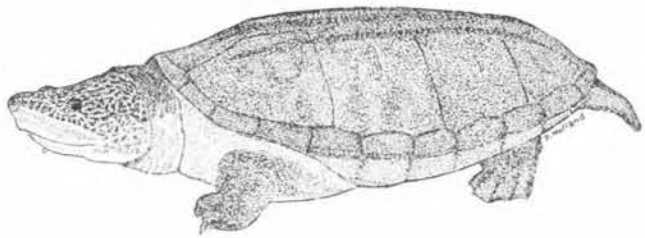
The species indices include some welcome changes. The name of the first author is cited for each entry, along with the identification number of the reference and the page number. Each index entry is identified as being from Bibliographic Addendum II, III, or IV. Each index includes generic names and their synonyms, species, subspecies, and names spelled incorrectly. The synonyms and invalid names are followed in parentheses by the combination accepted in this work. The indices are alphabetical. Cross indices to species combinations, subspecies combinations, and state occurrences, and the valid name list have been omitted. In place of a valid name list the final section of each chapter is a

list of names generated from the index. Surely, as the author notes, each includes all or nearly all the valid names available.

The author states that with this volume their "attempt to summarize in detail knowledge of the herpetofauna of Mexico ends, with the task scarcely started." So ends an era, an era marked by the effort of Hobart and Rozella Smith to provide a solid foundation for further study of the Mexican herpetofauna. The *Synopsis of the Herpetofauna of Mexico* is a fitting memorial to their dedication.

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Herpetofauna Mexicana. Annotated List of the Species of Amphibians and Reptiles of Mexico, Recent Taxonomic Changes, and New Species. By Oscar Flores-Villela, edited by C. J. McCoy. 1993. ISBN 0-91-239-42-1. Carnegie Museum of Natural History, Special Publication No. 17, iv+73 pp. US $15 (softcover).

The core of this work is a 23-page list of names of Mexican amphibian and reptile species in a two-column format. The first column lists the scientific names, alphabetized by families, and includes their authors and publication dates. Some of the names are followed by superscript numerals keyed to the section on "Notes to the species list" which follows the checklist. The second column contains a wealth of information about each taxon, including whether it is endemic to México, parthenogenetic or monotypic, plus its general distribution in México, all this condensed in a conveniently-coded system. For example, the entry for the indigo snake (*Drymarchon corais*), reads: "+ N; 1, 2, 3, 4, 5, 6, 7, 9, 10." The "+" means monotypic, the "N" means non-endemic, and the numbers are keyed to the general biogeographic areas discussed in the extensive Introduction and depicted in Fig. 2, a map of México.

This section is followed by a list of species that may (or may not) occur in México but for which there are no actual specimens or reliable published records. A five-page section on notes on the species list follows, which itself is followed by a 25-page list of "Recent taxonomic changes and new species," which includes an 11-page list of species described or first recorded from México since 1966, and a list of taxonomic changes at the species level which occurred since 1976. The last two sections deal with changes above the species level and changes in type-localities; both occupy less than six pages. The Acknowledgments and Literature Cited sections conclude the work.

This is the first attempt to summarize México's herpetofauna in almost 30 years, following the works of Smith and Taylor (1966) and Smith and Smith (1976a, 1976b). The author is to be commended for his courage in undertaking the summary of what amounts to almost 1,000 species, whose literature is scattered in all sorts of little-known journals. The herpetofauna is an extremely interesting one, with over 55% of the species endemic to México, a number that is likely to increase with the exploration of little-known or inaccessible areas. Some of the species, such as the Mexican axolotl, have been extremely well studied, while others are known only from the holotype. Here is a place where much work remains to be done, especially field studies by local or resident naturalists. It is extremely encouraging to see that this trend has been increasing rapidly in the past few years. The bilingual format of Oscar's work certainly makes it easier for exclusively Spanish-speaking Mexicans.

I cannot comment on the accuracy or completeness of the species list since México is not my geographic area of expertise. A sizable number of people reviewed it, however (I saw the first draft in the early 80's), so I assume it is as correct and complete as any checklist can be. The alphabetical (as opposed to phylogenetic) placement of genera under families makes the work easy to use, especially with large families. The author was selective in updating taxonomic changes although one may disagree with his selections. For example, he left all the anoles in one genus, but accepted the splintering of *Bothrops* and the Iguanidae, both of which have generated much controversy, while explicitly not accepting the rearrangement of the Centrolenidae (Ruiz-Carranza and Lynch 1991), which has not been controversial and has even been incorporated in the current herpetology textbook (Zug 1993).

I have two major, and a few lesser, criticisms of this work, and I write this with great hesitation since I respect Oscar's work and dedication, and he is my *compadre*. I do so only in a constructive way, hoping that a second edition can improve upon the first.

My main gripe pertains to the citation of the literature; it looks like the work of a committee rather than an individual. There are actually *three* major forms of literature citation! One is the "formal" Literature Cited, in which references are listed in the standard way. One would expect this to be a rather large section, but it is actually barely over a page long. The second is an in-text citation, which lists the author[s], date, title (in some cases), and journal or book reference. Some of the titles are quite long and pertain to unpublished theses done in México; these citations are duplicated due to the bilingual text, thus a lot of space is wasted. The third type of citation is the *Op. Cit.* type, which I find most problematic. For example, on page 44 I found a reference to "Villa et al. (1988, *op. cit.*: 63)." Because I didn't remember making the statement attributed to me, I had to work backwards through a number of similar "opcits" all the way back to page 39, where my memory was refreshed. My suggestion: make citations uniform to save time and space.

A second gripe is the exclusion of subspecific names. Granted, the list is clearly a *species* list, and including subspecies would have probably tripled the number of taxa listed. I could be accused of criticizing the same decision I myself made (to include or exclude subspecies) when compiling *Middle American Herpetology* (Villa et al. 1986). However, that was before Frost and Hillis' 1990 paper, and before Collins' (1991) proposal to elevate a number of allopatric North American subspecies to specific status. Although this proposal has generated considerable controversy, it may be accepted eventually, and a Mexican equivalent of J. T. Collins, if one can exist, may make a similar proposal for comparable Mexican subspecies. Thus, having the subspecific names available in an updated list becomes important.

One minor complaint pertains to the supposed bilingualism of the *Herpetofauna*. The text is bilingual throughout, except for the three sections on recent taxonomic changes. The introduction and the subtitles to these sections are bilingual, but the text itself is in English only. Some entries can easily be figured out, and

involve only a few lines, but many take up 10 lines or more. What went wrong here? If anything, the *opposite* should have occurred. This section involves some 25 pages, over 30% of the entire work. How will this be received in México?

The work's subtitle is a bit misleading, as it states it contains "Recent taxonomic changes, and *new species*" (my italics). I expected to find a number of new species described from México, but there are none. Either the new species were deleted from the work at the last minute and the subtitle not changed, or the "new species" refers to the listing of "Species described or first recorded from Mexico since 1966." The advertisement mailed by the Carnegie Museum lacks the subtitle, and makes no claims about any new species.

Herpetofauna Mexicana is a work large enough to merit a dedication, but it has none. This would have been an excellent opportunity to honor the two major Mexican herpetologists who recently passed away, Miguel Alvarez del Toro and Rafael Martín del Campo.

My last gripe is the price. Fifteen dollars is a lot of money to pay for an 80-page booklet, even for one as nice as this one, with glossy paper and octavo format. I hope that the Carnegie made some arrangements for a lower price in México, otherwise many local herpetologists will not be able to buy a copy.

Criticisms aside, *Herpetofauna Mexicana* is a major contribution to the knowledge of the herpetology of our neighbor to the south, and should facilitate—if not encourage—the work of others, both local and foreign. Anyone who has put together a checklist of similar magnitude knows how much devotion and work goes into it, how tedious and interminable the work can be, and how thankless the task is. Thank you, Oscar, for undertaking it; I hope your skin is of the squamate sort, rendering you impermeable to criticism.

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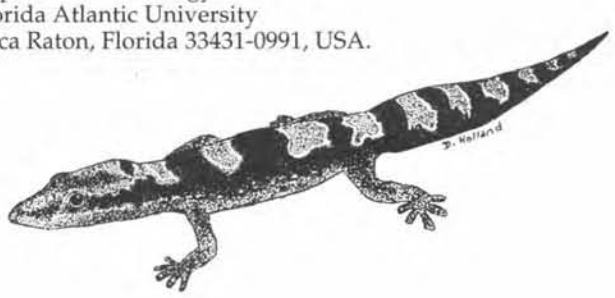
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The Amphibians and Reptiles of Maine, by Malcolm L. Hunter, Jr., John Albright, and Jane Arbuckle (editors). 1992. Maine Agricultural Experiment Station Bulletin 838. 188 pp. US $9.95. (Paperback).

The editors claim two motives for producing this book. First, the passage of Maine's Endangered Species Act in 1984, in part, prompted them to determine the status of Maine's amphibians and reptiles. Second, was their hope to increase the appreciation of amphibians and reptiles by the people of Maine.

As you can well imagine, it is no small task to determine the status of all the amphibian and reptile species of any state. The Maine Amphibian and Reptile Atlas Project (MARAP) was, evidently, the first such attempt by biologists in the state. A network of some 250 volunteers was established and enlisted to search for the presence of amphibians and reptiles. After about four years, the editors felt they had sufficient data to begin writing. They recruited volunteers to write individual species descriptions. Range maps were prepared based on the submittal of MARAP forms with three decreasing levels of confidence: a specimen was collected and preserved or photographed, a specimen was handled then released, or a specimen was seen or heard but not captured.

The book opens with two brief introductory chapters on the biology of amphibians and of reptiles. These are followed by a description of Maine's environment as habitat for herps and a summary of how the range maps were prepared. The main body of the text is descriptions of Maine's 18 species of amphibians, 19 species of extant reptiles, and the extirpated timber rattlesnake. The book closes with sections on finding and enjoying amphibians and reptiles; hypotheticals, accidentals, and other oddities; methods used in the MARAP; the distribution and abundance of herps in Maine; and conservation concerns.

There is very little new information about the amphibians and reptiles of Maine in this book. Most of the information comes from previously published sources, and because many different authors provided species accounts, the writing is uneven in content and in the use of citations. There is very little useable information on the density of any species in any one place.

The range maps offer information on the presence or absence of a species in the townships of Maine, but the operating premise (although unstated) is that at least one volunteer would examine suitable amphibian habitats in every township. This was not the case. I noticed that range maps for many of the abundant species were almost identical. The range maps for abundant species appear to this reviewer to be range maps of the locations of volunteers. With few exceptions, we learn from this type of survey that a species either occurs widely in the state or does not. Only the range maps for rare species may contain some kind of useful information for future comparisons, although I am not certain what that information is.

The illustrations are all black and white line ink drawings of generally poor quality and could not be used for identification purposes.

I know that other states in the northeast are using similar procedures to document the status of their herpetofauna. It seems to me for the information to be of use, much greater effort needs to be expended to determine not only whether a species occurs in the state, but we must systematically determine where the various species do and *do not* occur. The problem with MARAP-type surveys is that a species can only be found in an area if a volunteer happens to look there. In addition, as mentioned by the editors, rare species received more attention from volunteers than did common species, thus the data in some unknown way overestimate the abundance of rare species and underestimate the abundance of common species. A useful addition to the range maps would have been the collection location of

previously deposited museum specimens. Perhaps volunteer survey data taken together with more traditional surveys by working herpetologists would have provided more useful range maps.

A very important task for biologists today is to document systematically what are the densities of the region's fauna, because these will be the data needed in 10 or 20 years to determine whether or not a species has declined. It is unlikely that networks of volunteers can accomplish this task working alone. Even systematic surveys that result in unbiased measures of relative abundance provide data that can be used for comparative purposes over time.

The second objective of the book was to increase the appreciation of the state's herps by its citizenry. Because the book does summarize information on the species and is relatively inexpensive it may fulfill that objective.

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PUBLICATIONS RECEIVED

World Checklist of Threatened Amphibians and Reptiles, 5th edition, compiled by the World Conservation Monitoring Centre. 1993. Joint Nature Conservation Committee, Peterborough, U.K. vi + 99 pp. Softcover. £11.00 (approx. US $17). ISBN 1-873701-46-2.

A listing of those species of amphibians and reptiles listed in appendices I, II and III of CITES, and those included in the latest *IUCN Red List of Threatened Animals*. Included are 135 amphibian taxa in 19 families and 570 reptiles in 36 families. Each listing also provides commonly used synonyms (normally alternative generic assignments) and English language common names, when these exist. Countries, and sometimes less inclusive areas such as states, provinces, or mountain ranges where each species occurs are given. Each entry indicates the CITES appendix and/or Red List status of the taxon and references to general and regional literature on distribution, conservation status, and/or nomenclature are listed by number. A total of 738 references are included in the bibliography and the text is indexed by both common and Latin names. This edition includes many additional references and status updates with respect to the 4th edition (1988), but contrary to the previous version, does not provide information on the type of exploitation experienced by the species.

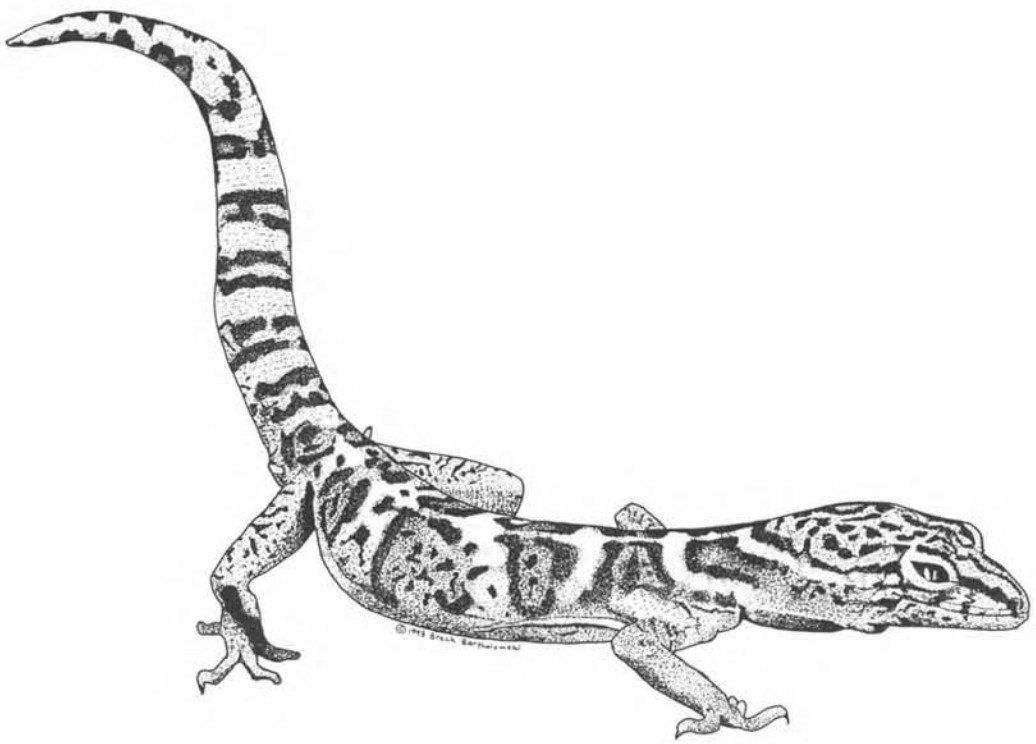
Amphibian Zooculture [in Russian] (many authors). 1990. USSR Academy of Sciences, Moscow. 120 pp. $8.00 + postage.

A collection of 13 papers dealing with a variety of topics associated with the captive breeding and maintenance of frogs and salamanders. Among the contributions included are papers on endocrine control of reproduction, growth in captivity, hybridization, conservation, reintroductions from captive stock, and human utilization of amphibians.

Trophology of Tailed Amphibians: Ecological and Evolutionary Aspects [in Russian] by S. L. Kuzmin. 1992. "Nauka" (Russian Academy of Sciences), Moscow. 168 pp. Softcover. $10.00 + postage. ISBN 5-02-005489-5.

A treatise on salamander feeding and trophic relations. Topics covered include methods of dietary analysis, niche dynamics and niche overlap, prey selection and optimal foraging, ontogenetic and evolutionary changes in diet, food as a limiting resource, and cannibalism. Examples are drawn from a wide variety of (chiefly temperate) salamander species and more than 750 references are cited. Illustrated by 23 figures, graphs, and charts.

Both publications are available from *Dr. Sergius L. Kuzmin, Institute of Evolutionary Morphology and Ecology of Animals, Russian Academy of Sciences, Leninsky Prospect, 33, Moscow 117071, Russia.*



Coleonyx variegatus variegatus. USA: Nevada: Clark Co., ca. 16 km S of Las Vegas. Illustration by Breck Bartholomew.

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Originals of illustrative material (e.g., tables, photographs, or diagrams) should be submitted with the text, with appropriate precautions taken to ensure delivery without damage. Illustrations should be discussed in the text and numbered sequentially with Arabic numbers. References to illustrations should be placed in parentheses at the end of sentences. Original photographs should be submitted as black and white glossy prints.

For further guidelines, authors should consult the *CBE Style Manual* (5th edition, 1983, Council of Biology Editors, Inc., 9650 Rockville Pike, Bethesda, Maryland 20814, USA).

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Herpetological Review

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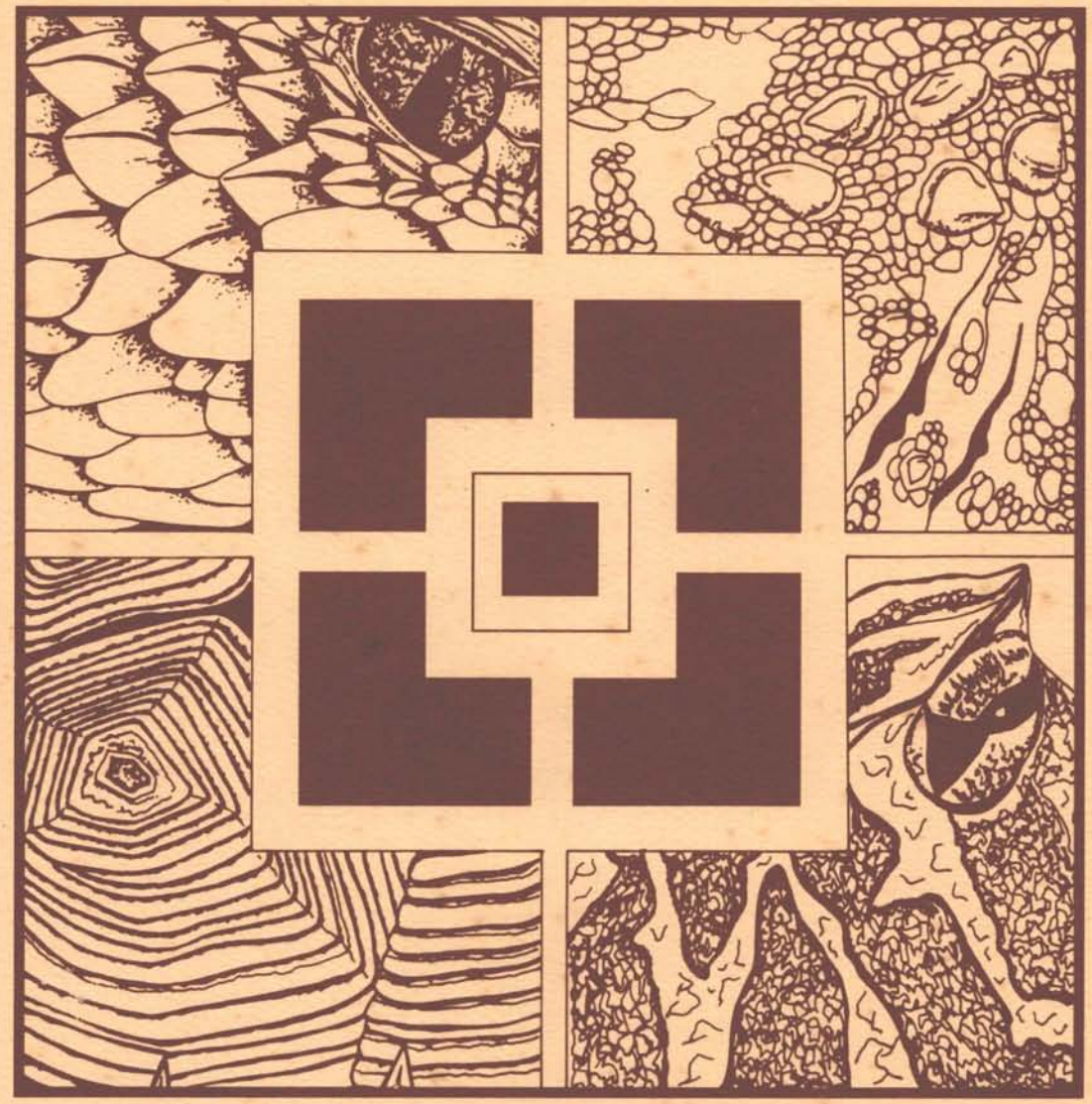
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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the ***Journal of Herpetology*** (4 issues annually), ***Herpetological Review*** (4 issues annually), and occasional issues of ***Facsimile Reprints in Herpetology***. Members may purchase other Society publications at reduced rates.

ANNUAL DUES 1993

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1994 Annual Meeting
Society for the Study of Amphibians and Reptiles
37th Annual Meeting
being held jointly with
The Herpetologists' League

28 July–1 August 1994

The University of Georgia, Athens, Georgia

Hosted by the University of Georgia Museum of Natural History and The Savannah River Ecology Laboratory

Meeting Announcement: All interested persons (members of SSAR or HL or non-members) are welcome to attend the 1994 meeting. All attendees must pay the registration fee. The full meeting announcement, description of activities, call for papers, pre-registration form, and full information on accommodations will be mailed to SSAR and HL membership no later than March 1994. For information in the interim, write the local committee Project Coordinator, Amy Edwards, Museum of Natural History, University of Georgia, Athens, Georgia 30602-1882, USA (706-542-4137; during weekday business hours (Eastern); FAX: 706-542-3920). Overseas members will not automatically receive the meeting announcement, but may request a mailing by writing or calling Amy Edwards.

Plenary Session: The meeting will begin with a Plenary Session at 9 AM on Thursday, 28 July. The Keynote address will be given by the 1994 Distinguished Herpetologist, Dr. Richard Shine ("The Evolution of Reptilian Viviparity Revisited").

Symposia: Three symposia, one colloquium, and one evening forum are planned. For further information on the forum, colloquium, or symposia, please contact the organizer directly.

Forum: "Issues in Conservation: Point-counterpoint" (Moderator: Robert Jaeger. Speakers: Henry Wilbur and Brad Shaffer. Sponsored by SSAR and HL).

Colloquium: "Turtle Phylogeography" (Organizer: Brian Bowen. Sponsored by the UGA Museum of Natural History).

Symposium: "Field and Behavioral Endocrinology" (Organizer: Diana Hews. Sponsored by SSAR and HL).

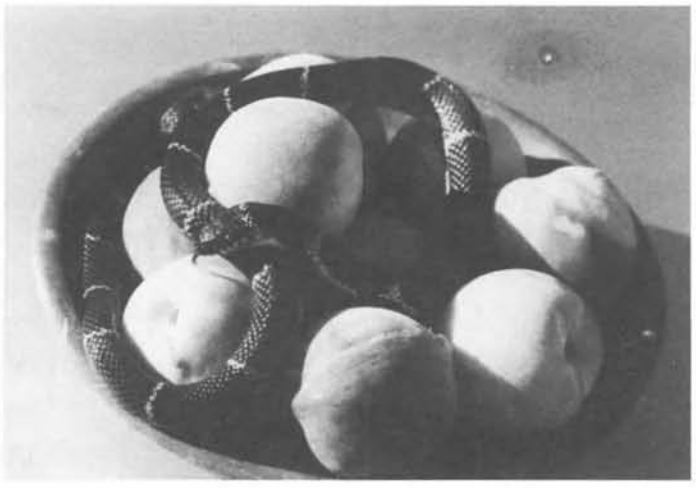
Symposium: "Interfaces Among Inter-individual Variation, Life Histories, and Population Dynamics of Reptiles and Amphibians" (Organizer: Art Dunham. Sponsored by HL).

Symposium: "West Indian Herpetology: A Symposium in Memory of Albert Schwartz" (Organizers: Robert Powell and Robert W. Henderson. Sponsored by SSAR).

Contributed Papers & Poster Sessions: There will be several concurrent sessions each day of the meeting. All sessions will be held in rooms at the Georgia Center. Contributed papers and Poster presentations require submission and acceptance of an abstract. US, Mexican, and Canadian members of SSAR and HL will receive the call for papers and abstract submission instructions by the end of March, 1994. Deadline for abstract submission is 15 May 1994. The space for oral presentations and posters will be allotted on a first come, first served basis. Authors will receive written confirmation of their presentations in late June. Questions concerning paper or poster sessions should be directed to Martina Conrad, Savannah River Ecology Laboratory, P.O. Drawer E,



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Georgia is known both for its peaches and its snakes!

Aiken, South Carolina 29802, USA (telephone 803-725-2472; FAX 803-725-3309; email CONRAD.SREL.EDU).

Student Paper Awards: There are two student paper competitions: SSAR's Seibert Awards for outstanding student presentations and the Herpetologists' League Award for Graduate Research. Winners of the Seibert Awards for the two best orally-presented student papers will receive $250 for first and $150 for second place. The winner of the Herpetologists' League Award for Graduate Research will be presented with $500 and ten years of back issues of *Herpetologica*, plus an invitation to submit an expanded, full-length manuscript to *Herpetologica* for publication. Details on how to compete for these two awards will be included in the meeting announcement.

Pre-registration: $115 for non-students and $80 for students registering before 20 June. Registration after that date will be $160 for everyone. Registration fees cover all administrative costs, printing of conference materials, refreshment breaks, evening socials, and miscellaneous expenses. All participants must register, including spouses and others that wish to attend meeting sessions, socials, or other programs.

Registration: On-site registration at the University of Georgia Center for Continuing Education will begin Wednesday, 27 July, from 4 PM to 7 PM. Registration will be open again on Thursday from 8 AM to 5 PM.

Social Programs:

Welcome social Thursday night, 28 July.
Graduate Students ONLY program and social Friday, 29 July.
Multimedia presentation Friday, 29 July.
Barbecue picnic at the State Botanical Gardens Saturday, 30 July, featuring one of Athens' favorite bands, *The Normaltown Flyers*.
Annual SSAR Auction Sunday, 31 July.
SSAR President's Travelogue (slide shows of exotic herps and habitats) Monday, 1 August.
Herptile art exhibit at the Institute of Ecology, Friday to Monday.
Live animal exhibit of southeastern reptiles and amphibians presented by SREL.

Field Trips: Arrangements are being made for five field trips, which will begin on Tuesday, 2 August. They include: Zoo Atlanta/Braves Baseball Game, Okefenokee Swamp, Savannah River Ecology Laboratory, Highlands Biological Station, and Sapelo Island. There are only a limited number of spaces for each trip, and participants must register ahead of time.

Family Programs: The University of Georgia recreational facilities at Lake Herrick may be used by participants of the meeting for a small fee. The facility includes a lake for swimming, short nature trails, and fields for playing sports. Children under 18 must be accompanied and supervised by adults. Other recreation facilities on campus include racquetball, squash, tennis and basketball courts, swimming pools and weight rooms. In addition there are several parks and recreational areas in Athens that have programs for children and parents. A variety of child care and children's programs will be available for nominal fees. A number of morning tours are being organized for spouses, including tours of the University Campus, historical sites in Athens, antebellum homes in Madison, and the State Botanical Gardens. More specific information on these programs will be included in the meeting announcement.

Climate: The summer months in Athens are usually filled with hot days and occasional afternoon thunder storms. Light summer clothing is appropriate in the day and evening.



"Gator Pond" on Sapelo Island, Georgia.

Collecting Permits: Collection of reptiles and amphibians for scientific or educational purposes in Georgia is regulated by the state's Department of Natural Resources. A permit for scientific collecting purposes, and a resident non-resident hunting/fishing license for recreational take are required. Direct inquiries for scientific permits to: Special Permit Unit, Georgia Department of Natural Resources, Game and Fish Division, 2070 U.S. Hwy 278 S.E., Social Circle, Georgia 30279, USA (permit information: 404-918-6404; other information: 404-918-6400).



Upper Three Runs Creek, Savannah River Site, South Carolina.

Accommodations: All housing reservations will be handled by the Georgia Center. There are rooms available at this facility and nearby hotels as well as in the University dormitory. UGA dormitory prices are: $25/night single and $30/night double occupancy. Current room charges for the Georgia Center range from $45/night for single occupancy in a room with two twin beds, to $55/night for double occupancy in a room with one queen-sized bed. Off campus hotels range in price from $42/night to $55/night. Space in these locations is available on a first come first served basis. Athens hosts a number of meetings during the summer, so making early reservations is strongly recommended. Questions concerning registration and accommodations should be directed to: Norma Reed, Conferences, Georgia Center for Continuing Education, University of Georgia, Athens, Georgia 30602-3603, USA (phone 706-542-6658).

Meals: Registrants may purchase University dining facilities meal tickets for breakfast, lunch, and dinner on Thursday through Monday. These may be purchased *in advance only* when pre-registering. In addition, there are a number of local restaurants in downtown Athens that are a short to moderate walk from the Georgia Center. Participants are encouraged to purchase meal tickets and use the conveniently located University facilities for breakfast and lunch.

Transportation and Parking: The University of Georgia is located on the edge of downtown Athens. Athens is just 66 miles east of Atlanta, Georgia. Athens is bisected by a number of state highways and US highway 78, and is just south of Interstate 85 and north of Interstate 20. Participants staying at the Georgia Center or the dormitory will be able to park at the Center's parking deck for a small fee.

Athens has a local airport just 15 minutes from campus. It is served by USAir from Charlotte, North Carolina ONLY. Shuttle transportation from the airport is provided by the local hotels or taxi. Participants may also fly into Atlanta International Airport. AAA, a privately owned and operated shuttle, carries passengers from Atlanta to Athens for approximately $45 round trip. Reservations must be made ahead to reserve a space on the shuttle; mention the SSAR/HL meeting for a 10% discount (phone: 800-354-7874 FAX: 404-767-9150).



Inhabitants of "Gator Pond."

Questions concerning registration and hotel reservations should be directed to Norma Reed, Conferences, Georgia Center for Continuing Education, University of Georgia, Athens, Georgia 30602-3603, USA (telephone 706-542-6658; FAX 706-542-5990; email REEDN@GACSRV.GACTR.UGA.EDU).

Questions concerning paper or poster sessions should be directed to Martina Conrad, Savannah River Ecology Laboratory, P.O. Drawer E, Aiken, South Carolina 29802, USA (telephone 803-725-2472; FAX 803-725-3309; email CONRAD.SREL.EDU).

Questions concerning general program arrangements should be addressed to Amy Edwards, Program Coordinator, Museum of Natural History, University of Georgia, Athens, Georgia 30602, USA (telephone 706-542-4137; FAX 706-542-3920; email AEDWARDS@ZOOKEEPER.ZOO.UGA.EDU).

SSAR BUSINESS

SSAR Annual Meeting: Bloomington 1993

Bloomington, Indiana was the site of a gathering of over 300 herpetologists between 7 and 12 August 1993, as Indiana University hosted SSAR for its 36th annual meeting. The meeting was co-chaired by Craig Nelson and Michael Ewert of the local committee.

The annual meeting of the SSAR Board of Directors got things under way on 7 August 1993, between 1010 and 1840 hours (EST), in the Distinguished Alumni Room of the Indiana Memorial Union. A wide range of those minding SSAR's business were present: nine officers and Board members were there, as were editors from all but one of the Society's publications, several coordinators, and chairs or representatives of virtually all committees; an additional 10-12 interested members rounded out the attendance. A summary of business conducted was later presented at the Business Meeting (see below).

Presentations

Local Co-chair Craig Nelson officially called the meeting to order at 1230 hours on Sunday, 8 August 1993, and welcomed us all to Bloomington and the University. The welcome was followed by a few brief announcements, and then we were off to see the lizards! President Fritts introduced our Keynote Speaker, Walter Auffenberg, of the Florida State Museum, who presented "Feeding Strategies of Monitor Lizards." Following the keynote address Amy Edwards made a brief presentation on next year's Annual Meeting, to be held 28 July to 1 August 1994 at the Georgia Conference Center, University of Georgia, Athens.

Dr. Auffenberg's exciting and informative discourse on monitor lizards was condensed from almost 25 years of study of the giant lizards. Walt noted that his real love was feeding ecology and the three species that were the subject of this address, the Komodo, Grey's, and Bengal monitors, all exhibited different feeding strategies. Although the juveniles are "almost boringly the same"—insectivores—the adults are all specialized to utilize different prey. With a mock sneer at those who study *Anolis* or *Sceloporus*, he noted the excitement of working with a 10 foot long, 140 pound dominant male Komodo monitor! Komodos are found mostly in lowland habitat, with a home range of up to 7 square miles. Adults are adapted for killing large prey, consume an average of 3 kg per minute, and can completely devour a water buffalo in three days, though deer are their preferred prey. Grey's monitor, ranging to 5.5 feet and 20 pounds, is found in mesic montane forest, and even climbs high into trees. Feeding on mollusks and the oily fruits of just over a dozen forest plants, their horizontal home range only averages 2 hectares, although there is a significant vertical component to their activities. The Bengal monitor is much more widespread than either of the others. Also unlike the other two species, the adults pretty much maintain juvenile feeding habits. They are insectivores, most of whose prey is 10-20 mm in length, and is obtained from bovine manure (where insect abundance peaks 3 to 4 days post-deposition).

Seventy papers were contributed by 100 authors in seven sessions between 1445 hours, 8 August 1993 and 1700 hours, 11 August 1993. In addition, 75 authors presented 37 posters during three sessions. Three symposia (Carpenter, Grants in Herpetology, and Vision), involving 46 authors and 35 papers completed the official scholarly presentations.

Sociality

A busy schedule of additional events attests to the Hoosier hospitality SSAR was shown in Bloomington. These efforts by the local committee, and especially Craig Nelson, were well appreciated.

Many of us arrived in Bloomington on Saturday, whether our presence was necessary at the Board meeting or not. So, after adjournment of the Board meeting, we checked out some of Bloomington's fine eating establishments, many within easy walking distance. The events of Sunday evening certainly kept us busy. The group photo was taken just prior to the barbecue, at which plenty of food and drink were had by all. Then followed the second edition of the newly revived "President's Herpetological Travelogue," where, again, those of us with the interest but no opportunity to visit exotic shores vicariously enjoyed their herpetofauna. Aaron Bauer entertained us with the herps of Australia, New Zealand and New Caledonia; Tom Fritts illustrated the habitats and herps of the Galapagos; Norm Scott presented the herps of Costa Rica; and Harold Voris described "Borneo: herpetological paradise." A thoroughly enjoyable evening all around!

The next evening, Monday, was covered by the annual SSAR Auction, with Joe Collins as auctioneer. It was yet another year of liquid refreshments and wild bidding, but for a good cause and was a successful and entertaining evening. A number of individuals assisted at the auction; in addition to Treasurer Doug Taylor, there were Jim Baron, Ellin Beltz, Suzanne Collins, Mark Deutchlander, Chris Grimes, Ian, Gene Kapler, Karen Toepfer, and Jeanne Young.

The annual multimedia event rounded out the week's evening events on Tuesday. "Amphibians of the Appalachians" and "Herpetology of the American West" by David Dennis and Eric Juterbock, and "Herpetologists Past and Present" by Kraig Adler and Dave Dennis, played to a large and enthusiastic audience in the Whittenberger Auditorium of the Indiana Memorial Union.

The live exhibit of local amphibians and reptiles, long an SSAR tradition, and awaited by many of the photographically inclined, was held in the Jordan Hall atrium. This locality made for a lot of traffic and many school children found their way there during the week; perhaps we sowed the seeds of herpetology in a few of them! The live exhibit was sponsored by the Hoosier Herpetological Society, and offered us looks at several dozen local species. Also available throughout the meeting were a show of herpetological art at the Campus-Community Art Center; a number of commercial exhibits, offering such items as books, arts and crafts, and research and care equipment, in the Union; tours of the Indiana University axolotl colony; and, another SSAR innovation, a students only reprint scavenge. For this latter event, a number of established herpetologists brought selections of their reprints which were then made available free of charge to any student willing to scavenge through the piles of reprints.

Business Meeting

The Annual Business Meeting was called to order at 1705 hours, Tuesday, 10 August 1993, in the Georgian Room of the Memorial Union, by President Tom Fritts. Tom welcomed everyone to the meeting and made a few opening remarks.

Secretary Juterbock presented a very brief summary of business conducted at the Board Meeting and not reported by anyone else. SSAR, through the efforts of Ed Moll, and along with ASIH and Herp League, received a grant from NSF to cover some graduate student travel to the Second World Congress of Herpetology in Australia this winter. Most of the publications damaged last year in the St. Louis flood were shipped to México and India to institutions that could not generally afford to purchase them. Treasurer Taylor and Publications Secretary Aldridge noted the very significant problems caused by late renewals. Treasurer Taylor announced that SSAR was in good financial shape, that membership appeared to be stable, and that the budget was balanced without having to raise dues.

A brief summary of editorial business indicates that all publications are on time and in good financial shape. *Journal of Herpetology* anticipates a new format for the Table of Contents. *Herpetological Review* introduced its new format last year. The *Catalogue of American Amphibians and Reptiles* still has a significant problem in soliciting accounts. *Facsimile Reprints in Herpetology* will issue Fauvel's "Alligators in China" (1879) in October 1993 and Fitzinger's "Neue Classification der Reptilien" (1826) in fall 1994; *Contributions to Herpetology* will issue Zhao and Adler's "Herpetology of China" in October 1993 and the Conant Symposium volume "Conservation and Captive Management of Amphibians and Reptiles" in spring 1994. *Herpetological Circulars* issued Brown's "Biology, Status and Management of the Timber Rattlesnake (*Crotalus horridus*): A Guide for Conservation" in February 1993. There was discussion about beginning a new series of works in herpetological conservation.

Committee work of note included the Grants in Herpetology Committee discussing new categories for submission: travel, conservation of amphibians and/or reptiles, field research, laboratory research, and education; these categories will be effective for the 1995 SSAR Grants in Herpetology program. The Annual Meetings Committee is pursuing meetings in 1996 in New Orleans and 1997 in Seattle; the Board accepted an invitation to meet in Boone, North Carolina in 1995.

Amy Edwards (1994 Local Committee Coordinator) was available to answer questions about the 28 July–1 August 1994 meeting in Athens, Georgia. SSAR will meet jointly with the Herpetologists' League; the University of Georgia Museum of Natural History and the Savannah River Ecology Laboratory will co-host the meeting. Be sure to follow *Herp. Review* for news of the plans and descriptions of the site.

Secretary Juterbock, reporting for the Nominating Committee, announced the candidates for terms of office beginning in 1994. President-elect: Victor H. Hutchison and Alan H. Savitzky; Secretary: J. Eric Juterbock; Treasurer: Karen L. Toepfer; Director: Janalee P. Caldwell and Ellen M. Dawley; Director (Regional Herp Society): Paul E. Moler and Martin J. Rosenberg. With no nominations from the floor, Don Forester moved (Bob Hansen seconded) to close the nominations; the motion carried without dissent.

The only item of old business discussed was the revision of the SSAR Bylaws. The Board had previously approved amending the Bylaws to clarify a couple of procedures. Copies of the proposed changes were distributed to attendees, who also approved the changes. The proposed amendments will be voted on by the membership in the 1993 election. As new business, a call was made for proposals for symposia for the 1995 meeting in Boone. George Pisani read the resolutions proposed for adoption by the membership (see below).

Finally, at about 1740 hours, President Fritts presented the official SSAR Presidential Gavel to President-elect Houck, who adjourned the meeting.

1993 SSAR Resolutions

Honoring Outgoing SSAR Officers and Editors

WHEREAS the following individuals have given freely of their time, skills, insight, and knowledge to the Society for the Study of Amphibians and Reptiles in this past year; and,

WHEREAS they have been therefore instrumental in advancing the Society's goals and furthering its growth as an international scientific society; and,

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WHEREAS SSAR is dependent upon the generosity of these persons and those who have gone before them, and is greatly indebted to them all for their fine efforts in its behalf;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles urges these persons not to withdraw from service, but rather to continue to be available, with or without official titles, as resources to guide those who follow; and,

RESOLVED FURTHER that the Society offers its most sincere thanks to the following persons who have served in these capacities:

WILLIAM S. BROWN— Chair, Long-Range Planning Committee
GUSTAVO CASAS-ANDREU— Director
CHARLES COSTA— Elector
STEVE CORN— *Herp. Review* section editor
DARREL FROST— *Herp. Review* section editor
STEPHEN H. HAMMACK— Chair, Regional Societies Liaison Committee and *Herp. Review* section editor
LYNNE HOUCK— *J. Herp.* Editorial Board member
JERRY JOHNSON— Co-Chair, 1992 Local Committee
CARL LIEB— Co-Chair, 1992 Local Committee
LINDA R. MAXSON— Immediate Past-President and *J. Herp.* Editorial Board member
EDWARD O. MOLL— President
HENRY R. MUSHINSKY— Director
HOBART SMITH— *J. Herp.* Editorial Board member
MARGARET M. STEWART— Chair, 1992 Nominating Committee
SAMUEL S. SWEET— Editor, *Journal of Herpetology*

Adopted unanimously by the Society for the Study of Amphibians and Reptiles, 10 August 1993 at its Annual Business Meeting.

Thanking The Local Committee

WHEREAS Indiana University at Bloomington has a long tradition of research in natural history and herpetology; and,

WHEREAS Indiana University at Bloomington has hosted this diverse assemblage of over 300 herpetologists at the 36th annual meeting of the Society for the Study of Amphibians and Reptiles; and,

WHEREAS Co-Chairs Craig Nelson and Michael Ewert obviously have worked long and hard to assure the success of this gathering as an intellectual and social event; and,

WHEREAS they have been assisted capably in this effort by John Philips, Jim Barron, Jean Capler, Pat Clark, Mark Deutschlander, Chris Grimes, Matt Klulowski, Wende Wente, Jennifer Alexander, Jake Streepy, Susan Barnett, Greg Delisle, Susan Duhon, Robert Webb, Patty Hooten, the members of the Hoosier Herpetological Society, and last— but by no means least—the staff of the Indiana University Conference Bureau;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles extends its most sincere thanks to these several persons whose effort and attention to detail has made this meeting a success.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles, 10 August 1993 at its Annual Business Meeting.

Kennedy Award Winner

The 1993 Kennedy Student Award, for student-authored papers published in volume 26 of the *Journal of Herpetology* is "The trade-mediated introduction of *Eleutherodactylus martinicensis* (Anura: Leptodactylidae) on St. Barthélémy, French Antilles, and its implications of Lesser Antillean biogeography" by Hinrich Kaiser. His present address is Redpath Museum, McGill University, 859 Sherbrooke St. W., Montréal, Québec, Canada H3A 2K6, and Department of Biology, McGill University, 1205 Penfield Ave., Montréal, Québec, Canada H3A 1B1. Hinrich's major professor is Dr. David M. Green of McGill University.

Twelve manuscripts were in competition this year. The Award Committee noted the high quality of the submitted papers. SSAR congratulates Hinrich Kaiser for his fine paper.

Seibert Awards

The second annual Seibert Awards were presented at the 36th Annual Meeting of the SSAR in Bloomington, 7–12 August 1993. These awards are named in honor of Henri C. Seibert, an early and tireless supporter of SSAR (having served as an officer for over 20 years). The awards recognize outstanding student presentations at the annual meeting.

The winners:

First Place: T.U. Grafe (Section of Neurobiology and Behavior, Cornell University), "Graded calls and the function of call alternation in the African reed frog *Hyperolius marmoratus*."

Second Place: David J. Able (Section of Neurobiology and Behavior, Cornell University), "Correlates to male mating success in the red spotted newt (*Notophthalmus v. viridescens*)."

SSAR congratulates these students for their fine presentations.

Joint SSAR–HL Directory of Herpetologists

The societies are in the process of compiling a new directory. In order to ensure accuracy, we ask that you review the address label used to mail this periodical to you. Please make any corrections (or, indicate OK), add your phone number, FAX number, and E-MAIL address to the sheet (or, if you are reading this in *Herpetological Review*, remove the label from the cover and tape to an index card or sheet of paper) and return this information to: *Karen L. Toepfer, SSAR Treasurer, 303 West 39th Street, Hays, Kansas 67601-1518, USA.*

NEWSNOTES

AAZK Grants Available

The American Association of Zoo Keepers announces the availability of two $750 research grants in the field of zoo biology. The deadline for submissions is 1 March 1994. Interested applicants should direct their inquiries to: *Sue Barnard, Chairperson, AAZK Research/Grants Committee, Zoo Atlanta, Department of Herpetology, 800 Cherokee Ave. SE, Atlanta, Georgia 30315, USA.*

Boa Survey

Persons with captive adult *Boa constrictor* are requested to write for a questionnaire concerning captive reproduction. The questionnaire is available in English, Spanish, French, German, and Dutch. Even if your animals have not reproduced, please respond if they are at least 4 years old and have had the opportunity to breed. Respondents' names and addresses will be kept confidential and will not be used for any purpose other than this survey. In return for a completed survey you will receive a chart showing subspecies, their scale counts, and ranges. *William D. Joy, P.O. Box 821433, Dallas, Texas 75382-1433, USA. INTERNET: 72223.220@COMPUSERVE.COM.*

Southwestern Research Station Volunteer Program

Approximately 20 volunteer positions are open in 1994 at the American Museum of Natural History's Southwestern Research Station in Portal, Arizona. The volunteer program is run annually and offers students in biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging are provided to volunteers in exchange for 24 hours per week of routine chores, with the remaining time available for research activities.

The program is open to both undergraduate and graduate students; the latter may pursue their own research projects. Faculty knowing of promising students should alert them to this opportunity for professional experience toward, development of, and evaluation of their career goals.

Volunteers are needed between 15 March and 1 November. Appointments are for part of this period, with a minimum appointment of six weeks. Applicants for spring positions (March–May) should submit applications by 15 February, summer volunteers (June–August) by 1 April, and fall volunteers (September–November) may apply any time.

For applications, write: *Dr. Wade C. Sherbrooke, Director, Southwestern Research Station, American Museum of Natural History, Portal, Arizona 85632, USA; Tel. (602) 558-2396.*

Call For Commercial Breeders Of Amphibians And Reptiles

Eco-Zoo is a private conservation group helping to foster a greater union and long-term cooperation between the scientific community and private enterprise. The Herpetology Section of Eco-Zoo plans to publish a World Directory of Amphibians and Reptiles being produced for commercial purposes or potentially as such, in government research programs, scientific projects, private captive breeders, etc. Anyone wishing to appear in the directory should contact Eco-Zoo in writing for more information. Persons interested in receiving publication data on the directory should send the name of a contact person, type of business or institution, address, and phone number to: *Eco-Zoo, Herpetology Section, 2255 North University Parkway, Suite 15, Provo, Utah 84604-7506, USA.*

Move Of Biological Survey Collection, Fort Collins

The National Ecology Research Center announces the move of the Biological Survey Collection, Fort Collins, Colorado (BS/FC) to Albuquerque, New Mexico effective January, 1994. The collection will be relocated in the Museum of Southwestern Biology at the University of New Mexico. Currently the collection numbers 20,000 mammals, 3000 birds, 7800 amphibians and reptiles, and 4600 catalogued lots of fishes. After 15 November, 1993, loan requests and inquiries should be made to Michael Bogan, Curator or Cindy Ramotnik, Collections Manager, at their new address: *National Biological Survey, Museum of Southwestern Biology, Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA; Tel. (505) 766-3903.*

Southwestern Research Station Student Support Fund

The American Museum of Natural History awards several grants each year of approximately $400–$800 to graduate students or postdoctoral students pursuing research at its Southwestern Research Station in the Chiricahua Mountains, Portal, Arizona. Information and application forms for this program and other Museum grant programs can be obtained by writing: *Office of Grants and Fellowships, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024-5192, USA.* Application due date: 15 February 1994. Address questions concerning the Station to: *Dr. Wade C. Sherbrooke, Director, Southwestern Research Station, Portal, Arizona 85632, USA. Tel. (602) 558-2396.*

Guidelines For The Husbandry Of Amphibians And Reptiles

Specific guidelines for the husbandry of "typical" laboratory animals such as rats, mice, hamsters, and dogs, are set forth by the federal government (*Guide to the Care and Use of Laboratory Animals*, NIH publication 86-23). Such federal guidelines have not been extended to amphibians and reptiles, and, perhaps this is fortunate as the highly diverse requirements of these animals would confound attempts to create a standard husbandry. On the other hand, the policies of institutions, granting agencies, etc. require that researchers follow appropriate husbandry protocols and research procedures. For this reason, I would like to recommend several recent publications that should be extremely useful to both researchers and institutional animal care committees.

The following three publications are available free-of-charge from the Animal Welfare Information Center (you must provide formatted HD disks). Contact: *Animal Welfare Information Center, National Agricultural Library, 10301 Baltimore Boulevard, Beltsville, Maryland 20705, USA. Tel. (301) 504-5563 or (301) 504-6212).*

1) Berry, D. J., M. D. Kreger, J. L. Lyons-Carter. 1992. Information resources for reptiles, amphibians, fish, and cephalopods used in biomedical research. USDA, National Agricultural Library, Animal Welfare Information Center, Beltsville, Maryland, 87 pp. (This is a bibliography of the major publications on care and use of amphibians and reptiles in the laboratory setting.)

2) Fact Sheet: Electronic information products available from AWIC. I. Animal welfare legislation and policies: The animal welfare act, amendments, and regulations, and, II. Animal welfare recommendations and resources.

3) Pough, F. H. 1991. Recommendations for the care of amphibians and reptiles in academic institutions. National Academy Press, Washington, D.C., 21 pp. (This publication was written, in part, to educate non-herpetologists about the features of ectotherms critical to their care.)

4) Schaeffer, D. O., K. M. Kleinow, and L. Krulisch, (eds.). 1992. The Care and Use of Amphibians, Reptiles and Fish in Research. Scientists Center for Animal Welfare, Bethesda, Maryland, 196 pp. [This publication has a series of papers on husbandry, including cage design, anesthesia, euthanasia, and stress management. Available from *Scientists Center for Animal Welfare, 4805 St. Elmo Ave., Bethesda, Maryland 20814, USA. Tel (301) 654-6390, $40*].

ROBIN ANDREWS
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MEETINGS

ASC/SPNHC Joint Meeting

The Association of Systematics Collections and the Society for the Preservation of Natural History Collections will have a joint meeting at the Missouri Botanical Garden 11-15 May 1994. The theme for the meeting is "Collections Planning and Policies." The meeting will include a joint workshop, a public policy review, SPNHC technical sessions and a training workshop. Program information and registration materials will be sent to members and included in upcoming issues of both the *ASC Newsletter* and the *SPNHC Newsletter*. For further information contact *ASC, 730 11th Street, NW, Second Floor, Washington, D.C. 20001, USA. Tel. (202) 347-2850.*

A Symposium On The Status And Conservation of Florida Turtles

This symposium will be held 2-3 April 1994 at Eckerd College, St. Petersburg, Florida. It is co-sponsored by the Gopher Tortoise Council, League of Environmental Educators in Florida, and Eckerd College.

Turtle conservation is an international effort. Florida, where ten percent of the world's turtle species are known to occur, is no exception. Over half of the 25 species that occur in Florida are in need of conservation attention. This symposium will address specific problems faced by Florida turtle species, as well as conservation strategies and potential solutions. This meeting will help to unite the previously separate efforts of marine turtle, tortoise, and freshwater turtle biologists. In addition to bringing together Florida turtle researchers, this two-day symposium will include representatives from the academic community, governmental agencies, conservation organizations, the environmental education community, and the outdoor/environmental writers' community for the benefit of Florida turtle conservation.

The League of Environmental Educators in Florida will be conducting an environmental education workshop during the symposium. The workshop will feature presentations by environmental educators actively involved in Florida turtle conservation.

For more information, or to be placed on our mailing list, please write to: *GTC c/o George Heinrich, P.O. Box 61301, St. Petersburg, Florida 33784-1301, USA*. Donations are needed to support this effort. Donations are tax-deductible and should be made payable to the Gopher Tortoise Council (earmarked for the Florida turtle symposium) and mailed to the same address.

British Herpetological Society Meetings For 1994

The following list provides dates, and in some cases, only preliminary details of meetings of the British Herpetological Society scheduled for 1994. Further details will follow in the *Bulletin* of the BHS.

February 5 - Herpetofauna Recorders' Meeting (HRM) 1994) (University of Manchester).

March 19 - Annual General Meeting (Birkbeck College London). Speakers will be Rob Quest (Heathrow Customs: "Reptile Imports"), Dr. Andy Smart (Bristol University: "Nesting success of green turtles at Kazanli, Turkey"), Dr. S. Hugh-Jones (Cambridge University: "Snakes, frogs, and other herps in northwest Amazonia").

May 1 - Joint Conservation & Education Committee Meeting.

May 7 - Captive Breeding Committee Amphibian Meeting (New Denham).

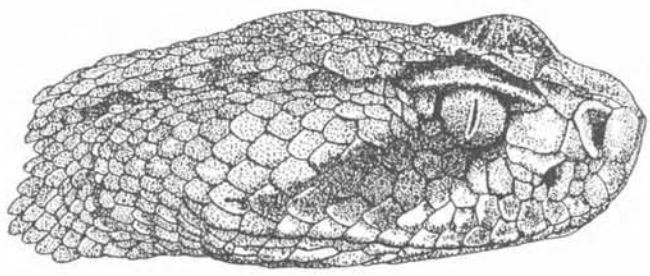
May 15 - "Leapers and Creepers" event, organized by Surrey Wildlife Trust, followed by visit to Beam Brook.

July 2 - Captive Breeding Committee Animal Husbandry workshop (New Denham).

October 15 - Autumn General Meeting (Birkbeck College London). Speakers will be Chris Wild (Nottingham: "The montane chameleons of the Cameroons Highlands"), Dr. Jim Foster (Durrell Institute of Conservation & Ecology: "Reptile conservation in south India"), Dr. Angelo Lambiris (Essex: "Southern African amphibians").

November 5 - Captive Breeding Committee Captive Stock Sale (New Denham).

December 3 - Research Committee Meeting (Birkbeck College, London).



Crotalus scutulatus. USA: Arizona: Pima Co., Avra Valley Rd. Illustration by Chuck Smith.

LEGISLATION & CONSERVATION ALERT

Call for information on the status of amphibians and reptiles.—This column serves to update the herpetological community on the regulatory status and protection measures implemented for rare, threatened, and endangered herps. We are in need of more information especially on the State and Province level. Please send pertinent information to the Section Editor.

USA: Department of the Interior: The National Biological Survey (NBS) was created 1 October 1993, by assembling portions of the biological research and survey elements of three Departmental bureaus—the U.S. Fish and Wildlife Service, the National Park Service, and the Bureau of Land Management. The NBS will not incorporate regulatory or resource management responsibilities. The NBS will use and establish scientific protocols in cooperation with other agencies to enhance comparability of reseach and long-term trend analyses. The inventory program will be conducted in concert with other federal and state agencies, The Nature Conservancy's Natural Heritage Programs, non-governmental organizations, and academia. (Department of the Interior news release, 26 April 1993).

USA: Arkansas: The Arkansas Department of Fish and Game has issued an Emergency Proclamation which prohibits the capture and possession of the alligator snapping turtle (*Macroclemys temmincki*). This emergency action was prompted by evidence of the decline and large scale commercial trade in this uniquely vulnerable stream-dwelling species. The trade was primarily in the export of turtle meat from the state. Regulations will be formulated within 120 days of the proclamation (4 October 1993) which will address the possession of captive animals. There are concerns that captive stock will be discarded in inappropriate habitats. Herpetologists and conservation biologists are encouraged to offer support in the formation of appropriate legislation. Contact: *Steve Wilson, Director, Arkansas Fish and Game, tel. (800) 364-4263.* This information was submitted by Steve D. Santhuff, *Macroclemys* Conservation Committee, Department of Zoology, University of Florida, Gainesville, Florida 32611, USA.

USA: Georgia: The Georgia Department of Natural Resources has updated its endangered species list and it now includes the following: Endangered: *Dermochelys coriacea, Eretmochelys imbricata, Lepidochelys kempii*; Threatened: *Caretta caretta, Chelonia mydas, Clemmys muhlenbergii, Drymarchon corais couperi, Gopherus polyphemus, Graptemys barbouri, Macroclemys temminckii*; Rare: *Graptemys geographica, G. pulchra, Ambystoma cingulatum, Amphiuma pholeter, Aneides aeneus, Cryptobranchus alleganiensis, Haideotriton wallacei, Notophthalmus perstriatus, Plethodon petraeus*; Unusual: *Clemmys guttata*. However, the DNR Board has limited the enforcement of the law to public lands owned by the State of Georgia. It also states that anyone charged with killing or harming a protected species must have shown intent to violate the act. Critics contend that these revisions have weakened the state's endangered species law. For more information contact: *Georgia Department of Natural Resources, 205 Butler Street, Suite 1252, Atlanta, Georgia 30334, USA.*

USA: Maryland: The Maryland Department of Natural Resources announced new regulations that affect the owners of all native reptiles and amphibians. Under the new regulations, an individual may possess up to four of each species of snake, lizard, salamander, or turtle and up to twenty-five of each frog, toad, or red-spotted newt without a permit. Any species listed by Maryland's endangered species law cannot be possessed. Bog (*Clemmys muhlenbergii*), wood (*C. insculpta*), and spotted turtles (*C. guttata*) may not be collected from the wild under these new regulations.

To possess more than the limits set forth, a permit ($25/yr) must be obtained. All animals above the limits must be of captive origin or purchased from a pet store; none may come from the wild. The permit allows for the captive breeding and commercial sale of captively produced animals. Pet stores must have a permit to sell herps considered native to Maryland and all animals must have come from captive breeding or been legally obtained from out of state. For a copy of the new regulations or to apply for a permit contact: *Permits Coordinator, Wildlife Division, Department of Natural Resources, Tawes State Office Building, E-1, Annapolis, Maryland 21401, USA.*

CITES Amendment: The Convention on International Trade in Endangered Species (CITES) is a treaty designed to control international trade in certain animal and plant species that are, or may become threatened with extinction. Appendix I contains species threatened with extinction that are, or may be affected by international trade; Appendix II includes species that may become threatened if their trade is not brought under control; Appendix III includes species that individual CITES Parties identify as subject to domestic regulations for the purpose of restricting or preventing exploitation. The wood turtle (*Clemmys insculpta*) has been added to Appendix II and the bog turtle (*Clemmys muhlenbergii*) has been moved from Appendix II to Appendix I (*Endangered Species Technical Bulletin*, Vol. XVIII No. 1, 1993).

KURT A. BUHLMANN
SSAR Conservation Committee.

REGIONAL SOCIETIES

New Herpetological Societies

Please note and add the following new regional herpetological societies to your directories:

Dragon Patch Herpetology Club
913 East Main Street
Salem, Virginia 24513, USA

Tennessee Valley Herpetological Society
P.O. Box 360
Ooltewah, Tennessee 37363, USA

Society Address Changes

Please note the following changes of address:

Lubbock Turtle and Tortoise Society
2295-G Chambers Road, #157
Aurora, Colorado 80011-3204, USA

Rocky Mountain Herpetological Society
c/o Charles Sarkisian
5362 North Nevada Avenue, Apt. 201
Colorado Springs, Colorado 80918-8621, USA

In addition, if anyone knows of current addresses for the following societies, please forward them to the Regional Societies Section Editor: Central Kentucky Herpetological Society, Endangered Turtle Protection Foundation, Upstate Herpetological Association.

ARTICLES

Intraspecific Oophagy In Reptiles

Reptilian behavior has been the subject of voluminous reviews which summarize the abundant anecdotal literature. For instance, Carpenter and Ferguson (1977) reviewed the massive literature on mating, courtship, aggression, and social communication. Greene (1988) reviewed antipredator behaviors. Somma (1990) reviewed parental care. Published reports on oophagy range from brief notes of its occurrence to full descriptions of the behavior. In this paper we provide an updated review of the literature on oophagy in reptiles, a review of the hypotheses proposed to account for this behavior, and suggestions for reporting future observations.

Oophagy (technophagy – Hamilton 1958; prolicide – Auffenberg 1981; cannibalism – Heimlich and Heimlich 1947; Martof 1956; Fitch and Henderson 1978; Christian and Tracy 1982) has been used to refer to two different behavioral acts: 1) predation of the eggs of other vertebrate species by, for example, *Dasypeltis* of Africa (Gans 1952) and *Pituophis melanoleucus* in North America (Wright and Wright 1957) (interspecific oophagy), and 2) consumption of a female's own eggs, embryos, or extraembryonic membranes, or the consumption of the eggs of a conspecific female by other females or by males (intraspecific oophagy). The published literature reflects these two definitions.

The following list catalogs published and unpublished observations of intraspecific oophagy known to us through 1992. Details are provided when available to differentiate between consumption of the individual's own eggs and the consumption of them by a conspecific. Additional information is included if pertinent. Some of the reports noted only that the behavior occurred in the species; these are indicated as "captive" or "field" observations to distinguish between these two environments. A primary aim of this review is to stimulate additional reports of such behavior so that a more complete database is available for analyses of causes and benefits. Higher order taxonomy follows Zug (1993). Observations by us are noted by our initials.

Lacertilia

Anguidae: *Elgaria coerulea* – Females ate extraembryonic membranes (J. R. Stewart *in* Guillette and Hotton 1986; Somma 1990). *Gerrhonotus liocephalus* – A nest-guarding female apparently removed spoiled eggs from the nest (H. W. Greene *in* Tinkle and Gibbons 1977). *Ophisaurus attenuatus* – Brooding females sometimes eat their own eggs (Fitch 1970, 1989). A captive female consumed her own freshly-laid eggs (Vogt 1981). *Ophisaurus ventralis* – A field-collected specimen contained two conspecific eggs (Hamilton and Pollack 1961). A captive female consumed her entire clutch (Villiard 1969).

Gekkonidae: *Ailuronyx seychellensis* – captive (Slavens 1987). *Cosymbotus platyurus* – field (Church 1962). *Gehyra mutilata* – field (Church 1962). *Gekko petricolus* – Zaworski (1987) observed captive females consume infertile eggs and empty eggshells. *Hemidactylus brookii* – Bustard (1957) observed a male eating eggs of conspecific females in captivity. *Hemidactylus frenatus* – captive (Miller 1979); field (Church 1962). *Hemidactylus turcicus* – Captive females guarding their eggs were "overpowered" by conspecifics who ate their eggs (L. A. Somma, pers. comm.). *Lepidodactylus lugubris* – captivity (Miller 1979). JDG observed a wild female on Guam eat two eggs after she was disturbed. *Phelsuma dubia, P. laticauda,* and *P. madagascariensis* – Captive females of these species will eat empty egg shells after neonates hatch, ingest inviable eggs, and consume freshly-laid eggs when their diet is deficient in calcium (Osadnik 1984). *Phelsuma sundbergi* – One wild-caught individual contained an egg shell, "probably gecko," in its stomach (Evans and Evans 1980). *Ptychozoon kuhli* – captivity (JDG). *Ptyodactylus hasselquistii* – One egg was found in a wild-caught female (Perry and Brandeis 1992).

Helodermatidae: *Heloderma horridum* – captive (R. E. Honegger, pers. comm.; JDG). *Heloderma suspectum* – captive (R. E. Honegger, pers. comm.; JDG).

Iguanidae: *Anolis equestris* – A male dug up and ate the eggs of a female with which he had mated (Miller 1979). *Conolophus pallidus* – Field observation of a female eating eggs of conspecifics (Christian and Tracy 1982). *Conolophus subcristatus* – Captive males ate eggs of conspecific females (H. K. Snell, pers. comm.). *Ctenosaura similis* – field (Fitch and Henderson 1978).

Lacertidae: *Lacerta agilis* – Darevsky (1946) described oophagy by captive males. *Lacerta lepida* – captivity (Laferrere 1970). *Lacerta viridis* – captivity (Street 1979).

Scincidae: *Corucia zebrata* – Captive females ate extraembryonic membranes of their offspring (Honegger 1985; Wright 1991). Consumption of extraembryonic membranes was observed on several occasions at the Philadelphia Zoo (JDG). *Egernia cunninghami* – Females ate extraembryonic membranes (Niekisch 1975, 1980). *Eumeces anthracinus* – A captive female ate four of her eight eggs (Hamilton 1958). *Eumeces callicephalus* – An egg of a captive female was eaten by her or a conspecific cagemate (Zweifel 1962). *Eumeces egregius* – A captive female *E. e. onocrepis* ate one of her four eggs and a captive female *E. e. insularis* ate all five infertile eggs (L. A. Somma, pers. comm.). *Eumeces fasciatus* – One of 25 females consumed all of her eggs after being brought into captivity (Cagle 1940). A captive female consumed two of her own eggs (McCauley 1945). Fitch (1954) found two eggs in field-collected females. Groves (1982) described the oophagic behavior of this species and found that 20 of 21 eggs were eaten by their attendant captive females; the last egg was eaten by a conspecific female. Vitt and Cooper (1986) observed ingestion of both dead and live eggs by captive females but gave no data. *Eumeces inexpectatus* – A field-collected female contained one of her own eggs in her stomach (Hamilton 1958). Vitt and Cooper (1986) observed ingestion of both dead and live eggs by captive females but provided no specifics. A captive female ate an infertile egg of a clutch she was brooding (L. A. Somma, pers. comm.). *Eumeces laticeps* – A female brooding 15 eggs consumed twelve of them after being placed in a terrarium (Martof 1956). Among 15 females with broods in the laboratory, seven ate 1-3 of their own eggs and three consumed their entire clutches (Vitt and Cooper 1985). These authors also provided circumstantial evidence that a wild female consumed two of her 12 eggs in a nine day period. *Eumeces obsoletus* – A captive female consumed her own eggs (Burt 1928). *Eumeces okadae* – 19 of 272 eggs in natural nests were eaten by the attending females (Hasegawa 1985). *Eumeces septentrionalis* – Frequently-fed, captive females consumed their inviable eggs (Somma 1989a,b). *Eumeces skiltonianus* – Tanner (1957) provided circumstantial evidence that a wild female had consumed one of her eggs. *Leiolopisma otagense* – Females ate extraembryonic membranes (Smithells *in* Sharrell 1966). *Leiolopisma smithii* – Females ate extraembryonic membranes (Somma 1990). *Mabuya capensis* – Females were observed eating extraembryonic membranes (FitzSimons 1943; Rose 1929, 1950). *Mabuya macrorhyncha* – A captive female ate the extraembryonic membranes of her neonates (Reboucas-Spieker and Vanzolini 1978). *Scincella lateralis* – Captive females were frequently observed to eat eggs of conspecifics (L. A. Somma, pers. comm.). *Sphenomorphus quoyii* – Females tore extraembryonic membranes and presumably swallowed them (Shine 1988). *Tiliqua (Trachydosaurus) rugosa* – Captive females ate the extraembryonic membranes of their neonates (Hitz 1983; Mertens 1960).

Teiidae: *Ameiva corvina* – A captive female was observed carrying a slit and flaccid egg in her mouth (JCM). *Cnemidophorus sexlineatus* – A captive female dug up and ate two eggs of a conspecific (L. A. Somma, pers. comm.). *Cnemidophorus tesselatus* – Captive females were observed to dig up and eat eggs of

conspecifics (L. A. Somma, pers. comm.). *Cnemidophorus uniparens* – On three occasions conspecifics consumed eggs of cagemates (Crews et al. 1983).

Varanidae: *Varanus bengalensis* – Deraniyagala (1953) mentioned this species eats the eggs of conspecifics. A male ingested eggs during two breeding seasons in captivity (W. Auffenberg *in* Slavens 1982). *Varanus exanthematicus* – Cissé (1972) found conspecific eggs in the stomach of a single field-collected specimen. *Varanus indicus* – 20 eggs of a female collected on Guam were ingested by a male or the female or both in captivity (JDG). *Varanus komodoensis* – Captive adult females ate eggs of conspecifics (Lederer 1942). Auffenberg (1981) observed this behavior in captive adult males. Other reports of oophagy in captives are in Brongersma (1932), Oesman (1967), and Galstaun (1973). *Varanus prasinus* – One of four eggs laid in captivity was eaten by an adult male (J. B. Murphy, pers. comm.). *Varanus salvator* – Captive males and females have been recorded eating conspecific eggs (R. E. Honegger, pers. comm.). A captive female consumed one of her own eggs at the Philadelphia Zoo (JDG).

Xantusiidae: *Xantusia henshawi* – A captive female ate the extraembryonic membranes of her neonate (Shaw 1949). *Xantusia vigilis* – Females ate extraembryonic membranes in captivity (Cowles 1944; Miller 1954).

Serpentes

Boidae: *Corallus enydris* – Captive females ate their own eggs after deposition (Jes 1984; Miller 1983). *Epicrates cenchria* – A captive female ate an undeveloped ovum (Boos 1976). A captive female ingested a dead neonate and its foetal membrane after nudging it with her snout (Groves 1981). *Epicrates striatus* – Captive females ate dead neonates and their membranes (Hanlon 1964; Huff 1980; Slavens 1987). Captive females have been observed to eat undeveloped ova, extraembryonic membranes, and dead neonates (Groves 1981). *Eryx colubrinus* – captive (Ross and Marzec 1990). *Eunectes murinus* – Neill and Allen (1962) described the feeding behavior of a captive female which ate 15 of 19 aborted embryos; the four live-born neonates were not eaten. Holstrom and Behler (1981) described the ingestion of extraembryonic membranes and an undeveloped egg in captive females. *Eunectes notaeus* – Captive females have been observed to eat infertile eggs (Holmstrom 1981; Slavens 1985, 1988; Townson 1985).

Colubridae: *Ahaetulla nasuta* – captive (Reippel 1970). *Cemophora coccinea* – Ditmars (1907) observed a captive female consume seven of eight eggs containing near-term embryos. Palmer and Tregembo (1970) observed one captive female swallow three eggs laid by a conspecific. *Elaphe scalaris* – captive (Leferrere 1970). *Heterodon nasicus* – captive (M. J. Kowak, pers. comm.). A captive female ate several of her own eggs on two separate occasions (Hammack 1991). *Lampropeltis triangulum* – An entire clutch was eaten by the resident captive male (J. B. Murphy, pers. comm.). A captive female was observed to regurgitate one of her eggs (Groves and Sachs 1973). *Leptodiera annulata* – A captive female consumed her entire clutch (Wehekind 1955). *Oligodon taeniolatus* – A recently captured female ate three eggs less than one hour after laying them (Minton and Anderson 1963).

Elapidae: *Naja naja* – Oophagy was presumed to occur based on Hindu scriptures dating to 600 B.C. (Rao 1957).

Pythonidae: *Python molurus* – A female was observed removing infertile or undeveloped ova from her clutch (Griehl 1984).

Viperidae: *Agkistrodon bilineatus* – A captive female ingested two dead neonates (and their extraembryonic membranes) of her own litter (JDG).

Testudines

Emydidae: *Clemmys muhlenbergii* – captive (Robotham 1963). Arndt (1977) noted that a captive female ate one of her own eggs after oviposition. *Terrapene carolina* – captive (Ernst and Barbour 1972; W. B. Love, pers. comm.).

Testudinidae: *Gopherus agassizii* – A captive female dug up and ate the eggs of a conspecific who had just completed nesting (Nichols 1953).

Crocodylia

Alligatoridae: *Alligator mississippiensis* – field (Kushlan and Simon 1981). Kellogg (1929) recorded three partially digested eggs in the stomach of a Louisiana specimen.

Crocodylidae: *Crocodylus niloticus* – Females were observed to pick up and eat eggs from nests, egg fragments were found in feces, and stomachs of several females killed contained eggs (Modha 1967; Welman and Worthington 1943). Cott (1961) found 87 conspecific eggs in the stomach of one individual.

Discussion

Intraspecific oophagy has been reported to occur in 58 species of lizards, 16 snakes, three turtles, and two crocodilians. In lizards, 59 observations (number of literature and personal observation records) occurred in captivity and 15 in the field, whereas all observations of snake and turtle oophagy were of captive specimens.

Oophagy is a specialized behavior not involving the active killing of another conspecific or consumption of carrion. Consumption of unhatched, late-term embryos might be considered cannibalism, but unhatched juveniles are unable to utilize defensive behaviors, whereas newly hatched neonates and those newly freed from embryonic membranes may possess innate defensive strategies, or visual or other cues that modify the predatory behavior of adult conspecifics. The hatching event is an adequate distinction between when the behavior should be called cannibalism or oophagy.

Intraspecific oophagy is probably a form of parental care when performed by females on their own eggs. Several hypotheses have been proposed to explain the causes of this behavior in brooding females.

Hunger/thirst hypothesis: Oophagy by the parental female may be caused by hunger (Cagle 1940) or a combination of hunger and thirst (Vitt and Cooper 1986). Fitch (1954) thought this behavior occurred in order to satisfy hunger without the female having to leave the nest.

Mistaken food hypothesis: Decomposing eggs may have a different odor than healthy eggs and females may mistake them for prey items (R. B. Huey *in* Shine 1988 p. 292).

Hygiene hypothesis: Oophagy by the brooding female may minimize the transfer of bacteria, fungi, and other harmful microorganisms from dead or infected eggs to viable eggs (Groves 1981, 1982; Shine 1988; Somma 1989, 1990; Tinkle and Gibbons 1977).

Predator avoidance hypothesis: Consumption of dead eggs by the female may reduce detection of the nest and attendant female by predators, presumably because of chemical cues released by rotting eggs and aborted ova (Groves 1982; Neill and Allen 1962; Somma 1990; Tinkle and Gibbons 1977).

Captive females of several species of *Phelsuma* ingested their own eggs after they were damaged experimentally, and when these animals were kept on a calcium deficient diet, they ate their eggs immediately after laying them (Osadnik 1984). Brooding captive female *Eumeces septentrionalis* will ingest mechanically killed or introduced rotten eggs and eggs swabbed with the contents of a rotten egg (Somma 1989). Brooding female *Eumeces fasciatus* will eat rotting eggs, even after consumption of insect prey (Groves 1982). These observations suggest that the hygiene and predator avoidance hypotheses may explain the causes of oophagy in brooding females of some species. However, dietary deficiencies may cause oophagy in other species. Data are lacking to more completely differentiate among the existing hypotheses. Oophagic behavior in brooding females may have multiple causes.

In addition to being a form of parental care, intraspecific oophagy is a form of predation when performed by conspecifics.

Hypotheses advanced to explain the causes of infanticide (Huntingford and Turner 1987) may also apply to the causes of oophagy. These are, as modified from Jenssen et al. (1989), (1) exploitation of eggs and aborted neonates in egg membranes as food, (2) elimination of potential population members as competitors for limited resources, (3) improved breeding opportunities for conspecific predators by removing non-related offspring in the embryo stage from prospective mates, and (4) improved inclusive fitness of parents by their selective killing of non-related offspring. In addition, intraspecific oophagy may be a method of density–dependent population regulation, as suggested for some cannibalistic lizards (Badir 1968; Jenssen et al. 1989; Mitchell 1986). None of the observations listed above, however, allows us to distinguish among these potential causes of oophagy by conspecifics.

Observations of oophagic behavior should be reported, but they should contain the circumstances within which the behaviors were performed, if they occurred in the field or in captivity, and whether a single individual (e.g., female parent) or a conspecific was involved. Consistent information and experiments on a variety of species could provide insights into the causes and benefits of these behaviors.

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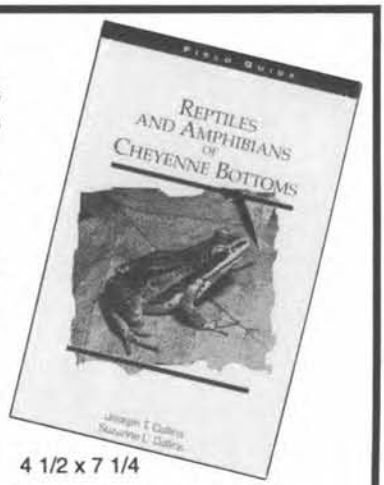
REPTILES AND AMPHIBIANS OF CHEYENNE BOTTOMS

Joseph T. Collins
Suzanne L. Collins

In the Western Hemisphere, Cheyenne Bottoms, a 19,857 acre marsh located in Barton County in central Kansas is famous as a way station for migrating waterfowl, but not much attention is given to the variety of amphibians and reptiles that call the Bottoms their home.

Joe Collins, author of fifteen wildlife books, and Suzanne Collins, a noted wildlife photographer, have combined talents to produce a field guide with stunning color photos and descriptions of these fascinating and misunderstood creatures that live in this important wetland.

This book, which initiates a series on the natural history of Cheyenne Bottoms, is the result of studies sponsored by the U.S. Fish & Wildlife Service, Western Resources, Inc., The University of Kansas Museum of Natural History, Kansas Department of Wildlife and Parks, and the Kansas Herpetological Society.



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Observations Of Autohemorrhaging In *Tropidophis haetianus, Rhinocheilus lecontei, Heterodon platyrhinos,* And *Nerodia erythrogaster*

In a recent review of reptilian defense mechanisms, Greene (1988) noted the occurrence of ocular hemorrhage commonly observed in *Phrynosoma* spp. and cited an observation of nasal and oral hemorrhage in *Tropidophis pardalis* (Hecht et al. 1955). In this note we present original observations of autohemorrhage in *Tropidophis haetianus*, *Rhinocheilus lecontei*, *Heterodon platyrhinos*, and *Nerodia erythrogaster*, and review the literature concerning autohemorrhage in snakes.

Dwarf boas of the genus *Tropidophis* have often been observed to respond to capture or handling with autohemorrhage in the vicinity of the eyes, mouth, and/or nose. This behavior has been noted in *T. greenwayi* (Iverson 1986), *T. maculatus* (Campbell 1951; Underwood 1952), *T. melanurus* (Mertens 1946; Stull 1928), *T. pardalis* (Hecht et al. 1955; Petzold 1969), *T. parkeri* (Campbell 1951), *T. paucisquamis* (Carvalho 1951), and *T. semicinctus* (Darlington 1927). On 5 March 1990 we collected a female *T. haetianus* (SVL 554 mm) (Bobby Witcher Memorial Collection, Avila College BWMC 4174) from under a rock beside a stream 6.1 km W of the junction of highways (Hwy) 44 and 46, along Hwy 46, Provincia de Barahona, República Dominicana. This specimen was placed in a collecting bag immediately after capture. Upon removal, some 10 min later, it was coiled in a tight ball and began bleeding profusely from the mouth and both eyes. An estimated 6-8 large drops of blood were expressed before the snake was returned to the sack where it continued to bleed for several minutes. No musk was exuded.

On 8 March 1990 another female (SVL 440 mm) was captured, again under a rock beside a stream, on the south edge of Paraiso, Provincia de Barahona. This snake responded similarly to the first by coiling into a tight ball. After a few minutes of further rock turning while the snake was still held in one hand, the collector noticed his hand was smeared with blood. A large drop was observed on the left side of the face of the snake, along the line of the mouth. No further bleeding was observed with handling on subsequent days.

During a field trip to the Provincia de Barahona during June 1991, simultaneous oral and ocular bleeding was observed in three of four captured *T. haetianus*. The behavior was observed in both males and juveniles of the species.

Cloacal hemorrhage has been noted in *Rhinocheilus l. lecontei* (Hanley 1943), and observed in 7 of 27 (26%) *R. l. tesselatus* taken in Eddy Co., New Mexico, and Culberson and Hudspeth Counties, Texas (McCoy and Gehlbach 1967). McCoy and Gehlbach also recorded cloacal hemorrhage in four other specimens of *R. l. tesselatus* and one incidence of nasal hemorrhage (epistaxis) in snakes from western Texas and Coahuila, México. They concluded that hemorrhaging may be confined to females of this

species, and that epistaxis is observed less commonly than cloacal hemorrhage. We here report cloacal hemorrhage in a female *R. l. tesselatus* (SVL 470 mm) (BWMC 1251) taken in Clark Co., Kansas, and 4 of 10 *R. l. lecontei* taken in Clark and Nye Counties., Nevada.

The Kansas specimen was found on 21 April 1979, under a rock on a dry hillside, 24.1 km N of Ashland at ca. 1400 h. Prior to any attempt to pick it up, the snake began writhing and expressing blood from the cloaca. No oral or nasal bleeding was observed. During subsequent handling the specimen went limp and bleeding stopped. On the assumption that the snake may have been injured, it was monitored carefully for several weeks in captivity, during which time it behaved normally and consumed two lizards.

The four specimens from Nevada were all taken on the road at night, between 31 May 1970 and 13 August 1973. One individual exhibited oral and cloacal bleeding. Of the four, it reacted most violently with much writhing, and production of considerable quantities of musk. Two of these specimens (both females) were preserved (KU 176894, LACM 133966). The other two were released without determination of sex.

Platt (1969) noted that snakes of the genus *Heterodon* sometimes exhibit oral hemorrhaging during the death-feigning (letisimulation) phase of defensive behavior. We have observed cloacal hemorrhaging twice in specimens of *Heterodon p. platyrhinos* from Missouri. The first occurrence was not associated with letisimulation. On 18 August 1978 a male (SVL 489) (BWMC 1022) was collected crossing a road at ca. 0600 h in eastern Jackson Co. When grasped, the snake coiled quickly and produced two or three drops of blood from the cloaca. It rapidly calmed, at which time the bleeding stopped. It did not release any musk. The specimen was maintained alive for several months before preservation.

On 16 June 1984 at ca. 2100 h, the second *H. p. platyrhinos* was observed crossing a gravel road, 12.8 km NE of Climax Springs, Camden Co. When grasped, the snake first writhed, forcefully exuded several large drops of blood from its vent accompanied with the sound of escaping flatus, and after a few seconds went limp in the collector's hand, apparently feigning death. There were no apparent signs of trauma other than the rather considerable bleeding. This specimen was released near the site of capture, and was gone the next morning.

To our knowledge autohemorrhage has never been reported in snakes of the genus *Nerodia*. On 26 March 1991 a male *Nerodia erythrogaster transversa* (SVL 604 mm) was collected in Cherokee Co., Oklahoma. When grabbed it thrashed wildly, defecating, and squirting musk from its cloacal glands. As the head was grasped the snake opened its mouth and several drops of blood oozed from the gums of the lower jaw.

McCoy and Gehlbach (1967) point out (in *Rhinocheilus*) that although autohemorrhage in snakes is often associated with defensive behavior, it is difficult to attribute operational defensive function to the bleeding. Frye (1981) indicates the causes of hemorrhage in reptiles are the same as those in higher vertebrates, and that spontaneous extravasation can result from a relative or absolute deficiency of thrombocytes. Spontaneous nasal bleeding is not an uncommon occurrence in young thoroughbred horses during extreme physical exertion (Kelly 1974) and it is possible both oral and cloacal autohemorrhage of the colubrids described here is similarly "exertion-related." In almost all cases, bleeding is subsequent to bouts of thrashing, writhing, or rapid coiling.

The autohemorrhaging observed in *Tropidophis* spp., however, may represent a different phenomenon. It differs from that observed in colubrids by being preceded, generally, by the described "balling" behavior, and by the presence of repeatedly observed nasal and orbital bleeding. This indicates more extensive involvement than that of superficial vessels of the oral or cloacal mucosae. Indeed the source of orbital bleeding could be the sinus orbitalis as associated with orbital blood spurting in *Phrynosoma* (Burleson 1942), although in *Tropidophis* the blood simply flows across the eye under the ocular and is not forcefully ejected. Still, it is difficult to assign defensive significance to this behavior. Until a defensive mechanism can be attributed to autohemorrhaging, at least in snakes, it seems prudent to consider it a physiological by-product of increased blood pressure associated with sudden and violent exertion and/or a "fright, fight, or flight" behavioral response.

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Sexual Selection: What Has Been Learned From Ectotherms? Quite A Lot!

Darwin was greatly impressed by behavioral and morphological characters in animals that appear to play no role in the "struggle for existence." Because such characters could not be explained as products of evolution by natural selection, Darwin formulated his theory of sexual selection to account for them. For Darwin, sexually selected traits provide an advantage to their bearers solely in relation to the "struggle to reproduce." He easily explained the evolution of such characters as fighting behavior and the possession of weapons, usually in males, as aiding their bearer in direct competition for females. However, the evolution of other traits, usually limited to males but not involved in direct competition, caused Darwin some trouble. By positing an aesthetic sense in females, Darwin explained such characters as vocalizations and bright, gaudy colors as being advantageous because they are attractive to and preferred by females.

Darwin was clearly aware of characters in fishes, amphibians, and reptiles that appear to have evolved by sexual selection for he devoted a whole chapter to these animals (chapter 12 of Darwin 1871). However, Darwin could never have foreseen the great theoretical and empirical advances that have been made in the study of sexual selection, most especially within the last 20 years or so (reviewed in Bateson 1983; Bradbury and Andersson 1987; Cronin 1991; Harvey and Bradbury 1991; Halliday 1992). A symposium entitled "Sexual selection: what has been learned from ectotherms?" was held at the 1993 Joint Meetings of the American Society of Ichthyologists and Herpetologists, the Herpetologists' League, The Annual Larval Fish Conference, and the American Elasmobranch Society, convened at the University of Texas at Austin (27 May – 2 June 1993). The goal of the symposium organizers, Michael J. Ryan (Univ. of Texas, Austin) and A. Stanley Rand (Smithsonian Tropical Research Institute, Panama) was to summarize our current understanding of sexual selection in "lower vertebrates," and to highlight promising avenues for future research.

The symposium consisted of 29 papers presented by authors from five countries. In terms of taxonomic scope, 11 papers considered fishes, 10 anurans, and six reptiles. Only two papers dealt with salamanders, and only one was devoted to snakes. My aim in this paper is to make available a report of the proceedings of the symposium, based largely on personal notes and abstracts. Instead of discussing individual papers in the same order as they were presented (by Class), I have chosen to order them more-or-less in conceptual terms. I hope this report will be of use to herpetologists interested in sexual selection, especially those who were unable to attend the Meetings.

The last ten or so years have seen spectacular advances in theoretical studies of sexual selection. This is especially true concerning the evolution of mate choice, where debate still rages over the extent to which females obtain benefits (for themselves or their offspring) by being choosy (Kirkpatrick and Ryan 1991). The symposium began with a theoretical overview presented by M. Kirkpatrick (Univ. of Texas, Austin), who then went on to consider the extent to which empirical studies of ectotherms have enabled us to test theories and models of sexual selection. He concluded that, until recently, data and theory have coexisted rather than interacted in a somewhat uneasy sympatry. However, ingenuity in recent experimental designs and refinements/advances in theories and models cause Kirkpatrick to be optimistic about a true marriage of data and theory in the near future.

One area in which studies of lower vertebrates are actually stimulating new theoretical development concerns the evolutionary origins of male traits preferred by females. Ryan (1990) suggested that males might evolve certain sexual traits because of pre-existing biases in female sensory systems. For example, if females are especially sensitive to the color red (perhaps because they feed on red prey), then this sensory bias in the visual system may drive the evolution of red-colored sexual signals in males. A number of papers were presented at the symposium providing evidence for the evolution of male sexual traits through sensory exploitation of pre-existing biases in females.

A. L. Basolo (Univ. of California, Santa Barbara) reported that, in the platyfish and swordtails, the absence of a sword in males is the ancestral state (the sword is formed by modification of the anal fin and looks like, well, a sword!). When Basolo attached artificial swords to males of species that do not naturally have them, she found that females of these naturally-swordless species nevertheless preferred conspecific males with swords. This suggests that a pre-existing bias in females may have favored the evolution of swords, the bias arising before the sword itself. Put another way, a bias leading to a preference apparently predated the evolution of the preferred trait.

Female sailfin mollies prefer larger males as mates, although it is not clear how this preference evolved. To address this question, C. A. Marler and M. J. Ryan (Univ. of Texas, Austin) studied a related species, the Amazon molly. This is an "all-female" hybrid species which reproduces clonally, but requires sperm from heterospecific males for egg activation. In the Amazon molly, males make no genetic contribution to offspring and provide females with no material resources, and so female mate choice would not be expected under conventional sexual selection theory. However, female Amazon mollies prefer larger heterospecific males as "egg activators," a finding which suggests that a preference for larger males may simply be an ancestral trait that need serve no current function in any molly species.

Female preference for larger males also occurs in pygmy swordtails, to the extent that preferred males may be larger than those typically found in natural populations. Indeed, females may prefer large, heterospecific males over normal-sized conspecifics! However, M. R. Morris and M. J. Ryan (Univ. of Texas, Austin) have now located one natural population of pygmy swordtails in which males are abnormally large. Unexpectedly, they found that females from this population did not show a preference for larger male partners. Morris and Ryan suggest that a preference for large males may be a primitive character in the genus *Xiphophorus*, and that it appears to have been secondarily lost in some populations of pygmy swordtails.

Frogs of the *Physalaemus pustulosus* species group have provided some of the best evidence that male traits may evolve to exploit pre-existing sensory biases in females, as reviewed by M. J. Ryan and A. S. Rand. Males of different species produce rather different calls from one another; differences include details of temporal structure as well as the presence/absence of certain acoustic elements. In all cases there are species in which females prefer call parameters that are not present in the calls of conspecific males! By mapping female preferences and male traits onto an independent phylogeny for this species group, Ryan and Rand concluded that male calls apparently have evolved to exploit pre-existing biases in the female's auditory system. However, the exact form taken by male calls in any one species seems to be determined by constraints arising from the structure of the male larynx.

Unfortunately, W. E. Wagner, Jr. (Univ. of California, Santa Barbara) was unable to attend the symposium. However, his abstract reports that males may sometimes be able to exploit female sensory biases by altering sexual signals on a moment-by-moment basis. In Blanchard's cricket frog, females prefer males with deep-pitched calls. An individual male can alter the pitch of his call to make it sound more attractive, but by doing this he decreases his call's "active space." So, although males can alter their calls to make themselves more attractive (perhaps exploiting

a pre-existing sensory bias in females), they do so at the cost of being detected by fewer potential mates.

The manner in which the environment either facilitates or attenuates the transmission of a signal is an important factor affecting the evolution of sexual signals in many animals (Endler 1992). L. J. Fleishman (Union College) and E. R. Loew (Cornell Univ.) reported that habitat structure apparently has influenced the evolution of visual displays in anoline lizards. They examined the visual systems and display behaviors of five *Anolis* species occupying different habitats in Puerto Rico. In terms of visual systems, the species appear very similar. However, dewlap colors of males vary among the species. Fleishman and Loew showed that these differences in dewlap color seem to have evolved primarily in response to habitat-generated differences in dewlap visibility. If females prefer one kind of dewlap over another, it may simply be because certain kinds of dewlap are more easily seen than others.

Why female choice should evolve and be maintained when females obtain nothing from males except sperm has long been a puzzle. One way of determining whether such choice results in a direct benefit for females is to replace chosen males with others and then monitor female reproductive success. R. R. Warner (Univ. of California, Santa Barbara) performed just such an experiment on bluehead wrasse. He reported that some, but not all, females changed mating sites if their chosen males were replaced. Female fecundity was actually lower for choosy females than for non-choosy females, and remained lower even if the choosy females shifted mating sites after the replacement of preferred males! This result suggests that choosiness is disadvantageous for female bluehead wrasse, at least in terms of egg production, and provides a clear warning that we cannot simply assume that choosy females enjoy higher reproductive success.

Choosing males that are physiologically/metabolically superior may be advantageous to females if their offspring inherit superior genes from their fathers. R. Borowsky (New York Univ.) reported that, in the platyfish *Xiphophorus variatus*, alleles for superior physiology also affect pigmentation, and that these alleles vary geographically in response to habitat diversity. Borowsky argued that such a system is ideal for studying the evolution of female choice. If pigmentation reliably signals physiological vigor, and if the latter is heritable, the platyfish may provide a fine example of a system in which a "superficial" character correlated with a selected character could be captured by sexual selection, especially if the environment changes.

Guppies are excellent subjects for testing models of sexual selection. Many studies have shown that females choose males on the basis of the size and color of their spot patterns. As discussed by A. E. Houde (Lake Forest College), a male's "spottiness" may be at least partly dependent on his health and vigor, and so females may obtain good genes for their offspring by mating with spotty males. Houde also demonstrated that patterns of preferences differ among guppy populations in a manner correlated with the expression of spot colors in males; female preferences for spotty males are strongest for populations with the spottiest males. Although the latter result suggests that there may be a genetic correlation between male traits and female preferences in guppies, F. Breden (Univ. of Missouri, Columbia) reminded us that other studies of these fishes, such as mass selection on attractive males, have failed to find support for such a genetic correlation. Clearly, more work is needed.

Guppy sex is made even more complex (and interesting) by the fact that certain experiential factors may modify female mate choice. For example, L. A. Dugatkin (Univ. of Kentucky) reported experiments in which female guppies that were allowed to observe mate preferences in other females copied the choices of these others. The effect of copying was so strong that females observing the mate choices of others would reverse their own previous mate preferences! Another paper, not included in the symposium but highly relevant to this issue, reported that female guppies reared with individuals from other populations show a clear effect of previous exposure on female mate choice after maturity (A. L. S. Schubert and F. Breden, Univ. of Missouri, Columbia). A clear challenge is for quantitative geneticists to develop models of sexual selection that fully incorporate such experiential effects on mate choice.

Another fish that has been instrumental in deepening our understanding of sexual selection is the humble stickleback. As discussed by D. A. McLennan (Royal Ontario Museum), most attention has focused on female responses to male traits in these fishes, both behavioral and morphological (especially color). However, careful observation has shown that females also broadcast sexual signals to males during courtship. In particular, female color pattern conveys information to males concerning species identity, sex, and willingness to mate. This sets the scene for male mate choice. McLennan suggested that the courtship of sticklebacks should be described as an intersexual "dialogue" rather than a male-centered "monologue."

Many of the behavior patterns exhibited by breeding males involve considerable energetic expenditure. This is especially true in the many frogs and toads in which males produce vocalizations to attract females and repulse same-sex rivals. Energetic costs are of great importance if they negatively affect a male's ability to acquire mates (Pough et al. 1992). As discussed by C. C. Robb and K. D. Wells (Univ. of Connecticut), a male's mating success typically is affected by how long he remains at and calls from the breeding site. Depletion of muscle glycogen apparently limits a male's ability to call on a per-night basis. Depletion of stored lipids may constrain his ability to call over the course of the breeding season. Selection has apparently acted to maximize male calling ability via physiological mechanisms, for trunk muscles have the highest aerobic capacities in those frog species in which males call the most.

J. J. Schwartz (Univ. of Missouri, Columbia) developed this theme further, illustrating the problems faced by calling males in the treefrog *Hyla microcephala*. In order to maximize his chances of mating, a male in a dense chorus of competitors should call at a high rate. But there's a catch; he must ensure his calls stand out against those of other males, but calling is energetically costly. Males appear to solve this dilemma by altering the temporal structure of their calls. On a fine time-scale, males avoid acoustic overlap with calls from their loudest neighbors (as Schwartz determined using some very clever, home-grown equipment). On a coarser scale, chorusing males call in distinct bouts separated by periods of silence. This appears to be an energy-saving tactic for, without these quiet periods, males would be unable to call for long periods due to depletion of glycogen reserves.

The issue of constraints on sexual selection was also discussed by T. Halliday (Open Univ., England). He began by pointing out that patterns of mate choice and competition (in both females and males) should depend, at least in part, on which sex can mate at the fastest rate (see Clutton-Brock and Parker 1992). Halliday illustrated this point with examples drawn from work on European anurans and newts. In addition, he suggested that constraints on mating performance should be considered at two levels: within a single mating episode, and in terms of the interval between one episode and the next. Different kinds of constraints may operate at these two levels. For example, while oxygen availability may limit the courtship performance of a male newt courting under water, time constraints on his ability to synthesize components of spermatophores may limit the frequency with which he can engage in multiple matings over longer periods of time.

Not all males in a population engage in "conventional" sexual behavior, such as fighting with rivals and courtship of females. In many animals, including many fishes, some males in a population adopt alternative sexual behavior patterns, such as sneaking and satellitism. M. R. Gross (Univ. of Toronto) discussed the evolution

of such alternative behavior patterns, especially in species in which males seem unable to switch between alternatives. He stressed that two classes of alternatives exist. First there are "strategies," in which the fitness of alternatives is more-or-less equal due to frequency-dependence. Then there are "tactics," which arise when males differ in status, and among which fitnesses are not necessarily equal. Gross concluded that most alternatives should be regarded as "tactics," because most reveal unequal fitness when carefully examined. Males of inferior status may be forced into adopting alternative tactics in order to "make the best of a bad job" (Dunbar 1982).

The suitability of reptiles as subjects for studies of sexual selection was discussed by A. S. Rand. In an entertaining but informative talk, Rand proposed that such phenomena as territoriality, lack of extensive parental care, conspicuous behavior patterns, and ease of manipulation make certain reptiles, especially iguanid lizards, ideal subjects for the study of different kinds of sexual selection. For snakes, Rand suggested that the complex hemipenes of most species make them suited for work on "cryptic" female choice based on individual differences among males in genitalic structure (Eberhard 1985).

The reptilian theme was developed further by D. K. Hews (Arizona State Univ.) in her discussion of male-male competition in lizards. She noted that sexual dimorphism is common in these animals, for both behavioral and morphological characters. Furthermore, she described examples of alternative mating tactics among males in several species. Hews suggested that the evolution of lizard sexual behavior should be viewed in an explicitly phylogenetic context, and that certain species may be amenable to studies of the proximate causes of such characteristics as sexual dimorphism (say, through endocrine manipulation).

The issue of proximate causes was also considered by A. J. Tousignant and D. Crews (Univ. of Texas, Austin), for the gecko *Eublepharis macularius*. Like many reptiles (Janzen and Paukstis 1991), this species has temperature-dependent sex determination. Even more interesting, developmental events affected by incubation temperature can result in differences in physiology, growth, and behavior that persist into adulthood. These differences exist both between the sexes, and among individuals of the same sex! It isn't yet known whether such differences among same-sex geckos influence mating success. But if they do, then they may become targets of sexual selection.

Snakes have received far less attention than lizards in the study of reptilian sexual selection. A theoretical framework for snake work was developed by D. Duvall (Arizona State Univ., West), S. J. Arnold (Univ. of Chicago), and G. W. Schuett (Univ. of Wyoming). They outlined a new theoretical approach to sexual selection which combines selection theory with encounter rate theory in order to predict how male snakes should behave in order to maximize mating success, and then to predict actual mating systems. The approach worked well in explaining patterns of mating success in prairie rattlesnakes, and will undoubtedly prove useful for other animal groups.

Although female choice may be of somewhat limited significance in snakes (at least relative to other ectotherms), both intersexual selection and intrasexual competition are often involved in determining patterns of mating success among males. A. Kodric-Brown (Univ. of New Mexico) compared territorial and non-territorial males of the Pecos River pupfish. She found that territory holders are more colorful, more aggressive, and more successful in spawning than non-territorial males. Some male traits (such as color) seem selected because they are both preferred by females and advantageous in male-male competition. In addition, female choice based on traits that appear to reflect male health and vigor may perhaps yield a genetic benefit to the offspring of choosy females.

In other species, intersexual selection and intrasexual competition seem to work in opposite directions on the same trait. J. M. Ellingson (Univ. of Texas, Austin) reported that, in the gecko *Gonatodes albogularis*, head color (which is brighter in males than in females) is used to settle contests among males: yellow-headed males win. Although females prefer large, yellow-headed males over smaller, red-headed males, red-heads are preferred when males are matched for body size. For this reason, a male that succeeds in an agonistic encounter may not necessarily be chosen as a mating partner.

B. K. Sullivan (Arizona State Univ., West) discussed determinants of mating system structure in temperate bufonid toads, focusing on intraspecific variation rather than comparisons among species. He found that sexual selection is most intense when breeding seasons are long and operational sex ratios are male-biased (so that breeding males outnumber breeding females). Although competition among males is the most important determinant of who mates when breeding seasons are short, Sullivan showed that females may still exercise some choice of partners. He concluded that, as in many other animal species, the spatial and temporal predictability of females is most important in determining the exact structure of a toad population's mating system.

Mating systems in the dart-poison frogs (*Dendrobates*) involve some kind of parental care, and so are very different from those of bufonids. K. Summers (Queen's University, Canada) and E. Bermingham and L. Weigt (Smithsonian Tropical Research Institute, Panama) described both behavioral and molecular approaches to understanding parental care in these frogs. The genus includes species with biparental care, maternal care, and paternal care. The fact that females suffer decreased reproductive success if males mate polygynously is consistent with the hypothesis that female care evolved from male care. Molecular work now underway should provide a phylogeny for use in reconstructing the evolutionary history of patterns of parental care.

It is easy to forget that, for anurans, most of the early studies of vocalization were concerned with species recognition and sexual incompatibility among species, rather than sexual selection within species (e.g., Blair 1958). Many biologists today regard species recognition as something of an "epiphenomenon" arising from intraspecific sexual selection (e.g., Ryan and Rand 1993). This idea was developed by M. J. Littlejohn (University of Melbourne, Australia). He started by reviewing the significance of anuran calls within populations, stressing their role in attraction of females and repulsion of rivals. He then suggested that females may gain two types of information when they hear a call: the species identity of the calling male and his suitability as a mating partner (based, say, on his genetic quality and/or any resources he may be defending). The effect of perceiving male calls on female frogs was discussed further by W. Wilczynski (Univ. of Texas, Austin) from an explicitly neurological perspective. He reported that neuroanatomical studies of frog brains have revealed the presence of connections between auditory centers and areas controlling reproductive activity. It seems possible, if not likely, that these neural connections may enable acoustic signals to affect the reproductive physiology of listening females.

The extent to which sexual selection may drive divergence among conspecific populations was addressed by P. A. Verrell (Washington State Univ.). He reported that some conspecific populations are highly sexually incompatible with one another in the salamander *Desmognathus ochrophaeus*. Observations of between-population sexual encounters have revealed that, in some cases, male-female interactions cease at the point in the courtship sequence when males apply courtship pheromones to their partners. Within-population studies have shown that these pheromones increase the rate at which females become sexually responsive, and so appear to have evolved by sexual selection. In these salamanders, sexual selection may have driven the divergence of courtship pheromones, and so incidentally resulted in sexual incompatibility among some populations.

The fate of populations that are in contact with one another

(either primarily or secondarily) has long fascinated biologists. If matings between such populations result in wasted reproductive effort, selection may favor the evolution of differences in sexual behavior to ensure that mismatings do not occur. Previous studies have typically compared male courtship signals for populations allopatric to and sympatric with others, predicting that signals should differ more in sympatry than in allopatry if selection has acted to prevent mismating (Butlin 1987). However, H. C. Gerhardt (Univ. of Missouri, Columbia) reported that divergence of female preferences, rather than male signals, appears to be responsible for the absence of mating between sympatric populations in the gray treefrog complex. In fact, sympatric females were more responsive to a species-specific call parameter and less responsive to another that mediates intraspecific mate choice than were allopatric females.

The symposium officially ended with a general discussion among participants and members of the audience. Many areas were covered, but one theme that I think emerged especially strongly was that we need to consider sexual selection in the context of all aspects of life-history (see also Partridge and Endler 1987). Especially for males, mating tactics may be dependent on experiences early in ontogeny, long before the attainment of sexual maturity. For example, feeding history as a juvenile may influence a male's later sexual behavior (say, through an effect on body size and thus competitive ability). If sexual behavior then influences mating success, one could argue that early feeding behavior can properly be regarded as a target of sexual selection.

The symposium unofficially ended at an open-house hosted by Mike Ryan. Lubricated by ample supplies of beer and fueled by munchies, all of us agreed that we have a learned quite a lot from studying sexual selection in ectotherms. But we also all agreed that there is still an awful lot more to be learned in the future.

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POINTS OF VIEW

Comments On The Taxonomic Arrangement Of Some Hispaniolan Amphibians And Reptiles

The evolutionary species concept (sensu Wiley 1978 and Frost and Hillis 1990) has recently been applied to amphibians and reptiles in both the eastern (Nilson and Andrén 1986) and western (Collins 1991) hemispheres. These applications have engendered numerous commentaries and replies (in temporal sequence: Schätti et al. 1991, Montanucci 1992, Van Devender et al. 1992, Lazell 1992, Collins 1992, Frost et al. 1992, Nilson and Andrén 1992, Schätti et al. 1992, Dowling 1993). Some addressed the relevance of the concept itself, others expressed greater concern over the methods by which it was applied. Proponents of the evolutionary species concept seek evidence to discern independent lineages. Some species may be polymorphic, but still historically cohesive. Other polymorphic assemblages are composed of evolving populations, operationally species.

Hispaniola and its satellite islands exist as a microcosm of various biomes, often only a few kilometers apart. The resultant biotic diversity, especially of amphibians and reptiles, lends itself well to examining the potential impact of applying the evolutionary species concept. Based on the best available published information (Schwartz and Henderson 1991), I have identified those taxa (Appendix 1) which exhibit two characteristics that indicate the possibility of species status: 1) they are distinctly mapped as allopatric, and 2) they have been formally diagnosed as being morphologically distinct. Suggestions regarding the validity of some of these species exist already; e.g., *Peltophryne fracta* (Powell 1992; Pregill 1981), *Aristelliger expectatus* (Cochran 1941), *Hemidactylus haitianus* (Powell and Parmerlee 1993), *Leiocephalus endomychus* (Pregill 1992), and *Amphisbaena hyporissor* (Powell 1992; Thomas 1965). In additional instances, data sufficient to draw definitive conclusions are lacking. These include: 1) wide-ranging colonizers (e.g., *Rana catesbeiana* and *Hemidactylus mabouia*) or established populations of more recently introduced species (*Anolis cristatellus* and *A. porcatus*); 2) at least some populations of species with broad insular ranges which include numerous distributional records of uncertain systematic status (e.g., *Ameiva taeniura, Anolis olssoni, Leiocephalus personatus, Epicrates fordii,* and *E. gracilis*); or 3) forms within the range of which intermediate localities in largely inaccessible areas are unknown (e.g., *Anolis barahonae, A. strahmi, Leiocephalus melanochlorus,*

Sphaerodactylus randi, and *Celestus haetianus*).

Excluding those situations listed above, 43 of the currently recognized Hispaniolan species may actually represent complexes containing as many as 92 specific taxa. Of the 43 possible complexes, five are anurans, one a turtle, 30 are lizards, one an amphisbaenian, and six are snakes. If one relates these to the species composition on Hispaniola, the resultant ratios quickly indicate that anuran species complexes are underrepresented when compared to those of reptiles. Alternative hypotheses include: 1) insular anurans speciate more rapidly than reptiles, resulting in more species of limited distribution—or conversely, fewer polymorphic species with broad distributions; 2) relatively more species of Hispaniolan reptiles have broader tolerances of varied habitat conditions, resulting in a greater number of wide-ranging polymorphic species; or 3) historically, systematists working primarily with anurans have used different criteria for species recognition.

The third alternative cannot be discarded out of hand, especially as the large number of subspecies among the Hispaniolan herpetofauna are largely the result of Al Schwartz's eye for detail. Schwartz recognized polymorphism in nearly every species with a range extending beyond the type-locality, particularly the diurnal lizards and snakes. Thus the high number of subspecies in the West Indies, compared with comparable diversities elsewhere in the Neotropics, is not surprising. Still, substantial support for the alternative hypotheses can be generated by examining those species complexes containing more than two diagnosable allopatric forms. Only two are frogs, while 15 are lizards and four are snakes. The majority of these taxa have broad, often island-wide distributions. Especially prone to the development of diagnosable populations are lizards of the genus *Ameiva*. *Ameiva lineolata* may represent a complex of as many as six, *A. chrysolaema* as many as eight, and *A. taeniura* as many as ten species. Although comprising a range of habitat preferences from decidedly xerophilic (*A. lineolata*) to mesophilic (*A. taeniura*), as a group these teiids historically occurred in all but the densely forested higher elevations on Hispaniola. These mountain ranges partition lizard populations in the intervening lowlands into discrete entities by limiting gene flow. Further instances of allopatry result from populations inhabiting satellite islands. Less diverse, but similar examples are represented by the *Anolis distichus* (up to five Hispaniolan species, as *A. dominicensis*) and *Celestus costatus* (up to six species) complexes among lacertilians, and by the *Antillophis parvifrons* and *Uromacer catesbyi* (up to five species each) complexes among snakes.

Proponents of the evolutionary species concept have argued that it not only reflects the appropriate phylogenetic (= historical) perspective of systematics, but that this historical view is the only philosophy capable of providing a realistic measure of natural species diversity. The latter is particularly important as biologists, especially in developing nations, are desperately attempting to develop conservation plans for biotas which have not been completely inventoried or for which inventories may include some species being misrepresented as subspecies. Even if only a subset of the Hispaniolan species elevated by application of the evolutionary species concept is valid, the inevitable (and I would argue justifiable) increase in species numbers can have a significant impact on evaluations of biodiversity and the resultant development of conservation plans. Regardless of one's preferred paradigm, this debate has focused considerable attention on what should be a fundamental and highly pragmatic concern, that of how many species exist in any given geographic area. As Dowling (1993) suggested, I would strongly recommend that herpetologists devote increased energy to examining and resolving the individual taxonomic questions that arise as a result of applying the evolutionary species concept on Hispaniola and elsewhere.

Acknowledgments.—Several colleagues read earlier drafts and commented on this manuscript with various degrees of agreement. I thank them for their input and respect their requests for anonymity. Gregory K. Pregill and an anonymous reviewer made a number of valuable suggestions. Joseph T. Collins encouraged this effort. Sixto J. Incháustegui, José A. Ottenwalder, Andreas Schubert, and Emílio A. Bautista M. often have facilitated opportunities for field work in the Dominican Republic.

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Appendix 1

Currently recognized Hispaniolan subspecies which may meet criteria for recognition as species by application of the evolutionary species concept: **Anura**, *Eleutherodactylus audanti melatrigonum*, *E. a. notidodes*, *E. ruthae aporostegus*, *E. r. tychathrous*, *E. schmidti limbensis*, *E. wetmorei sommeri*,

Peltophryne guentheri fracta; **Testudines**, *Trachemys stejnegeri vicina*; **Squamata (Lacertilia)**, *Ameiva chrysolaema abbotti, A. c. evulsa, A. c. ficta, A. c. jacta, A. c. richardthomasi, A. c. secessa, A. c. woodi, A. lineolata beatensis, A. l. meracula, A. l. perplicata, A. l. privigna, A. l. semota, A. taeniura aequorea, A. t. barbouri, A. t. ignobilis, A. t. meyerabichi, A. t. navassae, A. t. pentamerinthus, A. t. rosamondae, A. t. tofacea, A. t. vafra, Anolis bahorucoensis southerlandi, A. baleatus lineatacervix, A. barahonae mulitus, A. coelestinus demissus, A. c. pecuarius, A. cybotes doris, A. c. ravifaux, A. distichus dominicensis, A. d. juliae, A. d. patruelis, A. d. sejunctus, A. d. tostus, A. longitibialis specuum, A. olssoni insulanus, A. whitemani breslini, A. w. lapidosus, Aristelliger cochranae expectatus, Celestus costatus aenertergum, C. c. badius, C. c. emys, C. c. nesobous, C. c. saonae, C. curtissi aporus, C. c. diastatus, C. c. hylonomus, Cyclura cornuta onchiopsis, C. c. stejnegeri, Hemidactylus brookii haitianus, Leiocephalus barahonensis beatanus, L. b. altavelensis, L. lunatus louisae, L. l. melaenascelis, L. pratensis chimarus, L. schreibersii nesomorus, L. vinculum endomychus, Phyllodactylus wirshingi hispaniolae, P. w. sommeri, Sphaerodactylus altavelensis brevirostratus, S. armstrongi hypsinephes, S. cinereus stejnegeri, S. clenchi apocoptus, S. copei deuterus, S. c. polyommatus, S. darlingtoni boblini, S. d. mekistus, S. difficilis euopter, S. elegans punctatissimus*; **Squamata (Amphisbaenia)**, *Amphisbaena gonavensis hyporissor*; **Squamata (Serpentes)**, *Antillophis parvifrons alleni, A. p. rosamondae, A. p. stygius, A. p. tortuganus, Darlingtonia haetiana perfector, Epicrates striatus warreni, Hypsirhynchus ferox exedrus, H. f. paracrousis, Uromacer catesbyi cereolineatus, U. c. frondicolor, U. c. inchausteguii, U. c. insulaevaccarum, U. frenatus dorsalis, U. f. wetmorei.*

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Anonymous Reviews: Necessary Convention Or Outmoded Obscurantism?

One of the vital hallmarks of scientific publishing is the system of peer review. In this system, well known to anyone who has ever attempted (successfully or otherwise) to publish a scientific paper, the editor (of a journal, for example) sends out a submitted paper to an individual or individuals he or she thinks competent to prepare a critical review. It is largely on the basis of the response of these reviewers whether the paper will be deemed worthy of publication. This system is extremely important in assuring the quality of published scientific work.

It is not the purpose of this paper to debate the utility of the peer review system. We consider such to be above question. What we do wish to explore herein is the usefulness of the **anonymous** peer review system. In this variant of the system, the identity of the reviewers is withheld from the author of the submitted paper. Matters pertaining to the revision of said paper are funnelled through the editor of the journal. In this roundabout fashion, the business of the preparation of an accepted paper for publication is conducted. If an author has a question concerning the reviewer's comments, he writes to the editor; the editor writes to the reviewer; the reviewer writes back to the editor; and, finally, the editor writes back to the author.

Wilson has been the section editor for Serpentes for the *Catalogue of American Amphibians and Reptiles* since 1974. During that time, he has processed over a hundred mss. of *Catalogue* accounts. Unlike with most herpetological publications, he has never exercised his option to reject a submitted account. He has simply worked with the author of the account until it was deemed ready to be published. It is to be granted that these accounts are essentially reviews of the literature on a given taxon and, thus, are not going to be plagued with problems of faulty experimental design, statistical analyses, or conclusions, which are good reasons for rejecting papers sent to the professional journals. Nonetheless, by virtue of the fact that he works with an author until the account is in publishable form has meant, in some cases, a lot of correspondence back and forth between Wilson and the author, on the one hand, and the reviewer(s), on the other.

Over the 30 years that Wilson has been publishing, he has produced over 150 publications, ranging in size from one-pagers to books. McCranie has been publishing since 1976 and has produced slightly over 70 papers. We have dealt, therefore, with a large number of editors and reviewers. It is because of that experience that this paper has been written.

As is typical in our profession, every year one or both of us are asked to review several papers written by our colleagues. For the last several years, we have signed those reviews, indicating the desire that our identity be made known to the author(s) of the papers.

In attempting to assess views on this subject at potential variance with our own, we have spoken or corresponded with an eclectic, but idiosyncratic set of colleagues, among whom are the current or past editors of the four major herpetological journals in this country (Janalee P. Caldwell and Laurie J. Vitt, former general herpetology coeditors for *Copeia*, Samuel S. Sweet, former editor of the *Journal of Herpetology*, Robert G. Jaeger, editor of *Herpetologica*, and Martin J. Rosenberg, former editor of *Herpetological Review*). To each of these individuals and ourselves we asked two questions. The first one was, "Are you in favor of the anonymous peer review system used in our field?" The second one was, "Why or why not?" We also asked for their permission to quote their opinions in this paper. In this way, we have built a list of reasons both for and against the current system. These reasons are discussed below.

Reasons in Favor of the Anonymous Peer Review System

All of the editors of herpetological journals from whom we solicited comment on the anonymous aspect of the peer review system were fundamentally in favor of it. Most appeared to have given serious thought to the nature of the anonymous peer review system prior to our letter, and some indicated that they held no strong opinion on the subject, one way or the other. In all instances, however, the comments were well-conceived, thoughtful, and useful.

What follows is a summarization of the reasons the various editors that we contacted gave in favor of the anonymous peer review (their opinions subsume those of the non-editors we spoke with):

1. It is a means of protection of less well-established and less powerful people in the field from vindictive retribution by more prominent people capable of such acts, in the event that an unfavorable review is produced by the former. Such retribution might take the form of an unfavorable review on a paper in return, such as a review of a grant proposal, or a negatively critical response concerning the former's qualifications for an applied-for position.

Robert Jaeger provided the best example of what can result when "academic revenge" (Bob's term) is visited upon junior members of the academic community by senior members. He said, "I know of a person who was up for promotion for tenure and associate professor status. The department sought five outside letters of recommendation on the candidate. Four of the letters strongly favored promotion and tenure and one opposed both. The one opposing letter was from a senior ecologist whose paper, the year before, had been highly criticized in a review by the applicant for promotion. This one letter was used by the department head as a rationale for *not* recommending promotion for the applicant, because the applicant was perceived as not being broadly respected among his peers. I was on the faculty where this event transpired. The angry person whose paper had been reviewed by the applicant evaluated the applicant as immature and lacking high professional standards. The applicant, as you might guess, had signed his review and was, eventually, denied tenure largely on the basis of the one critical letter from a 'top man in his

field of research.' I was appalled at the time and am still amazed that such vengeance can exist in the academic community."

2. It allows free rein to the opinion of the reviewer to say what must be said concerning the merits of a reviewed paper. Martin Rosenberg opined that ". . . some reviewers might temper their words somewhat if they were asked to review a manuscript from a colleague who is also a friend or good acquaintance—and if they knew they would be identified to the author as the reviewer. This may not be a major concern when the review is positive, but it certainly is a possibility when the review is negative. To avoid such a situation, some reviewers might refuse to review some manuscripts or might reduce the intensity of their review, but not its general thrust."

3. It is the best way to obtain balanced reviews, given the concerns indicated above. Samuel Sweet provided a thoughtful discussion of this point of view. He said, "My own view is that anonymous reviews offer a closer approach to the overworked concept of a level playing field, simply because an author is obliged to consider the logic of the review without being influenced by the prominence or obscurity of the reviewer. If a reviewer's points are good, it really should not matter." Sam supported the merit of this opinion with a lengthy explanation, which we do not feel it necessary to quote here.

In summary, these editors fundamentally consider that the anonymous peer review system is a better way of guaranteeing the receipt of reviews that fairly assess the scientific merits of a piece of research, which are not influenced by the nature of the relationship between the author of the research and the preparer of the review (either one of friendship or enmity) or the relative stature of the two in the field.

Reasons Against the Anonymous Peer Review System

We have written this paper because we are not in favor of the anonymous aspect of the peer review system. We have spoken to other colleagues who also are not, but we consider it best not to ask them to subscribe to the reasoning provided below. What follows, then, is the set of reasons, presented in approximate ascending order of importance, why we think the anonymous feature of the peer review system should be abandoned.

1. The method is cumbersome and time-consuming. For an author to have a question concerning a review answered, he must become involved in a four-step process described in the second paragraph of the introduction. By way of contrast, if the reviewer's identity were known to the author, the latter could contact the former directly in a one-step process (with a copy to the editor to keep him informed). Given the use of the time-consuming approach now in vogue, the publication process is considerably lengthened and becomes more expensive.

2. The reverse side of the first reason discussed in the section above is that the anonymous peer review system provides the shelter of anonymity to those reviewers who would be vindictive. In essence, the editor and such a reviewer form a secret pact against the author. The author is known to both reviewer and editor. The author knows only the editor, who is not the author of the vindictive review. The vindictive reviewer has his vindictiveness thereby sanctioned; he is allowed to feed on his insecurities.

3. The anonymous peer review system is a type of academic dishonesty, which has no place in the scientific community. All scientists are held to exacting standards of ethical conduct. Violation of any of those standards is tantamount to expulsion from the field. As we all know, data have to be gathered scrupulously, hypotheses must be assessed fairly and without prejudice, and our published work must be squeaky clean. Science, unlike government, must always operate in the sunshine. We are all asked to take credit for our failures, as well as our triumphs. Why is it, then, that there is this part of science called the anonymous peer review system that is allowed to operate in the shadows? Why does the author have to own what he writes, but the anonymous reviewer does not?

4. The anonymous peer review system can allow exercise of selfish behavior. In some cases, individuals with a proprietary interest in given areas of research may attempt to keep others from engaging in similar research by handing down unfavorable reviews. Thus, another type of unethical behavior can be fostered under this system.

5. The anonymous peer review system is cowardly. Following the line of reasoning developed in the section immediately above, people who do not sign their reviews do not have the courage of their convictions. They are uncourageous, a synonym of cowardly. That the intellectual courage we demand of the author should stand alongside the cowardice allowed of the reviewer is paradoxical and unworthy of the dignity of our profession, indeed.

6. Because of the problems outlined above, the anonymous peer review system discourages cooperation among scientists. Cooperation is one of the hallmarks of the biologist's concept of society and traditionally science has hewed to the strictest form of cooperation existing in human society, transcending bounderies of politics, race, and religion. Surely, we do not wish to maintain the disoperative anonymous peer review system in view of its ability to strike at the very heart of the nature of scientific inquiry.

Conclusions

Little doubt should remain about our opinion of the anonymous peer review system. We think it is unprincipled, unethical, uncooperative, unscientific, and unwarranted. We appreciate the opinions of the editors we consulted, and we can understand the widespread appeal those opinions have; but, in our opinion, what those in favor of the anonymous peer review system are favoring is the maintenance of a system possessing the features indicated in the second sentence of this paragraph. Science in general, and the science of herpetology in particular, deserve a better quality of practitioner than the alternately vindictive and obsequious type of person described by our editorial consultants as the impetus for the existence of the anonymous aspect of the peer review system. With this paper, we are calling for a debate on this matter throughout the field of herpetology. For our part, we strongly suggest that this type of review system be abandoned in our field and be replaced with an acknowledged or nominal peer review system. Furthermore, we see no use for it in any other field of science. We also feel that it should be done away with by granting agencies, such as the National Science Foundation. As long as the kind of people who serve as the reason for the existence of the system are allowed to operate in its shadows, science will continue to be ill-served.

Acknowledgments—We are very appreciative of the time and effort the editors that we consulted undertook to respond to our request for their opinions on the merits of the anonymous peer review system, even though we do not necessarily agree with them. Our paper would have suffered without their help. We are also thankful to Roger Conant and Kenneth L. Williams for their opinions, so much so that we have not asked them to subscribe to the incendiary remarks we have made in the section arguing against the maintenance of this system. The collegial spirit is alive and well in these people.

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TECHNIQUES

Use Of Fluorescent Pigment For Tortoise Nest Location

Works on assessment of reproductive potential in chelonians are frequently based on information obtained in a laboratory, from dissections and induced oviposition by oxytocin injection (Ewert and Legler 1978) or observations of captive animals. The location of nests in the field normally involves a much greater investment of time and effort, depending on behavioral and habitat specific aspects of each species. The most commonly reported methods are the monitoring of well known egg-laying sites and the focal monitoring of females about to oviposit, usually in combination with methods such as x-rays to assess pregnancy (Gibbons and Greene 1979), radio-tracking, or direct observation.

For European land tortoises, Stemmler-Gyger (1963, 1965) and Kirsche (1966) reported nesting activity of captive individuals through direct observation. Swingland and Stubbs (1985), in a field study on the reproduction of *Testudo hermanni*, located nests by searching for females in the egg laying process. Hailey and Loumbourdis (1988), working on energetic aspects of reproduction in *T. graeca*, *T. hermanni*, and *T. marginata*, combined x-ray, oxytocin injections, and monitoring of focal individuals to assess nests.

Fluorescent pigment marking has been used for general tracking of animals: small mammals (Duplantier et al. 1984; Lemen and Freeman 1985; McShea and Gilles 1992), fish (Phinney 1969), salamanders (Ireland 1973), lizards (Fellers and Drost 1989) and tortoises (Blankenship et al. 1990; Butler and Graham 1993). In this study I describe the use of fluorescent pigment to locate the nests of spur-thighed tortoises (*Testudo graeca*).

In a study of the activity patterns and reproductive biology of a *T. graeca* population from Doñana National Park (southwestern Spain), the method used was that of thread trailing, first developed by Breder (1927). Low density of individuals rendered active searching for nesting females unproductive. Nests are scattered randomly through the heath habitat and are too unconspicuous to be detected by visual searching. Not even the careful checking of the thread trail was enough to locate them. Oxytocin was not used because the natural nesting behavior of the females could not be accelerated or altered in any way.

Hence, to locate the nests of the thread-trailed females, they were x-rayed every 15 days during the egg laying season. Those which showed hard shelled eggs were released with the thread trackers and an additional patch of rabbit fur glued to the plastron. The fur was impregnated with fluorescent pigment powder (Swada Co., London). Every evening the route was first checked with the thread trail until the female was found at its resting site. The animal was then weighed and, if there was enough weight loss to indicate oviposition (Turner et al. 1984), the same route was followed during the night for the trail left by the pigment. A car lantern was used as a UV-light source, where the conventional fluorescent tube was replaced by a 6 VA UV-light tube, powered by a 12 V portable battery. Four colors of pigment (Fiesta Daylight Fluorescent Pigments, series E) were tested: aurora pink, rocket red, fire orange, and lunar yellow. In the UV-light, however, only the yellow, orange, and red hues were distinguishable. Pink and red were identical. Pigment impregnation was renewed each day, and each female received a different color from the day before. An average of 7 days (min. = 1 day, max. = 15 days) elapsed between the detection of the eggs through radiograph and oviposition. During this period females moved an average of 120 m/day (min. = 3 m, max. = 297 m).

The pigment draws a much more precise picture of the animal's trail than the thread, showing minor digressions like loops and back and forth movements. Furthermore, it indicates spots where the tortoise rested for some reason (e.g., basking, eating, nesting), through accumulation of pigment. The nest is not visibly distinguishable among these resting spots: these must be checked manually for soft substrate, and careful digging immediately reveals the eggs, which are always within 5–6 cm beneath the surface.

Pigment was washed away to a considerable extent by heavy rain, but the trail was still visible after 2–3 days and the nests could be found. No harmful effect due to the tracking devices was noticed, nor did these seem to alter the normal behavioral pattern of the tortoises. According to data from the manufacturer, toxicity of the pigment is very low. Further, the pigment trails showed that the tortoises rarely use the same path, and so run a very low risk of eating plants covered with the powder. Inspection of eggs revealed no trace of pigment on the shells.

During the nesting seasons of 1990 and 1991 (April to June) 24 pregnant tortoises were monitored, yielding a total of 31 nest sites, since 7 females had double clutches. In one case the thread-trailed female was found nesting, and a second nest was found by checking propitious points along the thread trail. In the other 29 cases the pigment method was employed. In two cases only the pigment was used. These two females were lost before nesting due to convergence of pigment trails from successive days before laying the eggs.

In 27 cases the females were followed with the combination of thread-trailing and pigment. Twenty-one nests were searched for on the same day of egg-laying or up to three days later; six nests were looked for 15–60 days later. Twenty-two of the 27 nests were located. Three of the failures occurred because the pigment had faded away, and the other two females were lost after running out of thread and pigment following exceptionally long movements before egg-laying (more than 400 m).

The simultaneous use of thread-trailing and pigment marking has the advantage of (1) permitting the detection of oviposition apart from the use of the pigment, sparing the effort of several nights of unnecessary UV-tracking, and (2) minimizing the chances of losing an animal due to mixing of pigment trails from successive nights—pigment persists on the ground for many days. This method is particularly suitable for low density populations, where searching for nesting females is unproductive and where there are no specific egg-laying sites. In this way, many nests may be located, with the additional advantage that each nest may be associated with a specific female.

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A New Method For Making Waistbands To Mark Anurans

Several published methods for marking anurans allow for the identification of individuals from a distance, thus eliminating the need to handle the specimens. For example, Nace (1982) sewed strings of colored beads into the forearms of African clawed frogs, *Xenopus laevis*, and Robertson (1984) glued squares of reflective sheeting to the heads of the leptodactylid *Uperoleia rugosa*. Both of these techniques required slight traumatization of the specimens in order to apply the label, although both markers reportedly remained on for extended periods of time (several weeks in Robertson 1984, several years in Nace 1982) and were eventually tolerated by the frogs. Elmberg (1989) devised a less injurious label which consisted of small plastic fish tags tied around the knee of a frog. However, Elmberg stated that these tags were useful for long-distance identification only if different combinations of color and right/leg application were used. A variety of waistbands, either color-coded (Emlen 1968; Wells 1977, 1978), or numbered (Howard 1978; Ryan 1980) have also been used to mark anurans, but some problems with these labels have also been reported. Wells (1977, 1978) had to replace tags every few weeks, and waistbands used by Ryan (1980) often fell off when his frogs moved onto land. Despite variable success, waistbands are effective labels because they can be applied quickly and non-invasively if the proper materials are used, and they can be constructed large enough to be observable from long distances. We describe below an inexpensive method for making waistbands which are large and visible but lightweight, and thus do not affect the mobility of anurans.

Our waistbands consist of surgical thread sewn through a square patch of surveyor's flagging. The thread is tied around the waist of the specimen so that the patch of flagging lies flat on the dorsal surface. A patch of ca. 1.5 cm x 1.5 cm and 0.03 g is used for individuals between 35 and 60 mm snout-vent length. Different colors of flagging can be used to identify different species, and a unique number can be written on the patch with a waterproof marking pen to identify individuals. The thread must be tied loosely enough to allow for some growth but tightly enough so that it does not slip off. Frogs appear to tolerate the waistbands since we have never observed any attempts by individuals to remove these tags. We recommend that the waistbands be checked weekly because they quickly become too snug and eventually cause chafing in newly metamorphosed, rapidly growing individuals. Approximately 95% of the waistbands remain on small frogs until removal is required after 2-3 weeks. We have made no observations of the effects of these waistbands on adult frogs that grow at a slower rate.

These waistbands are very lightweight and do not appear to impede the locomotor capabilities of anurans. We conducted a simple test to determine the potential effect of the waistbands on the jumping ability of the frogs. The test specimens were twelve recently metamorphosed green frogs, *Rana clamitans*, (30-37 mm SVL, 2.50-4.00 g mass). These frogs were randomly divided into two groups, and on every test day the frogs were induced to jump once by placing them on a 100 cm^2 Plexiglas shock pad which administered a single 13.4V shock and therefore stimulated the frogs in a standardized, consistent manner. This shock sequence had been used by us in other experiments, and we never observed loss of coordination or physical trauma in any specimen even after repeated shocks. The two groups were alternately tested either with or without a waistband over a six-day period so that each frog was tested three times with a waistband and three times without. All jumping distances were divided by the cube root of the mass of each frog in order to reduce the variation within the samples. The jumping distances/$mass^{0.333}$ of the 3 tagged and 3 untagged trials for each frog were averaged, providing a mean tagged and a mean untagged jumping distance/$mass^{0.333}$ for every frog. The differences between the mean tagged and mean untagged jumping distances/$mass^{0.333}$ for all frogs were compared with a two-tailed paired difference Student's t-test to determine if there was any contrast between the tagged and untagged trials.

No significant difference was detected in the jumping distance/$mass^{0.333}$ of the frogs whether or not they were tagged ($df=11$, $t=0.679$, $p=0.511$). The mean jump distance/$mass^{0.333}$ for all frogs was $11.47\ mm/g^{0.333} \pm 1.14$ SE when untagged as compared to $12.16\ mm/g^{0.333} \pm 1.15$ SE when they had tags on. These data suggest that the waistbands had no observable effect on the locomotor ability of the frogs.

These waistbands can be applied quickly by one person without invasive measures and they are large but lightweight. Therefore, this method should prove especially useful for behavioral studies in which individuals must be marked with minimal stress and observed without handling. This type of waistband might also be useful for marking urodeles and lizards. Several aspects of this technique remain to be evaluated, including their potential utilization in marking adult and larger frogs or specimens used in field studies.

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A Simple Stomach Flushing Method For Ranid Frogs

Since reports of declines among amphibian populations have been postulated (Roberts 1992; Wake 1991), killing frogs for dietary analyses is even less justified. Stomach flushing has become an increasingly favored alternative to killing organisms to obtain diet data. Flushing techniques are especially useful for dietary analyses of protected species or populations under long-term study. To date, such techniques have been successfully used in a variety of groups including fishes (Dos Santos and Jobling 1988; Hopkins and Larson 1990; Swenson and Smith 1973), crocodilians (Fitzgerald 1989; Taylor and Webb 1978), lizards (James 1990; Legler and Sullivan 1979), turtles (Balazs 1980), and salamanders (Fraser 1976; Joly and Giacoma 1992). Although flushing techniques have been attempted on some species of frogs and toads (Gittins 1987; Joly 1987; Legler and Sullivan 1979), the method has not been extended to large ranid frogs.

This report describes an adaptation of the method of Legler and Sullivan (1979) and Joly (1987) to stomach flushing of ranid frogs with the use of anesthetic. We tested this method on frogs ranging in size from 45 to 150 mm snout-urostyle length (SUL), so it also represents the first application of stomach flushing to large ranids (> 120 mm SUL). The method presented here is well suited to field work; it requires a minimum of equipment, it is easy to use, and it is inexpensive to apply.

The flushing apparatus consists of a syringe to which flexible tubing is attached. The internal and external diameters of the tubing and the syringe size should be selected based on frog size. For frogs ranging in size from 45 to 90 mm SUL we recommend using a 2 mm internal and 3 mm external diam tubing and a 60 cc syringe, and for larger frogs, a 3 mm internal and 4 mm external diam tubing and a 100 cc syringe.

The frogs are immersed in an aqueous solution of the anesthetic tricaine methanesulfonate (MS-222) (1 g/l) until they lose righting response. Loss of righting response will require 5–15 min, depending on frog size and temperature of the anesthetic solution. The temperature of the anesthetic solution should reflect the temperature tolerance requirements of the species studied. When possible, frogs should be immersed in as warm a solution as possible to allow more rapid anesthesia. During our field work, we obtained best results when the anesthetic solution was at 28-30°C. We chose immersion rather than intracoelomic injection (see Letcher 1992) because of the convenience of its application in the field. The degree of anesthesia attained by the frogs was easily followed, and no previous body weight-specific dosage had to be calculated. However, caution is advised when first applying the technique to other ranids as some species may be extremely susceptible to anesthesia, necessitating in these cases weight-specific dosages.

Once sufficiently anesthetized, the frogs should be rinsed in fresh water to prevent overdose from residual anesthetic on the skin. While the frog is held belly up in one hand, its mouth should be opened with gentle backward thumb pressure on the skin of the throat or by gently inserting the flush tube into the mouth near the mandibular symphysis. Contrary to manipulations of unanesthetized lizards (Legler and Sullivan 1979) or crocodilians (Taylor and Webb 1978), no need existed to use a ring to keep the mouth open because once anesthetized, frogs offered no significant resistance. After the mouth is opened, the tube is inserted into the stomach with a little water for lubrication. The tube is moved around any food mass to the pyloric end of the stomach. Care must be taken not to enter the lung.

Once the tube is in place, the animal should be held head down in a vertical position and water pumped into the stomach. Initial pumping should be gentle and then increased enough to flush food. Abdominal contractions and expansion of the gular region signal imminent evacuation of the stomach contents. Usually a major bolus will emerge both preceeded and followed by fragments. Sometimes, it may be necessary to remove a large food item stuck in the throat with forceps. The food bolus and fragments are flushed directly into a sample bottle. Preservative is then poured in. Either 70% ethyl alcohol or 10% formalin is used as a preservative for food items depending on the type of analysis (counting or weighing prey) to be performed (see Howmiller 1972).

Frogs subjected to this flushing procedure were toe-clipped for future identification and to obtain a phalangeal sample for skeletochronological analyses (Leclair and Castanet 1987). After processing, frogs were held in a covered plastic bucket during recovery, which required less than 60 min. Frogs were released at their point of capture less than 24 h after being flushed.

Once one learns the technique, processing including anesthesia takes about 15 min. If frogs to be processed are staggered by placement in anesthetic at 5 min intervals, it is possible for two operators to process 9–10 frogs per hour.

We used the technique on three ranid species. Initially, it was tested on 3 *Rana pipiens* (52, 59 and 60 mm SUL). Those individuals were killed and only one still contained a 4 mm long homopteran. As we got accustomed to the technique we were later able to feel through the abdominal wall if food remained in the stomach.

We later applied the technique to *R. septentrionalis* (45–75 mm SUL) and *R. catesbeiana* (45–150 mm SUL). Three *R. septentrionalis* and one *R. catesbeiana* were killed and only small fragments representing less than 1% of the total food volume were not flushed from the stomachs. In the course of a study on sympatric populations of these two frog species during 1992, we stomach-flushed 236 individuals. We observed less than 1% mortality attributable to our manipulations: one male *R. septentrionalis* (50.5 mm SUL) died probably because of excessive exposure to anesthetic and a female *R. septentrionalis* (52.5 mm SUL) died because its lung was perforated by the flushing tube. Moreover, two *R. septentrionalis* and four *R. catesbeiana* captured during this study were flushed twice over roughly a one-month interval. In each case, the stomach contained food items; this led us to believe that these frogs were not significantly traumatized by the flushing process. One juvenile *R. catesbeiana* was flushed three times during a 41-day period without apparent ill effects. The only observable trauma the method caused was occasional irritation of the throat mucosa or stomach evidenced by minor bleeding in a few specimens.

We tried to flush unanesthetized specimens of both *R. septentrionalis* and *R. catesbeiana*, but it was almost impossible to immobilize the limbs of the frogs, and they frequently removed the tube with their forefeet (see also Legler and Sullivan 1979). Since mortality is low, if anesthetic is properly applied, its use will greatly decrease handling time when flushing ranid frogs. Loman (1979) has shown that for *R. arvalis* and *R. temporaria*, most food is visibly affected by digestion within 6 h. Therefore, if the frogs are not to be processed soon after capture, we suggest placing them on ice packs to slow down digestion and facilitate prey identification. Aside from its simplicity, this field-tested method has proven useful in obtaining diet data on a broad size range of ranid frogs. Because this method avoids killing study organisms, it is useful for demographic studies where dietary information needs to be obtained by sampling with replacement. As a consequence, this method could prove essential to demographic studies of protected species or small populations.

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A Modified Drift Fence For Capturing Treefrogs

Drift fences have become standard equipment for catching amphibians, and their use has become central to studies of the demography, population dynamics, and behavior of amphibians (e.g., Christein and Taylor 1978; Gibbons and Bennett 1974; Gibbons and Semlitsch 1982; Pechmann et al. 1991; Semlitsch and Pechmann 1985). Typically, these fences are made of hardware cloth (e.g., Howard 1978, 1980; Storm and Pimentel 1954) or metal flashing (e.g., Caldwell 1987). Although these designs are very effective for many species, they are less effective for treefrogs, which have adaptations for climbing vertical surfaces (e.g., toepads) and can therefore scale these fences (Dodd 1991; Gibbons and Bennett 1974; Gibbons and Semlitsch 1981). In this note, I describe a fence that I developed and used during a study of the barking treefrog (*Hyla gratiosa*) and that appeared to be highly effective in intercepting treefrogs.

The fence consists of a support structure made of PVC pipe and nylon strings and a flexible barrier made of clear, roll plastic (see Figs. 1, 2A-B). The PVC supports are 1.27 cm diam and consist of one 61 cm vertical post and two 30.5 cm "arms"; these sections are glued into a T-joint using PVC cement. In each arm, a hole is drilled at each end of the arm, approximately 2.5 cm from the end of the arm; the nylon string from which the plastic barrier is suspended passes through these holes.

For the two-way fence described here, two flexible plastic barriers are made, one for each side of the fence. Each barrier consists of 7.62 m x 1.07 m sections of 0.08 mm (3 mil) thick, clear, plastic. This thickness provides a good combination of strength and flexibility, and the use of clear plastic allows one to see frogs caught in the fence without bending over. I used 7.62 m sections because the plastic used to make the sections came in rolls of this length; one could use longer or shorter sections. About 8 cm of the bottom edge of each section is folded over and sewn with a sewing machine to the rest of the plastic to produce a tube 2.5 cm diam running along the bottom of the entire length of the section (Fig. 2A). The tube is filled with sand, and the weight of the filled tube holds the fence in contact with the ground; the flexibility of the tube allows it to conform to the shape of the ground. The sand-filled tube is placed on the ground next to the base of the T-supports, and the plastic barrier is attached to the two nylon strings with clothes pins placed about 1 m apart.

To install the fence, the PVC supports are placed 1.5–2 m apart and pushed into the ground approximately 10–15 cm (Fig 1A). Once the supports are in place, nylon strings are threaded through the holes in the arms. Depending on the size and shape of the pond, it may be easier to do this in sections (e.g., one-half or one-third of the pond at a time) because friction between the string and the supports eventually makes threading difficult. Once the strings are threaded and the sections of string are tied together, the strings are tightened so that they do not sag under the weight of the plastic barrier. The sections of the plastic barrier are placed at the base of

the supports with the sand-filled tube resting on the ground (Fig. 2B). Holes in the ground underneath the tube should be filled and obstructing vegetation should be cleared to insure that the tube rests snugly on the ground. The ends of adjacent sections are folded over each other and fastened with small (1.9 cm) binder clips. Binder clips are preferable to clothes pins because they are less likely than clothes pins to get caught on objects during the nightly installation of the fence.

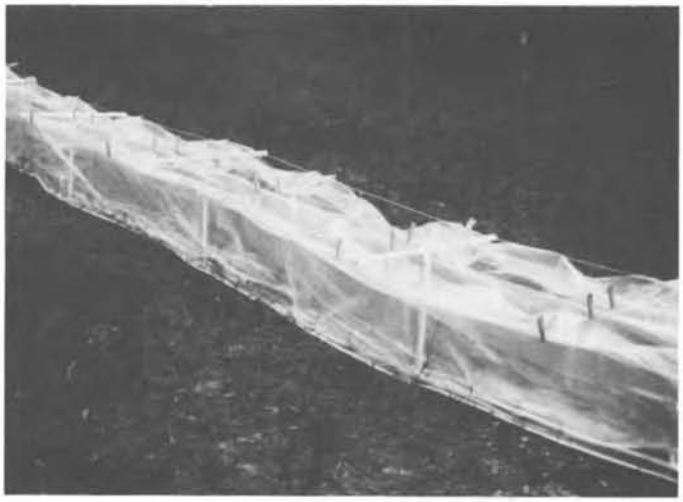


FIG. 1. Photograph of a fence for capturing treefrogs as they enter and leave ponds. See Fig. 2 for a diagram of this fence.

To allow animals to enter and leave the pond when investigators are absent and to prevent damage during strong winds or rain, the plastic barrier is rolled down and covered when the fence is not being monitored. Covers are made of 60 cm x 7.62 m sections of black roll plastic; each section is weighted down by sand-filled tubes (2.5 cm diam) sewn along the length of both sides of the section. Each time the fence is used, the cover is removed, and the fence plastic is suspended from the nylon strings, forming an inverted "L" (Fig. 2B). The plastic is attached to the string at 1-m intervals by folding a small piece of the plastic over the string and fastening it with a clothes pin (see Fig. 2C). Approximately 8–10 cm of the plastic is allowed to hang down from the outside edge of the horizontal part of the plastic barrier (Fig. 2A-C). One person can erect 42 m of two-sided fence in 30 min and lower and roll the same amount of fence in about 15 min.

As part of a study of the mating behavior of the male barking treefrogs, *Hyla gratiosa* (Murphy 1992), I estimated the effectiveness of the fence described here by calculating the percentage of male *H. gratiosa* that left the pond that had not been captured entering the pond. From 24 June to 4 August 1989, my assistants and I monitored a pond in the Ocala National Forest in Marion County, Florida. This pond was elliptical (20 x 50 m), and the edge of the pond was at least 30 m from the surrounding forest. Tall grass grew from the edge of the forest and into portions of the pond and was mowed in the areas where the fence was installed. We encircled the pond with 230 m of the two-way fence described here; the fence was located 10–20 m from the edge of the pond, which was far enough from the forest that frogs could not jump directly from the trees into the pond. Each night of the study, we erected the plastic barrier of the fence shortly before sunset and rolled it down at around 0200 h. Males and females begin arriving at the pond shortly after sunset, and by 0200 h all unmated males and females have left the pond, although mated pairs remain in the pond for at least another hour (Murphy 1992). We monitored the fence continuously by walking around the fence and capturing frogs that were intercepted by the fence; the amount of time required to check the full perimeter of the fence varied depending on the number of frogs intercepted by the fence (due to marking and handling time), but each point along the fence was checked at least every 15 min. This monitoring regime was chosen because the goals of the study of male mating behavior required us to maximize the number of individuals captured each night. On 23 of the 49 nights of the study, we attempted to capture males as they left the chorus. Of the 329 males caught as they left the pond during these 23 nights (some of which represent multiple captures of the same males on different nights), 309 (93.9%) had been caught as they entered the pond that night.

Several lines of evidence indicate that some of the 20 males that presumably escaped capture when entering the pond did not actually climb over the fence, but rather were already in the pond, having remained there overnight after being in amplexus the previous night. First, males were occasionally found during the day in the tall grass in the pond. Second, on a given night, the number of males caught departing the pond that had not been captured entering the pond was positively correlated with the number of females on the previous night that entered the pond and did not leave the pond before the fence was taken down (Spearman rank correlation, $r_s = 0.56$, $N = 21$, $P = 0.01$). These females presumably had mated on the previous night because females that mate do not leave the pond until after 0300 h, whereas females that do not mate leave the pond several hours earlier (Murphy 1992). Hence, the number of males that were captured leaving the pond but not captured entering the pond was correlated with the number of females presumed to have mated the night before, suggesting that they had been in amplexus the previous night. Third, of the 20 males that were captured leaving the pond but were not caught entering the pond that same night, eight (40%) were not caught leaving the pond the previous night after having been captured as they entered the pond that night, further indicating that these males were in amplexus. Three (38%) of these eight males were sighted in amplexus that night, and because no systematic searches for amplexed pairs were conducted, it is likely that the other five males were also in amplexus. If I exclude these eight males from the analysis, then the estimated effectiveness of the fence is 96.3% (= 309/[329-8]).

The behavior of frogs when they encountered the fence also suggests that the fence is highly effective. Upon reaching the fence, *H. gratiosa* usually climbed the wall of the plastic barrier. When they reached the corner between the horizontal and vertical portions of the plastic, frogs sometimes tried to move laterally, but they often remained motionless in this corner. During a four-year study in which the fence was monitored for over 3600 person-hours and in which over 12,500 captures of *H. gratiosa* were made, my assistants and I never saw a *H. gratiosa* climbing either along the underside of the horizontal portion of the fence or over the top.

Although several authors have indicated that traditional fence designs are less effective in intercepting treefrogs than in intercepting other species of amphibians (Gibbons and Bennett 1974; Gibbons and Semlitsch 1981), only one other study has estimated the effectiveness of a fence design in capturing treefrogs. In a six-year field study, Dodd (1991) employed a fence consisting of aluminum flashing and pitfall traps that he checked five days a week between 0700 and 0900 h; he estimated that the fence intercepted 93%, 86%, and 57% of the individuals of *Acris gryllus*, *Pseudacris ocularis*, and *Hyla femoralis*, respectively, that attempted to cross it. Of these three species, *H. femoralis* has the most developed adhesive toepads (Conant and Collins 1991) and is most similar to *H. gratiosa* in its climbing abilities (pers. obs.). However, a comparison of the relative effectiveness of the fence used by Dodd (1991) and the one described here is not valid because of the difference between the two studies in the frequency with which the fences were checked.

Although my research has focused on *H. gratiosa*, my assistants and I have routinely caught individuals of all of the species of anurans that visit or emerge from fenced ponds during my field

seasons (April–August); these species include *Acris gryllus, Bufo quercicus, B. terrestris, Gastrophryne carolinensis, Hyla femoralis, H. squirrella, R. catesbeiana, R. utricularia,* and juvenile *Rana capito aesopus*. I have not quantified the effectiveness of the fence in capturing these species, but my impression is that it is highly effective for all of these species except medium-sized and large *R. catesbeiana* and *R. utricularia*, which can leap over the fence.

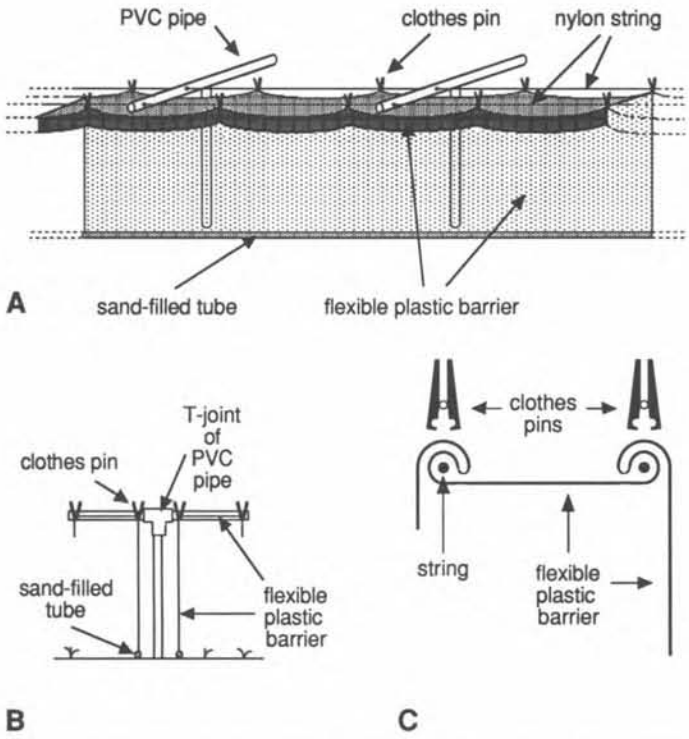


FIG. 2. Diagram of a fence for capturing treefrogs as they enter and leave ponds. A) Front view of the fence. Only a portion of the fence and only one of the plastic barriers are shown. B) Side view of the fence showing both plastic barriers. C) Enlarged side view of the fence showing method of attachment of flexible plastic barrier to strings.

There are some limitations to the design described here. First, I designed the fence primarily for species that tend to climb when they encounter obstacles; the fence may not be as effective in capturing species that are able to burrow under (e.g., *Scaphiopus*), or jump over (e.g., *R. catesbeiana, R. utricularia*) the fence or are large enough to dislodge the sand-filled tube from the ground by jumping against the plastic barrier (e.g., *R. catesbeiana*). Second, because my assistants and I checked the fence at least every 15 min, I do not know how effective the fence would be if it were monitored less frequently. Third, during heavy rains, the horizontal portion of the plastic barrier (the "roof") fills with water, and this added weight may cause the plastic to slip out of the clothes pins and fall. This problem might be alleviated by punching small holes in the roof of the fence with a paper hole-punch and reinforcing the plastic around these holes with duct tape. Fourth, the fence does not hold up well in strong winds if the plastic barrier is in place, although it can withstand heavy winds and rain when rolled down and covered. Finally, the plastic barrier becomes weak and brittle after continued exposure to sunlight; uncovered plastic that I left in direct sunlight usually lasted about two months. However, use of the black plastic covers described above extended the lifespan of the plastic barrier through an 81-day field season.

The fence that I have described is highly effective for capturing *H. gratiosa*, and is probably equally effective for other species of treefrogs. Use of this fence should facilitate efforts to gather information about the population dynamics, demography, and behavior of these species of anurans.

Acknowledgements.—I thank Mike Blouin and Sharon Forster-Blouin for helpful suggestions during the development of this fence and Jessica Boinoff and Steve Carpenter for assistance in collecting data on the effectiveness of the fence. I also thank Kraig Adler, Steve Emlen, Carl Hopkins, Harvey Pough, Paul Sherman, Mike Webster, and two anonymous reviewers for helpful comments on previous drafts of this manuscript. Funding was provided by the Nongame Section of the Florida Game and Fresh Water Fish Commission, and I thank the National Forest Service for permission to conduct research in the Ocala National Forest.

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HERPETOLOGICAL HUSBANDRY

Observations On A Captive-Born Litter Of Typhlonectid Caecilians (Amphibia: Gymnophiona)

Various aspects of caecilian biology have been investigated in some depth, such as their unique jaw and trunk musculature (e.g, Bemis et al. 1983; Nussbaum 1983; Nussbaum and Naylor 1982) and urogenital systems and reproductive biology (e.g., Wake 1968, 1972, 1977), including investigations of the foetal teeth of typhlonectids, specialized for rasping the walls of the maternal oviduct for nourishment (Parker and Dunn 1964; Taylor 1968; Wake 1976, 1977). There is also significant literature regarding their taxonomy and descriptive morphology (Nussbaum and Wilkinson 1989; Savage and Wake 1972; Taylor 1968; Wilkinson 1989). Ecological and life history information regarding caecilians is however very limited, partly due to their reclusive habits and strictly tropical distribution (Moodie 1978; Wake and Case 1975), and descriptions of any kind of behavior are similarly rare (Bemis et al. 1983; Murphy et al. 1977). Due to this paucity of available literature regarding behavioral and life history information of these secretive animals, I will here describe observations of a litter of captive-born caecilians (*Typhlonectes*), including size of neonates and female, gill attachments, and early feeding behavior.

A female caecilian was purchased in April 1990 from a commercial pet dealer who had no information on the animal's origin. The animal was identified as *Typhlonectes compressicaudus* based on external morphology (Taylor 1968; Wilkinson 1989), though it has been suggested that *T. natans*, a similar species, is more common in the pet trade. Unfortunately the specimen was lost before an exact post-mortem identification could be made. The caecilian was housed in a 41 x 20 x 25 cm glass aquarium with a gravel substrate, several flat rocks, two plastic plants, and water maintained at a depth of 16 to 20 cm. The water temperature was kept at 23±1°C with an electric 50-watt thermostatic heater, and a corner Biosponge filter provided aeration. This is very similar to housing used by Murphy et al. (1977), in which copulation was observed.

When first introduced to the tank, the animal moved about rapidly in an undulatory swimming motion, pausing to breathe at the surface every few minutes. This activity decreased gradually over the course of two days, after which it was rarely ever seen unless disturbed, spending most of its time hidden beneath rocks and gravel and only extending the anterior portion of its body from cover in order to breathe (observed very rarely). It was noted that the caecilian molted its skin sometime in the first two days after purchase. This skin was found in one piece draped through the plastic plants, and upon removal from the water collapsed into a slimy wad that defied any attempts to spread for investigation.

The caecilian fed readily on whole or cut-up earthworms (primarily *Lumbricus terrestris*) offered on forceps, and ate every one to two weeks to satiety. Worms were usually pulled under the substrate with a quarter-turn lateral twisting motion of the animal's body. This behavior is similar to that described for terrestrial *Dermophis mexicanus*, in which animals retreated into burrows with corkscrew spinning motions that effectively sheared prey into small pieces (Bemis et al. 1983). It was never observed to feed on guppies (*Poecilia reticulata*) kept in the same aquarium, and refused freshly dead fish offered on forceps, despite reports of this species feeding on fish chunks in the wild (Moodie 1978). It did on occasion eat pelleted fish food resting on the substrate.

After about three months in captivity, the animal began to show a reduced appetite, finally refusing food altogether, while it appeared to be growing stouter in girth. On the evening of 3 November 1990, two neonates were found in the tank, with three more discovered late the next morning. Of this litter of five, two were observed to still have attached gill sheets. One of these gill sheets was limp and apparently torn, having been tangled in a plant, while the other was still turgid, though tranluscent with a few flecks of red toward the periphery. Both individuals had lost their gills by the following day (5 November). The neonates had proportionately large heads with relatively prominent subdermal eyes, and bore the white marks of gill sheet attachments across the backs of their heads (Fig. 1). These sites showed no surface damage, only a lack of dark pigment. All breathed with pronounced gular pumping when lifted from the water, and surfaced very frequently (ca. 30 s apart) thereafter while observed.

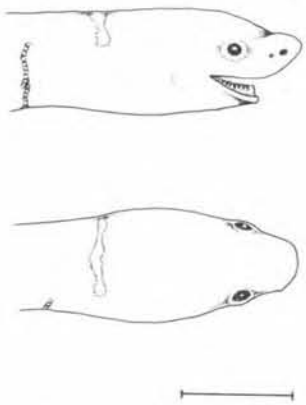


FIG. 1. Head of neonate *Typhlonectes compressicaudus* showing position of gill sheet attachments. Scale bar = 5 mm.

About 3 times over the next several hours, at least one individual was behaving sluggishly or lying limp on the bottom of the tank. Upon removal from the water, the neonate breathed vigorously and then struggled to reenter the water. To avoid further problems, I moved all offspring to a smaller tank (ca. 25 x 12 x 14 cm) with a low water level (ca. 2 cm). This container also had a gravel substrate with a few flat rocks, although no filter, and was kept at the same temperature as the maternal tank. Neonates could easily reach the surface to breathe while still anchored under rocks, whereas previously they had to swim or climb the plants to breathe, and the sluggishness observed earlier ended. Small pieces of earthworm (1–2 mm cubes) were refused, although two individuals prodded the bits with their snouts.

On 5 November, cast-off gill sheets and a white cylindrical object (presumably feces) were removed from the tank and preserved. Small pieces of earthworm were again offered, this time producing interest. Neonates were clumsy and the smaller individuals especially had difficulty maneuvering food into their mouths. One animal bit itself repeatedly, and all of them pushed at or bit at pieces of gravel in the vicinity of the worm bits.

One neonate (and the adult) were observed shedding their skins, though no skins were found in the tanks later, suggesting that these had been eaten. The adult female had also been observed eating a gill sheet shortly before young were removed from her tank.

All caecilians were weighed and measured on 6 November, when offspring were 2-3 days old, using an electronic balance and a metal meter stick. Individual measurements are reported in Table 1. The total mass of the litter was 12.64 g, which was 39.5% of the female's body weight. All animals were then photographed, returned to their respective tanks, and offered food. The female ate one small piece of worm, but neonates refused all offerings.

Moodie (1978) reports that pregnant female *Typhlonectes compressicaudus* in Brazil ranged in size from 450 to 800 mm in length, with litter sizes of 6 to 14, with a possible correlation between

female length and litter size. Wake (1977) reports a a comparatively small female *Typhlonectes* of 330 mm that gave birth to offspring of 200 mm, and notes that litters contained up to nine young. Parker and Dunn (1964) report a fetal *T. c. compressicaudus* to be 135 mm in length, and Heimroth (1915) describes normal neonates as 190–200 mm in length. Both my female and her litter were smaller than most of these values. In fact, my neonate sizes were well below that of 175 mm reported for prematurely born *T. compressicaudus* (Peters 1874), although free-living individuals with adult dentition are reported as small as 140 mm in length (Parker and Dunn 1964). It is unknown whether the small size of these neonates reflects a particularly small and/or young female or a population difference, since the precise origin of my animal is unknown.

TABLE 1. Weights (grams) and lengths (mm) of a captive *Typhlonectes compressicaudus*, and her five offspring at 2–3 days of age.

Subject	Weight	Length
Adult female	32.02	353
Neonate 1	2.94	136
Neonate 2	1.96	123
Neonate 3	1.72	118
Neonate 4	2.52	126
Neonate 5	3.50	141
Neonate mean:	2.53	128.8

Over the next few months the neonates required a great deal of attention. Their skill at feeding improved slowly, and they refused foods other than finely chopped worms (*L. terrestris*). Several varieties of dried and frozen prepared fish foods and live "blackworms" purchased at an aquarium specialist's store were offered at the suggestion of other caecilian owners, but were refused by my animals.

The two smallest neonates died within three weeks of birth, without ever effectively feeding. The third died after approximately one month while the last two survived to about three months of age. The last two neonates had been observed feeding regularly, but were apparently killed by infections of bites from *Poecilia*. It is interesting to note that Moodie (1978) reported that *Typhlonectes* skin secretions were toxic to fish, whereas I observed *Poecilia* biting neonates with no apparent ill effects to the fish.

Acknowlegments.—I would like to thank W. Parker, T. Henley, and an anonymous reviewer for helpful comments on the manuscript.

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LIFE HISTORY NOTES

Instructions for contributors to Life History Notes appear in Volume 24, number 1.

CAUDATA

AMBYSTOMA TIGRINUM TIGRINUM (Eastern Tiger Salamander). **DEVELOPMENTAL POLYMORPHISM**. Mature branchiate morphs (= paedomorphic adults) are common in several *Ambystoma tigrinum* subspecies (see review in Collins et al. 1980. Copeia 1980:938–941), but have been noted only twice in *A. t. tigrinum* (both in Michigan: at one site in the Upper Peninsula, and one site in the northern Lower Peninsula [Hensley 1966. Herpetologica 20:203–204]). On 8 June 1992, DKS and EEW observed several mature branchiate *A. tigrinum* in two of a set of newly constructed experimental ponds on the University of Michigan's Edwin S. George Reserve, Livingston Co., Michigan. We collected one larva (SVL=32 mm, UMMZ 200733) and two adult female vouchers (UMMZ 200731-32). Both females were sexually mature and had likely bred in 1992. One female (SVL=109 mm) was reproductive stage 3 (Collins et al. 1988. *In* R. C. Szaro, K. E. Severson, and D. R. Patton [eds.], Proc. Symp. Management of Amphibians, Reptiles and Small Mammals in North America, pp. 45–53. USDA Forest Serv. Gen. Tech. Rep. RM-166) with numerous copora luteal scars, the other (SVL=112 mm) was reproductive stage 5, also with numerous corpora luteal scars.

The E. S. George Reserve is located ca. 39 km NW Ann Arbor and ca. 7 km W Pinckney. The Reserve is ca. 5 km^2, and has been maintained as a protected research area since 1930. The numerous water bodies on the Reserve and their associated amphibian communities have been described by Collins and Wilbur (1979. Occas. Pap. Mus. Zool. Univ. Michigan 686:1–34). They list at least 12 ponds on the Reserve where breeding populations of *A. tigrinum* have been found; no mature branchiate *A. tigrinum* have ever been seen on the Reserve. The experimental ponds were constructed in a newly fenced addition, contiguous to the northeast corner of the Reserve. The ponds are circular and lined with 20 mil PVC liners covered with 30 cm of soil. The pond array consists of 12 ponds, 1 m deep and 15 m in diameter, and nine ponds, 2 m deep and 30 m in diameter. The small and large ponds were constructed and filled in Fall 1988, and Spring 1989, respectively. The ponds were allowed to colonize naturally with the exception of two ponds in which fish were stocked. Amphibians now breeding in the ponds include *Rana catesbeiana, R. clamitans, R. pipiens, Bufo americanus,* and *Hyla* cf. *chrysocelis,* in addition to *A. tigrinum.* We collected the mature branchiate A. *tigrinum* from a large, fishless pond, and observed additional mature branchiates in an adjacent large, fishless pond.

There is considerable debate about the relative contributions of genetics and environment to the expression or evolution of the mature branchiate morphology. Mature branchiates can only exist in permanent, usually fishless, habitats. *A. t. tigrinum* typically breed in temporary habitats; permanent, fishless ponds are scarce throughout most of the range of eastern tiger salamanders. Our observations suggest that environmental factors may play an important role in the expression of this trait. There is no doubt that typical, metamorphosed *A. tigrinum* colonized the ponds originally, and this is the first record of mature branchiates on the Reserve. Thus, conditions in the experimental ponds might have suppressed metamorphosis resulting in the branchiate adult morphology (e.g., Werner 1986. Am. Nat. 128:319–341; Wilbur and Collins 1973. Science 182:1305–1314). Nonetheless, genetic characteristics of these populations may differ from those of *A. t. tigrinum* elsewhere in the range, and expression of this morphology may be closely tied to genetics. All known mature branchiate *A. t. tigrinum* are from Michigan (including the Upper Peninsula). Allozyme data suggest there are substantial genetic differences between northern (including Michigan) and southern *A. t. tigrinum* (Jones, unpubl.; H. B. Shaffer, pers. comm.). Data in Routman (*In press.* J. Evol. Biol.) suggest that absence of mature branchiate *A. t. tigrinum* is due to genetic constraints, and Jones (1989. Ph.D. dissertation, Arizona State Univ.) provided correlative evidence linking developmental polymorphisms and genetics of *A. t. nebulosum.*

Submitted by **THOMAS R. JONES,** Museum of Zoology and School of Natural Resources and Environment, University of Michigan, Ann Arbor, Michigan 48109, USA, **DAVID K. SKELLY,** and **EARL E. WERNER,** Department of Biology, University of Michigan, Ann Arbor, Michigan 48109, USA. Present address of DKS: Department of Biology, University of Wollongong, P.O. Box 1144, Wollongong, N.S.W., Australia 2500.

ANURA

BUFO MARINUS (Cane Toad). **PREDATION.** *Didelphis marsupialis* is a large opossum that can exceed 5 kg in weight, and body lengths of 1 m. These omnivores occur below 1500 m and frequent watercourses in search of food (Gardner 1983. *In* D. H. Janzen (ed.), Costa Rican Natural History, pp. 468–469. University of Chicago Press). *Bufo marinus* is the largest bufonid in tropical America (Zug 1985. Pacific Sci. 29:31–50), reaching a length of 200 mm, and a weight of 1.2 kg.

Small mammals prey upon *B. marinus* (Cintra 1988. Herpetol. Rev. 19(4):82; Zug 1985. *op. cit.*). While at La Selva Biological Station, Heredia Province, Costa Rica (ca. 10°20'N, 84°00'W), we observed a *D. marsupialis* prey upon a *B. marinus.*

On 2 October 1990 at 1800 h an adult *D. marsupialis* (SVL ≈ 520 mm) ran across the lawn with a large *B. marinus* (SVL ≈ 150 mm) in its jaws. The opossum stopped beneath a stand of *Heliconia* sp. and dropped the toad. The toad raised its venter completely off the ground and inflated, and tilted its head downward, presenting the dorsal aspect of the parotoid glands. This defensive posturing did not deter the opossum. The opossum chewed on and around the parotoid and orbital regions for ca. 2 min then began to foam profusely at the mouth. Foaming continued for 4 min, while the opossum raked its oral cavity with its forepaws.

After the toad was dead, the opossum thoroughly chewed the inguinal region and legs. After 10 min the opossum carried the remains of the toad to a burrow. Attempts to recover the remains of the toad were unsuccessful.

Submitted by **CLAY M. GARRETT** and **DONAL M. BOYER,** Department of Herpetology, Dallas Zoo, 621 East Clarendon, Dallas, Texas 75203, USA.

TESTUDINES

APALONE SPINIFERA EMORYI (Texas Spiny Softshell). **COLORATION.** A large xanthic female softshell (MSB 53538; straight-line carapace 312 mm) was collected in the Rio Grande near Radium Springs, Dona Ana County, New Mexico, on 4 June 1988. Bill MacDonald was fishing for catfish, using live crawfish as bait, when he hooked this turtle. In life, overall coloration was lemon yellow, soft parts were dull yellow. The blotched pattern usually seen on the carapace of adult female spiny softshells was absent. The eyes had white irises and dark brown pupils. Of 119 New Mexican *A. spinifera* examined none possessed this coloration. To my knowledge, this is the first report of xanthic coloration in *A. spinifera* (Dyrkacz 1981. SSAR Herp. Circ. No 11. 31 pp.; Hensley 1959. Publ. Mus., Michigan State Univ. Biol Ser. 1(4):133–159).

Submitted by **CHARLES W. PAINTER,** Endangered Species Program, New Mexico Department of Game & Fish, P.O. Box 25112, Santa Fe, New Mexico 87504, USA.

CHELYDRA SERPENTINA (Snapping Turtle). **PREDATION.** The common crow (*Corvus b. brachyrhynchos*) is an opportunistic and omnivorous feeder (Bent 1946. Bull. U.S. Nat. Mus. 191:1–495; Goodwin 1976. Crows of the World. Cornell Univ. Press, 354 pp.; Wilmore 1977. Crows, Jays and Ravens and their Relatives. Davis & Charles Publ. Co. 208 pp.). Its diverse diet includes insects (especially beetles and grasshoppers), small mammals, crustaceans, mollusks, amphibians, snakes, young waterfowl, poultry, eggs of various species, large quantities of grain, and road-kill carrion. Crows also are habitual scavengers on garbage and human food scrapes.

On 26 September 1992 at 1230 h a common crow caught a hatchling snapping turtle (*Chelydra serpentina*) on the campus of Northern Illinois University, DeKalb County, Illinois. The crow apparently attempted to crack open the hatchling turtle by dropping it onto the pavement. The turtle measured 21.2 mm in total length and was deposited in the Northern Illinois University collection (HDW-NIU 1474). Occasionally in early spring snapping turtles nest near the Biological Sciences building, in tilled earth adjacent to a small stream and lagoon.

The common crow may drop hard-shelled food such as crabs and nuts from great heights in order to break open the shells (Goodwin 1976, *op. cit.*; Wilmore 1977, *op cit.*). We may have observed a variation of this technique. Alternately, the crow may

have been startled and dropped its prey item.

Predation of snapping turtle nests can be high, averaging 70% (range 30-100%) in a two-year study in southeastern Michigan (Congdon et al. 1987. Herpetologica 43(1):39–54), and 90% in northern New York (Petokas and Alexander 1980. J. Herpetol. 14(3):239–244). Major predators were raccoons and skunks. This note documents predation on snapping turtles by the common crow.

I thank Downey Hunter for his notes on this observation, and Randy D. Jennings for useful comments on the manuscript.

Submitted by **HARLAN D. WALLEY**, Department of Biology, Northern Illinois University, DeKalb, Illinois 60115, USA.

CLEMMYS INSCULPTA (Wood Turtle). **REPRODUCTION**. Kaufmann (1992 Herpetol. Monogr. 6:1–25) recently described copulatory ties in *Clemmys insculpta* as preceded by gentle side to side shaking of the mounted pair. He has shown that most episodes of clasping, biting, and thumping with or without shaking are not associated with insemination.

On 11 October 1992, at 1430 h, I discovered a mounted pair of adult wood turtles on dry land, several feet from a shallow stream in Westmoreland County, Pennsylvania. Air temperature was 15.5°C, water temperature was 8-9°C, and stream depth was approximately 15 cm. The male was alert, his plastron was in tight contact with the female's carapace, and there was no cloacal contact. I carefully placed the pair in the stream. Without losing his hold, the male promptly began biting at the female's head area and gently shaking from side to side.

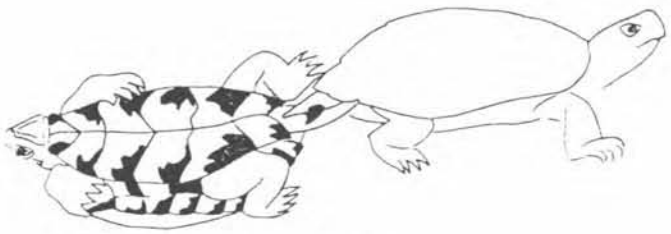


FIG. 1. *Clemmys insculpta* in copulatory tie.

I left the site and returned at 1505 h to find the pair in copulatory tie (Fig. 1). Approximately 3 mm of penile shaft was visible between the two tail vents. I watched for several minutes during which the male remained motionless, underwater. The female's head was above water; and she was breathing. When I gently tapped the male's plastron twice, he attempted to right himself. In doing so he pivoted around the point of cloacal contact until within reach of the female. He clasped her in plastron-to-plastron position, maintaining the copulatory tie (Fig. 2).

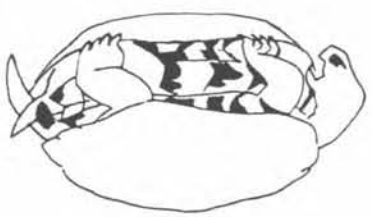


FIG. 2. Plastron-to-plastron copulatory position.

The male gripped the marginals of the female's carapace, not her plastron. Biting and thumping continued for approximately 20 min. By 1600 h the pair appeared fatigued. The male was clasping with front feet only; and the cloacae were no longer in contact. The turtles separated, remained beside each other on the stream bed for 5-10 min, and then moved apart.

While careful placement of the mounted pair into the stream and gentle tapping of the male carapace may have influenced the turtles' behavior, the observations reported here are in accord with Kaufmann's detailed report of copulatory ties preceded by shaking and expand the reported repertoire of mating behavior of *Clemmys insculpta* to include plastron-to-plastron clasping, biting, and thumping with maintenance of the copulatory tie.

Submitted by **ROBERT D. TRONZO**, 328 Dewey Avenue, Pittsburgh, Pennsylvania 15218, USA.

GOPHERUS POLYPHEMUS (Gopher Tortoise). **BURROWS**. Gopher tortoise burrows are an important habitat for a wide range of species in addition to gopher tortoises (Jackson and Milstrey 1982. *In* J. E. Diemer, D. R. Jackson, J. L. Landers, J. N. Layne, and D. A. Wood (eds.), Proc. Gopher Tortoise Relocation Symp. Nongame Wildl. Program Tech. Rep., Florida Game and Fresh Water Fish Comm., Tallahassee). From October 1990 to February 1991, 73 gopher tortoise burrows were located on a 20 ha pine flatwoods/range site at the University of Florida, Southwest Florida Research and Education Center in Immokalee (Collier County), Florida. Burrows were classified as active (57) or inactive (16) following Auffenburg and Franz (1982. *In* R. B. Bury (ed.), North American Tortoises: Conservation and Ecology, pp. 95–126, U.S. Fish and Wildlife Service. Wildlife Res. Rep. 12.). In March 1991, 59 of the burrows were carefully excavated using a backhoe. No gopher tortoises were captured even though 78% of the burrows had been classified as active. However, eight other vertebrate species were captured or observed in 21 of the burrows including 4 green anoles (*Anolis carolinensis*), 5 squirrel treefrogs (*Hyla squirella*), 6 greenhouse frogs (*Eleutherodactylus planirostris*), 2 pinewoods treefrogs (*Hyla femoralis*), 1 ringneck snake (*Diadophis punctatus*), 2 eastern diamondback rattlesnakes (*Crotalus adamanteus*), 8 eastern box turtles (*Terrapene carolina*), and 3 cotton rats (*Sigmodon hispidus*). Ten burrows had bedding material suggesting that they were being used by small mammals. Seven of the 8 burrows with box turtles had originally been classified as active, while 7 of 9 that had frogs had been classified as inactive.

Submitted by **LAURA A. BRANDT**, **KENT L. MONTGOMERY**, **ARTHUR W. SAUNDERS**, and **FRANK J. MAZZOTTI**, Department of Wildlife and Range Sciences, University of Florida, P.O. Box 110430, Gainesville, Florida 32611-0430, USA.

LEPIDOCHELYS KEMPII (Kemp's Ridley). **NESTING**. Most of the world's population of *Lepidochelys kempii* nests along a small stretch of beach known as Rancho Nuevo in the Mexican state of Tamaulipas. Occasional nestings have been reported from elsewhere along the Gulf Coast of México, and a single nesting has been reported from the Gulf Coast of Florida (Ross et al. 1989. The Status of Kemp's Ridley. Center for Marine Conservation).

On 17 June 1992 a female *L. kempii* was observed and photographed nesting at Long Beach, Brunswick County, North Carolina. The turtle came ashore at ca. 1300 h EDT amid a large crowd of human beach visitors and laid 97 eggs in a nest dug just beyond the dune line before returning to the sea at ca. 1345 h EDT. The turtle had an estimated CL of ca. 60 cm. Several fish hooks with line were attached to the side of the turtle's shell; these were removed by onlookers. The turtle was not tagged, but bore a scar on the right foreleg where a tag may once have been attached.

Shortly after the nesting, the eggs were counted and moved to a safer location ca. 0.5 km W of the nest site by North Carolina Wildlife Resources Commission personnel. Forty-eight hatchlings emerged during the late evening of 26 August 1992. One dead hatchling was deposited in the North Carolina State Museum of Natural Sciences (NCSM 32024). Photographs of the nesting female are also on file at the NCSM.

Sally Murphy (pers. comm.) reported a *L. kempii* nest at Litchfield Beach, Georgetown County, South Carolina (ca. 50 nautical miles south of Long Beach) on 28 May 1992. That nest was carefully monitored, and 61 hatchlings emerged with assistance on 5 August from the 95 eggs that were laid. It is possible that these nestings were by the same turtle, although that has not been verified. These nestings are the first ever reported for *L. kempii* along the Atlantic Coast.



FIG. 1. Kemp's ridley (*Lepidochelys kempii*) nesting at Long Beach, Brunswick County, North Carolina, 17 June 1992.

I thank J. C. Beane, A. L. Braswell, and W. M. Palmer for assistance in preparing this manuscript, and Therese Conant, Sally Murphy, and South Carolina United Turtle Enthusiasts (S.C.U.T.E.) volunteers for sharing information on the hatchling data and the Litchfield Beach nesting.

Submitted by **ROBERT PALMATIER**, 2507 Pickett Rd., Durham, North Carolina 27705, USA.

LACERTILIA

AMEIVA EXSUL (Ground Lizard). **BEHAVIOR**. A large male *Ameiva exsul* was observed following a smaller female, the distance between them being approximately 2 m. When she was in his apparent line of vision, he walked directly toward her. When she was concealed, having moved behind a boulder or tuft of grass, the male followed her path through olfaction, indicated by rapid tongue flicking of the substrate. I have not found an account of the alternative use of vision and olfaction in a male *A. exsul*, trailing a female, in the literature available to me.

Submitted by **ARNOLD GROBMAN**, The Valley, Virgin Gorda, British Virgin Islands.

CNEMIDOPHORUS UNIPARENS (Desert Grassland Whiptail). **BEHAVIOR**. While presenting indirect evidence for the natural occurrence of pseudocopulation in the unisexual lizard *Cnemidophorus uniparens*, Crews and Young (1991. Anim. Behav. 42:512–514) noted that there were limited direct observations substantiating the occurrence and prevalence of this behavior in natural populations.

I spent June and July of 1991 and 1992 studying the foraging behavior of a natural population of *C. uniparens* located three miles east of Portal, Cochise County, Arizona. During these periods, pseudocopulation was observed four times (three times by me and once by a field assistant, Dennis Skalla). During 1991, this behavior was observed twice on 3 July and once on 4 July. In each of the 1991 occurrences, a foraging female approached another female who had crossed her path and mounted her in the manner depicted by the upper *C. uniparens* picture in Fig. 1 of Crews (1989. *In* R. M. Dawley and J. P. Bogart, (eds.), Evolution and Ecology of Unisexual Vertebrates. New York State Museum, Albany). Some of the females had been individually marked; there were four to six lizards involved in the three interactions, with a different combination of lizards each time.

Pseudocopulation was observed for a fourth time on 7 July 1992. As described above, a foraging female approached another female and mounted her while biting her neck. After 94 s, the biting lizard moved into the doughnut position shown by the lower *C. uniparens* picture in Fig. 1 of Crews (1989, *op. cit.*). The pair separated after a total contact time of 146 s.

These observations support the notion that pseudocopulation is a regular event in nature and provide some information on its seasonal occurrence.

Submitted by **DOUGLAS A. EIFLER**, Biological Laboratories, Harvard University, Cambridge, Massachusetts 02138, USA.

HYDROSAURUS WEBERI (Weber's Sail-Fin Dragon). **MORPHOLOGY**. The holotype of *Hydrosaurus weberi* (MCZ 7505) collected at Weeda, Halmahera Island, Indonesia, has a bifid tail. Both branches of the tail are regenerated. The longer branch measures 98.8 mm (SVL=330 mm, tail=668 mm). The shorter branch measures approximately 11 mm and is encircled by at least four scale rows. Bifurcation occurs 533 mm from the cloaca. Tail autotomy and regeneration are poorly noted in the Agamidae. In fact, Moody (1980. Doctoral dissertation, Univ. of Michigan, 327 pp.) states that tail autotomy reportedly does not occur within Agamidae. At best, tail autotomy and regeneration occur sporadically within the Agamidae with the distribution of the trait within the family being unknown (Halliday and Adler (eds.) 1986. The Encyclopedia of Reptiles and Amphibians. Equinox Ltd., Oxford, p. 143; S. Moody, pers. comm.). This is the first report of tail regeneration and bifurcation in *Hydrosaurus*, and is likely the first known case of tail bifurcation for the Agamidae.

Submitted by **GREGORY J. COLWELL**, Department of Biological Sciences, Ohio University, Athens, Ohio 45701, USA.

SERPENTES

ALSOPHIS PORTORICENSIS (Puerto Rican Racer). **DIET**. *A. portoricensis* is a West Indian colubrid snake known to feed in the wild on frogs (e.g., *Eleutherodactylus*), lizards (*Hemidactylus, Sphaerodactylus, Anolis, Ameiva*, and juvenile *Iguana*) and snakes (*Arrhyton* and *Typhlops*) (Henderson and Crother 1989. Biogeographic patterns of predation in West Indian colubrid snakes. *In* C. A. Woods (ed.), Biogeography of the West Indies: Past, Present, and Future, pp. 479–517. Sandhill Crane Press, Gainesville, Florida; Schwartz and Henderson 1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. Univ. Florida Press, Gainesville, Florida. 720 pp). However, information about specific prey items is lacking, and all but *Iguana* and *Arrhyton* are represented by several species on the islands where

A. portoricensis occurs. In Table 1 we list prey species taken by *A. portoricensis* at ten sites in Puerto Rico and other islands within the species range: Cambalache and Río Abajo Forest Reserves, Arecibo, Puerto Rico (PR) (Subtropical Moist Forests); Luquillo Experimental Forest, Luquillo, PR (Subtropical Wet Forest); and Guayama, PR; Water Island; Saint Thomas; Virgin Gorda; Caja de Muertos; Culebra; and Mona islands (Subtropical Dry Forests) based on stomach contents of an indeterminate number of preserved and live specimens.

TABLE 1. Natural prey species of *Alsophis portoricensis* taken at (1) Cambalache Forest Reserve, Arecibo, Puerto Rico (PR), (2) Luquillo Experimental Forest, Luquillo, PR, (3) Ranchos de Guayama, Guayama, PR, (4) Río Abajo Forest Reserve, Arecibo, PR, (5) Caja de Muertos Island, (6) Culebra Island, (7) Mona Island, (8) Saint Thomas, (9) Virgin Gorda, and (10) Water Island.

Prey Items	Locality
ANURANS	
Leptodactylidae	
Eleutherodactylus antlllensis	1,3,6
Eleutherodactylus coqui	2
LIZARDS	
Anguidae	
Diploglossus pleei	1
Gekkonidae	
Hemidactylus sp.	1
Sphaerodactylus macrolepis	6
Sphaerodactylus nicholsi	5
Iguanidae	
Iguana iguana	10
Polychridae	
Anolis cristatellus	1,5
Anolis evermanni	4
Anolis monensis	7
Anolis pulchellus	1,4,6,8
Anolis stratulus	6,9
Teiidae	
Ameiva exsul	1,5,6,8
SNAKES	
Colubridae	
Arrhyton exiguum	1
Typhlopidae	
Typhlops platycephalus	1
MAMMALS	
Muridae	
Rattus rattus	1

Our records confirm that *A. portoricensis* is an opportunistic predator on small vertebrates. Despite this, *A. portoricensis* employs different techniques when feeding upon *Anolis cristatellus* and *Eleutherodactylus coqui* (Rodríguez-Robles and Leal 1993. J. Herpetol. 27:163–168). Whether *Alsophis* also shows different behavioral repertoires when preying upon snakes and mammals deserves further study.

One *A. portoricensis* at Cambalache swallowed an *Eleutherodactylus antillensis* tail-first, whereas another at Guayama swallowed two *E. antillensis*, one head-first and one tail-first. In contrast, all the lizards that we recovered from snakes in the field were swallowed head-first. These findings seem to support our suggestions, based on observations of *Alsophis* during staged predatory episodes with *Eleutherodactylus* and *Anolis*, that *A. portoricensis* may use ventral scale overlap as a signal for head-first ingestion of reptiles (Rodríguez-Robles and Leal 1993, *op. cit.*). Although the ventral scales of *Diploglossus*, *Sphaerodactylus*, and *Anolis* exhibit some degree of overlap, those of *Ameiva* do not overlap at all. Hence, we hypothesize that *A. portoricensis* should not exhibit any preference for the direction of ingestion of *Ameiva*, which can easily be tested.

We thank M. Canals, J. C. Gillingham, and R. W. Henderson for sharing their records of natural prey items of *Alsophis portoricensis*, and H. W. Greene for reviewing the manuscript.

Submitted by **JAVIER A. RODRÍGUEZ-ROBLES** and **MANUEL LEAL**, Department of Biology, P. O. Box 23360, University of Puerto Rico, Río Piedras, Puerto Rico 00931-3360, USA. Present address (JAR): Museum of Vertebrate Zoology and Department of Integrative Biology, University of California, Berkeley, California 94720, USA.

BOTHROPS ATROX (Common Lancehead). **DIET**. The most frequent prey of *B. atrox* are mammals, frogs, birds, and lizards (Campbell and Lamar 1989. The Venomous Reptiles of Latin America. Comstock Publ. Assoc., Ithaca, New York. 425 pp.) Puorto et al. (Resumos, XIV Congresso Brasileiro de Zoologia, Universidade Federal de Juiz de Fora, Juiz de Fora, p. 136) found a large (80 cm) colubrid (*Leptodeira annulata*) in the stomach of an adult *B. atrox* (total length = 72 cm). Ophiophagy has been reported for other species of *Bothrops* although no attempt has been made to quantify the importance of snakes in the diet of a single population (see references in Campbell and Lamar, *op. cit.*).

As part of a study on the feeding habits of *B. atrox*, the gut contents of 107 preserved specimens from Santa Rosa, the Estrada da Vigia, ca. 60 km northeast of Belém, Pará, Brasil (collected from 1973 to 1975), were examined. Santa Rosa is located in a deforested region with patches of remaining forests (see Cunha and Nascimento 1978. Publ. Avul. Mus. Para. Emilio Goeldi 31:1–218). All snakes were killed at the site of capture by locals during an intensive snake survey in the region (see Cunha and Nascimento, *op. cit.*). Each intact prey item or prey remain was recorded. Hair, feathers, and squamate scales were evident when present in the hindgut. When only insect remains were found in the hindgut we recorded the prey as a frog, because no insects were found in the foregut. After being dried with blotting paper, each snake and intact prey item (or a reference specimen of comparable size; Greene 1989. Proc. California Acad. Sci. 46:193–207) was measured to the nearest 1 mm with a flexible rule and weighed to the nearest 0.1 g with spring scales. Snake measurements are presented as snout-vent length (SVL) plus tail length. Prey/predator mass ratio (MR) was calculated when possible.

Fifty-four *B. atrox* from Santa Rosa had prey items in the gut. Two thirds of the snakes were juveniles with SVL's below 450 mm. The diet of the snakes was comprised of frogs (44% of all prey items), mammals (29%), lizards (11%), snakes (7%), centipedes (5%), and birds (4%). Four individual snakes were found as prey. Two nearly intact *Tantilla melanocephala* (183+53 mm 3.0 g; ca. 130+60 mm, 2.3 g) were eaten by a *B. atrox* measuring 437+80 mm (29 g; MR = 0.10) and 332+50 mm (14 g; MR = 0.16), respectively. Two additional individuals of *B. atrox* (333+57 mm and 378+59 mm) had the tail of a *T. melanocephala* and that of an unidentified colubrid. Except for one *T. melanocephala*, all snakes were ingested head first.

Most young *B. atrox* have yellowish cream tail tips that could be used as lures to attract insectivorous prey (see Greene 1992. *In* J. A. Campbell and E. D. Brodie (eds.), Biology of the Pitvipers, pp. 107–117, Selva, Tyler, Texas; Heatwole and Davison 1976. Herpetologica 32:332–336; Sazima 1991. Copeia 1991:245–248). *Tantilla melanocephala*, as well as centipedes, feed on invertebrates, including insects (Beebe 1946. Zoologica 31:11–52; Cunha and Nascimento, *op. cit.*) and may be attracted by caudal lures.

All snakes and some of their gut contents (including the snakes above) are deposited at the Museu Paraense Emilio Goeldi (MPEG), Belém, the State of Pará, northern Brasil. Logistical support and permission to examine snakes at MPEG were kindly provided by T. C. S. Ávila-Pires and F. P. Nascimento; S. G. Egler helped in laboratory work; I. Sazima and M. E. Oliveira provided helpful suggestions on the manuscript. The CNPq provided a grant to M. Martins. This note is a contribution of the Convênio Universidade do Amazonas/Instituto de Medicina Tropical de Manaus.

Submitted by **MARCIO MARTINS** and **MARCELO GORDO**, Departamento de Biologia, Instituto de Ciências Biológicas, Universidade do Amazonas, 69077-000 Manaus, Amazonas, Brasil.

GEOGRAPHIC DISTRIBUTION

Instructions for contributors to Geographic Distribution appear in volume 24, number 2.

CAUDATA

AMBYSTOMA OPACUM (Marbled Salamander). USA: INDIANA: Ohio Co: Pike Township: Bear Branch-Aberdeen Road, 3 km E Bear Branch above South Fork Creek. 4 May 1993. Paul X. Hellmann. Verified by John W. Ferner. Cincinnati Museum of Natural History (CMNH 3860). New county record; first confirmed specimen from extreme southeastern Indiana (Minton 1972, Amphibians and Reptiles of Indiana. Indiana Acad. Sci., Indianapolis, Indiana. 346 pp.).

Submitted by **PAUL J. KRUSLING**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amy Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

AMBYSTOMA TIGRINUM MAVORTIUM (Barred Tiger Salamander). USA: NEBRASKA: Deuel Co: 11.3 km N Big Springs. 28 June 1993. Carl E. Bock and H. M. Smith. Verified by David Chiszar. UCM 56785. County record (Lynch 1985. Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **HOBART M. SMITH**, **CARL E. BOCK**, and **JANE H. BOCK**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

CRYPTOBRANCHUS ALLEGANIENSIS ALLEGANIENSIS (Eastern Hellbender). USA: TENNESSEE: Lawrence Co: 22 July 1992. Buffalo River, ca. 1 km downstream from Hicks Branch tributary. T. Casey and B. T. Miller (Tennessee Scientific Study Permit 654). Verified by J. L. Miller. Middle Tennessee State University (MTSU 110-C). Four individuals branded, weighed, measured and released. Fifth individual returned to lab and photographed. County record (Redmond 1985, A Biogeographic Study of Amphibians in Tennessee. Doctoral Thesis, Univ. Tennessee, Knoxville. 290 pp.).

Submitted by **BRIAN T. MILLER**, **TIM CASEY**, and **GARY PRITTS**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

GYRINOPHILUS PORPHYRITICUS (Spring Salamander). USA: KENTUCKY: Adair Co: Gundy Hollow Creek (trib. to Green River), 2.4 km NE Rt. 76 on Winfrey Hill Road. 31 December 1992. G. A. Marvin. County record. Verified by P. V. Cupp, Jr. Eastern Kentucky University Department of Biology Collection (EKU 1100). New county record.

Submitted by **GLENN A. MARVIN**, Department of Zoology, University of Oklahoma, Norman, Oklahoma 73019, USA.

NECTURUS MACULOSUS (Mudpuppy). USA: TENNESSEE: Bledsoe Co: Sequatchie River at McWilliams Road crossing. 28 July 1992. T. Casey and B. T. Miller (Tennessee Scientific Study Permit 654). Verified by J. L. Miller. Middle Tennessee State University (MTSU 111-C). County record (Redmond 1985, A Biogeographic Study of Amphibians in Tennessee. Doctoral thesis, Univ. Tennessee, Knoxville. 290 pp.).

Submitted by **BRIAN T. MILLER** and **TIM CASEY**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

PLETHODON OUACHITAE (Rich Mountain Salamander). USA: OKLAHOMA: LeFlore Co: North Slope Spring Mountain, SE side of Forest Road 6007, 3.5 road km E jct. State Hwy 1, 488 m elevation. 5 November 1988. C. D. Anthony, M. E. Dorcas, J. R. Mendelson III, and J. A. Wicknock. Verified by J. A. Campbell. University of Texas at Arlington Collection of Vertebrates (UTA A-31154–31163). Spring Mountain is located 3.2 km north of, and parallel to, Rich Mountain, and directly east of Winding Stair Mountain. Although *P. ouachitae* occurs on both Rich and Winding Stair Mountains, the species has not been previously found on Spring Mountain. In subsequent years (1991–1993), we observed ninety-seven additional individuals on Spring Mountain in a continuous area 0.6 km W and 0.5 km E of the above locality. We found both the Rich Mountain and Winding Stair Mountain color variants of *P. ouachitae* (*sensu* Blair and Lindsay 1965, Copeia 1965:331–335) at these localities.

Submitted by **CARL D. ANTHONY** and **JILL A. WICKNICK**, Department of Biology, University of Southwestern Louisiana, Lafayette, Louisiana 70504-2451, USA.

PSEUDOTRITON RUBER (Red Salamander). USA: TENNESSEE: Cannon Co: wooded hillside off Sinks-Miller Road, ca. 8.7 km SE Rt. 64. 6 July 1992. B. T. Miller (Tennessee Scientific Study Permit 522). Verified by D. E. Metter. Middle Tennessee State University (MTSU 50-C, 51-C). Extends the known distribution into the low rolling hills of the eastern edge of the Outer Nashville Basin in middle Tennessee (Redmond 1985, A Biogeographic Study of Amphibians in Tennessee. Doctoral thesis, Univ. Tennessee, Knoxville. 290 pp.).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

SIREN INTERMEDIA NETTINGI (Western Lesser Siren). USA: LOUISIANA: West Carroll Parish: 0.1 road km S Newhope, Rt. 577, Sec. 35, T20N, R9E. 8 May 1992. L. Kemp and S. G. George. Verified by Neil H. Douglas. Northeast Louisiana University Museum of Zoology (NLU 70398). New parish record.

Submitted by **STEVEN G. GEORGE**, Department of Biology, Northeast Louisiana University, Monroe, Louisiana 71209, USA.

ANURA

BUFO COGNATUS (Great Plains Toad). USA: NEBRASKA: Deuel Co: 11.3 km N Big Springs. 28 June 1993. Carl E. Bock and H. M. Smith. Verified by David Chiszar. UCM 56783–4. County record (Lynch 1985. Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **HOBART M. SMITH**, **CARL E. BOCK**, and **JANE H. BOCK**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

BUFO COGNATUS (Great Plains Toad). USA: COLORADO: Logan Co: Rt 138, 3.1 km E Crook. 29 May 1982. W. Lippincott. National Ecology Research Center, Ft. Collins, Colorado (BS/FC 2339). Verified by Stephen Corn. New county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife, Denver. 131 pp.).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA, **GEOFFREY A. HAMMERSON**, Nature Conservancy, 201 Devonshire Street, Boston, Massachusetts 02110, USA, **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA, and **CINDY RAMOTNIK**, U.S. Fish and Wildlife Service, National Ecology Research Center, 4512 McMurry Avenue, Ft. Collins, Colorado 80525-3400, USA.

BUFO MICROSCAPHUS MICROSCAPHUS (Arizona Toad). USA: ARIZONA: Gila Co: Pinto Creek at U.S. Forest Service Road 287, Sec. 2, T1N, R13E. 19 April 1993. S. G. Seim. Verified by B. K. Sullivan. To be deposited in Arizona State University Lower Vertebrate Collection (Field Series BK S371). One calling male observed 60 km SW nearest record (Sullivan, Great Basin Nat., *in press*). Not previously known to occur on south side of Lake Roosevelt.

Submitted by **SHARON G. SEIM**, Arizona Game and Fish Department, Nongame Branch, 2221 West Greenway Road, Phoenix, Arizona 85023, USA.

BUFO SPECIOSUS (Texas Toad). USA: TEXAS: Llano Co: 24.1 km SE Llano off County Road 310 at Sandy Creek, vicinity of Click. 30 May 1993. L. D. Gage. Verified by V. R. McDaniel. Arkansas State University Museum of Zoology (ASUMZ 19083–19085). New county record filling a distributional gap between Burnet and Mason counties (Dixon 1987, Amphibians and Reptiles of Texas, Texas A & M University Press, College Station, Texas, 434 pp.).

Submitted by **CHRIS T. McALLISTER**, Renal-Metabolic Lab (151-G), Department of Veterans Affairs Medical Center, 4500 South Lancaster Road, Dallas, Texas 75216, USA, and **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, USA.

BUFO WOODHOUSII WOODHOUSII (Woodhouse's Toad). USA: SOUTH DAKOTA: Ziebach Co: Bald Eagle Ranch, 16 km E Howes. 31 May 1992. J. Bald Eagle & D. Chiszar. Verified by Todd Gleeson. UCM 56569; Haakon Co: S bank Cheyenne River at Rt. 34 crossing. 31 May 1992. A. Chiszar, L. Chiszar & D. Chiszar. Verified by J. Mitton. UCM 56570. County records (Fishbeck and Underhill 1959. Proc. South Dakota Acad. Sci. 38:107–113).

Submitted by **DAVID CHISZAR**, Department of Psychology, and **HOBART M. SMITH** Department of EPO Biology, both Museum of Natural History, University of Colorado, Boulder, Colorado 80309-0345 and 0344, USA.

HYLA GRATIOSA (Barking Treefrog). USA: TENNESSEE: Warren Co: on gravel road at Rt. 127 crossing of Collins River. 17 July 1992. T. Casey, G. Pritts and B. T. Miller (Tennessee Scientific Study Permit 654). Verified by J. L. Miller. Middle Tennessee State University (MTSU 50A). Second record from Eastern Highland Rim physiographic region of middle Tennessee (Miller and Miller 1992, SSAR Herpetol. Rev. 22:133; Redmond 1985, A Biogeographic Study of Amphibians in Tennessee. Doctoral Thesis, Univ. Tennessee, Knoxville. 290 pp.).

Submitted by **BRIAN T. MILLER**, **TIM CASEY**, and **GARY PRITTS**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

OSTEOPILUS SEPTENTRIONALIS (Cuban Treefrog). USA: FLORIDA: Pinellas Co: Largo, jct. Highland Avenue and 5th Avenue NE, ca. 0.48 air km N of Fla. Rt. 686 and ca. 1.9 air km E of Fla. Rt. 651, Sec. 35, T29S, R15E. 8 July 1993. D. M. Crawford and L. A. Somma. Verified by David L. Auth. Florida Museum of Natural History (UF 87694–701). Eight adults collected from trees bordering a pond and from walls of buildings near adjacent parking lot, surrounded by suburban development. Syntopic with active *Hyla cinerea*. County record; extends range in Florida ca. 109 air km N of nearest Gulf coast record in Sarasota County, and ca. 152 air km WSW of northernmost records of inland populations in Orange and Seminole Counties (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part Three. The Amphibians. Windward Publishing, Miami, 191 pp.; unpubl. museum records UF 87341 through 87344). Moreover, these specimens help substantiate an unverified literature record for Pinellas County in nearby St. Petersberg (Carmichael and Williams 1991, Florida's Fabulous Reptiles and Amphibians. World Publications, Tampa, Florida. 120 pp.). Current U.S. distribution of this rapidly spreading Caribbean frog includes Florida's east coast from Dade County north to Indian River County and Florida's Gulf coast from the Florida Keys, Monroe County, north to Sarasota County, an isolated inland record in Glades County, and Puerto Rico and St. Croix (Duellman and Crombie 1970, Cat. Amer. Amphib. Rept. 92:1–2; Wilson and Porras 1983, Univ. Kansas Mus. Nat. Hist. Spec. Publ. 9:1–89; Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed., Houghton Mifflin Co, Boston, Massachusetts. 450 pp.)

Submitted by **LOUIS A. SOMMA**, Department of Zoology, University of Florida, Gainesville, Florida, 32611 USA, and **DANIEL M. CRAWFORD**, 13521-120th Lane North, Largo, Florida 34648 USA.

PSEUDACRIS TRISERIATA (Western Chorus Frog). USA: COLORADO: San Juan Co: Columbine Ranger Station, Sec. 13, T39N, R9W, 2693 m. 13 May 1966. A. W. Spencer. National Ecology Research Center, Ft. Collins, Colorado (BS/FC 857); Deer Creek, Sec. 21, T40N, R8W, 2963 m. 13 May 1966. A. W. Spencer (BS/FC 729–767). Verified by Stephen Corn. New county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife, Denver. 131 pp.).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, **GEOFFREY A. HAMMERSON**, Nature Conservancy, 201 Devonshire Street, Boston, Massachusetts 02110, **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, and **CINDY RAMOTNIK**, U.S. Fish and Wildlife Service, National Ecology Research Center, 4512 McMurry Avenue, Ft. Collins, Colorado 80525-3400, USA.

RANA PIPIENS (Northern Leopard Frog). USA: COLORADO: Bent Co: Arkansas River, 130 km E Pueblo. 21 August 1947. B. N. Horstman. National Ecology Research Center, Ft. Collins, Colorado (BS/FC 3835, 3837, 3839–40, 3842, 3844); Yuma Co: 19.4 and 32.2 km S Holyoke. 4 October 1967. David Pettus and Douglas D. Post (BS/FC 5466–8). The Bent County record is the southeasternmost in the state and suggests occurrence of the species in Crowley and Otero counties, which lie between Bent and Pueblo counties where it is already known. The Bent County record lies well within the almost exclusive range of *Rana blairi* (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife, Denver, pp. 37, 40), but sympatry is already known in Colorado at several localities farther north and west. Indeed the present series is accompanied from the same locality by nine *R. blairi* (BS/FC 3472–3, 3836, 3838, 3841, 3843, 5469–71). Verified by Stephen Corn. New county records (Hammerson 1982, *op. cit.*).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA, **GEOFFREY A. HAMMERSON**, Nature Conservancy, 201 Devonshire Street, Boston, Massachusetts 02110, USA, **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA, and **CINDY RAMOTNIK**, U.S. Fish and Wildlife Service, National Ecology Research Center, 4512 McMurry Avenue, Ft. Collins, Colorado 80525-3400, USA.

RANA PIPIENS (Northern Leopard Frog). USA: COLORADO: Hinsdale Co: Williams Creek State Wildlife Area, adjacent to southwest corner of Williams Creek Reservoir. 15 August 1991. G. A. Hammerson. UCM Herp Slide no. 74. Lake Bed Reservoir, 2.3 km W Williams Creek Reservoir. 15 August 1991. G. A. Hammerson. UCM Herp Slide no. 73. Both identifications verified by Richard L. Holland. First records for county (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Denver. 131 pp.). Adults and newly metamorphosed young were present at both sites.

GEOFFREY A. HAMMERSON, The Nature Conservancy, 201 Devonshire Street, Boston, Massachusetts 02110, and **HOBART M. SMITH**, Department of EPO Biology and Museum, University of Colorado, Boulder, Colorado 80308-0334, USA.

SCAPHIOPUS HOLBROOKII (Eastern Spadefoot). USA: FLORIDA: DeSoto Co: SR-70, 2.4 km W of Arcadia. 28 June 1993. W. E. Meshaka, Jr. Verified by J. N. Layne. Vertebrate Collection, Archbold Biological Station (ABS 1178). County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida, Part Three, The Amphibians, Windward Publishing, Miami., Florida).

Submitted by **WALTER E. MESHAKA, JR.**, Archbold Biological Station, P. O. Box 2057, Lake Placid, Florida 33852, USA.

SPEA BOMBIFRONS (Plains Spadefoot). USA: NEBRASKA: Hooker Co: Tucker Ranch, S fork Dismal River. 30 June 1993. Carl E. Bock and H. M. Smith. Verified by David Chiszar. UCM 56789 (5 tadpoles). County record (Lynch 1985. Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **HOBART M. SMITH, CARL E. BOCK**, and **JANE H. BOCK**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

TESTUDINES

CHRYSEMYS PICTA BELLII (Western Painted Turtle). USA: SOUTH DAKOTA: Ziebach Co: Bald Eagle Ranch, 16 km E Howes. 31 May 1992. R. Bald Eagle & D. Chiszar. Verified by Todd Gleeson. UCM 56573–4. County record (Fishbeck and Underhill 1959. Proc. South Dakota Acad. Sci. 38:107–113).

Submitted by **DAVID CHISZAR**, Department of Psychology, and **HOBART M. SMITH**, Department of EPO Biology, both Museum of Natural History, University of Colorado, Boulder, Colorado 80309-0345 and 0344, USA.

CLEMMYS MUHLENBERGII (Bog Turtle). USA: NORTH CAROLINA: McDowell Co: 16 km SSE Marion. R. E. Weaver, Jr. Verified by A. L. Braswell. NCSM 93-7-8 (NCSM photo voucher DWH 93.09). New county record and first for Broad River drainage. Extends range 37 km SE nearest Blue Ridge province record in Yancey County (Herman 1986, Herpetol. Rev. 17(2):50) and 74.4 km NW nearest Piedmont record in Gaston County (Herman et al. 1992, Herpetol. Rev. 23(4):122).

Submitted by **DENNIS W. HERMAN**, Zoo Atlanta, 800 Cherokee Ave. SE, Atlanta, Georgia 30315, **BERN W. TRYON**, Knoxville Zoological Gardens, P. O. 6040, Knoxville, Tennessee 37914, and **ALLEN C. BOYNTON**, North Carolina Wildlife Resources Commission, 209 Ervin Road, Morganton, North Carolina 28655, USA.

KINOSTERNON SUBRUBRUM SUBRUBRUM (Eastern Mud Turtle). USA: NORTH CAROLINA: Rutherford Co: 15.1 km N Rutherfordton. D. W. Herman and A. C. Boynton. Verified by A. L. Braswell. NCSM 93-7-8 (NCSM photo voucher DWH 93.01A). New county record and westernmost record for the state. Extends range 26.7 km SW nearest Burke Co. record (NCSM files).

Submitted by **DENNIS W. HERMAN**, Zoo Atlanta, 800 Cherokee Ave. SE, Atlanta, Georgia 30315, and **ALLEN C. BOYNTON**, North Carolina Wildlife Resources Commission, 209 Ervin Road, Morganton, North Carolina 28655, USA.

STERNOTHERUS MINOR PELTIFER (Stripeneck Musk Turtle). USA: MISSISSIPPI: Tishomingo Co: Bear Creek at county road bridge ca. 3.2 km ENE Dennis. NE 1/4, NE 1/4, NE 1/4, Sec. 13, T6S, R10E. 18 August 1993. R. L. Jones, C. Knight, T. Majure. Verified by Terry L. Vandeventer. Mississippi Museum of Natural Science (MMNS 2021). First record from Tennessee River drainage of northeastern Mississippi (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts. 450 pp.); extends range ca. 50 km SW of nearest Tennessee River tributary record in Alabama (Iverson 1977, Copeia 1977:502–517).

Submitted by **R. L. JONES, CHARLES KNIGHT**, and **TERRY MAJURE**, Mississippi Department of Wildlife, Fisheries, and Parks, Museum of Natural Science, 111 North Jefferson Street, Jackson, Mississippi 39201, USA.

LACERTILIA

CNEMIDOPHORUS SEXLINEATUS (Six-lined Racerunner). USA: NEBRASKA: Nuckolls Co: Angus, T4N, R6W, Sect. 27. 16 September 1931. L. T. Barry. Verified by Stephen Corn. USFWS National Ecology Research Center (Ft. Collins, Colorado) BS/FC 3210. First county record (Lynch 1985, Trans. Nebraska Acad. Sci., 13:42).

Submitted by **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, **HOBART M. SMITH**, Department of EPO Biology, Univ. Colorado, Boulder, Colorado 80309-0334, and **CINDY RAMOTNIK**, U.S. Fish and Wildlife Service, National Ecology Research Center, 4512 McMurry Avenue, Ft. Collins, Colorado 80525-3400, USA.

EUMECES MULTIVIRGATUS MULTIVIRGATUS (Northern Many-lined Skink). USA: COLORADO: Logan Co: Tamarack Ranch Wildlife Area, 4.9 km S Crook. 18 May 1982. E. L. Smith and J. F. Ellis. National Ecology Research Center, Ft. Collins, Colorado (BS/FC 2345). Verified by Stephen Corn. New county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife, Denver. 131 pp.).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA, **GEOFFREY A. HAMMERSON**, Nature Conservancy, 201 Devonshire Street, Boston, Massachusetts 02110, USA, **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA, and **CINDY RAMOTNIK**, U.S. Fish and Wildlife Service, National Ecology Research Center, 4512 McMurry Avenue, Ft. Collins, Colorado 80525-3400, USA.

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). USA: LOUISIANA: Ouachita Parish: West Monroe, department store on Thomas Avenue, 1.2 road km N I-20. 8 May 1992. S. G. George, et al. Northeast Louisiana University Museum of Zoology (NLU 70468); Hanna Hall Geoscience Building on Northeast Louisiana University campus, University Avenue, 0.5 road km W of Rt. 165. 25 September 1992. S. L. Jensen. NLU 70470. Both specimens verified by Neil H. Douglas. New parish records; extends the range ca. 250 road km north of prior records in Louisiana. (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State Univ. Press, Baton Rouge. 300 pp.).

Submitted by **STEVE L. JENSEN** and **STEVEN G. GEORGE**, Department of Biology, Northeast Louisiana University, Monroe, Louisiana 71209, USA.

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). USA: NEVADA: Clark Co: Las Vegas, NW 1/4 Sec. 1, T20S, R61E.

Breeding population of 12 adults (5 males, 7 females) and 2 juveniles (1 male, 1 female) collected in a trailer park. 3 October 1992. Mary B. Saethre. Verified by John W. Wright. LACM 140328–140341. State record; first known locality in Nevada, and extends known range ca. 370 km NW nearest known localities in Phoenix-Tempe, Maricopa County, Arizona (Robinson and Romack 1973, J. Herpetol. 7(3):311–312), 392 km N Ocotillo, Imperial County, California (LACM 137493–137495; Porter 1988, San Diego Herpetol. Soc. Newsletter 10:5), and 390 km N El Centro, Imperial County, California (Laudenslayer et al. 1991, Calif. Fish and Game 77(3):109–141; W. F. Laudenslayer, Jr., pers. comm.). Establishment of the species in Las Vegas is not surprising; it appears to be dispersed via travelers and Las Vegas has a high volume of traffic moving through the area. These lizards were found in a long-standing trailer park (>30 years), and the population is likely to have been in this area for a number of years.

Submitted by **MARY B. SAETHRE**, University of California at Los Angeles, Laboratory of Biomedical and Environmental Sciences, P. O. Box 495, Mercury, Nevada 89023, USA, and **PHILIP A. MEDICA**, Natural History Museum of Los Angeles County, Section of Herpetology, 900 Exposition Boulevard, Los Angeles, California 90007, USA.

HOLBROOKIA M. MACULATA (Northern Earless Lizard). USA: NEBRASKA: Box Butte Co: Running Water (= Niobrara River) Quarry, S Marsland. No date. No collector. Verified by Richard L. Holland. UCM 50529. First county record (Lynch 1985, Trans. Nebraska Acad. Sci. 13:43).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, and **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA.

PHRYNOSOMA SOLARE (Regal Horned Lizard). USA: NEW MEXICO: Hidalgo Co: Guadalupe Canyon, pitfall trap in canyon bottom 0.16 road km NNE of NM/AZ border and ca. 53 air km S Rodeo, Sec. 14, T34S, R22W. 25 June 1993. Barney R. Tomberlin. Verified by Wade C. Sherbrooke. University of New Mexico Museum of Southwestern Biology (MSB 55920). New state record.

Submitted by **CHARLES W. PAINTER**, Endangered Species Program, New Mexico Department of Game and Fish, P. O. Box 25112, Santa Fe, New Mexico 87504, USA.

SCELOPORUS SERRIFER CYANOGENYS (Blue Spiny Lizard). MEXICO: COAHUILA: Municipality of Guerrero: Misión San Bernardo at Guerrero on México Hwy. 2, 300 m elev. 9 May 1988. Ernest A. Liner, Richard R. Montanucci, Arturo González Alonso, and Fernando Mendoza Quijano. Museo de Zoología, Facultad de Ciencias, UNAM. MZFC 5849, male, 127.5 mm SVL, broken tail. Verified by Oscar Flores-Villela. Found on the walls of the Misión. First record for the state but was to be expected since it has been recorded from nearby localities in Texas. A specimen (TCWC 54448) listed by Olson (1989, Bull. Maryland Herpetol. Soc. 23:158–167) as from 3 mi S Sabinas Hidalgo, Hwy 85, Coahuila, is actually located in Nuevo León.

Submitted by **FERNANDO MENDOZA QUIJANO**, Museo de Zoología, Facultad de Ciencias, UNAM, Apdo. Postal 70-399, D. F. 04510, México, **ERNEST A. LINER**, 310 Malibou Boulevard, Houma, Louisiana 70364-2598, USA, **RICHARD R. MONTANUCCI**, Department of Biological Sciences, College of Science, 132 Long Hall, Clemson University, Clemson, South Carolina 29634-1903, USA, and **ARTURO GONZALEZ ALONSO**, San Marcos 79, San Marcos Azcapotzalco, D. F. 020202, México.

SCELOPORUS UNDULATUS ERYTHROCHEILUS (Red-lipped Plateau Lizard). USA: COLORADO: Teller Co: Mueller State Park, 0.5 km W Sand Burr Mine, Dome Rock Trail. 19 July 1993. Russell P. DeFusco. Verified by Richard L. Holland. UCM 56792. First county record (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife, Denver. 131 pp.); westernmost range limit in that area where it is rare; found in crevice in granite boulders (no preferred sandstone in vicinity).

Submitted by **RUSSELL P. DEFUSCO**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

SCELOPORUS UNDULATUS GARMANI (Northern Prairie Lizard). USA: COLORADO: Adams Co: Bijou Creek, 2 km S Hoyt. 5 August 1993. Richard L. Holland and H. M. Smith. Verified by David Chiszar. UCM 56795. First county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Denver. 131 pp.), southernmost known locality in the South Platte River drainage; in Adams County apparently limited to Bijou Creek.

Submitted by **RICHARD L. HOLLAND**, Science Department, Boulder High School, 1604 Arapahoe Avenue, Boulder, Colorado 80302, and **HOBART M. SMITH**, Department of EPO Biology and Museum, University of Colorado, Boulder, Colorado 80309-0334, USA.

SCELOPORUS UNDULATUS GARMANI (Northern Prairie Lizard). USA: NEBRASKA: Box Butte Co: 8 km E & 8 km S Alliance. 1 July 1993. Royce E. Ballinger, Brian R. Roh, Kristin S. Bird and Hobart M. Smith. UCM 56790. Verified by David Chiszar. First county record (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **ROYCE E. BALLINGER**, School of Life Sciences, University of Nebraska, Lincoln, Nebraska 68588-0118, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

SERPENTES

COLUBER CONSTRICTOR FLAVIVENTRIS (Eastern Yellowbelly Racer). USA: NEBRASKA: Gosper Co: 8 km N Elwood. 29 June 1993. H. M. Smith. UCM 56787; Hayes Co: 16 km NE Hayes Center. 29 June 1993. H. M. Smith. UCM 56788. Both verified by David Chiszar. County record (Lynch 1985. Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **HOBART M. SMITH**, **CARL E. BOCK**, and **JANE H. BOCK**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

COLUBER CONSTRICTOR FLAVIVENTRIS (Eastern Yellowbelly Racer). USA: SOUTH DAKOTA: Ziebach Co: near village of Cherry Creek at confluence of Cherry Creek and Cheyenne River. 31 May 1992. D. Chiszar. Verified by Todd Gleeson. UCM 56571. County record (Fishbeck and Underhill 1959. Proc. South Dakota Acad. Sci. 38:107–113).

Submitted by **DAVID CHISZAR**, Department of Psychology, and **HOBART M. SMITH**, Department of EPO Biology, both Museum of Natural History, University of Colorado, Boulder, Colorado 80309-0345 and 0344, USA.

CROTALUS ATROX (Western Diamondback Rattlesnake). USA: ARKANSAS: Conway Co: SW 1/4 NW 1/4 Sec. 1, T5N, R19W. 11 June 1992. Steve Austin and Christine Austin. Verified by J. T. Collins. KU 220925 (skin only; large adult). New county record.

Submitted by **GLYN TURNIPSEED**, Department of Biology, Arkansas Tech University, Russellville, Arkansas 72801, USA.

CROTALUS TIGRIS (Tiger Rattlesnake). USA: ARIZONA: Cochise Co: AOR along a gravel road into Guadalupe Canyon, ca. 5.6 air km W Arizona/New Mexico state line and ca. 47 air km E

Douglas, Sec. 17, T24S R32E. 11 August 1993. Chris Milensky and Darrell James. University of New Mexico Museum of Southwestern Biology (MSB 56030). Verified by James N. Stuart. First county record and extends range ca. 138 km to the east (C. H. Lowe Jr. pers. comm.; Lowe et al. 1986, Venomous Reptiles of Arizona. Publ. Arizona Game and Fish Dept., Phoenix. 115 pp.)

Submitted by **CHARLES W. PAINTER**, Endangered Species Program, New Mexico Department of Game and Fish, Santa Fe, New Mexico 87504, USA, and **CHRISTOPHER M. MILENSKY**, 1955 East Colorado #24, Las Cruces, New Mexico 88001, USA.

CROTALUS VIRIDIS VIRIDIS (Prairie Rattlesnake). USA: COLORADO: Phillips Co: Amherst. October 1977. Landreth. National Ecology Research Center, Ft. Collins, Colorado (BS/FC 2436–65). Verified by Stephen Corn. New county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife, Denver. 131 pp.).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA, **GEOFFREY A. HAMMERSON**, Nature Conservancy, 201 Devonshire Street, Boston, Massachusetts 02110, USA, **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA, and **CINDY RAMOTNIK**, U.S. Fish and Wildlife Service, National Ecology Research Center, 4512 McMurry Avenue, Ft. Collins, Colorado 80525-3400, USA.

CROTALUS VIRIDIS VIRIDIS (Prairie Rattlesnake). USA: COLORADO: Teller Co: High Park, 2 km N Fremont County line, Rt. 11. 1 August 1993. David Chiszar, Adam Chiszar, and H. M. Smith. Verified by Richard L. Holland. UCM 56793. First county record (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife, Denver. 131 pp.), reputedly common and, according to local reports and available preferred habitat, apparently occurring only in extreme southwestern corner of the county; last county in eastern Colorado from which not previously recorded.

Submitted by **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA, and **HOBART M. SMITH**, Department of EPO Biology, 80309-0334, USA.

ELAPHE EMORYI (Great Plains Rat Snake). USA: KANSAS: Chautauqua Co: Sec. 4, T35S, R10E. 23 April 1993. Mark Van Doren and Russell Toepfer. KU 221199. Verified by Joseph T. Collins. County record (Collins 1993, Amphibians and Reptiles in Kansas. Third edition. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 13:1–397).

KAREN TOEPFER, 303 West 39th Street, Hays, Kansas 67601, USA.

ELAPHE GUTTATA EMORYI (Great Plains Rat Snake). USA: COLORADO: Gunnison Co: 1 km W Somerset, Rt. 133 at old route turnoff to Bowie. 26 July 1993. Sean Hart and Sharon Manchester. UCM 56797. Verified by H. M. Smith. County record (Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife, Denver. 131 pp.), establishing the easternmost known range limit of the isolated western population of the species.

SEAN HART and **SHARON MANCHESTER**, 1028 Balsam Street, Lakewood, Colorado 80215, USA.

ELAPHE GUTTATA GUTTATA (Corn Snake). USA: TENNESSEE: Cannon Co: Burt-Burgen Road at Bradyville Hill Road jct., ca. 4 km SE Rt. 64. DOR. 3 August 1993. J. L. Miller and B. Miller. Verified by D. E. Metter. Middle Tennessee State University (MTSU 60-S). County record; extends known distribution into the inner edge of the Outer Nashville Basin of middle Tennessee (Conant and Collins 1991, A Field Guide to the Reptiles and Amphibians of Eastern and Central North America, 3rd ed. Houghton Mifflin Co., Boston, Massachusetts. 450 pp.).

Submitted by **BRIAN T. MILLER** and **JOYCE L. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

HEMIRHAGERRHIS NOTOTAENIA (Bark Snake). NIGER: town of Maradi. April 1990. Laurent Chirio. Muséum national d'Histoire naturelle, Paris, France: MNHN 1993. 3172. New country record. Rare species in western Africa, previously only known from Burkina Faso, Bénin, and Togo (Roman 1984, Serpents des Pays de l'Entente. CNRST Ouagadougou, Burkina Faso, 45 pp.).

Submitted by **LAURENT CHIRIO** and **IVAN INEICH**, Muséum National d'Histoire Naturelle, Laboratoire de Zoologie (Reptiles & Amphibiens), 25 Rue Cuvier, 75005 Paris, France.

NERODIA RHOMBIFER (Diamondback Water Snake). USA: LOUISIANA: West Carrol Parish: 0.1 rd km S Newhope, Hwy 577 Sec. 35, T20N, R9E. 8 May 1992. L. Kemp and S. G. George. Verified by Neil H. Douglas. Northeast Louisiana Univ. Mus. of Zool. NLU 70399. First record for parish.

Submitted by **STEVEN G. GEORGE** and **STEVE L. JENSEN**, Department of Biology, Northeast Louisiana University, Monroe, Louisiana 71209, USA.

NERODIA SIPEDON SIPEDON (Northern Water Snake). USA: COLORADO: Arapahoe Co: 3.2 km S Littleton. 20 June 1971. J. Cancalosi. National Ecology Research Center, Ft. Collins, Colorado (BS/FC 6256–8). Verified by Stephen Corn. New county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife, Denver. 131 pp.).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA, **GEOFFREY A. HAMMERSON**, Nature Conservancy, 201 Devonshire Street, Boston, Massachusetts 02110, USA, **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA, and **CINDY RAMOTNIK**, U.S. Fish and Wildlife Service, National Ecology Research Center, 4512 McMurry Avenue, Ft. Collins, Colorado 80525-3400, USA.

PITUOPHIS CATENIFER SAYI (Bullsnake). USA: SOUTH DAKOTA: Meade Co: Rt 34, 1/4 mi W Mile Marker 70 near Plainview. 31 May 1992. A. Chiszar, L. Chiszar and D. Chiszar. Verified by Todd Gleeson. UCM 56572. First county record (Fishbeck and Underhill 1959. Proc. South Dakota Acad. Sci. 38:107–113).

Submitted by **DAVID CHISZAR**, Department of Psychology, and **HOBART M. SMITH**, Department of EPO Biology, both Museum of Natural History, University of Colorado, Boulder, Colorado 80309-0345 and 0344, USA.

REGINA RIGIDA (Glossy Crayfish Snake). USA: VIRGINIA: New Kent Co: Diascund Creek, tributary to the Chickahominy River, 3.2 km SW Lanexa. 29 April 1991. K. A. Buhlmann. Verified by G. R. Zug. USNM 327174. This juvenile was found buried in detritus of a muskrat house at the edge of a freshwater tidal marsh. A second juvenile was captured in the same marsh on 4 April 1992 by A. H. Savitsky and B. A. Savitsky in a crayfish burrow under several pieces of bark. This individual was photographed and released; photographs (AHS-FS 954) are in the possession of A. H. Savitsky, Old Dominion University. Two juvenile glossy crayfish snakes representing the first Virginia records were collected from Diascund Creek on 28 October 1939 (Richmond 1940, Herpetologica 2:21; CM 18171, CM 18172). Five others were found by N. D. Richmond in February and March 1940 (CM 18531, 18862-65). This species was not collected again until 1991 despite several herpetological forays in the 1980s. It has yet to be found elsewhere in Virginia. The nearest North Carolina records are 190 km SE in Manns Harbor, Dare County (L. Palmer and A. Braswell, pers. comm). The recent collections confirm *R. rigida* as a member of Virginia's herpetofauna and suggest that further inventory of

other freshwater tidal marshes in southeastern Virginia is warranted.

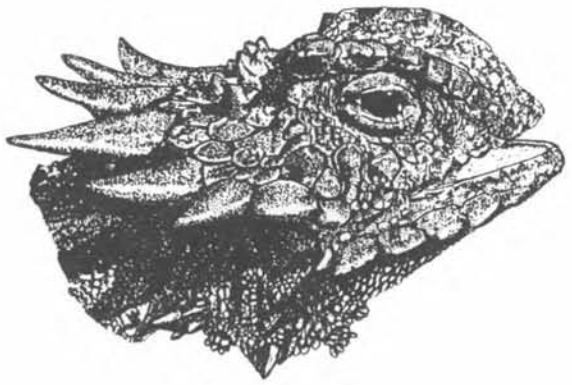
Submitted by **KURT A. BUHLMANN**, Division of Natural Heritage, Virginia Department of Conservation and Recreation, 1500 East Main Street, Suite 312, Richmond, Virginia 23219, USA, (present address: Savannah River Laboratory, P. O. Drawer E, Aiken, South Carolina 29802, USA), **ALAN H. SAVITSKY** and **BARBARA A. SAVITSKY**, Department of Biological Sciences, Old Dominion University, Norfolk, Virginia 23529, USA, and **JOSEPH C. MITCHELL**, Department of Biology, University of Richmond, Richmond, Virginia 23173, USA.

TANTILLA NIGRICEPS (Plains Blackhead Snake). USA: COLORADO: Douglas Co: 24.2 km SW Englewood. 10 June 1964. G. McCrae and Scott Altenbach. National Ecology Research Center, Ft. Collins, Colorado (BS/FC 6288–9). Verified by Stephen Corn. New county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildlife, Denver. 131 pp.).

Submitted by **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309-0334, USA, **GEOFFREY A. HAMMERSON**, Nature Conservancy, 201 Devonshire Street, Boston, Massachusetts 02110, USA, **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA, and **CINDY RAMOTNIK**, U.S. Fish and Wildlife Service, National Ecology Research Center, 4512 McMurry Avenue, Ft. Collins, Colorado 80525-3400, USA.

THAMNOPHIS SIRTALIS (Common Garter Snake). USA: COLORADO: Yuma Co: wet meadow just W Stalker Lake, 3.2 km W Wray. 13 June 1993. G. A. Hammerson. Verified by Richard L. Holland. UCM Herp Slide 72. Pregnant female. County record; first record for Republican River in Colorado (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Denver, 131 pp.). Extends range W in the Republican River system from previously reported sites in southwestern Nebraska (Lynch 1985. Trans. Nebraska Acad. Sci. 13:33–57) and northwestern Kansas (Collins 1993, Amphibians and Reptiles in Kansas. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 13:1–397).

GEOFFREY A. HAMMERSON, The Nature Conservancy, 201 Devonshire Street, Boston, Massachusetts 02110, USA, and **HOBART M. SMITH**, Department of EPO Biology and Museum, University of Colorado, Boulder, Colorado 80309-0334, USA.



Phrynosoma solare. USA: Arizona: Pima Co. Illustration by Chuck Smith.

New Distributional Records Of Amphibians And Reptiles For The State Of Falcón, Venezuela

As part of our activities at the Centro de Investigaciones en Ecología y Zonas Aridas (CIEZA), of the Universidad Francisco de Miranda, Coro, Venezuela, we surveyed the herpetofauna of the state of Falcón. Field work and examination of catalogs in important Venezuelan museums have yielded a series of first records for this state. Specimens reported are deposited in the Museo de Historia Natural La Salle, Caracas (MHNLS), Museo de Ciencias Naturales de Caracas, Caracas (MCNC), Museo de Ciencias Naturales de Guanare, Guanare (MCNG), and Estación Biológica de Rancho Grande, Maracay (EBRG).

ANURA

CERATOPHRYS CALCARATA. Distrito. Silva: Sanare. 1 December 1984. EBRG 1407; 18 October 1985. EBRG 1515; 22 October 1985. EBRG 1516. All collected by R. A. Rivero and I. Rivero. Identified by R. A. Rivero. Easternmost record for Venezuela (La Marca 1992).

ELACHISTOCLEIS OVALIS. Distrito. Silva: Palma Sola-Boca de Aroa Hwy, Finca El Sixcom, 20 m. 6 July 1968. Collected by J. Joly and J. L. Garcia. Identified by J. M. Peláez. MHNLS 3472. Northeasternmost record in Venezuela (La Marca 1992).

HYLA MINUTA. Distrito. Colina: 13.0 km (by road) from Dos Bocas via Pueblo Nuevo de la Sierra, Sierra de San Luis, ca. 410 m. 7 August 1992. Collected by A. Mijares, J.-M. Hero and F. Sánchez. Identified by J.-M. Hero. MCNG 2180-82. Northwesternmost record for the species in Venezuela (La Marca 1992).

FLECTONOTUS PYGMAEUS. Distrito. Petit: Curimagua. 20 December 1957. Collected by E. Valladares. Identified by Juan A. Rivero. MHNLS 1512. Westernmost record in Venezuela (La Marca 1992).

PHYLLOMEDUSA TRINITATIS. Distrito. Petit: Curimagua. 19 December 1957. Collector unregistered. Identified by Juan A. Rivero. MHNLS 1503. Westernmost record in Venezuela (La Marca 1992).

AMPHISBAENIA

AMPHISBAENA FULIGINOSA. Distrito. Acosta: Las Lapas. September 1968 (specific date not given). Collected by L. Duque. Identified by A. R. Lancini. MCNC 5183.

LACERTILIA

ANOLIS AURATUS. Distrito. Mauroa: Mene de Mauroa. July 1968 (specific date not given). Collected by Pedro Ricardi. Identified by E. E. Williams. MCNC 4115, 4118, 4126. First definite record for the state, although previously reported as in "Venezuela" by Peters and Donoso-Barros (1970) and Hoogmoed (1973).

BASILISCUS BASILISCUS BARBOURI. Distrito. Acosta: Río Tocuyo (Boca de Tocuyo). 11 February 1984. Collected by G. Cordero. Identified by R. A. Rivero. EBRG 1738. Northeasternmost record in Venezuela (Lancini 1980).

SERPENTES

MICRURUS MIPARTITUS SEMIPARTITUS. Distrito. Silva: Sanare. 21 July 1984. Collected and identified by R. A. Rivero.

EBRG 1791. Northeasternmost record in Venezuela (Lancini 1979; Roze 1966).

Acknowledgments.—We thank those who gave us access to museum specimens and/or catalogs: Francisco Bisbal and Ramón Rivero (EBRG), María J. Praderio and J. Celsa Señaris (MHNLS), Pedro Delgado (MCNC), and Pedro Pacheco (MCNG). Enrique La Marca provided helpful criticism on an earlier draft of this manuscript. Partial financial support was provided by grant No S1–9112–030 from the Fundación para el Desarrollo de la Ciencia y la Tecnología del Estado Falcón.

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1994 Chicago Herpetological Society Grants Program

The Chicago Herpetological Society announces the CHS Herpetological Grants program to award financial support for herpetological research, education, and conservation. Four awards of up to $500 each will be available. Interested parties may apply for a grant in any one of the following categories: 1) Illinois herpetology; 2) Graduate Student Research in Herpetology; 3) Field Studies in Herpetology; 4) Conservation; 5) Captive Management, Husbandry, and Propagation.

Applicants must be CHS members. In accepting a grant, the recipient agrees to abide by all state and federal laws, to submit a written summary at the end of their work for publication in the CHS *Bulletin*, and to acknowledge the CHS in any publications that result from their subsidized research. Recipients are encouraged to submit their work in article form or as a CHS monthly meeting program.

Applications should include the following: 1) statement of proposal objectives; 2) description of materials and methods; 3) complete budget, not to exceed $500; 4) brief resume of the applicant, if an individual. If the applicant is an organization, background information on the organization should be included. 5) A completion date for the project.

Applications must be typed, double-spaced, with four copies submitted. Applications should be kept brief; proposals longer than four pages are discouraged. All applications must be received by 1 March 1994, and awards will be announced by 1 May 1994.

It is the goal of the Grants Committee to award grants to a variety of applicants; enthusiastic amateurs will receive equal consideration with professional herpetologists and graduate students. Topics including Illinois herpetology, captive husbandry and propagation, and those which may translate into quality CHS *Bulletin* articles or monthly meeting programs are favored, though not requisite.

Submit applications to: *CHS Herpetological Grants, Chicago Herpetological Society, 2001 North Clark Street, Chicago, Illinois 60614, USA.*

An Annotated List Of The Reptiles And Amphibians Of Macau, Southeast Asia

The herpetological fauna in Macau would be expected to be somewhat similar to that found in the neighboring British colony of Hong Kong which is located just 40 km away across the Pearl River estuary. Assuming that Hong Kong as well as Macau lie in an intermediate zone between the Oriental and the Palearctic faunal regions (Hill and Phillipps 1981), both Hong Kong and Macau should possess a mixed fauna with elements from both regions. Geographically like Hong Kong, Macau consists of a peninsular land area connected to the Guangdong Province of mainland China as well as islands. Macau has only two islands—Taipa (113°35'N, 22°10'E) and Coloane (113°33'N, 22°08'E)—which are connected to the mainland by either a road bridge or a causeway. Despite this connection there appears to be little faunal interchange. Habitats for herps on the mainland peninsula are under threat due to the recent urbanization in Macau as well as in other areas of Southeast Asia, and aquatic habitats on the islands are also dwindling in size.

Material reported in this study was largely collected between 1989 and 1992 from the islands of Taipa and Coloane and the Guia light house forested hill area on the Macau peninsula. Records are also included from a small collection of herps maintained at the CMI Agriculture and Forestry center on Coloane (Leung-Va 1991). Identifications of the local fauna were made with the aid of color plates found in Karsen et al. (1986), and representative specimens deposited in the Bernice P. Bishop Museum (BBM) in Honolulu, Hawaii have been identified by J. D. Lazell.

The fauna of Hong Kong is much better known than that of Macau largely due to the efforts of Romer (1975, 1979a, 1979b) as recently reviewed by Lazell (1988). Due to geographic isolation the fauna of Macau is not identical with that of Hong Kong and we here report a number of new distributional records.

AMPHIBIA

BUFO MELANOSTICTUS Schneider. Asian Common Toad. BBM 11654 found 2 June 1990, BBM 11654 and 11655 in August 1989, and BBM 11656 on 4 June 1990 (E. Easton leg.). Commonly observed foraging at night under street lamps in Coloane village, Coloane Island, and likely the most common amphibian in Macau. Serves as food for numerous serpents; three individuals were observed regurgitated from a disturbed *Ptyas mucosus* on Taipa island. Eggs and tadpoles are common during early summer in roadside gutters that fill with water. Metamorphosis occurs in less than one week in ±1.0 cm individuals that leave the water.

RHACOPHORUS (POLYPEDATES) LEUCOMYSTAX (Gravenhorst). Brown Treefrog. BBM 11648 and 11649 found on 27 June 1990; BBM 11650 is a foam nest with many hatched tadpoles found on 30 May 1990 (E. Easton leg.). This frog has been observed resting on horizontal branches of the horsetail tree at heights of 3 m on the islands of Taipa and Coloane. Foam nests have been observed in cement cisterns partially filled with water near a construction site on the university campus and attached to the upper edges of road culverts during spring and early summer.

RANA LIMNOCHARIS Boie. Paddy Frog. BBM 11651 and 11652 found 19 June 1990 (E. Easton leg.) and 14 August 1991 at Guia Hill (E. Easton and G. Ades leg.). A common frog observed in freshwater ponds on both Taipa and Coloane islands.

RANA GUENTHERI Boulenger. Günther's Frog. Found 17 September 1991 in road culvert near Ka-Ho village, Coloane island (E. Easton leg.). Also observed inhabiting a stream flowing through a mine shaft near Choec-van village in August and September.

KALOULA PULCHRA Gray. Asiatic Painted Frog. BBM 11647 found 9 June 1990 on Taipa Island in rain gutter (E. Easton leg.). Commonly seen at night after a rain foraging for food in roadside gutters on Taipa Island. Mating noted on Guia Hill on the Macau peninsula in a water filled ditch near a jogging track. This frog burrows in mud during the drier periods of the year.

MICROHYLA PULCHRA (Hallowell). Marbled Pigmy Frog. BBM 11646 found 27 June 1990 and 19 June 1992 (E. Easton leg.) along roadside at bottom of hill on Taipa Island near cemetary. Frog is seen in low lying areas at night where it crosses roadways.

MICROHYLA ORNATA (Duméril and Bibron). Ornate Pigmy Frog. Found 15 June and 15 July 1991 on Taipa island (E. Easton leg.) in similar locality as *M. pulchra* above.

REPTILIA

GEKKO CHINENSIS Gray. Chinese Gecko. BBM 1163 found 22 September 1989 on Taipa Island; 14 January 1992 near reservoir, Siac Pai Van, Coloane Island (E. Easton leg.).

HEMIDACTYLUS BOWRINGI (Gray). Bowring's Gecko. BBM 11660, 11661, and 11662 found on 2 February 1990, BBM 11659 on 30 May 1989, all on Taipa Island (E. Easton leg.) on walls of buildings associated with the University of Macau.

HEMIDACTYLUS BROOKI Gray. Brook's Gecko. Found June 1991 and 4 January 1992 on stone wall and in drainage ditch near university campus on Taipa Island (E. Easton leg.). First reported by Romer (1978) in Macau from specimens collected by S. J. Karsen near a tourist hotel on the Macau peninsula. Mortality appeared to be high in January 1992 when insect prey was not available and geckos could not enter semi-hibernation.

HEMIDACTYLUS GARNOTI Duméril and Bibron. Indo-Pacific Gecko. Found 5 January 1992 near Tai Fung Building on the University of Macau campus, Taipa Island (E. Easton leg.).

CALOTES VERSICOLOR (Daudin). Crested Tree Lizard. BBM 11657 found on 23 May 1990 (C. J. Lopes leg.) and BBM 11658 in July 1989 (Y. Y. Mei leg.) from Taipa Island. Commonly seen climbing vegetation on both islands of the territory.

LEIOLEPIS REEVESII (Gray). Butterfly Lizard. Female (SVL 10 cm, tail 20 cm) found behind beach at Hac-Sa village on 9 July 1991, Coloane Island (E. Easton and Leung-Va leg.). A small resident population of this species occupies an old field habitat containing numerous underground burrows. Only females have so far been observed, suggesting the species is parthenogenetic. Also observed on Taipa Island (Leung-Va, pers. observ.). This species has not been reported from Hong Kong or from any of its islands (Karsen et al. 1986).

ATEUCHOSAURUS CHINENSIS Gray. Chinese Forest Skink. BBM 11669 found in June 1989 and on 16 June 1991 in rain gutter on Taipa Island near University (E. Easton leg.). Also collected from a park near Siac Pai Van on Coloane Island in summer 1992.

EUMECES QUADRILINEATUS (Blyth). Blue-tailed Skink. BBM 11671 collected on 22 June 1990 in rain road side gutter near University on Taipa island (E. Easton leg.).

SCINCELLA (LEIOLOPISMA) REEVESI (Gray). Reeves' Smooth Skink. BBM 11670 found in June 1989 in rain gutter on Taipa Island (E. Easton leg.). Also noted in forested area near stream at Choec-van on Coloane Island.

PYTHON MOLURUS BIVITTATUS Schlegel. Burmese Python. Specimen with an SVL of 63 cm (tail 10 cm) was found on 7 September 1991 at Estrada Choc-van, Coloane Island; another collected on 22 August 1991 at Hovione Chemical Plant area on Taipa Island (E. Easton leg.).

AMPHIESMA STOLATA (Linnaeus). Buff-striped Keelback. BBM 11674 found August 1989 and BBM 11675 found 17 June 1990, both on Taipa Island near university campus (E. Easton leg.).

BOIGA MULTIMACULATA (Boie). Large-spotted Cat Snake. Specimen with SVL of 55 cm (tail 12 cm) found July 1984 on Coloane Island (Leung-Va leg.). A shed skin of this species was noted along a road side near Hac-sa village during the summer of 1991.

ENHYDRIS BENNETTI (Gray). Mangrove Water Snake. Specimen with an SVL of 29.5 cm (tail 5.0 cm) found on 15 July 1992 at Siac Pai van on reclaimed land near Mangrove, Coloane Island (Leung-Va leg.).

OLIGODON FORMOSANUS (Günther). Taiwan Kukri Snake. Specimen with an SVL of 38 cm (tail 7.5 cm) was found on 27 August 1991 at Estrada da Choec-van, Coloane Island (E. Easton leg.); another collected on 23 May 1990 from a park at Siac Pai Van, Coloane Island (Leung-Va leg.) is believed to be the first record of this uncommon species in Macau.

PTYAS KORROS (Schlegel). Indo-Chinese Rat Snake. BBM 11676 found in October 1989 on Taipa Island on a hillside near the University of Macau campus (E. Easton leg.).
PTYAS MUCOSUS (Linnaeus). Common Rat Snake. BBM 11672 found on 14 October 1989 at Guia hill on Macau peninsula (S. H. Chan and E. Easton leg.). BBM 11673 found on 6 October 1989 on Taipa Island on hillside near university campus (E. Easton leg.).

BUNGARUS M. MULTICINCTUS Blyth. Many-banded Krait. Specimen observed on 21 July 1991 in rain gutter along road side near cemetary on Taipa Island.

NAJA NAJA ATRA (Cantor). Chinese Cobra. On 20 August 1991, two immature specimens were found DOR near university campus on Taipa Island (E. Easton leg.).

RAMPHOTYPHLOPS BRAMINUS (Daudin). Brahminy Blind Snake. BBM (catalog number pending) found in summer 1989 on hill on Taipa Island (identified by A. Allison); SVL's 12.5, 10 (tail lengths 2.0, 1.0); another specimen on 12 September 1991 in a drainage ditch along roadside near Ka-Ho village, Coloane Island (E. Easton leg.).

TRIMERESURUS ALBOLABRIS (Gray). White-lipped Pit Viper. Specimen found on 14 September 1991 along roadside near Choec-van village, Coloane Island (E. Easton leg.).

CHINEMYS REEVESI (Gray). Reeves' Terrapin. From a stream on C-4 Mountain, Coloane Island, during 1981 (Leung-Va leg.). The currrent status of this species in Macau is not known.

CUORA FLAVOMARGINATA (Gray). Yellow-lined Box Terrapin. Specimen with a carapace length of 12.5 cm (plastron 7.4-5.7 cm) found on 21 May 1992 at Siac Pai van in reclaimed area of Coloane Island (Leung-Va leg.).

CUORA TRIFASCIATA (Bell). Three-banded Box Terrapin. This species was last observed in a marshy area near Hac-sa Beach on Coloane Island in 1989. Current status is unknown as it is widely sought for human food and sold in Macau markets.

TRIONYX (PELODISCUS) SINENSIS Wiegnann. Chinese Softshell. Specimen found on 10 April 1992 at Siac Pai van on Coloane Island (Leung-Va leg.). This is a very common species sold in Macau markets; most individuals are probably being imported from mainland China.

Even though Barros (1978) listed four species of Elapidae and one species of hydrophiid sea snake as occurring at one time in Macau we have not been able to determine the current status of *Hydrophis cyanocinctus* (Daudin), *Bungarus fasciatus* (Schneider), and *Ophiophagus hannah* (Cantor), because preserved specimens are not available locally for examination. Mendes et al. (1991) also listed three species of Ranidae as occurring on Macau, according to a zoological survey completed by the zoological institute in Portugal. The third species of ranid may have been *Rana tigrina* because the Chinese bullfrog is commonly sold as human food in Macau markets. Often specimens in the Macau markets are not found locally and such seems to be the case for *Takydromus sexlineatus ocellatus*, a lizard that is commonly sold in pet shops as food for birds, but has not been observed locally and probably is imported from one of the neighboring provinces of mainland China.

Acknowledgments.—The authors wish to thank Father Anthony Bogadek, St. Louis School, Hong Kong for determining the identity of *Leiolepis reevesii* from Macau. This study could not have been made without the cooperation of Mr. Carlos D. C. Batalha, Head of Agrarian Dept., Câmara Municipal das Ilhas, Coloane (Island government, Macau).

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PUBLICATIONS RECEIVED

Guide to the Reptiles and Amphibians of the Savannah River Site by J. Whitfield Gibbons and Raymond D. Semlitsch. 1991. The University of Georgia Press. xii + 131 pp. Hardcover. US $20.00. ISBN 0-8203-1277-0.

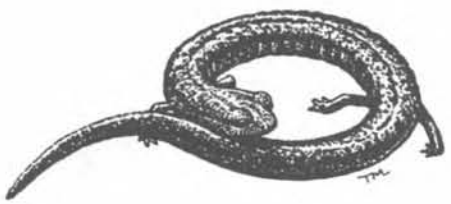
Keys and species accounts for the 100 species of amphibians and reptiles found at the Savannah River Site (SRS) near Aiken, South Carolina. The ecological information presented is derived specifically from data on animals on the SRS. Descriptions of particular sites representing all habitat types on the Site are provided. The book also features a bibliography of herpetological reprints of the Savannah River Ecology Lab (indexed by taxon and subject), theses and dissertations based on work at the lab, and general references.

Geographic Variation and Speciation in the Torrent Salamanders of the Genus *Rhyacotriton* (Caudata: Rhyacotritonidae) by David A. Good and David B. Wake. 1992. University of California Publications in Zoology 126. xii + 91 pp. Softcover. US $12. ISBN 0-520-09778-5.

A systematic treatment of torrent salamanders in which two new species are described, another raised from subspecies, and a new family, the Rhyacotritonidae, is erected. Variation in morphometrics, color, life history, osteology, and proteins are discussed in detail and a scenario is presented for the phylogenetic and biogeographic history of these salamanders. Illustrated by numerous maps, line drawings and bivariate plots.

Anfibios y Reptiles en Nuestro Folklore by Juan A. Rivero and Donato Seguí Crespo. Date of publication not stated. Published by Juan A. Rivero. 98 pp. (including 21 color figures, 8 black & white figures). Price to booksellers is US $9.80 + $2 per book insured air mail (minimum order of 3 books); $12 to libraries and individuals (+ $2 shipping). Order directly from Rivero (Box 5121, College Sta. Mayagüez, Puerto Rico 00681, USA). In Spanish.

A detailed look at the natural history of four prominent species of herps in Puerto Rico. The profiled species are the coquí (*Eleutherodactylus coqui*), the crested toad (*Peltophryne lemur*), the giant green anole (*Anolis cuvieri*), and the Puerto Rican boa (*Epicrates inornatus*). Includes poems and musical compositions dedicated to these animals.



Batrachoseps pacificus complex ("Santa Lucia Mts." form). USA: California: Monterey Co., Pacific Grove. Illustration by Tim Manolis.

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Authors should submit an original and two copies of manuscripts. Manuscripts should be typewritten, double-spaced, on 21.5 x 28 cm (8.5 x 11 inch) white paper. Refer to this issue of ***HR*** for style and format information, including correct format for literature citations. More detailed information for submissions to Geographic Distribution, Life History Notes, and Recent Population Changes appear in a recent issue of ***HR*** under their respective headings.

Originals of illustrative material (e.g., tables, photographs, or diagrams) should be submitted with the text, with appropriate precautions taken to ensure delivery without damage. Illustrations should be discussed in the text and numbered sequentially with Arabic numbers. References to illustrations should be placed in parentheses at the end of sentences. Original photographs should be submitted as black and white glossy prints.

For further guidelines, authors should consult the *CBE Style Manual* (5th edition, 1983, Council of Biology Editors, Inc.; 9650 Rockville Pike, Bethesda, Maryland 20814, USA).

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The receipt of a manuscript by an editor will be promptly acknowledged. At present, there is little lag time between acceptance of a manuscript and its publication. Although the advice and assistance of external reviewers will be sought for all feature articles, the Editor has final responsibility for deciding whether a manuscript is suitable for publication. Notes submitted for publication in Geographic Distribution and Life History Notes ordinarily will be reviewed by the Section Editor only. The Editor and Section Editors reserve the right to edit a manuscript, but substantial alterations will not be made without permission of the primary author.

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SOCIETY FOR THE STUDY OF AMPHIBANS AND REPTILES

NEW PRICE for the

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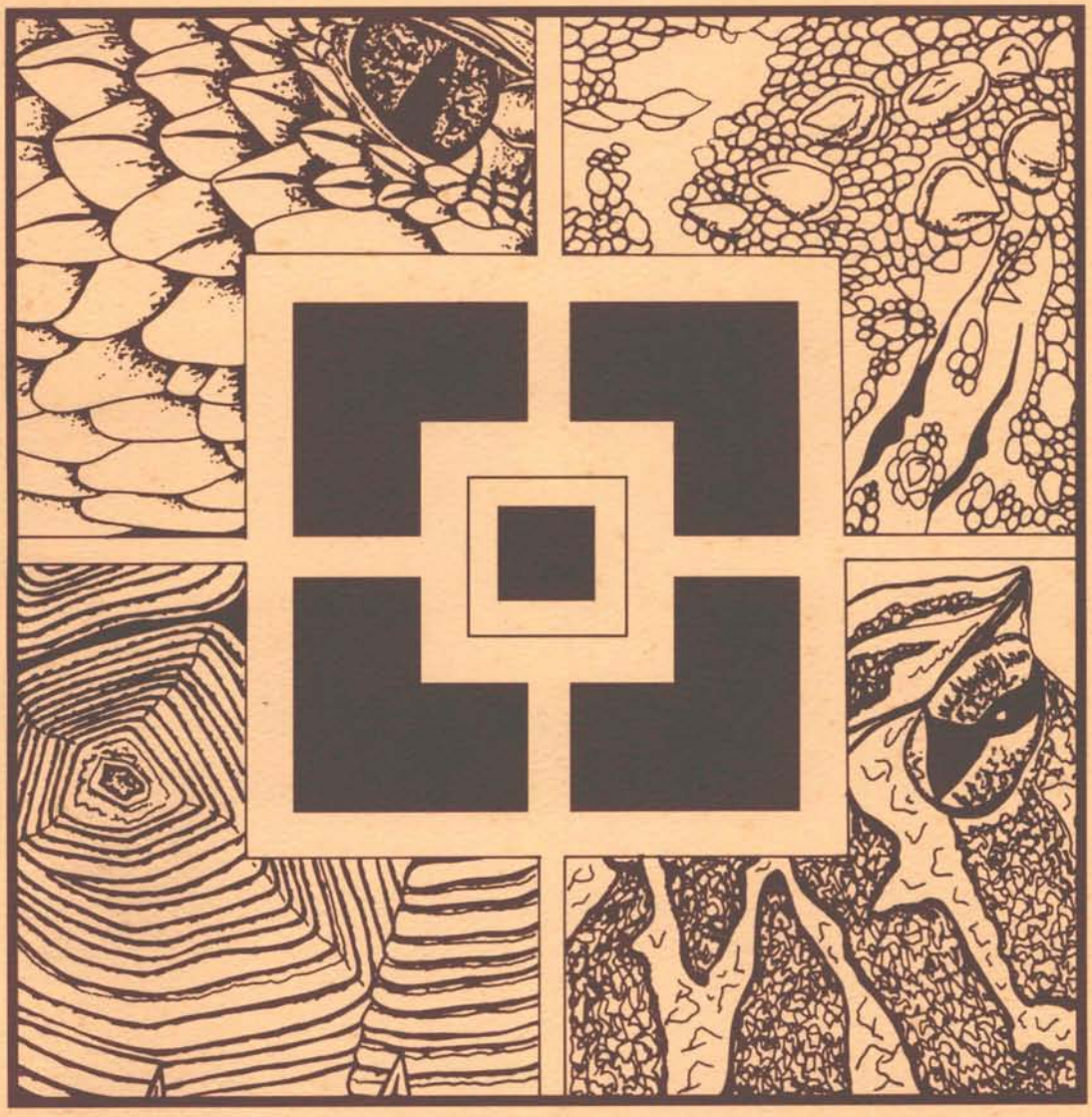
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SSAR BUSINESS

New Section Co-Editors

Jerry Johnson has assumed the section co-editorship for Geographic Distribution effective immediately. He takes over for Darrel Frost who served in this capacity for three years. Darrel's efforts on behalf of *HR* are sincerely appreciated. All non-US, non-Canadian distribution records should be sent to: *Jerry D. Johnson, Department of Biology, El Paso Community College, P.O. Box 20500, El Paso, Texas 79998-0500, USA.*

Lee Fitzgerald is the new section co-editor for Life History Notes. He will handle all manuscripts concerning reptiles, while current section editor Randy Jennings will process those dealing with amphibians. Fitzgerald's address is: *Lee A. Fitzgerald, Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA.*

Annual Report (1993) Grants-In-Herpetology Committee

Five awards (of $500 each) in four categories were made this year, as follows:

Graduate Student Research.—Kelly R. Zamudio, Department of Zoology, University of Washington, Seattle. Title: "Female reproductive investment: investigating the trade-offs between current reproduction, survival and growth."

Field Work.—Janna M. Ellingson, Department of Zoology, The University of Texas at Austin. Title: "Sensory systems and selection on male coloration in a diurnal gecko."

Field Work.—Timothy B. Watkins, Department of Ecology and Evolutionary Biology, University of California, Irvine. Title: "Predator-mediated selection on locomotor performance in *Hyla regilla*."

Zoo Research.—J. Kevin Bowler and Ann Weber-Rabin, Audubon Park and Zoological Garden, New Orleans, Louisiana. Title: "Amphibian decline exhibits and education."

Regional Society.—John J. Moriarty, Hennepin Parks, Maple Plain, Minnesota. Title: "Minnesota frog and toad survey, pilot study."

Committee: Dawn S. Wilson (University of South Florida), Anders G. J. Rhodin (Chelonian Research Foundation); Charles W. Painter (New Mexico Department of Game and Fish), Julian C. Lee (University of Miami), Randy Jennings (University of Nevada, Las Vegas), Carole L. Hom (University of California, Davis), Maureen A. Donnelly (University of Miami), A. Dale Belcher (chair, Rio Grande Zoo).

Catalogue Of American Amphibians And Reptiles

The board of the Society for the Study of Amphibians and Reptiles and the editors of the *Catalogue of American Amphibians and Reptiles* wish to publicly acknowledge and thank the following persons for reviewing *Catalogue* accounts: Jonathan A. Campbell, Ronald I. Crombie, Brian I. Crother, David E. Darda, Oscar Flores-Villela, Orlando H. Garrido, Robert W. Henderson, John B. Iverson, J. Eric Juterbock, William W. Lamar, James R. McCranie, John S. Mecham, James E. Platz, Gregory K. Pregill, Douglas A. Rossman, Michael E. Seidel, Richard Thomas, Stephen G. Tilley, Jaime D. Villa, David B. Wake, and Ernest E. Williams.

Catalogue Erratum

Some copies of account number 546, *Rhadinaea godmani*, in the *Catalogue of American Amphibians and Reptiles* were inadvertently sent out in error (pages 2-3 were from account number 539, *Amphisbaena gonavensis*). Correct copies of account number 546 will be mailed with 1993 subscriptions.

C. J. McCoy

Dr. Clarence J. (Jack) McCoy, Curator of the Section of Amphibians and Reptiles at the Carnegie Museum of Natural History, and a Past President of SSAR, passed away on 7 July 1993. An endowment has been established in Jack's name. Contributions earmarked for this fund may be sent to the *Office of the Director, The Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213, USA.* For more information please contact Mary Ann Schmidt at the Museum, (412) 622–3287. An obituary will appear in a forthcoming issue of *HR*.

NEWSNOTES

Chelonian Research Foundation Linnaeus Fund — 1992 Grant Recipients

The Chelonian Research Foundation (CRF), established as a 501(c)(3) nonprofit private operating foundation in 1992, awarded four grants of $500 each for turtle research through its Linnaeus Fund endowment program on 16 December 1992. Awards granted were as follows:

Frye, Sheila E., Antioch New England Graduate School, Concord, New Hampshire. — The ecology and natural history of the wood turtle (*Clemmys insculpta*) in southern New Hampshire.

Janzen, Fredric J., University of California, Davis, California. — Molecular systematics and evolution of sex-determining mechanisms in marsh turtles (*Clemmys*).

Perillo, Kathy, University of New Haven, New Haven, Connecticut. — Seasonal movements and habitat preference of spotted turtles (*Clemmys guttata*) in southern New England.

Webb, Robert G., University of Texas, El Paso, Texas. — Geographic variation in the giant softshell turtle, *Pelochelys bibroni* (Owen).

Linnaeus Fund awards are granted annually to individuals for specific turtle research projects, with either partial or full support as funding allows. Priority is given to projects concerning freshwater turtles, but tortoise and marine turtle research proposals are also considered. Priority is given sequentially to the following general research areas: Taxonomy and Systematic Relationships, Distribution and Zoogeography, Morphology, Ecology and Natural History, and Other Turtle Research. Priority is also given to projects that demonstrate potential relevance to the scientific basis and understanding of Chelonian Diversity and Conservation Biology. Award recipients agree to publish at least partial or summarized results of supported research in a CRF-sponsored publication.

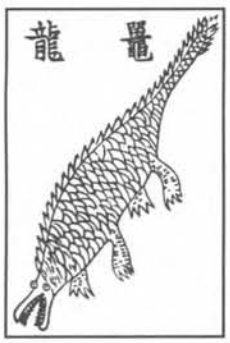
Awards for 1993 are expected to be in the range of five hundred dollars each, hopefully with increasing grant support as the endowment grows. The annual application deadline is 15 November, with annual disbursement prior to 31 December. Submit applications in grant proposal format: title page, project objective, background and research rationale, methods, materials, total project expenses, funding requested from CRF, funding available or requested from other organizations, general timetable, bibliography, and curriculum vitae for all key personnel. Awards will be granted through a review process carried out by the Director and members of the Scientific Advisory Board of CRF. Submit proposals to: ***Chelonian Research Foundation**, Anders G. J. Rhodin, M.D., Director, 168 Goodrich Street, Lunenburg, Massachusetts 01462, USA.*

A New, Extensively Color-Illustrated Book from SSAR

HERPETOLOGY OF CHINA

by Er-mi Zhao and Kraig Adler

•



CHINA, WITH 661 SPECIES OF AMphibians and reptiles in 164 genera and 34 families, possesses one of the largest and most diverse herpetofaunas of any country, and it occupies a strategic geographic position, as it bridges the Oriental and Palaearctic biogeographic zones. Despite the size and relative importance of China's herpetofauna, however, there is no existing work—in Chinese or in any other language—that comprehensively reviews all recognized species, until now.

The purpose of this new, 500-page book, written in English by Er-mi Zhao (Chengdu Institute of Biology) and Kraig Adler (Cornell University), is to summarize the current taxonomic status and distribution of all Chinese species. The geographic coverage includes all of mainland China, plus Macao, Hong Kong, Hainan, and Taiwan.

Table of Contents

History of Herpetological Studies in China

Illustrated Keys to Chinese Amphibians and Reptiles

Annotated Checklist of Genera, Species, and Subspecies (including synonymies)

Distribution of Chinese Amphibians and Reptiles (including charts of distribution by province)

Annotated Bibliography (containing 1825 references)

Appendices (gazetteer of localities; collecting and preserving techniques; Chinese herpetological journals)

Indices to Names of Authors and to Scientific Names

The book contains **48 COLOR PLATES** (371 individual photographs of animals and habitats), *including all genera and 330 species*. Due to the high cost of producing extensively color-illustrated works, this book will be issued in a relatively small edition, a significant part of which is destined for scientists and libraries in China and East Asia.

Specifications: 505 pages, 1 color frontispiece, 72 portraits of herpetologists, 14 other photographs, 24 charts of species distribution, 30 text figures, 4 maps (1 foldout), and 48 color plates. Clothbound in library-grade buckram, 7 x 10–inch format (18 x 25.5 cm). *To be published November 1993.*

ALSO AVAILABLE:

ALLIGATORS IN CHINA, BY A.-A. FAUVEL

A facsimile reprint of the original description of the Chinese alligator (*Alligator sinensis*), published privately in Shanghai in 1879. Includes classical history and legends, natural history, technical description, and literature review. 42 pages, 3 plates, 6 x 9–inch format (15 x 23 cm).

Send Orders To: SSAR Publications Secretary, Robert D. Aldridge, Department of Biology, St. Louis University, St. Louis, Missouri 63103, USA (*telephone* 314-658-3900 or -3916; *fax* 314-658-3117). Make checks payable to "SSAR"; receipt sent on request only. Overseas orders must be paid in USA funds. Orders may be charged to MasterCard or VISA (account number and expiration date required); a 6.1% bank charge will be added. Price list of SSAR publications and membership application available on request.

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- Single booklet, postpaid (worldwide) $6



HERPFAUN

HERPFAUN is a taxon and faunal unit cross-referenced bibliography of publications concerning the geographical distribution of reptiles and amphibians. It includes faunal monographs, checklists, determination keys, taxonomic revisions, bibliographies, conservation status reports, field guides, etc.—any kind of publication that provides information relevant to the study of area-specific faunas.

The coverage is worldwide; it is not intended to be exhaustive, but does make an especial effort to include more recent publications. The bibliography is available as a pair of 5.25-inch floppy diskettes plus instructions for a limited time only for $5 from: *Dr. Charles H. Smith, 331 Devonshire Street, Apt. D-8, Pittsburgh, Pennsylvania 15213, USA.*

MEETINGS

2nd Annual International Reptile Breeders Convention

The International Reptile Breeders Convention will be held 2-3 October 1993 at the San Diego Concourse, Plaza Hall, in San Diego, California. Speakers and topics include *Husbandry of Gray-banded Kingsnakes* (Bob Applegate), *Breeding Rosy Boas* (Brendan McGraw), *Care, Maintenance & Breeding of Turtles & Tortoises* (Jeff Gee), *Care, Maintenance & Reproductive Husbandry of Gila Monsters & Beaded Lizards* (Bob Applegate), *Panel Discussion on Varanids and Husbandry of Large Lizards* (Robert Sprackland, Mark Bayless, Rick Abrahams).

For further information contact: *IRBA, P.O. Box 85152-279, San Diego, California 92186. Tel. (800) 497-3550, FAX (619) 295-7129.*

LEGISLATION & CONSERVATION ALERT

Call for information on the status of amphibians and reptiles.—This column serves to update the herpetological community on the regulatory status and protection measures implemented for rare, threatened, and endangered herps. We are in need of more information especially on the State and Province level. Please send pertinent information to the Section Editor.

French West Indies: Since 1989, all herpetofauna has been protected in the French West Indies (Guadeloupe, Grande Terre, Desirade, Marie-Galante, Les Saintes, Martinique, Saint-Martin, SaintBarthelemy, and the cays around all these islands). This protection law was published in the Journal Officiel de la Republique francaise (24 March 1989). Scientists who wish to conduct field studies or collect must apply for a permit in which they justify their research and specify the number of animals to be collected. Write to: Direction de la Nature et des Paysages, Ministere de l'Environnement, 14 avenue du General Leclerc, F-92524 Neuilly-sur-Seine. Collection of specimens in the Parc national de la Guadeloupe also requires a permit from the park. Write to: *Monsieur l'attache scientifique, Parc national de la Guadeloupe, Habitation Beau Soleil, Monteran, F-97120 Saint-Claude. This information was supplied by Dr. Michel Breuil, Museum National d'Histoire Naturelle, 25, rue Cuvier - 75005 Paris.*

A Request for Information on Rattlesnake Commercialization: There is an unquantified and unregulated commercial trade in rattlesnakes. Snakes from rattlesnake roundups apparently account for less than half of the snakes entering the trade. A study funded by TRAFFIC USA/World Wildlife Fund has been initiated to evaluate the extent of rattlesnake commercialization for whole animals and parts. The researchers would appreciate any information regarding: what parts are sold; the origin and species of snakes used; the prices and types of items; and the addresses of the businesses selling these products. Herpetologists can gather information at curio shops, "tourist traps," mall stores, boot and leather dealers, etc. This information will be used to formulate conservation strategies aimed at preserving rattlesnake populations. Send information to: *Charles W. Painter and Lee A. Fitzgerald, Museum of Southwestern Biology, Biology Department, University of New Mexico, Albuquerque, New Mexico 87131, USA. FAX: (505) 277-0304.*

KURT A. BUHLMANN
SSAR Conservation Committee.

Amphibian Decline Newsletter

The *Froglog*, the newsletter of the IUCN/SSC Task Force on Declining Amphibians, provides for communication among researchers working on this conservation problem. The newsletter contains information on recently funded research projects, abstracts from recent meetings, citations for recent reports and published papers, and advertises job opportunities. For further information contact: *Dr. James L. Vial, Task Force Coordinator, Center for Analysis of Environmental Change, EPA Environmental Research Laboratory, 200 SW 35th Street, Corvallis, Oregon 97333, USA; tel. (503) 754-4798.*

LETTER TO THE EDITOR

Dear Editor:

I found Mr. Rundquist's recent review (HR 24:75-76) of *Snakes of the United States and Canada: Keeping Them Healthy in Captivity, Vol. I*, to be quite unfair, taking numerous quotes out of context, and insinuating that I had actually suggested releasing exotic reptiles into native populations. In fact, if I may quote that section directly, the following words end the chapter on releasing: "One should never release exotics, mutants, or sick individuals. They may be very harmful to native populations."

Furthermore, I do not seek to "encourage the deliberate release of captives into wild populations . . . for the purpose of augmenting those populations." For goodness sakes, this chapter was meant to encourage ten-year olds to release their captive garter snakes and babies when they grew tired of them! It provides them with a technique for conditioning these snakes for release and a logical place to release them—no more. In addition, the text of this section clearly states that "no one knows how well snakes that have been raised (or even just maintained for a short while) in captivity adjust to living in the wild again." Also, it is clearly stated in this section that observing other members of the same species in an area "indicates that the habitat is suitable for that species although it doesn't tell you if that area can support more snakes of that species (that area may have already reached its carrying capacity, the maximum number of snakes it can support)."

In addition, this section was written nearly five years ago, a long time before we were aware of the deadly infectious nature of URDS in tortoises. Indeed, this was Mr. Rundquist's only valid argument against release, since the "genetic effect" he is so concerned about was addressed in the book by the statement: "Perhaps the safest and

Catalogue of American Amphibians and Reptiles

The *Catalogue of American Amphibians and Reptiles* is seeking qualified contributors. Many American and a number of U.S. taxa remain to be assigned (see the partial listing below).

To encourage contributions by students and herpetologists in developing nations, the Society for the Study of Amphibians and Reptiles is making the following offer: for each published account (assignment is subject to approval by the pertinent section editor—names are listed below—and the *Catalogue's* editorial board) the author will receive 100 consecutively-numbered previously-published accounts. Here is an opportunity to make a contribution to the herpetological community and simultaneously build a complete set of accounts (otherwise available for $215 from the Publications Secretary). For more information about this offer contact Robert Powell, CAAR Editor, Department of Natural Sciences, Avila College, 11901 Wornall Road, Kansas City, Missouri 64145, USA.

If you are interested in writing an account, please contact the pertinent section editor: **Marvalee H. Wake** (Gymnophiona), Department of Integrative Biology, University of California, Berkeley, California 94720, USA; **R. Wayne Van Devender** (Caudata), Department of Biology, Appalachian State University, Boone, North Carolina 28608, USA; **John D. Lynch** (Anura), School of Life Sciences, University of Nebraska, Lincoln, Nebraska 68508, USA; **Michael W. Klemens** (Testudines), American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024-5192, USA; **Andrew H. Price** (Sauria and Amphisbaenia), Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744, USA; **Larry David Wilson** (Serpentes), Department of Biology, Miami-Dade Community College, Kendall Campus, 11011 S.W. 104th Street, Miami, Florida 33176, USA; **I. Lehr Brisbin** (Crocodylia), Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29801, USA.

Unassigned U.S. accounts:

Caudata: *Ambystoma barbouri, Batrachoseps aridus, B. attenuatus, B. campi, B. major, B. nigriventris, B. pacificus, B. relictus, B. simatus, B. stebbinsi, Desmognathus fuscus, Gyrinophilus subterraneus, Necturus alabamensis, N. beyeri, N. maculosus, N. punctatus, Plethodon albagula, P. chattahoochee, P. chlorobryonis, P. cylindraceus, P. glutinosus, P. grobmani, P. kiamichi, P. mississippi, P. ocmulgi, P. petraeus, P. richmondi, P. savannah, P. variolatus.*

Anura: *Acris crepitans, A. gryllus, Bufo compactilis, B. debilis, B. speciosus, B. woodhousii, Eleutherodactylus cystignathoides, E. guttilatus, E. marnockii, Hyla arenicolor, H. chrysoscelis, H. cinerea, H. eximia, H. versicolor, Pseudacris crucifer, P. ornata, P. regilla, P. triseriata, Rana pipiens, R. sphenocephala, Spea bombifrons, S. hammondi, S. intermontana, S. multiplicata.*

Testudines: *Eretmochelys, E. imbricata, Graptemys ernsti, G. gibbonsi, G. kohnii, Lepidochelys olivacea, Pseudemys, P. concinna, P. floridana, Trachemys, T. scripta.*

Sauria: *Callisaurus draconoides, Cnemidophorus flagellicaudus, C. gularis, C. inornatus, C. septemvittatus, C. sonorae, C. tigris, C. velox, Eumeces anthracinus, E. fasciatus, Gerrhonotus liocephalus, Holbrookia maculata, Phrynosoma modestum, Sceloporus jarrovii, S. scalaris, S. serrifer, Urosaurus microscutatus, Uta stansburiana.*

Serpentes: *Carphophis amoenus, Chilomeniscus cinctus, Chionactis, C. occipitalis, C. palarostris, Coniophanes, C. imperialis, Contia tenuis, Crotalus ruber, C. viridis, C. willardi, Diadophis punctatus, Elaphe guttata, E. obsoleta, Heterodon nasicus, Hypsiglena torquata, Lampropeltis getula, Leptodeira, L. septentrionalis, Masticophis bilineatus, Micrurus, Nerodia cyclopion, N. fasciata, Opheodrys aestivus, O. vernalis, Oxybelis, Regina alleni, R. rigida, Rhadinaea, R. flavilata, Salvadora, S. grahamiae, S. hexalepis, Sistrurus, Sonora, Storeria occipitomaculata, Tantilla gracilis, T. rubra, Thamnophis marcianus, T. radix.*

most logical place to release baby snakes is where their parents were captured." Indeed, radio-transmitter studies to date indicate that a corn snake may travel as much as 17 km in a straight line in one season, and that pine snakes have huge home ranges (Dick Franz, pers. comm.).

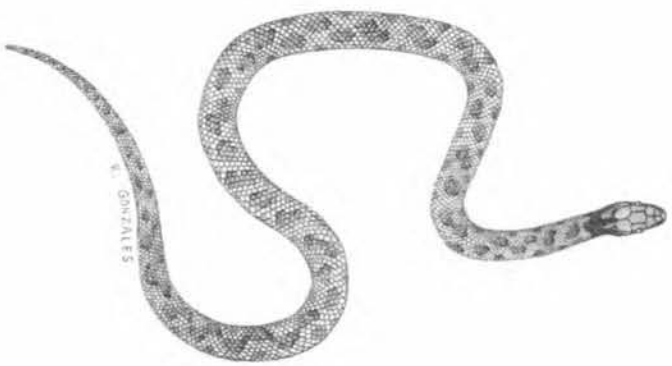
With regard to his comments on my views about the indigo snake, I must express amazement. He commented "as if captive breeding would have solved the problem of habitat destruction for this species." No, Mr. Rundquist, I do not think that captive breeding will solve the problem of habitat destruction, but it appears that little else will either. I am a firm believer in habitat preservation as a first line means of defense against extinction. I am a member of the The Nature Conservancy and even suggested that the readers of this book contribute to that cause and why. I noticed you carefully left this out of your quotations from the book.

I am also a realist. I live in Florida, where indigo snakes are supposed to be "protected." Indigo snakes have a home range of 75–400 hectares. Even in an area zoned for rural use, this translates into few long term viable populations over much of the state. This state is adding 400,000 new people per year, and even the gopher tortoise, which should be listed as endangered, will not be because of the tremendously negative economic impact that this will have. I would suggest that those who do not recognize the inevitable results of this kind of development are "incredibly naive," not those who suggest that captive breeding is a major positive force for the conservation of these animals. Even where human development is far away, such as in the national parks, pollution may be destroying entire populations of amphibians in the next few years. Can reptiles be far behind?

Lastly, if captive breeding and release are as inherently useless as Mr. Rundquist implies in his review, then why does the U.S. Department of the Interior suggest both of these alternatives be utilized in the species survival programs of the New Mexico ridgenose rattlesnake and the Concho water snake? Ask the respective state commissions of Florida and California how they would manage Florida panthers and California condors if they could do it all over again.

Mr. Rundquist has allowed our philosophical differences on the future of the remaining wilderness dictate his final non-recommendation of the book, in spite of his positive early comments about the "unique insights" with which he credits this book. If our debate here spawns a heated discussion among herpetologists about the role of herpetoculture in conserving elements of disappearing ecosystems, so be it.

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Hypsiglena torquata. USA: California: Tulare Co. Illustration by Ronald Gonzales.

ARTICLES

Preliminary Analysis Of Peripheral Blood Components Of *Macroclemys temmincki*

Peripheral blood components of approximately 60 species of reptiles including members of Testudines, Crocodylia, Sauria, and Serpentes have been published (Frye 1973; Girons 1970; Glassman et al. 1981). This project was undertaken to describe heretofore unstudied selected formed elements in the peripheral blood of *Macroclemys temmincki*.

Values for hemoglobin, hematocrit, red blood cell (RBC) counts and indices, and white blood cell (WBC) total and differential cell counts were determined from 10 alligator snapping turtles (2.8–31.8 Kg). The turtles were trapped from bayous and rivers in northern Louisiana, and transported after capture to the Northeast Louisiana University Turtle Research Facility and maintained in 1.5 x 1.5 x 1.5 m tanks at approximately 25°C during the study period (spring, 1991).

One to three mls of blood were collected in 3 ml heparinized (Lithium heparin) tubes via tail caudal vein puncture (Galbraith 1991; Powell and Knesel 1992). Thin smears of peripheral blood cells were stained with Wright stain (Wintrobe 1981) and examined to determine the percentages of cell types in the circulating blood. RBC's and WBC's were counted with a Neubauer hemocytometer, hemoglobins were determined by a cyanmethemoglobin colorimetric procedure (Sigma Diagnostics, P. O. Box 14508, St. Louis, Missouri, 63178, USA) and packed cell volumes were recorded from spun hematocrit tubes. Using determined hematocrit, hemoglobin, and the total number of red blood cells, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC) values were calculated.

The red blood cells were nucleated oval cells with homogeneous, translucent, pale pink cytoplasm. The oval, centrally located, dense nucleus contained a prominent chromatin condensation. Many of the cells were noted to contain intracorpuscular parasites, possibly *Haemogregarina* (Alleman and Jacobson 1992), *Haemoproteus*, or *Plasmodium* (Girons 1970) which have been reported to parasitize the RBC's of chelonians.

Cells in the lymphocyte series were composed of light blue cytoplasm and rounded ovoid nuclei with a coarse chromatin condensation pattern. The cytoplasm of some of the larger lymphocytes contained azurophilic granules (Girons 1970). Monocytes contained abundant blue-gray cytoplasm with a round, kidney shaped or lobulated nucleus (Frye 1973).

There were four types of cells in the granulocytic series: non-acidophils (similar in appearance to mammalian neutrophils), eosinophils, heterophils, and basophils (Alleman and Jacobson 1992; Frye 1973; Girons 1970). The non-acidophil (neutrophil) was seen as a large mononuclear cell containing abundant pale-pink to rose-violet granules in the cytoplasm. The small non-segmented nucleus, containing coarse clumped chromatin was usually located at the periphery of the cell. Heterophils and eosinophils were the most common white blood cells seen. The small dense dark blue nucleus, of each cell type, was eccentrically situated in the large cell and the cytoplasm was completely filled with eosinophilic granules. Heterophils differed from eosinophils by the presence of rod-shaped granules as opposed to the rounded granules of the eosinophil cell (Girons 1970). The circular cell of the basophil was easy to recognize by abundant dark-stained granules which filled the cell and obscured the nucleus.

Thrombocytes were noted as elliptical cells, occasionally seen in clumps, about one third the size of the RBC. Their spherical, highly chromophilic nucleus was centered in the blue gray cytoplasm. The nuclear:cytoplasm ratio was high with scant cytoplasm bordering

the nucleus. The thrombocytes were fragile and sometimes only the nuclei were present on the smear.

The number of WBC's per cubic millimeter of blood averaged 1,735. Per 100 cells, the average differential counts were eosinophils = 26.40, heterophils = 25.90, basophils = 19.70, nonacidophils (neutrophils) = 15.00, and monocytes = 3.30. The mean value for lymphocytes equaled 14.80.

Average hemoglobin (6.56 g/dl), hematocrits (22.8%), and RBC (419,000) values were used to calculate RBC indices: MCV, MCH, and MCHC = 551.50, 154.90, and 28.80, respectively. A summary of hematologic values of *Macroclemys temmincki* is presented in Table 1.

TABLE 1. Hematologic data for *Macroclemys temmincki*.

Parameter	Mean	Std. Dev.
	N = 10	
White Blood Cells (x 103/mm^3)	1.74	0.62
Eosinophils (per 100 cells)	26.40	4.81
Heterophils (per l00 cells)	25.90	4.95
Basophils (per l00 cells)	19.70	15.11
Non-acidophils (per 100 cells)	15.00	3.49
Lymphocytes (per 100 cells)	14.80	8.13
Monocytes (per 100 cells)	3.30	3.00
Red Blood Cells (x 105/mm^3)	419.00	56.82
Hemoglobin (g/dl)	6.56	0.77
Hematocrit (%)	22.80	4.23
Mean Corpuscular Volume (fL)	551.50	98.55
Mean Corpuscular Hemoglobin (pg)	154.90	25.99
Mean Corpuscular Hemoglobin Concentration (g/dL)	28.80	3.06

Hematological values found were comparable to previous data reported from other chelonian species (Melby 1974; Wintrobe 1981) with the exception of increased mean corpuscular volume and mean corpuscular hemoglobin. Further research is needed to describe the cytochemical staining characteristics of bone marrow and peripheral blood cells, and the identification of the intracorpuscular parasite.

Acknowledgments.—We would like to thank Jerry Liles and the medical technologists at North Monroe Hospital for their assistance.

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Vertebrate Predation On The Neotropical Amphisbaenian *Leposternon wuchereri*

Predation on neotropical amphisbaenians is poorly documented (Greene 1988), and even more so for the specialized genus *Leposternon* (Gans 1971a). Here we report on instances of predation on *Leposternon wuchereri* by seven species of vertebrates (four birds, two snakes, and one mammal). *Leposternon wuchereri* is a slender species and reaches 460 mm SVL, and until this study it was poorly represented in collections (Gans 1971a; U. Caramaschi, pers. comm.).

Fieldwork was done in the vicinity of Mucuri, southern Bahia, Brazil (ca. 18°05'S, 39°36'W, 10 m). The area is covered by cacao groves, remnants of coastal rain forest, and pasture (see Carvalho-Filho and Silva 1976 for further description of the site). In July 1991 (dry season) and January 1992 (rainy season), we collected 72 specimens unearthed by clearing and plowing tractors. Vouchers of *L. wuchereri* found in gut contents of some predators are in the Museu de Historia Natural, Universidade Estadual de Campinas (ZUEC) and the Departamento de Biologia, Universidade Federal do Espirito Santo (ZUFES).

Leposternon wuchereri was found both during dry and rainy seasons at 20-40 cm depth in the upper layer of 40-100 cm deep sandy soil limited by a deeper clay layer. Our 72 specimens plus 10-12 individuals caught by birds within the same period were found in an area of about 3500 m^2, which would indicate a population density of about one individual/50 m^2. Major items in the diet were earthworms (ca. 80%), which suggests that *L. wuchereri* is a food specialist (Zamprogno et al. 1992).

We observed two turkey vultures (*Cathartes aura*) as they glided closely behind a tractor, scanning the ground. Upon spotting an exposed *L. wuchereri* one bird alighted and swallowed the prey while standing on the ground. One focal bird (cf. Altmann 1974) caught six *L. wuchereri* in ca. 50 min of such hunting. A crested caracara (*Polyborus plancus*), two yellow-headed caracara (*Milvago chimachima*), and an unidentified hawk (probably an immature *Buteo*) used another tactic. They perched along the path of the tractor and scanned the ground; when a *L. wuchereri* was unearthed, a bird alighted near the prey and also swallowed it on the spot. Our presence did not disturb the birds; indeed, we had to compete with them to secure *L. wuchereri* specimens.

One coral snake (*Micrurus corallinus*), which was also unearthed by the tractor, disgorged a *L. wuchereri* which it had swallowed tailfirst—an indication that the prey probably was caught underground (O.A.V. Marques, pers. comm.). One individual of the fossorial colubrid snake *Elapomorphus wuchereri* also had remains of *L. wuchereri* in its gut.

One juvenile crab-eating fox (*Cerdocyon thous*) was found dead along a road. Three whole *L. wuchereri* and pieces of three other individuals (including heads and tails) were found in its gut.

In general, the raptors and the fox we observed are opportunistic predators on healthy or wounded small vertebrates and with the exception of *Buteo*, all are known to scavenge (Nowak and Paradiso 1983; Sick 1985; pers. obs.). Although raptors or foxes would not habitually feed on *L. wuchereri* were it not for tractors, clearing and plowing are far from being unusual conditions in

eastern Brazil, and may be regarded as a mortality factor for subterranean reptiles such as *L. wuchereri*. The sight of crested caracaras following plowing tractors and picking up unearthed reptiles and other animals is a common one in Brazil (Sazima and Abe 1991).

Heavy tropical rains and floods cause amphisbaenians and subterranean snakes to surface (pers. obs.), making them vulnerable to predation. This may be the case of a *Mesobaena huebneri* found in the gut of a wader, *Belonopterus cayennensis* (=*Vanellus chilensis*) in Colombia (Gans 1971b).

The only known specialized predators on *Leposternon* seem to be the similarly fossorial coral snakes (*Micrurus*). Boulenger (1885) reported on a *M. "lemniscatus"* (probably *M. ibiboboca*, see Campbell and Lamar 1989), which had eaten a *L. polystegum*. *Leposternon microcephalum* is the predominant prey in the diet of *M. corallinus* at several localities in the coastal rain forest of southeastern Brazil (O.A.V Marques and I. Sazima, unpubl. data). Some species of the fossorial snakes of the genus *Elapomorphus* also seem to specialize on amphisbaenian prey (T. Lema, pers. comm.; pers. obs.) but data are too limited to elaborate further.

The coral snake *Micrurus laticollaris* was found to prey on the amphisbaenian *Bipes canaliculatus* (Papenfuss 1982). Autotomized tails were found in 3-17% of 3820 specimens of three species of Bipes, and the tail loss was attributed to predation (Papenfuss 1982). Only two out of the 72 specimens of *L. wuchereri* (ca. 3%) had scars on the tail, which is short and does not autotomize. This small percentage of tail-scarred *L. wuchereri* (presumably survivors of predation attempts) may be viewed either as slight predator pressure (see Papenfuss 1982, for such a view on *B. biporus*) or, more likely, as evidence of low predation survival rates in an amphisbaenian with limited defenses.

Some amphisbaenians invoke obvious antipredator behaviors such as biting and thrashing (*Amphisbaena alba*, Gorzula et al. 1977), or displays of an easily broken tail (*A. fuliginosa*, Greene 1973; *A. mertensii*, and *A. vermicularis*, pers. obs.). *Leposternon wuchereri* appears to have a limited antipredator repertoire which includes simple escape movements and production of a foul odor. These behaviors are ineffective against both visually-oriented (birds) and olfactorily-oriented (mammals, snakes) predators.

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Why Do Snakes Sleep On The Vegetation In Central Amazonia?

Snakes are prey for diverse predators, from invertebrates to mammals (see review in Greene 1988). However, many studies of vertebrate predation fail to consider carnivorous invertebrates (McCormick and Polis 1982). For instance, snakes may be preyed upon by scorpions, spiders, giant waterbugs, ants, and centipedes although literature references are rare (Greene 1988; McCormick and Polis 1982). In an extensive review of snake predators, Greene (1988) provided references for nearly 160 snake species, yet only 12 were by invertebrates.

Many diurnal snakes, even exclusively terrestrial species, are found at night sleeping on leaves and branches of low vegetation in Amazonian forests (Dixon and Soini 1986; Duellman 1978; pers. observ.). By sleeping above the ground, these snakes are less vulnerable to terrestrial predators. During a study on forest snakes in Central Amazonia, I found evidence that predation by ants may be a risk factor in sleeping on the ground for some snakes, here illustrated by the vine snake, *Oxybelis argenteus*, an arboreal colubrid.

Observations were made from July 1991 to October 1992 in a primary forest reserve (Reserva Florestal Adolpho Ducke, Instituto Nacional de Pesquisas da Amazonia) 25 km north of Manaus, Amazonas, Brasil. About 90 man-hrs of exclusive snake searching were conducted each month, during different times of the day. Visual searches were conducted by walking slowly along forest trails; the search effort extended to all visually-accessible microhabitats. Additional snake sightings were made during other activities. Each captured snake was measured (snout-vent length and tail length), weighed, marked by ventral scale clipping, and released at the site of capture.

A total of 356 individual snakes of 41 species were found (45 by day, 311 at night). Three species of diurnal, terrestrial snakes were found coiled asleep on the vegetation at night: four *Drymoluber dichrous* (0.7-1.6 m above ground), nine *Liophis reginae* (0.3-2.3 m), and three *Liophis typhlus* (0.3-0.7 m). Several arboreal or semiarboreal, diurnal and nocturnal snakes were also found coiled asleep or resting on the vegetation at night (e.g., diurnal species: *Chironius* spp., *Oxybelis* spp., and *Pseustes* spp.; nocturnal species: *Dipsas catesbyi*, *Leptodeira annulata*, and *Tripanurgos compressus*). No snake was found sleeping on the ground during this study.

Evidence of the risk of sleeping on the ground was observed in *Oxybelis argenteus*. Eighty-seven sightings were made. During the day, snakes (N = 10) were found active on low vegetation, searching for small frogs on the forest floor. At night (N = 77) they were found coiled asleep on thin branches of shrubs and small trees and on horizontal palm leaves, 8-400 cm ($\bar{x}$ = 138.3, SD = 69.5) from the ground. All snakes found at night were at least 30 cm above ground, except one found 8 December 1991, that was only 8 cm above ground. This snake had approximately 200 mm of its tail resting on the leaf litter of the forest floor. This part of the tail showed several small bites clearly made by ants, probably a species of *Camponotus*. The proximal portion of the bitten tail had deep bites that went through the vertebrae. The snake had no apparent prey in the gut and behaved normally when manipulated, except that it could not move the bitten portion of the tail. On 14 January 1992 I again observed this marked individual on a shrub, 120 cm from the ground and 23 m from the site of the first observation. By then it had lost the bitten part of the tail and three vertebrae were exposed at the tail tip, with no evidence of regeneration. This individual was not seen again. (At a site 250 km north of Manaus, I observed bites similar to those described above made by *Camponotus* ants on the tail and body of several snakes that fell on pitfall traps raided by these ants).

At the study site, other terrestrial, diurnal animals were found on low vegetation at night (e.g., insects, spiders, frogs, and lizards). Strong predation pressure may have forced snakes and other animals to avoid sleeping on the ground. Although many terrestrial vertebrates that prey on snakes occur in Neotropical forests (e.g., Cunha and Nascimento 1978; Dixon and Soini 1986; Duellman 1978; Janzen 1983), invertebrate predators, including carnivorous ants and tarantulas, also may have contributed to this pressure (see McCormick and Polis 1982). Tarantulas (Theraphosinae) are able to eat small to medium-sized snakes in captivity (pers. obs.); these spiders and carnivorous ants both are very common throughout Amazonia. As proposed by McCormick and Polis (1982), group foraging by ants and the large size of tarantulas may facilitate predation on relatively large vertebrates.

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Aerial Basking By Hatchling Freshwater Turtles

Many freshwater turtle species exhibit aerial basking behavior (Boyer 1965). Janzen et al. (1992) described three observations of basking by hatchling freshwater turtles (considered, as in the present study, to include turtles in their first full growing season) for the species *Chrysemys picta*, *Kinosternon odoratum*, and *Trachemys scripta*. They commented on the lack of reports of basking behavior in hatchlings, and were able to cite similar observations for only six other species (Table 1). They suggested that hatchling basking is more common than can be inferred from literature records, either due to researchers' inability to observe the phenomenon or their failure to report it.

TABLE 1. Reports of aerial basking by hatchling freshwater turtles.

Family	Species	Source
Emydidae		
	Chrysemys picta	Janzen et al. 1992; Vogt[1]; this study
	Clemmys guttata	Janzen et al. 1992[2]
	Emydoidea blandingi	Janzen et al. 1992[2]
	Graptemys flavimaculata	Vogt[1]
	G. geographica	Janzen et al. 1992[2]; Vogt[1]
	G. nigrinoda	Waters 1974; Vogt[1]; this study
	G. oculifera	Vogt[1]; this study
	G. ouachitensis	Vogt[1]; this study
	G. pseudogeographica	Janzen et al. 1992[2]; Vogt[1]; this study
	G. pulchra	Shealy 1976; Vogt[1]; this study
	G. versa	This study
	Pseudemys concinna	Vogt[1]; this study
	Trachemys scripta	Moll and Legler 1971; Auth 1975; Janzen et al. 1992; Vogt[1]; this study
Kinosternidae		
	Kinosternon carinatum	Vogt[1]
	K. leucostomum	Vogt[1]
	K. minor	Vogt[1]
	K. odoratum	Janzen et al. 1992
Trionychidae		
	Apalone mutica	This study
	A. spinifera	This study
Pelomedusidae		
	Podocnemis unifilis	Vogt[1]

[1]References attributed to Vogt are observations confirmed by hand capture while snorkeling (R. Vogt, pers. comm.).
[2]Cited as pers. comm. from D. Moll and E. Moll.

I report basking behavior for hatchlings of six species for which it has not been previously reported, as well as five for which it has, and include unpublished observations of hatchling basking (R. Vogt, pers. comm.) (Table 1). These observations suggest that basking by hatchling turtles is indeed common, and basking by hatchlings is shown to occur both among larger conspecifics, and segregated by basking substrate (with hatchlings often using smaller branches or logs) and occasionally by habitat.

Methods.—Observations were made either through capture techniques that rely on the basking habit of turtles (dipnetting and hand capture of basking turtles and basking traps), or with a 36X spotting scope. Captured hard-shelled turtles can be readily identified as hatchlings by inspection of growth rings (only a "zero" ring is present in hatchlings). Positive identification of turtles as hatchlings when viewed with a spotting scope is more problematic, but is facilitated by the fact that rate of growth declines progressively with age in turtles (e.g., Dunham and Gibbons 1990), such that hatchlings exhibit a marked difference in body size from other cohorts in a population. I have found that it is best to assess the size of a turtle by viewing it with the naked eye after observing it through a spotting scope, or by scaling it against larger conspecifics with which it may be basking. Additional useful diagnostic characteristics of hatchlings are that their heads are larger relative to body size, and their shells are rounder in a horizontal plane, than in older turtles. It is possible that some of the spotting scope observations reported herein as involving hatchlings actually involve turtles that were in their second growing season, particularly for individuals that had grown relatively slowly in their first season. I am confident, however, that most or the vast majority of these turtles were hatchlings.

Data were collected during a mark-recapture census of a northern Idaho population of *Chrysemys picta* in 1986 and 1987 (the Syringa Trailer Court population in Lindeman 1990). Principal means of capture were dipnetting turtles as they basked along the shorelines of three adjacent ponds, and basking traps. In 1992 I began population surveys of various turtle species in Kentucky Lake, an impoundment of the lower Tennessee River in Kentucky. Basking-dependent capture methods used included hand capture and basking traps.

A spotting scope survey of basking turtles was conducted between 24 July and 8 August 1992 in several major rivers of Mississippi, Louisiana, Texas, and Arkansas. Drainages surveyed included the Tombigbee, Pascagoula, and Pearl in Mississippi, the Sabine in Louisiana and Texas, the Trinity, Brazos, Colorado, and Guadalupe in Texas, and the Red in Arkansas. At each site (defined as an access point on the river, usually at a road crossing), a single count of basking turtles present was made from shore.

TABLE 2. Captures of basking *Chrysemys picta* hatchlings in an Idaho population. I = Individuals (excluding recaptures), I+R = Individuals + recaptures. No hatchlings were recaptured in either year.

Year	Capture method	Number of hatchlings	Total numbers captured I	Total numbers captured I+R	Percent hatchling I	Percent hatchling I+R
1986	Dipnet	5	97	139	5	4
	Basking trap	0	17	18	0	0
	Combined	5	109*	157	5	3
1987	Dipnet	9	128	203	7	4
	Basking trap	4	121	171	3	2
	Combined	13	177*	374	7	3

*Combined numbers are not additive because some individuals were caught by both methods.

I made four long-term observations of basking behavior of Kentucky Lake turtles using a spotting scope in 1992, from partial concealment afforded by shoreline vegetation. Absolute numbers of each species could not be determined due to the tendency for turtles to submerge and then re-emerge over the course of observation. Instead, minimum numbers of each species were determined based on maximum numbers seen simultaneously, together with notes on different size classes and occasional distinctive individual markings.

TABLE 3. Hatchling turtles observed basking during a survey of Gulf Coast river drainages, 24 July – 8 August 1992.

Species	Number of hatchlings (Number of different sites)	Number of non-hatchlings at same sites	Total number of individuals seen (Total number of sites where seen)	Percent hatchling: Sites with hatchlings	Percent hatchling: All sites
Apalone spinifera	1 (1)	0	3 (3)	100	33
Graptemys caglei	0	—	3 (2)	—	0
G. flavimaculata	0	—	9 (3)	—	0
G. nigrinoda	1 (1)	6	10 (3)	14	10
G. oculifera	2 (1)	15	27 (2)	12	7
G. ouachitensis ouachitensis	0	—	13 (3)	—	0
G. ouachitensis sabinensis	2 (1)	40	56 (3)	5	4
G. pseudogeographica	0	—	13 (6)	—	0
G. pulchra	6 (3)	9	22 (7)	40	27
G. versa	2 (1)	6	16 (3)	25	13
Kinosternon carinatum	0	—	6 (3)	—	0
Pseudemys concinna	1 (1)	1	15 (5)	50	7
P. texana	0	—	45 (10)	—	0
Trachemys scripta	0	—	14 (7)	—	0
Totals	15 (8)	77	252 (33)	16	6

Results.—Hatchlings comprised 5% and 7% of the *C. picta* captured by one or both capture methods in 1986 and 1987, respectively (Table 2). Counting recaptures, hatchlings constituted 3% of all captures in both years (Table 2). At Kentucky Lake in 1992 I captured seven aerially basking hatchlings by hand: five *Trachemys scripta* (plus one recapture), one *Graptemys ouachitensis*, and one *Apalone mutica*. The latter, which as a trionychid exhibited no growth rings, had a prominent yolk sac scar and was 38 mm plastron length and 53 mm carapace length on 18 June (compare to hatchling body sizes reported in Table 4 of Plummer 1977). One additional hatchling *G. ouachitensis* drowned when it became entangled in netting inside a basking trap.

Table 3 details numbers of hatchling turtles observed during the 1992 survey of Gulf Coast drainages. Fifteen of 252 turtles (6%) identified during this survey, of 7 of the 14 species seen, were judged to be hatchlings (Table 3). Negative results generally were obtained for species seen in lesser abundance (Table 3).

Two longer observations were made on 13 and 20 June 1992 in Kentucky Lake, both involving single large logs, near the creek inlets of Jones Creek Embayment and Nickell Cove, respectively. Minimum numbers of turtles seen were 17 *Trachemys scripta*, 4 *Pseudemys concinna*, and 1 *Graptemys ouachitensis* for the first observation, and 9 *T. scripta*, 3 *G. pseudogeographica*, 2 *P. concinna*, and 1 *G. ouachitensis* for the second. None of these were hatchlings; however, during the second observation a hatchling *T. scripta* basked nearby for approximately two hours on a small branch that protruded ca. 15 cm above the water.

On 19 August 1992, I observed basking turtles from 0852 until 1430 h in a cove on the canal that connects Kentucky Lake to Lake Barkley, an impoundment of the lower Cumberland River. I observed a minimum of 16 *Graptemys ouachitensis*, 13 *Trachemys scripta*, 3 *G. pseudogeographica*, and 3 *Pseudemys concinna* (Table 4). Of these, at least five hatchling *T. scripta* and two hatchling *P. concinna* were present. Basking times for the *T. scripta* hatchlings were as follows: on a small branch in shallow water, 0852-1018 h and 1040-1223 h (probably the same individual); on a large log in shallow water, 0907-1115 h and 1008-1115 h; and on a floating log in deeper water, 0940-0945 h, 1010-1257 h, and 1345-1400 h (possibly a single individual), and 1045-1100 h. Basking times for *P. concinna* hatchlings were 0852-1018 h and 1052-1227 h on the first site (probably the same individual) and 0915-1130 h on the second site. The percent of turtles that were hatchlings declined throughout the observation, particularly after 1100 h; however, this may have been due to the later peak of basking *Graptemys*, of which none were hatchlings, since peak numbers of hatchlings and of all individuals of *T. scripta* and *P. concinna* coincided at 1100 h Table 4).

Finally, on 31 August 1992, basking *Apalone mutica* were observed on a gravel bar in Nickell Cove, from 0910 until 1230 h. Maximum density was seven, of which one was judged to be a hatchling. It basked from 1108 until 1137 h.

Discussion.—Including the unpublished observations of R. Vogt (pers. comm.; see Table 1), aerial basking for hatchling freshwater turtles has now been described for 20 species in four families (Table 1), and is very likely characteristic of other species in which larger individuals bask habitually. The apparent ease with which hatchlings are observed basking confirms speculation by Janzen et al. (1992) that this is a common behavior that has merely been little noted in literature accounts of basking behavior. Many of the hatchlings observed basking in the present study were among larger con- and heterospecifics, although some used smaller basking substrates that might not have held larger turtles, and some observations suggest habitat segregation on a larger scale as well. For instance, many of the Idaho *Chrysemys picta* hatchlings were dipnetted from atop emergent shoreline grasses or *Typha* leaves in an area of one pond not frequented by larger turtles. Three of the hatchling *Trachemys scripta* captured at Kentucky Lake were in a shallow cove of approximately 40 m^2 adjacent to a boat ramp, where I have frequently observed hatchlings and small juveniles, but never adults, of *T. scripta*, *Graptemys ouachitensis*, and *G. pseudogeographica*. Most hatchlings seen during the survey of Gulf Coast river drainages were observed among larger conspecifics (Table 3). Exceptions included two *G. pulchra* hatchlings seen in the Chickasawhay River near Meehan Junction, Mississippi, and the two *G. versa* in the Llano River near Junction, Texas, which basked in separate backwaters apart from six larger *G. versa* seen in the main channel. Near Shubuta, Mississippi, the only turtles seen were a hatchling *Apalone spinifera* and a hatchling *Pseudemys concinna* which shared a small (1 m long) log with a larger *P. concinna*. Finally, the small branches in shallow water utilized by two hatchlings in the observation conducted 19 August 1992 at Kentucky Lake were also utilized by up to three juvenile *T. scripta* and one juvenile *G. ouachitensis*, but no adult turtles.

TABLE 4. Observations of basking turtles in a cove on the canal connecting Kentucky Lake and Lake Barkley, conducted 19 August 1992. Numbers of hatchlings appear in parentheses.

Time	*Trachemys scripta*	*Pseudemys concinna*	*Graptemys ouachitensis*	*Graptemys pseudogeographica*	Total	Percent hatchling
0852	1(1)	1(1)	—	—	2(2)	100
0900	3(2)	2(1)	1	—	6(3)	50
0915	3(2)	3(2)	2	—	8(4)	50
0930	4(2)	3(2)	3	—	10(4)	40
0945	4(3)	2(2)	2	—	8(5)	63
1000	4(4)	3(2)	4	—	11(6)	55
1015	6(4)	3(2)	3	—	12(6)	50
1030	10(3)	1(1)	5	—	16(4)	25
1045	11(5)	3(2)	4	—	18(7)	39
1100	13(5)	2(2)	7	1	23(7)	30
1115	11(2)	3(2)	8	1	23(4)	17
1130	10(2)	1(1)	12	1	24(3)	13
1145	7(2)	2(1)	13	3	25(3)	12
1200	5(2)	1(1)	12	1	19(3)	16
1215	5(2)	1(1)	13	—	19(3)	16
1230	5(1)	—	13	—	18(1)	6
1245	6(1)	—	16	—	22(1)	5
1300	4	—	12	1	17(0)	0
1315	5	—	11	1	17(0)	0
1330	3(1)	—	12	—	15(1)	7
1345	4(1)	—	13	—	17(1)	6
1400	3	—	7	—	10(0)	0
1415	3	—	7	—	10(0)	0
1430	3	—	7	—	10(0)	0

Boyer (1965) discussed observations of basking behavior in terms of coincident physical conditions. He concluded that basking is primarily, but not exclusively, a thermoregulatory behavior. Turtles bask as a means of elevating their body temperature, presumably to facilitate subsequent activities such as foraging, mating, or nesting, and possibly also to increase digestive efficiency. Observations of turtles basking under natural conditions indicate that basking is used to maintain preferred body temperatures (Crawford et al. 1983; Schwarzkopf and Brooks 1985). Other benefits derived from basking apparently include drying of the epidermis, which eliminates plant and animal parasites and aids in ecdysis (Boyer 1965), and exposure of turtles to grackles (*Quiscalus quiscula*) which consume attached leeches (Vogt 1979). Pritchard and Greenhood (1968) speculated that basking may also promote vitamin D synthesis.

Presumably, the same thermoregulatory and other physiological demands that cause older turtles to bask are also applicable to hatchlings. That such demands are important is seen in the time spent basking, which cannot be spent foraging or engaging in reproductive activities (Crawford et al. 1983), and in the fact that basking exposes turtles to predation (e.g., Ross 1988). Under threat of predation, hatchlings appear to have the same escape behavior as larger turtles—diving into the water and swimming downward and away—as several hatchlings have used this strategy effectively in Kentucky Lake to avoid hand capture by me. Although their smaller size and less calcified shells expose them to a greater range of potential predators, my observations together with those of Janzen et al. (1992) and Vogt (pers. comm.) suggest that the cost-benefit ratio of basking still favors basking over not basking for hatchling turtles. Further studies should examine possible differences between hatchlings and larger turtles in time spent basking. Such differences, if they exist, may relate to differential heating relationships based on body size and shell shape (Boyer 1965), and ontogenetic differences in diet and metabolism (e.g., as related to calcium intake and shell formation; Clark and Gibbons 1969).

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Shifts In Activity Patterns In Lizards

Lizards can generally be categorized according to their activity patterns: nocturnal, diurnal, crepuscular, or a combination thereof. However, sufficient examples exist to suggest that many species might exhibit activity outside of their normal (or recognized) activity periods. These exceptions appear, in part, to be driven by three major classes of events: effects of urbanization, species interactions, and resource availability.

Urbanization.—On 23 November 1990, between 1930 and 2000 h, two actively foraging *Cryptoblepharus poecilopleurus* (a diurnal skink) were collected under porch lights of a dwelling on Cocos Island, Territory of Guam. This species was also observed in 1988 feeding at night under lights on Cocos Island (G. Rodda, pers. comm.). We have observed *Anolis carolinensis* actively foraging in vegetation at 0530 h under lights at a house in Edinburg, Hidalgo Co., Texas on 16 October 1992. Schwartz and Henderson (1991) observed nocturnal foraging in normally diurnal *Anolis bimaculatus*, *A. cristellus*, and *A. sagrei*. Powell and Henderson (1992) reported three additional diurnal species (*A. marmoratus*, *A. sabanus*, and *A. gingivinus*) that foraged around lights nocturnally. Schwartz and Henderson have termed the above phenomena the "night-light" niche in which artificial lights extend the foraging period for typically diurnal lizards.

Species Interactions.—*Hemidactylus frenatus* has been introduced on islands throughout the tropical Pacific Basin and has had presumed negative impacts on native gekkonids (McCoid 1993; McKeown 1978; Zug 1991). Petren et al. (1993) have shown experimentally that *H. frenatus* replaced *Lepidodactylus lugubris* and concluded that avoidance behavior by *L. lugubris* was responsible for observed changes. In an unpublished study on Hawaii, Lazell (in litt.) documented the replacement of *L. lugubris* by *H. frenatus* but did not speculate if this replacement was due to behavioral interaction or direct predation. Our observations in the Territory of Guam indicate that predation probably plays a role in interactions between

these two species. We have observed adult *H. frenatus* pursuing and consuming juveniles and hatchlings of both conspecifics and *L. lugubris*. We have also repeatedly observed that small *H. frenatus* (19-30 mm SVL) became active about 1400 h in a house on Guam (McCoid and Hensley 1991) and openly foraged on ceilings and walls. At about dusk (1830 to 1930 h), these hatchlings and juveniles retreated to refugia and either reduced their foraging areas to immediately adjacent to the refugia or did not emerge until the following day. At dusk, adult and subadult (to 65 mm SVL) *H. frenatus* emerged from daytime refugia and foraged in the areas formerly occupied by much smaller *H. frenatus*. We suggest that this may be an heretofore unrecognized activity shift in young *H. frenatus* to reduce cannibalism.

Resource Availability.—McKeown (1978) mentioned that *Hemidactylus garnoti* may emerge diurnally to feed. Zug (1991) noted the same phenomenon for *Gehyra oceanica* and *G. vorax*. We have observed (during the span of daylight hours), on numerous occasions, three species of nocturnal gekkonids (*L. lugubris*, *G. oceanica*, and *Perochirus ateles*) feeding diurnally on Guam and Cocos Island (Territory of Guam). *Lepidodactylus lugubris* is a common human commensal that has been observed numerous times diurnally feeding on sugar-based food scraps. On Guam, we have also observed this species diurnally feeding on the blooms (and/or insects attracted to the blooms) of palm trees (*Cocos nucifera*). Groups of one to five have been seen around a single bloom. On Cocos Island, we have observed both *G. oceanica* and *P. ateles* diurnally feeding on palm blooms (and/or insects attracted to the blooms) in groups of one to five. Because these feeding events do not involve large numbers of lizards, we suspect that only the inhabitants of that tree are involved in the periodic feeding episode even though not all trees are in bloom at the same time. We have also observed that these feeding assemblages involve only conspecifics. We suggest that some normally nocturnal gekkonids in the tropical Pacific routinely alter activity patterns to take advantage of periodically available resources.

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Applicants must designate to which of the five categories their proposal is submitted (although the committee reserves the right to reassign categories). All proposals must be submitted (postmarked) no later than 31 DECEMBER 1993 to be considered. Failure to meet the guidelines may result in elimination of a proposal from consideration. The awards will be announced by 1 April 1994. Successful applicants will be expected to submit a written report of the results of this support within a reasonable amount of time after the project year is completed. They are also encouraged to submit the results of research projects for publication in the *Journal of Herpetology* or *Herpetological Review* or to present their findings at the annual meeting of the SSAR. Submit proposals or questions regarding application procedures to: *Dale Belcher, Chair, SSAR Grants-in-Herpetology, Rio Grande Zoo, 903 Tenth St. SW, Albuquerque, New Mexico 87102-4098, USA. Tel. (505) 843-7413, FAX (505) 842-7281.*

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Natural Occurrence Of Shell Abnormalities In Hatchling Red-Footed Tortoises (*Geochelone carbonaria*)

The characteristic arrangement of the scutes covering the carapace and plastron of turtles is of wide use in the taxonomy of the order (Lovich and Ernst 1989; Lovich et al. 1991; Pritchard 1979). Abnormalities in the carapace and plastron scutes, however, are frequently reported for different species of turtles (Pritchard 1979; Zangerl 1969). Experimental studies have shown that such abnormalities can be related to inadequate temperature or humidity levels in which the embryo has developed (Lynn and Ullrich 1950; Packard et al. 1987). Nevertheless, the frequency of abnormalities in turtles, and even reptiles, in nature is poorly known.

A group of hatchling red-footed tortoises, *Geochelone carbonaria*, was confiscated from poachers by federal forest police during transportation to southeastern Brazil. The tortoises were caught in northeastern Brazil to be sold in the pet trade. Examination of the 163 hatchlings revealed that 19% had shell abnormalities on either the carapace or plastron. The presence of one or two supranumerary scutes was present in 9.2%. of the individuals, and was by far the most common abnormality. In 6.1% of tortoises, the carapace was deformed; 3.1% had the scute partially or completly fused, and 2.4% showed irregular arrangement of the scutes. The scutes most affected were vertebrals (37.9%), pleurals (31%), marginals (24%), and supracaudal (3.4%). Table 1 depicts the frequency of scute abnormalities observed in our sample.

Geochelone carbonaria has a wide geographic distribution throughout South America (Pritchard and Trebbau 1984). The female produces 2–7 eggs, measuring ca. 4.9 x 4.2 cm, each reproductive season (Medem et al. 1979; Pritchard and Trebbau 1984). The eggs are buried in a shallow hole at an approximate depth of 6–10 cm (Pritchard and Trebbau 1984). The incubation time ranges from 105 to 202 days (Medem et al. 1979). *G. carbonaria* is often found in temporary habitats (Pritchard and Trebbau 1984), such as the "caatinga," a thorn shrub vegetation found in most of northeastern Brazil, where the hatchling tortoises were obtained. In such an environment, with eggs buried in a shallow nest, and having long incubation periods, embryos are often exposed to harsh seasonal conditions. Under these circunstances it is reasonable to suppose that, as in other chelonian species so far reported (cf. Lynn and Ullrich 1950; Packard et al. 1987), environmental conditions during incubation may result in embryonic deformities in *G. carbonaria*.

TABLE 1. Frequency of carapace scute abnormalities in a sample of 163 hatchling *Geochelone carbonaria*. Abbreviations: vert. = vertebrals; pleur. = pleurals; marg. = marginals; s.c. = supra-caudals; nc = normal count for the species.

N	vert.	pleur.	marg.	s.c.
1	7	9	nc	nc
1	6	nc	23	nc
1	nc	nc	23	nc
1	nc	nc	24	nc
1	4	9	nc	nc
1	nc	nc	nc	2
1	nc	7	nc	nc
1	4	nc	nc	nc
2	6	9	nc	nc
2	6	nc	nc	nc
2	4	nc	20	nc
2	nc	nc	20	nc
4	nc	9	nc	nc
nc	5	8	22	1

The abnormalities observed in hatchling *G. carbonaria* are similar to those reported for experimental studies in which the eggs of other species were exposed to temperature or humidity stress (Lynn and Ullrich 1950). The experimental results suggest that the abnormalities we observed may be caused by environmental stress during incubation. However, severe deformities like those reported by Lynn and Ullrich (1950) were not seen in our sample of *G. carbonaria*. However, Lynn and Ullrich (1950) dissected the eggs at the end of the incubation period, and removed embryos with gross deformities. If such severe deformities occurred in *G. carbonaria*, the young turtles may fail to emerge from the egg or the nest, or may be discarded by poachers. Therefore, the incidence of abnormalities in *G. carbonaria* may be even higher than here reported.

Shell abnormalities were observed in one fifth of the sample of hatchling *G. carbonaria* studied. However, scute abnormalities like those here reported are also frequently observed in adult tortoises (Pritchard 1979; pers. observ.). This finding may suggest that these scute abnormalities do not affect the fitness of the red-footed tortoise.

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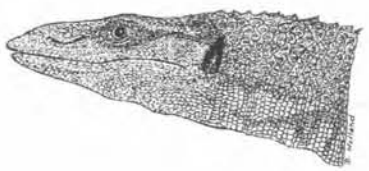
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POINT OF VIEW

Comments On The Distribution Of *Clemmys insculpta* On The Coastal Plain Of Maryland

"The problem with wood turtles is that people just can't leave them alone."—Lazell (1976)

Of the 46 species that comprise the reptile fauna of Maryland, the distribution of the wood turtle, *Clemmys insculpta*, is the most enigmatic and is one that unfortunately will never be accurately known. This situation arises from three factors: (1) the species is at one limit of its range in Maryland (Conant and Collins 1991; Ernst 1972; Iverson 1992) and distributions typically become erratic under such circumstances, (2) this active and handsome turtle has great appeal that frequently leads to its collection and release or escape elsewhere, and (3) there has been, and continues to be, inadequate documentation of distributional data published by Marylanders, not only for the wood turtle but for the herpetofauna generally. This review has been prompted by a recent article by Norden and Zyla (1989), who reported a number of wood turtle localities from the coastal plain of southern Maryland. I think these authors have not attended to the second and third points, and have not seen the necessity to be critical of their records, relying instead on sheer numbers to speak for themselves. Criticism of their note is thus hindered somewhat because the authors do not explicitly state what their records mean. Are they evidence of natural occurrence and supportive of a previously mapped distribution (Ernst 1972), or are they suggestive of introductions, which have a rich tradition in the area (Brady 1937; Carver 1970; Conant 1958a; Cooper 1959, 1960, 1961, 1965; Dukehart 1884; Fowler 1943, 1945; Groves, J. D. 1972; Groves, M. F. 1940; Hardy and Mansueti 1962; Harris 1966, 1968, 1969b, 1975; Mansueti 1941a, b; Mansueti and Wallace 1960; Manville 1968; McCauley 1945; Nemuras 1964; Nemuras and Sparhawk 1966; Norman 1939; Polley 1989; Rambo 1992; Reed 1956b, c, 1957, 1958a; Schwartz and Dutcher 1961; Truitt 1939)? Or are they perhaps a combination of the two? The first possibility seems to be what the authors believe, and it is on this assumption that the following comments are based.

The earliest record of the wood turtle on the coastal plain of Maryland appears to be USNM 14582 from Havre de Grace, Harford County, collected in 1886. Havre de Grace lies just below the Fall Line at the mouth of the Susquehanna River, and precisely where the specimen was taken is not known. Henshaw (1907) mentioned this specimen and McCauley (1945) cited and mapped it, but he did not take the locality literally and regarded *Clemmys insculpta* as absent from the coastal plain. In any event, the Susquehanna River Valley has undoubtedly been an important dispersal corridor for the wood turtle (the species is well documented upstream—Conant 1958a; Cooper 1949; McCoy 1982; Prince et al. 1955) and the record presents no distributional problem. As recorded by McCauley (1945), Surface (1908) was the first author to report *Clemmys insculpta* from an unquestionably coastal plain locality at White Marsh, Baltimore County. McCauley (1945) clearly discounted this record, but Reed (1956a) found it quite acceptable and suggested that McCauley was misguided and unclear in his reasons for not accepting it. Having examined the disputed passage in Surface (1908), I agree with McCauley that there is no basis for assigning this vague verbal report to *Clemmys insculpta*, and that Surface was reckless in so doing. It should also be noted that McCoy (1982) considered Surface's herpetological work to "consist largely of uncritical compilations from the literature." Norden and Zyla (1989) do not mention either of these localities.

The next report from the Maryland coastal plain, this time on the Eastern Shore, was that of Norman (1939), who noted a specimen (NHSM 529; discarded) found "near Easton City," Talbot County, taken on 9 September 1939. Conant (1958a) and catalogue data fix its point of collection more precisely at 4.5 miles (7.2 km) W Easton, AOR on Md. Route 17 (now Md. Route 33). Fifty years after the collection of this turtle, and without any additional material having been reported or taken anywhere near Easton, it is surprising to see Norden and Zyla (1989) giving credence to this record. Nearly all herpetologists (Conant 1958a, b, 1975; Conant and Collins 1991; Cooper 1960, 1965; Harris 1969b, 1975; McCauley 1945) who have worked comprehensively with the Maryland herpetofauna have rejected this locality, the lone exception being Reed (1956a, b, c, 1958b). Nonetheless Norden and Zyla have paid little heed to the weight of evidence against this record, and have chosen to cite Reed (1956a, 1958b) for support. Reed (1956a) was "sure" *Clemmys insculpta* occurred in the vicinity of Easton because "Many plants are known off the Piedmont Plateau only in this one Coastal [sic] region of the Eastern Shore." Leaving aside the above locality clarification, which places the site out on a narrow peninsula, it seems dubious justifying a 70 km (across the Chesapeake Bay from Bennings, District of Columbia) or 90 km (from Havre de Grace, Harford County) range extension of a vertebrate on the basis of "many" disjunct species of plants. More important, Reed, as well as Norden and Zyla, are under the misapprehension that the wood turtle is a piedmont species, not recognizing that it is a montane (in Maryland especially) and northern animal whose range encompasses very little of the piedmont, regardless of how liberally one accepts locality records. Thus there can be no convincing correlation between a montane turtle found in a remote area of the coastal plain that possesses an unquantified number of piedmont plants. Reed (1958b) listed localities for and crudely mapped 17 amphibian and reptile taxa that he considered to be "predominantly Piedmont in distribution in Maryland and the Delmarva Peninsula, but that are also known from the Coastal Plain of southern Maryland and the Delmarva Peninsula." This paper fails remarkably in its objective, with only one taxon, *Natrix* (=*Regina*) *septemvittata*, meeting the criterion. Six of the species listed, *Carphophis amoenus*, *Haldea* (=*Virginia*) *valeriae*, *Lampropeltis getulus*, *Opheodrys vernalis*, *Storeria occipitomaculata*—and *Clemmys insculpta*—are emphatically not "predominantly Piedmont in distribution." Reptile distributions in Maryland were well known long before Reed's 1958b article (McCauley 1945) and 45 years of subsequent field work have not significantly altered them. No comprehensive work on the amphibians of Maryland existed prior to Reed's efforts in herpetology (and none exists today), but had he consulted his own privately published specimen lists or, better, thoroughly surveyed museum holdings, he might not have committed so many egregious errors. If Norden and Zyla (1989) had wanted to build a case for the occurrence of *Clemmys insculpta* on the central Eastern Shore, they would have been better served by citing one of Norden's own notes (Lee and Norden 1976) and papers mentioned therein.

The article by Norden and Zyla (1989), the focus of this review, records 12 new localities for the wood turtle in southern Maryland: three in Anne Arundel County and nine in Prince George's County; the species had not been reported before from the former county. They also plot two previously mapped sites shown by Ernst (1972) in southern Maryland. Superficially this appears to be impressive evidence of natural occurrence, but I believe there are grounds for skepticism.

Although I find none of Norden and Zyla's localities compelling, I do find some more implausible than others. It is highly unlikely that naturally occurring populations of *Clemmys insculpta* could exist near Colmar Manor and at "Mt Rainer" (Mount Rainier) and remain undetected until 1989. The two localities, while only about 3.0 km apart, lie in a densely populated portion of Prince George's County and within 2.0 km of the District of Columbia, an even more heavily urbanized area. The National Museum has extensive holdings for the District of Columbia and surrounding counties that date

back over one century, yet no specimens of *Clemmys insculpta* from Prince George's County (or Anne Arundel County) are present in the collection. The nearest records to those under discussion lie in the District of Columbia (USNM 62556; verified) and, for Maryland, along the Potomac River in the piedmont of adjacent Montgomery County (USNM 36801, 77029, 86612, 107640-107641; all verified). Although a short distance from the Colmar Manor and Mount Rainier sites, these localities have age and numbers to commend them. All were collected between 1906 and 1938, and four of the five Montgomery County specimens were taken in the Cabin John–Plummer's Island area; the other is from a few km farther upstream at Great Falls. In addition to summarizing the Montgomery County and one of D.C. records, Clark (1930) provided additional support for the natural occurrence of wood turtles along the Potomac River in the piedmont of adjacent Virginia, citing several localities, with the oldest (USNM 61095) dating from 1918. The D.C. specimen, for which there are no further locality data in the USNM catalogue, is almost certainly the turtle reported by Shufeldt (1919) and stated to be from near Bennings. Palmer (1919) also mentioned three wood turtles from Eastern Branch (since renamed Anacostia River) without further specificity, but presumably from the District of Columbia. Although these D.C. records, all from the coastal plain and also overlooked by Norden and Zyla, could be viewed as providing support to the upstream localities of Colmar and Rainier, they predate them by 70 years and no reports or specimens have appeared in the interim. It should also be noted that the turtle found at the junction of "Washington Road and Tantallion Drive" (Fort Washington Road and Tantallon Drive) was found in the middle of a residential area, as were the two from Greenbelt. There has also been some confusion with the Fort Washington record and their "Piscatoway Creek Road" [Piscataway Road (Md. Route 223)] site. Both localities have been mapped at the latter spot, although they are at least as far apart as the Colmar Manor and Mount Rainier sites, which were plotted separately.

Like the Colmar Manor and Mount Rainier sites, no reliance can be placed on the Elvaton, Anne Arundel County record. Interest in the amphibians and reptiles of northern Anne Arundel County has been keen since the time of Mansueti (1941b), and was particularly pronounced during the 1960s and 1970s. This section of the state produced many members of the Maryland Herpetological Society, and gave rise to its predecessor and brief competitor, the Free State Herpetological Society. The area has been thoroughly explored, as a glance at Harris (1969b, 1975) will confirm, yet the wood turtle from Elvaton is the only one to surface. I searched the collector's (the late E. Clyde Prince) herpetological notes (present in the Department of Biology, Towson State University) and found no mention of this unusual find, perhaps because Prince himself did not consider the specimen significant.

One unwarranted action in the article by Norden and Zyla is the liberty they have taken with a paper by Ernst (1972). Norden and Zyla (1989) state: "The only other author to actually give Coastal Plain records for this species was Carl Ernst (1972), who published a map showing it [*Clemmys insculpta*] to be generally distributed west of the Fall Line but included two records for the Maryland Coastal Plain, one north-west of Annapolis and the other in eastern Charles County." Although Ernst did indeed publish a map showing at least two localities in southern Maryland, nowhere in his account does he provide any geographic details. Furthermore, Ernst's map is so small that it is impossible to state anything specific about the records he has plotted. This notwithstanding, Norden and Zyla confidently plot one of Ernst's sites in extreme east-central Charles County, thus inventing a county record on a narrow extension of land that separates Prince George's County from St. Mary's County, and the other at a position arbitrarily located next to their Elvaton site. Moreover, Ernst (pers. comm.) cannot account for his records, so they cannot be allowed. Norden and Zyla also err in stating that Ernst (1972) and Harris (1975) were the only previous authors to report localities for the wood turtle on the coastal plain of Maryland (and by implication the District of Columbia). In addition to the previously discussed sites of Surface (1908), Palmer (1919), Shufeldt (1919) and the marginal Havre de Grace site of Henshaw (1907) and McCauley (1945), there have also been contributions by Conant (1958a), Harris (1969a, 1969b) and Iverson (1986). Conant (1958a) stated that the Natural History Society of Maryland has one or more specimens from Elk Neck, Cecil County. I have searched the NHSM catalogue and can find no entry for *Clemmys insculpta* on Elk Neck, and am unable to verify this claim. Harris (1969a) reported the first record for *Clemmys insculpta* from Prince George's County, for a turtle found at the junction of the Baltimore-Washington Parkway (Md. Route 295) and Md. Route 193, Greenbelt. (This record would have been of use to Norden and Zyla, but they were not aware of it.) However, Harris (1969b), while plotting this record in Prince George's County, erroneously placed it on the Fall Line. Iverson has stated (pers. comm.) that his (1986, 1992) southern Maryland sites were simply based on the maps of Ernst (1972) and Harris (1975).

Some herpetologists may be concerned about the almost total absence of documentation for the records presented by Norden and Zyla. Although the authors use the word "specimen" frequently in their article, specimens, in the strict sense of the word (i.e., a preserved organism in a systematic collection), do not appear to exist. Only in the case of the Mount Rainier turtle, where a photograph accompanies the article, is evidence provided. Several of the turtles were apparently not examined by either author, and in only two of the 12 reports are either of the authors specifically mentioned as having seen them. The two turtles from Clinton (Prince George's County) date long before Zyla's possible involvement with them and one wonders what these records are based on. In eight of the 12 reports no statement is given as to the whereabouts of the "specimen" listed. The names of collectors are not given for four of the nine Prince George's County localities.

I find it impossible to accept that a turtle as large and conspicuous as *Clemmys insculpta* could be as common (i.e., naturally occurring) in the suburbs of Baltimore, Washington, and Annapolis as Norden and Zyla indicate, yet somehow go unnoticed until very recently. Four of their records date from the early to mid-1970s, and seven others were found between 1988 and 1990. [The remaining record (which has conflicting locality data), from 1958, is correct as printed, but the site is based solely on the recollection of a local resident and the turtle's identification was not verified by anyone (J. D. Zyla, pers. comm.). The statement that the "specimen" was brought to the Clearwater Nature Center is erroneous (J. D. Zyla, pers. comm.).] As mentioned earlier the National Museum has no specimens from southern Maryland, nor to my knowledge does any other systematic collection. In this regard, it is significant that at the Patuxent Wildlife Research Center, an 1800-ha tract that lies midway between several of Norden and Zyla's localities, and where professional biologists have made collections and conducted research since the early 1940s, no records of *Clemmys insculpta* exist (Patuxent . . . 1979). Nor do I agree with the authors that "The number of specimens found in that area [southern Maryland] over the years clearly indicates the presence of a viable population . . . ." The lumping of recent, improbable, and far-flung localities, based largely on single individuals in a region of fragmented habitat, and designating them a "viable population" is scarcely proven. Only in the case of the hatchling from Greenbelt has some hard evidence of regeneration been adduced. But even here the locality is suspect, and it is well known that female emydids can store sperm for at least four years and still produce viable offspring (Ewing 1943; Hildebrand 1929). At best I believe Norden and Zyla have provided evidence for a potentially successful introduction of *Clemmys insculpta* at this one locality.

The accurate determination of animal ranges is difficult and complicated by many factors, one being the influence of man. This is particularly true for turtles because of their attraction and susceptibility to collection, and "the propensity of human beings, young people especially, to transport turtles and liberate them far from their natural habitats" (Conant 1958a). As noted at the outset, a

sizable literature deals solely or in passing with the subject of feral turtles in Maryland and the District of Columbia, and I believe the article by Norden and Zyla is an important, if unintentional, contribution to it. Obviously the problem is more complex when the species in question is indisputably a part of the native fauna, as *Clemmys insculpta* is. This species' natural distribution is much more debatable in the Maryland piedmont, and there is also need for elucidation on the Allegheny Plateau. I do not greatly fault the authors for publishing their records; given the number they have gathered, I can understand the urge to do so. What I do not understand is their failure to marshal any sort of argument in the face of a century's worth of contrary evidence.

One other aspect of the note by Norden and Zyla deserves comment. Their article underwent no peer review, or even a proofreading, and was published in a journal completely controlled by the senior author. These practices, unfortunately an expanding tradition at the Natural History Society of Maryland, have been previously discussed and deplored in a more serious context by McCranie and Wilson (1979), and by subsequent authors in this journal. Regrettably their criticisms are being widely ignored.

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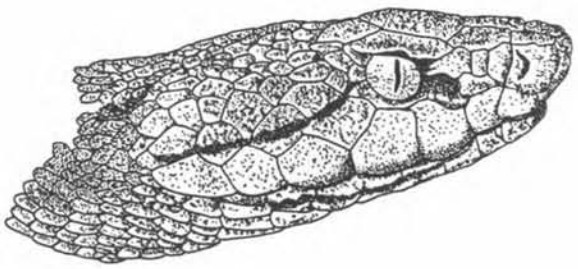
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Agkistrodon contortrix contortrix. USA: South Carolina: Jasper County. Illustration by Chuck Smith.

TECHNIQUES

An Alternative Method For Preparing Skeletons Of Fluid-Preserved Specimens Using Dermestid Beetles

The use of dermestid beetles for skeleton preparation is often preferred because of their efficiency. Techniques for maintaining and using beetle colonies have been developed and reviewed (Anderson 1948; Coleman and Zbijewska 1968; Dirrigl 1989; Hangay and Dingley 1985; Hildebrand 1968; Matthiesen 1989; Sommer and Anderson 1974). Often, preparators wish to make skeletal preparations from material previously preserved in fluid (e.g., formalin, 70% alcohol). This process poses difficulties because the beetles do not feed on fluid-preserved specimens.

De la Torre (1951), Hildebrand (1968), and Hooper (1965) presented procedures for preparing skeletons from fluid-prepared specimens using dermestid beetles. Hildebrand (1968) suggested dipping specimens in cod liver oil or soaking them in bouillon to restore flavor, and offering them in absence of other food. Most recently, Gritis and Brunner (1990) found that use of a "blood solution" produced better results than coating specimens with fat, grease, or cod liver oil.

We developed steps to accompany Hildebrand's (1968) bouillon suggestion. Our steps are similar to those of Gritis and Brunner (1990). The method we present involves preparing beef solutions using bouillon or seasoning packets from instant noodle soups:

1. Prepare beef solution by adding one seasoning packet per two cups of hot water; or one bouillon cube or one teaspoon of instant bouillon per cup of hot water. Mix the solution until all the bouillon or seasoning is dissolved. Enough solution should be made to completely cover the specimen(s). This solution can be made fresh or can be stored for later use. For storage over a prolonged period, we recommend placing the solution in a refrigerator.

2. Skin and flesh out and thoroughly rinse the specimen in cold water. Large specimens may be disarticulated or sectioned appropriately. Remove large pieces of muscle from the bones. Small specimens (e.g., < 100 g) should be placed separately in a small covered container of water to soak for 1-3 days. Larger specimens (e.g., > 3000 g) should be placed in larger covered containers and soaked in water for 1-5 days, changing the water daily. We found that a specimen rinses better when the water covers the entire specimen and cold water is used. Specimens prepared in formalin tend to take almost twice as long for the fixative to wash out as specimens preserved in alcohol.

3. Rinse the specimen a final time with cold water, and submerge in the beef solution. Small to medium (e.g., < 3000 g) specimens should be soaked in the beef solution for at least 1-3 days at room temperature. Remove the specimen and place it on a wire mesh frame over a tray (to catch drainage) and dry under a fume hood. The mesh frame allows air to circulate and the specimen to dry evenly. A tray that is lifted at one end by a large rubber stopper will allow the run-off to collect. It can then be wiped up using a sponge. The hood will remove odors and help prevent the growth of mold which can be disastrous to dermestid colonies. A quick way to tell if a specimen is dried enough is to stick a sharp probe into the flesh. If the probe is clean of fluid when removed, the specimen is ready to be placed into the dermestid colony.

4. All specimens prepared using this method should be identified. This will allow for long term preservation studies and assist researchers who may use the bones for studies (e.g., a trace mineral study).

We found that dermestids will clean most fluid-preserved specimens prepared using this method. We have used this method successfully for reptiles, amphibians, birds, and mammals. Over 100

cat skulls (in formalin) and many anoles (in alcohol) were added to the Vertebrate Collection of The University of Connecticut (UCONN) following the method presented. The effects of bouillon (mostly salt, hydrolyzed vegetable protein, corn syrup solids, sugar, and beef fat) and seasoning (mostly salt, sugar, monosodium glutamate, hydrolyzed vegetable protein, and maltodextrin) solutions on bone (mostly calcium and phosphate) may include the creation of cations that would make the solution become alkaline and could cause bone corrosion. However, for bones placed in the bouillon/seasoning solution for two weeks, we found no evidence of the solution becoming alkaline. Since 1985 and for all specimens prepared using this method, we have found no effects on the preservation of bone using the mixtures of bouillon and seasoning.

We agree with Gritis and Brunner (1990) that many factors (e.g., time in water or solution, condition and cyclic activity of the beetle colony, size of specimen, presence of salt as a main ingredient in bouillon or seasoning) may affect the success of preparing skeletons from fluid-preserved specimens. Use of bouillon or seasoning packets is a successful alternative that offers many advantages. First, it is inexpensive. Bouillon cubes, instant bouillon, or soup packages usually cost under $2.00 at grocery stores. Second, the solutions can be prepared easily any time and stored before and after use. Lastly, this procedure produces practically no odor, and does not stain bones.

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Retention Of Imitation Satellite Transmitters Fiberglassed To The Carapace Of Sea Turtles

It is difficult to collect continuous data on animals that are wide-ranging, hard to capture, and spend limited time in accessible areas. Sea turtles, for example, are present at the ocean's surface for < 2 hr a day (Byles 1989; Renaud 1990; Standora et al. 1984) and the chance of unaided multiple observations on one or more of these animals is uncommon. Satellite and radio telemetry are two methods of remote sensing available to study various aspects of sea turtle biology (Byles 1988, 1989; Byles and Dodd 1989; Dizon and Balazs 1982; Keinath et al. 1989; Kemmerer et al. 1983; Kolz et al. 1980; Manzella et al. 1990; Renaud et al. 1992; Standora et al. 1984; Standora et al. 1989; Stoneburner 1982; and Timko and Kolz 1982).

Methodology for the attachment of satellite tags (platform transmitter terminals; PTTs) has improved such that PTTs may remain on sea turtles longer than 10 months. However, there are concerns that PTTs may 1) not completely detach from the animal, 2) interfere with breeding behavior, 3) increase the chance of predation on sea turtles, 4) interfere with feeding behavior, or 5) inhibit sea turtle growth. This paper reports on the retention and usefulness of tags fiberglassed to the carapace of Kemp's ridley (*Lepidochelys kempi*) sea turtles and addresses these concerns.

Materials and Methods

Twelve sub-adult Kemp's ridley sea turtles (ca. 32 months old) from the Kemp's ridley Head Start project at the National Marine Fisheries Service (NMFS) Galveston Laboratory were fitted with imitation satellite transmitters (ISTs) (Fig. 1, Table 1). Sea turtles were held individually, indoors in partitioned raceways (2.0 X 2.0 X 0.5 m per turtle) for 16 months. They were fed Purina Trout Chow supplemented with live blue crabs (*Callinectes sapidus*) during the last month of their captivity.

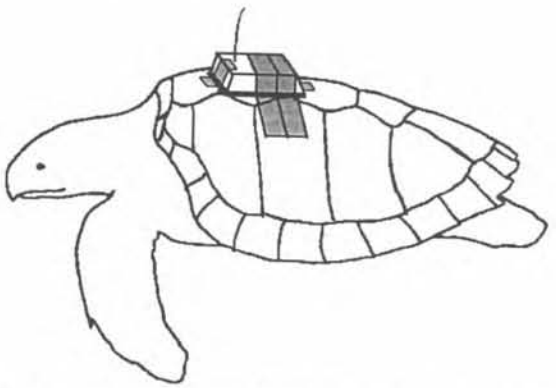


Fig. 1. Schematic of Kemp's ridley sea turtle with imitation satellite transmitter.

Tag Design and Fabrication.—ISTs, fabricated with epoxy resin, were designed after Telonics ST-3 satellite transmitters. They were scaled down in dimension (13 x 8 x 2 cm) and weight (335 g) to accommodate the small size of sea turtles available for experimentation. Scaled-down dimensions were based on the proportion of dimensions of the Telonics ST-3 satellite transmitter to straight carapace lengths (51-60 cm) and widths (48-56 cm) of five previously

TABLE 1. Sea turtle flipper tag numbers, straight length and width, growth rates, and dates of platform and Imitation Satellite Transmitter application and removal.

Sea Turtle ID Number*	Initial Straight Measurements L X W (cm)	Final Straight Measurements L X W (cm)	Straight Length Growth Rate (cm/yr)	Weight Initial Weight (kg)	Final Weight (kg)	Growth Rate (kg/yr)	Platform Base Applied	IST Applied	IST Removed	Fiberglass Loose on IST Edges**
QQA-025	41.3 x 42.0	49.5 x 50.0	6.2	10.4	15.0	3.5	3/12/91	3/12/91	7/08/92	F - B
QQA-860	40.3 x 41.7	48.5 x 50.3	6.2	10.0	20.0	7.6	3/13/91	4/01/91	7/08/92	R - F - B
QQA-969	42.7 x 40.8	47.2 x 48.0	3.4	10.9	17.3	4.9	3/28/91	4/01/91	7/08/92	R - F - B
QQA-974	38.6 x 37.9	47.0 x 45.0	6.4	8.2	15.4	5.5	3/28/91	4/01/91	7/08/92	R - F - B
QQA-942	39.6 x 39.8	48.0 x 48.0	6.4	9.5	17.7	6.3	3/28/91	4/02/91	7/08/92	F
QQA-106	41.7 x 42.2	47.4 x 47.4	4.3	10.4	18.6	6.3	3/28/91	4/02/91	7/08/92	F
QQA-913	40.1 x 40.4	48.1 x 49.5	6.1	9.5	14.1	3.5	3/28/91	4/02/91	7/08/92	F
QQA-854	38.9 x 39.3	49.8 x 50.9	8.3	9.8	14.1	3.8	3/28/91	4/02/91	7/08/92	F
QQA-121	39.1 x 40.0	47.1 x 48.3	6.1	9.5	13.6	3.1	4/01/91	4/03/91	7/08/92	F
QQA-033	41.4 x 42.0	45.7 x 45.0	3.3	11.4	14.5	2.4	4/01/91	4/03/91	7/08/92	R - F - L - B
QQA-960	42.3 x 43.7	50.5 x 50.9	6.2	11.4	21.3	7.5	4/01/91	4/03/91	7/08/92	F
QQA-063	39.9 x 39.6	50.8 x 48.8	8.3	10.0	20.4	7.9	4/02/91	4/03/91	7/08/92	F

* Hasco Type, Style 681 inconnel tags applied to the right flipper of the turtle.
** R = right, F = front, L = left and B = back

tagged wild subadult Kemp's ridley sea turtles.

Wooden molds were constructed to conform to the above dimensions. Prior to pouring the epoxy resin, molds were coated with PAM non-stick cooking spray to facilitate removal of the finished product. Weight was adjusted with split shot fishing lead to achieve a density equal to that of the ST-3 transmitter. Short plastic cable ties were used to simulate a satellite transmitter antenna. Once hardened, each IST was removed from the mold, sanded to remove rough edges, and weighed and measured to verify that the appropriate specifications were achieved.

IST Attachment.—Given the characteristic dorsal ridge of the juvenile Kemp's ridley sea turtle, IST attachment was performed in three phases. Phase one consisted of shell preparation—cleaning, sanding and drying. Phase two involved construction of a level platform on the sea turtle's back for the IST. Finally, the IST was attached with epoxy resin and fiberglass cloth.

A rectangular clay mold was formed on the sea turtle carapace surrounding the area of IST attachment. A two-part epoxy mixture of HobyPoxy Quick-Fix Formula 4[1] was poured into the mold. Due to the exothermic reaction of the epoxy mixture, the platform was made in multiple layers to prevent excessive heat and discomfort to the sea turtle. Three to five layers were used depending on the height (10–15 mm) of a sea turtle's dorsal ridge. Platforms were 5 cm wide and 11 cm in length. Each layer required approximately 5 minutes to harden. The ISTs were attached by techniques previously used by NMFS for satellite tagging of wild sea turtles. Strips of fiberglass cloth were laid across each IST and allowed to overlap onto the sea turtle carapace. The fiberglass cloth was held in place with epoxy resin. Three separate applications of epoxy and fiberglass cloth were used on each sea turtle. Usually 45-60 minutes of drying was allowed before applying the next layer of epoxy and cloth.

Behavioral Monitoring and IST Maintenance.—Observation of swimming and feeding behavior and documentation of IST sloughing were conducted approximately every two weeks. Conditions considered to be associated with IST sloughing were peeled, chipped, or raised fiberglass cloth. Algal growth on the carapaces of the sea turtles was periodically cleaned off with a medium bristle brush and sponge. This prevented bacterial decomposition of sea turtle food caught in the algae. Removing the algae also facilitated successful assessment of any developments in the sloughing process.

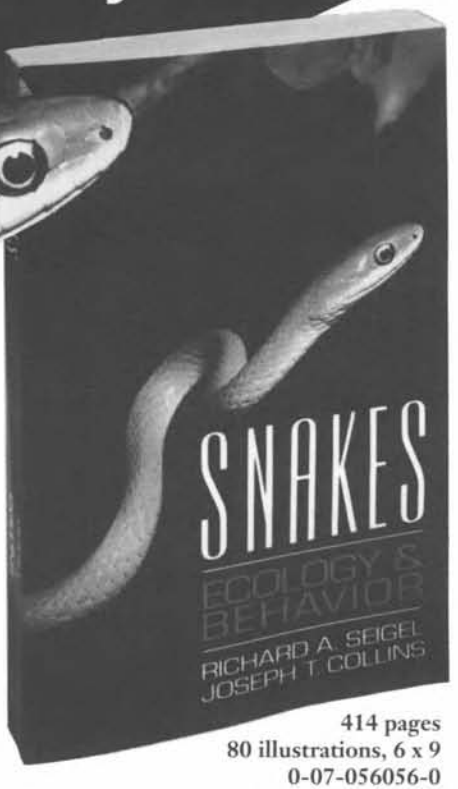
Tag Removal.—The fiberglass cloth was cut with a hacksaw on the front and right sides of the IST. The IST and the remaining fiberglass cloth on the left and rear sides of the carapace were pulled off by hand in one piece. The fiberglass cloth on the anterior and right side of the carapace was easily pried off with a screwdriver.

RESULTS

No ISTs detached during this 16-month study. The epoxy and fiberglass cloth at the margins of all IST attachment points were peeling away from each sea turtle carapace at the termination of this experiment. However 5-7 cm of epoxy and fiberglass cloth remained securely attached to each carapace. Scutes under the IST and fiberglass attachment site were examined after the removal of ISTs. They were comparable to surrounding scutes except for a lighter coloration, likely due to lack of ultraviolet radiation.

Upon completion of the experiment, sea turtles were certified to be in excellent health by a veterinarian. Growth ranged from 2.5 to 8.2 kg/yr (mean = 5.3 kg/yr) and from 3.4 to 8.6 cm/yr (mean = 6.0 cm/yr) in straight length (Table 1). This is similar to other records of Kemp's ridley growth in captivity (Caillouet et al. 1986; Louis et al. 1988).

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Discussion

Our experience with satellite tracking suggests that the transmitting package attached to a turtle's carapace usually outlasts the battery life of the PTT. This is based on erroneous data output by PTTs for approximately one week prior to the cessation of data transmission. Therefore, the period of data transmission by a PTT is generally an underestimate of PTT attachment life. The average life of our PTTs on five loggerhead (*Caretta caretta*) and five Kemp's ridley turtles tracked in the Gulf of Mexico or Atlantic Ocean has been 8.5 and 6.5 months respectively. In two cases, however, PTTs have stopped transmitting witin four months without the characteristic week of erroneous data output. Although hard evidence is not available, we suspect that these tags fell off of the turtles. Overall, we feel that PTT detachment is controlled by environmental influences. Sea turtles in our experiment were isolated from each other, held indoors, and thus were not afforded normal environmental contacts such as direct exposure to sun, wave action, weather disturbances, rock jetties, etc. Therefore, we believe that the ISTs would have remained on the sea turtles for several more months.

Evidence suggests that transmitters fiberglassed to the carapace of wild sea turtles sustain impacts during daily activities. One green sea turtle (*Chelonia mydas*) tagged during a radio-tracking experiment at South Padre Island, Texas (Renaud et al. 1992), was recaptured 8 months later without its radio transmitter or sonic tag. In a second study (Renaud et al. 1993) antennas on tags broke off or tags were detached from 5 of 9 green turtles tracked in the vicinity of rock jetties over a 60 day period. Visual observation of these turtles disclosed that every transmitter antenna was bent during the first week of the study. All transmitters were attached in the same manner described in this report.

Sea turtle behaviors (which include swimming through seagrass beds, burrowing in the mud, and wedging under rock overhangs or between rocks) create a harsher environment than that encountered under laboratory conditions. It is not surprising that tags became detached in less time than under laboratory conditions or conversely, that tags in the laboratory did not detach from the sea turtles. We believe that the inshore environment is harsher than the offshore environment and that tags will not last as long on sea turtles inhabiting regions near rock groins or seagrass beds.

It is now hypothesized that PTTs will come off in one piece, preventing a partially detached PTT from being carried by a sea turtle. This is supported by an earlier tagging experience in 1990 (NMFS unpublished data) when a satellite transmitter with its hardened fiberglass attachment was accidentally knocked off a sea turtle in one piece. This hypothesis is further substantiated by the easy removal of ISTs and fiberglass cloth at the conclusion of this experiment. There was no attempt to remove the ISTs by pulling off the entire package in one piece. In hindsight, though, we should have tried this because the ISTs came off very easily once cut on two sides. A few bumps or jolts on rocks or other solid objects in the environment may produce the same result.

If tags fall off juvenile sea turtles within 12 months, they would not interfere with breeding behavior. Small PTT's would probably not interfere with mating turtles, or in the worst case, be knocked off a female turtle during the mating process.

We do not think that PTTs make sea turtles more vulnerable to predation. Tags blend in with the color of the sea turtle carapace and are quickly overgrown with algae to reduce any visual cues of their presence. White barnacles are commonly seen on sea turtle shells in the wild. The high contrast of the barnacle shell would offer more of a visual cue to a predator than a larger PTT with less contrast.

This experiment tested the longevity of packages fiberglassed to sea turtle carapaces. The design of satellite transmitters takes into account swimming and related behaviors (R. A. Byles, pers. comm.). Tags are small compared to sea turtles (<6% body weight) and are relatively streamlined to produce minimal resistance to swimming. The swimming and feeding behaviors of the experimental sea turtles appeared comparable to those of hundreds of captive-raised and wild sea turtles previously observed by the authors in captivity. ISTs did not seem to interfere with daily turtle activity. Sea turtles moved swiftly through the water in their holding tanks and executed quick, sharp turns necessary for the capture of live prey items in the wild. These turtles captured and fed on live crabs while in captivity. Their increase in weight and length during the experiment falls within the growth range of similar-aged turtles (Louis et al. 1988).

In a study similar to ours, Beavers et al. (1991) compared longevity of tag attachment and ease of tagging among 1) polyester resin with fiberglass cast base, 2) epoxy alone, and 3) dental compound with fiberglass cast base. Their choice of tag attachment was dental compound due to quick setting time. No shedding time was given. Tags attached with polyester resin or epoxy remained on the turtles for at least 142 days. No deleterious effects on the sea turtles or changes in sea turtle behavior due to tag attachment were noted by Beavers et al. (1991).

Based on our results, we feel that transmitter packages attached to the carapace of sea turtles are not harmful. Continuous data on sea turtles in the wild is lacking and the use of satellite telemetry is a cost-effective means of collecting such information. If the tags can last for 6–10 months they can provide a wealth of data on sea turtle behavior.

Acknowledgments.—We thank Dr. Richard Henderson, Galveston Veterinary Clinic, for physical examination of sea turtles prior to their release.

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[1] When this experiment was conducted, HobyPoxy was the preferred substance for platform construction. Due to variability in the exothermic reaction of this substance it is no longer recommended for use. Now we construct platforms in advance with dental compound, a non-toxic, cold-cure medium. Each platform can be cut with a razor blade to fit the dorsal ridge of any sea turtle just prior to tag attachment. A considerable reduction in the out-of-water time for each sea turtle is achieved by having these platforms made in advance.

Adhesive Trapping II

Bauer and Sadlier (1992) introduced the herpetological community to sampling possibilities offered by mouse glue traps (Woodstream, Inc., P.O. Box 327, Lititz, Pennsylvania 17543, USA) and extolled the virtues of adhesive trapping for sampling arboreal lizards. Since 1988, we have used adhesive trapping to sample a variety of reptiles and amphibians on islands of the western Pacific under a wide range of conditions. Our cumulative sampling experience exceeds 30,000 trap-h (one trap set for one hour = 1 trap-h). Adhesive traps are often the best available sampling method.

While adhesive traps offer a high capture rate, relative ease of use, and some utility for wary species, they do have some disadvantages. Capture rate declines sharply with time in place (Fig. 1); this reduction is probably due to both localized depletion of trap-vulnerable animals and deterioration of the adhesive. Dust, water, debris, and insects will cover the sticky surface of a trap and render it ineffective. Rain almost completely disables a trap, and moisture weakens the backing paper. Glueboards by other manufacturers can be backed with shallow plastic trays, but rain water accumulates in the plastic trays and renders them useless. When we have set plastic and paper-backed traps in alternation (N > 700 trap-h), the plastic-backed traps captured 95% fewer reptiles than the paper traps. Because of rapid decline in trap effectiveness, paper backed traps are rarely useful for more than one 24-h period; their modest cost ($.50/trap when purchased in bulk) justifies replacing them frequently. In countries without a trash removal system, we have found it difficult to dispose of used adhesive traps without the spent traps coming in contact with children or domestic animals. Under these conditions they should probably be buried or burned.

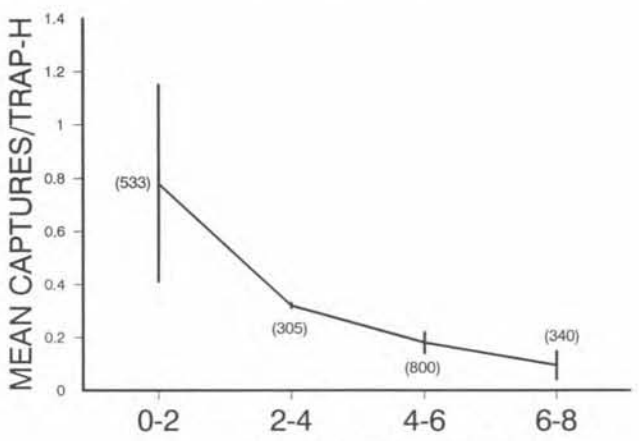


FIG. 1. Decline in success of capture of lizards on adhesive traps following setting, based on daylight captures from single-day ground-trap arrays on Guam (symbols represent catches at respective sets). Error bars are standard deviations of the means for each array (arrays consisted of 8–36 traps). The decline in capture success from 0–2 to 2–4 h after set is not attributable to the normal activity cycle of lizards in this area, which typically reach maximal levels at 1000-1200 h, 2–4 h after initiation of trapping. When trapping was continued for additional days, subsequent mean capture rates did not exceed 25% of the rate achieved during the first two hours.

Glue viscosity is affected by temperature and below 20°C it is challenging to remove delicate lizards without tail loss; an extremely slow, gentle pull is required. Bauer and Sadlier (1992) noted that corn oil dissolves the adhesive and facilitates removal. Robust skinks can usually be removed in excellent condition and without resorting to oil. Geckos, especially those with delicate skins (Bauer et al. 1989), must be oiled for removal. If an unoiled reptile is discovered to have some residual stickiness after removal, it should

be placed in a plastic bag that has been coated with a very light layer of cooking oil. A few drops, well distributed in the bag, is enough to create a usable film; excess oil may cause the sides of the bag to adhere and smother the animal. We have found, however, that some individuals do not survive after being removed from traps and coated with cooking oil.

Nontarget organisms (e.g., crabs, birds, and ants) may accidentally contact or may be attracted to the traps and will remove traps or captured animals. Dogs, cats, and pigs unintentionally carry traps away after stepping on them. The impact of undesired trap contacts are minimized by checking the traps frequently. Over a 24-h period, we typically lose 0–4% of the traps to damage and disappearance. We compensate for this anticipated loss by setting about 20% more traps than required by sampling protocol.

Some species (e.g., *Emoia mivarti*) are relatively difficult to capture because they frequent litter items (e.g., fallen branches) that are not well suited to the use of adhesive traps. Other species (e.g., *Carlia* cf. *fusca*) may be drawn to insects or lizards already adhered to the trap. We have captured lizards and snakes up to a mass of about 100 g (e.g., *Varanus indicus*, *Sphenomorphus muelleri*, and *Boiga irregularis*). In attempting to escape from the traps, these reptiles become further entangled and lose the ability to locomote. Moist amphibians are difficult to trap, although toads can be captured on fresh traps. While no single method catches all species equally (Fitch 1992), adhesive traps catch an unusually broad variety of species, frequently with minimal damage to the specimen.

Reptiles trapped in sunlit areas will rapidly become hyperthermic (Bauer and Sadlier 1992). While we have had minimal success capturing diurnal lizards using small paper tents arched over the traps for shade, nocturnal brown tree snakes (*Boiga irregularis*) are more likely to be captured by traps that are covered by small shelters. Natural shade should be utilized for trapping most species of lizards. We have had excellent success trapping grassland species in the shade of nearby tree rows. The relative success of arboreal versus terrestrial placement will vary among reptile communities. In marked contrast to Bauer and Sadlier (1992), we found adhesive traps much more effective on the ground than in trees. For example, in one seven hour period on Guam we captured 334 skinks on 40 terrestrial traps.

Forty terrestrial traps can be set at 5 m intervals in less than 0.5 h. To facilitate relocation, place the white glueboard covers (which curl upon removal) around a branch above the trap. This procedure also helps to verify the disappearance of traps, especially in dense vegetation or at night. When setting the traps in trees, tying the traps around a trunk or limb by placing a string across the adhesive is less cumbersome than a taping procedure (Bauer and Sadlier 1992). With practice, 40 terrestrial traps can be checked at 15-min intervals and all lizards processed by a single individual. Forty traps and their packaging weigh about 1.0 kg, and occupy a storage space of about 8 x 15 x 25 cm.

Adhesive traps are inexpensive, convenient, highly effective, and usable in areas where drift fences or pitfall traps cannot be placed. Adhesive traps are particularly useful for lizards too wary to allow capture by hand, noose, or rubber banding. For insectivorous reptiles, adhesive traps are somewhat self-baiting. Because they capture an animal only through the animal's own movements, the traps provide an index of locomotor activity. They can also be used for non-lethal sampling of most arboreal or terrestrial reptiles active in patches sheltered from direct sunlight.

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HERPETOLOGICAL HUSBANDRY

Notes On The Captive Maintenance And Feeding Behavior Of A Juvenile Short-tailed Snake (*Stilosoma extenuatum*)

The short-tailed snake (*Stilosoma extenuatum*) is perhaps one of the most secretive snakes of North America. Few specimens have been collected and even fewer have been studied in captivity. Therefore, the habits, including feeding behavior, of this fossorial snake are very poorly known.

Allen and Neill (1953) and Ashton and Ashton (1981) reported that *Stilosoma* primarily consumes small reptiles, namely lizards (including *Scincella lateralis*) and snakes, but Ditmars (1939) and Mushinsky (1984) stated that their captives accepted only small snakes.

Perhaps the most intensive observations on the feeding behavior of this snake were by Mushinsky (1984). He reported that a *Stilosoma* consumed *Tantilla relicta*, but refused three other species of snakes and five species of lizards. Mushinsky also described the loose or weak constricting pattern of this snake and compared it with the boid pattern of constriction as described by Greene and Burghardt (1978).

The following observations on the feeding behavior of a juvenile *Stilosoma* support the contention that this species is primarily ophiophagous, although perhaps not as specialized as described by Mushinsky (1984).

A female *S. extenuatum* (TL=21.5 cm, SVL=19cm) was captured in Gainesville, Florida on 14 April, 1992. An umbilical scar was evident, suggesting that the snake hatched that spring or the previous fall. The snake was housed in a small aquarium with several inches of loose dry sand, and was offered a variety of potential prey, including

Scincella lateralis, centipedes, and small insects. It displayed no interest in any of these items.

On 25 April, a *Scincella* tail was gently placed in the snake's mouth and was swallowed voluntarily. This procedure was repeated on 19 May, 27 May, 3 June, and 9 June. During this time the snake refused to voluntarily consume live or dead skinks placed in its cage.

On 13 May the snake was moved into a simpler cage arrangement consisting of a plastic shoe box with indoor/outdoor carpet as a substrate, a hide box, a water bowl, and several rocks. No supplemental heat or light was provided and the *Stilosoma* was exposed to filtered daylight in quantities naturally occurring in Jacksonville, Florida, USA. Low temperatures ranged from 14.3°C in April to 26.6°C in August and high temperatures ranged from 18.5°C in April to 32.2°C in August. Room humidity ranged from 44% to 92%.

A live newborn *Storeria dekayi victa* (TL=9.0 cm) was placed in the cage on 11 June and was actively pursued, captured, constricted, and consumed in the manner described by Mushinsky (1984). The *Storeria* was grasped posteriorly, wrapped in three coils, and held while the *Stilosoma* advanced its jaws anteriorly. Once the head of the *Storeria* was in the jaws of the *Stilosoma*, the coils were released and swallowing proceeded rapidly.

During the next five months the snake was observed eating twenty times, shed regularly at approximately one-month intervals, and grew 2.3 cm. It consumed seven newborn *S. d. victa*, two newborn *S. d. dekayi*, two newborn *Tropidoclonion lineatum annectens*, three newborn and one juvenile *Virginia striatula*, two newborn *Storeria occipitomaculata occipitomaculata*, two newborn *S. occipitomaculata obscura* and one hatchling *Diadophis p. punctatus*. The size of the snakes consumed without ill effects to the *Stilosoma* ranged from 7.0 cm to 10.15 cm TL.

Seventeen of these snakes were offered alive and three were offered pre-killed, having been frozen and thawed. Three other pre-killed snakes were offered, but were refused. No live snakes were refused except for a 14 cm *D. p. punctatus*, from which the *Stilosoma* appeared to flee.

It soon became apparent that the motion and size of the prey were the most important factors in eliciting a feeding response, although olfactory cues presumably played a role in the recognition of the pre-killed food items. It appeared that normal serpentine locomotion attracted the attention of the *Stilosoma* since pre-killed snakes offered on forceps failed to elicit a feeding response. Minutes after a pre-killed snake was offered and refused, a live snake of the same species was offered and accepted.

We observed, as did Mushinsky (1984), that larger snakes were constricted and smaller snakes were seized near the head and swallowed without constriction. Seventy-five percent of the prey snakes were seized posteriorly and constricted, while the remainder were seized anteriorly and swallowed without constriction.

In no instance was constriction the cause of death of the prey snakes. All were swallowed alive, even after prolonged struggles. The constricting abilities of *Stilosoma* are limited and function as a means of restraining prey.

The actual swallowing process is a rapid side to side motion similar to that of *Lampropeltis*, and the bite appears powerful, visibly compressing the prey. Nevertheless, several prey escapes did occur as observed by Mushinsky (1984). Escapes occurred most frequently when the *Stilosoma* released its bite and began searching for the head of its prey. Generally, the constricting coils were not loosened until the head of the prey was seized. Several prey snakes escaped at least once, but all were recaptured within the close confines of the enclosure.

On 20 September, the *Stilosoma* consumed its largest meal, a live 12.5 cm *Virginia striatula* with a head size and mid-body circumference similar to that of the *Stilosoma*. The *Stilosoma* regurgitated the *Virginia* and died the next day. A necropsy revealed swelling and apparent trauma to the gastrointestinal tract. No parasites were observed.

It is important to note that this snake was a juvenile, and as such, its behavior may have differed somewhat from that of adults of the same species. Regardless of whether any ontogenetic changes occur, these observations have several important implications for future work with *Stilosoma*. They suggest that *Stilosoma* can be maintained in a simple cage setup comparable to that used for commonly maintained species. They demonstrate that at least five species of common, live bearing snakes, some of which may readily be bred in captivity, can be utilized to provide a reliable food source.

Further, these observations reconfirm that very large meals are hazardous to snakes and may result in trauma or death. Lastly, they show that frozen and thawed food items will occasionally be consumed, although live prey is preferred. This allows storage of seasonally available prey species and can assist in parasite control in captive snakes (Rossi 1992).

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Ambystoma californiense. Adult male, 103 mm SVL, 204 mm TL. USA: California: Madera Co. Illustration by Ronald Gonzales.

RECENT POPULATION CHANGES

Apparent Long-Term Decline In Diamondback Terrapin Populations At The Kennedy Space Center, Florida

Diamondback terrapins (*Malaclemys terrapin*) are residents of brackish water habitats along the Atlantic and Gulf coasts of the United States between Massachusetts and Texas (Conant and Collins 1992). Much of the habitat used by diamondback terrapins has been subjected to extensive development, especially in Florida (Ashton and Ashton 1985). The effect of habitat loss and other human disturbance on diamondback terrapin populations is unknown, primarily because few long-term ecological studies have been conducted on the species. Because turtles are long-lived (Gibbons 1987), long-term studies are essential in determining population status.

From 1977 to 1979, I studied the ecology of diamondback terrapin populations at the Kennedy Space Center/Merritt Island National Wildlife Refuge/Canaveral National Seashore (KSC/MINWR/CNS) in east-central Florida (Seigel 1984). The KSC/MINWR/CNS is the largest area of protected habitat along the Atlantic coast of Florida, and is co-managed by the U. S. Fish and Wildlife Service, the National Aeronautics and Space Administration (NASA), and the National Park Service. The KSC/MINWR/CNS harbors considerable suitable habitat for diamondback terrapins, including three large brackish water lagoons (the Indian River, the Banana River, and Mosquito Lagoon), and numerous brackish water marshes and impoundments. In 1992 and 1993 I resampled the diamondback terrapin populations I studied in the late 1970's. This paper reports results from the 1992–1993 surveys.

Studies in the late 1970's emphasized the two largest concentrations of terrapins at the KSC/MINWR/CNS, one located in the northern Indian River along a dike known as "Shiloh Dike," and another in the northern Banana River, centered on a small spoil island ("Island #42"). These populations were estimated at 404 (95% CI = 183–791) and 213 (95% CI = 59–627) individuals, respectively, in 1977–1979 (Seigel 1984). Smaller populations were found in a canal leading into Mosquito Lagoon, the southern end of Shiloh Dike, and along Banana Creek, although population size estimates are not available for these sites. Terrapins also were encountered crossing several roads within the KSC/MINWR/CNS, especially near the Indian River and Banana Creek (R. Seigel, pers. obs.). Seigel (1984) provides a more detailed description of the study sites and techniques used to collect turtles.

Materials and Methods.—During May and August 1992, and April 1993, I resampled *Malaclemys* populations at the KSC/MINWR/CNS using the same techniques used in the 1970's. The Shiloh Dike site was sampled for five consecutive days in May 1992 using small-mesh gill nets to block off a stretch of a narrow canal bordering the dike (Seigel 1984). The Banana River site was sampled on one day each in May and August 1992 and April 1993 by walking in the clear, shallow (< 1 m) waters near Island #42 and other, nearby islands. Attempts were also made to find aggregations of terrapins in canals leading into Mosquito Lagoon, along other areas of the Shiloh Dike, and near Banana Creek during six days in May, two days in August, and six days in April. At all sites, the timing of the sampling, the exact sites sampled, and the sampling procedures were identical to those used in the 1970's.

In addition to my surveys, P. Konen, a graduate student at Florida Institute of Technology, surveyed the Shiloh Dike weekly from mid-March to mid-May 1992 for aggregations of terrapins, which were common during those months in the 1970's (Seigel 1980a). These aggregations frequently contained > 50 individuals in the 1970's, and were very conspicuous.

Results.—During my 1992 surveys, I found only one terrapin, an unmarked adult female in the Banana River. In 1993, a total of 4-6 terrapins were seen in a small brackish water impoundment near the Indian River. No terrapins were seen or captured at Shiloh Dike, the Indian River, Mosquito Lagoon, or Banana Creek during either 1992 or 1993.

Results from P. Konen's surveys along Shiloh Dike resulted in the observation of only a single terrapin. The last large aggregation of terrapins reported from the KSC/MINWR/CNS was seen in August 1986 along the Indian River (T. Lamb, pers. comm.). However, a survey of this site in 1993 showed no terrapins present. My interviews with personnel from the Fish and Wildlife Service, the National Park Service, and the Bionetics Corporation (NASA Life Sciences Support Contractor), indicated that terrapins have been seen only rarely at KSC/MINWR/CNS in recent years. One long-term Fish and Wildlife Service employee reported he had seen only a single terrapin since 1985. Personnel from Bionetics Corp. reported seeing terrapins on only one occasion in the Banana River, despite extensive field work in the area. In addition, no terrapins were observed during U.S. Fish and Wildlife Service seagrass surveys in the vicinity of the Banana River spoil islands during the past two years (C. K. Dodd, Jr., pers. comm.). Finally, neither personnel from Bionetics Corp., the National Park Service, or the U.S. Fish and Wildlife Service reported seeing terrapins crossing roads on the KSC/MINWR/CNS, although one terrapin was found by a local citizen in late August 1992 (R. B. Smith, pers. comm.)

Discussion.—My data suggest that terrapin abundance has declined markedly at the KSC/MINWR/CNS since 1979. Not only were turtles absent almost completely at the Shiloh Dike and Banana River sites, but aggregations in the Mosquito Lagoon canal were also absent. Furthermore, although 45 terrapins were seen crossing two major roads on the KSC/MINWR/CNS between 1973-1979 (L. Ehrhart and R. Seigel, pers. obs.), only one turtle has been seen in recent years, despite extensive travel by local personnel along the same roads (R. B. Smith, pers. comm.).

Another line of evidence for terrapin declines concerns predation on adult terrapins by raccoons, which commonly killed adult terrapins of both sexes when turtles crossed or nested on dike roads in the 1970's (Seigel 1980b). Such predation leaves a record in the form of shells, which were common along at least three dikes in the late 1970's. Despite intensive surveys, no terrapin shells were found in 1992 or 1993, although raccoons were still extremely abundant along the Shiloh Dike area (R. Seigel, pers. obs). Because it is unlikely that raccoons have suddenly stopped eating terrapins for behavioral reasons, the implication is that terrapins are no longer available as prey.

No obvious cause was seen for the apparent decline in *Malaclemys*. The primary habitat changes since 1979 involve the loss of mangrove vegetation along Shiloh Dike, the result of freezing temperatures during the winters of 1983 and 1985 (Provancha et al. 1986), and some subsequent erosion and siltation of the canal bordering the dike. No obvious habitat changes were apparent in the Banana River, Banana Creek, or near the roads where terrapins were seen crossing in the 1970's. Possible causes for the apparent decline include (1) the vegetative changes noted above (which may have led to erosion and siltation near the Shiloh Dike), (2) long-term effects of raccoon predation (Seigel 1980b), (3) incidental catch and drowning in crab traps (Bishop 1983), which are very common in the Indian River and Mosquito Lagoon, and (4) direct mortality from low water temperatures in 1983 and 1985.

Attempting to determine long-term changes in populations of amphibians and reptiles that have not been studied continuously is difficult, especially when only limited time and funds are available for resampling. This case is no exception. Although my data suggest that terrapin populations have declined since 1979, other explanations are possible. For example, terrapin populations may use local

habitats for only short periods, then move on to other sites. Because terrapins often exist in discrete, dense aggregations (Seigel 1984), it is possible that populations are still common at the KSC/MINWR/CNS, but were not observed owing to limited sampling time.

Because of their use of coastal habitats and occurrence in discrete populations, diamondback terrapins may be impacted heavily by habitat development, pollution, and incidental mortality from crab fisheries (Ashton and Ashton 1985; Bishop 1983). Such impacts have led to increased concerns about terrapin populations by state and federal management agencies. For example, all five subspecies of diamondback terrapins in Florida were classified as "imperiled taxa" by a recent survey by the Florida Game and Fresh Water Fish Commission (Millsap et al. 1990). The U. S. Fish and Wildlife Service has initiated surveys of terrapin populations (L. LaClair, pers. comm), as have several states (e.g., Alabama, Mississippi, New York).

I suggest that the apparent declines noted for terrapin populations at the KSC/MINWR/CNS indicate the need for more attention for this species. I hope this paper will encourage state management agencies to address the population status of diamondback terrapins, and I urge researchers with data on population trends to contact both the U. S. Fish and Wildlife Service and their state wildlife agencies.

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LIFE HISTORY NOTES

Instructions for contributors to Life History Notes appear in volume 24, number 1.

ANURA

RANA CATESBEIANA (Bullfrog). **CANNIBALISM.** Cannibalism by adult *Rana catesbeiana* is well documented (Bury and Whelan 1984. U.S. Dept. Interior Fish and Wildlife Serv. Resource Pub. 144:1-23). However, its importance in the diet of bullfrogs has less often been considered. Smith (1973. Diss. Abs. Intl. B34[6]:3015) found that cannibalism of immature bullfrogs by adults provided up to 80% by volume of total food in the native Kansas population. We report on a similar high rate of cannibalism in a non-native, high-density population of bullfrogs in a reservoir in southwestern New Mexico.

Wall Lake is a ca. 7–9 ha impoundment on Taylor Creek in the Gila drainage of southeast Catron Co., New Mexico (see description in Fleharty 1967. Southwest. Nat. 12:207-230). The lake has supported a large bullfrog population since at least the late 1950's despite often heavy sport hunting. On 18 July 1978, a sample of 138 adult bullfrogs (90 males, 48 females; 90-191 mm SVL) was collected at Wall Lake and preserved. A stomach contents analysis revealed the following prey items (in order of importance by total percent-volume): newly-metamorphosed and larval *Rana* (87%); aquatic snails (5%); adult and larval aquatic Coleoptera (3%); adult and larval Odonata (3%); and unidentified or other material (2%). Vertebrate remains other than *Rana* included a small unidentified *Thamnophis* sp. and the bones of a small fish.

A total of 57 *Rana* prey items (48 juveniles and 9 tadpoles) was found in 56 stomachs (40.6% of the sample), and 29 of these items (51.8%) were identifiable as *R. catesbeiana*. Although a native ranid occurred in Wall Lake (*R. chiricahuensis*, = *R. pipiens* formerly in Fleharty, op. cit.), we could refer no prey item to this species, which probably had disappeared from the lake by 1978 (CWP, pers. obs.). We therefore considered all *Rana* prey items to be *R. catesbeiana*.

Our results are concordant with those of Hubbard and Schmitt (1977. New Mexico Dept. Game and Fish, unpubl. report) who conducted a stomach contents analysis of introduced *R. catesbeiana* at San Simon Cienega, Hidalgo Co., New Mexico. Of 138 adult bullfrog stomachs in their study, 29.5% contained conspecific prey (juvenile frogs, tadpoles, and eggs) while other vertebrate remains were nearly absent. It is evident that smaller conspecifics can be important food items for adult bullfrogs in some high-density populations (such as at Wall Lake and San Simon Cienega) where other prey are not available.

We thank B. D. Woodward for help in collecting the Wall Lake sample, and J. P. Hubbard and C. G. Schmitt for providing their unpublished data. E. J. Bedrick and T. H. Fritts provided advice on data analysis, and R. D. Jennings, R. E. Robino, and N. J. Scott, Jr. commented on earlier versions of the manuscript.

Submitted by **JAMES N. STUART**, Department of Biology and Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA, and **CHARLES W. PAINTER**, Endangered Species Program, New Mexico Department of Game and Fish, P.O. Box 25112, Santa Fe, New Mexico 87504, USA.

TESTUDINES

TESTUDO KLEINMANNI (Egyptian Tortoise). **MAXIMUM SIZE.** The maximum documented size is 127 mm for females and 116 mm for males of *Testudo kleinmanni* (Buskirk 1985. 9th International Symposium on Captive Care and Propagation. San Diego. pp. 35-52; Loveridge and Williams 1957. Bull. Mus. Comp. Zool. 115(6):153-557). The record is held by a specimen from Mersa Matruh, Egypt (Flower 1933. Proc. Zool. Soc. London 1933:74-851). Statements that this species can reach the size of 135 mm (Ernst and Barbour 1989. The Turtles of the World. Smithsonian Institution Press, Washington, D.C., 312 pp.) or even 157.5 mm on average (Pritchard 1985. IUCN Freshwater Turtle and Tortoise Newsletter 1:3) are the results of "misreading" the accounts of either Flower (op. cit.) or Buskirk (op. cit.; Buskirk, in litt.). We recently received a small sample (allegedly from a Cairo "pet shop"), of which one female (HNHM uncataloged: BLF 362) clearly exceeds the previously published size record for this species. It has a highly domed, somewhat asymmetrical carapace with well-defined growth rings on the scutes, and lacks the characteristic plastral figure usually present in *T. kleinmanni*. There are 11 marginals on the left and 10 marginals on the right side. The female measured: CL = 129.6 mm, maximum CL = 132.3 mm, maximum CW = 93.5 mm, maximum PL = 112.5 mm, maximum shell height = 72.8 mm (all straight-line measurements taken with vernier calipers).

I thank James R. Buskirk, Oakland, California for encouraging me to publish this record, and reviewing and submitting the manuscript, and Ido Zuri, Tel-Aviv for checking and measuring specimens on my behalf.

Submitted by **BALÁZS L. FARKAS**, Herpetology Section, Department of Zoology, Hungarian Natural History Museum, H-1088 Budapest, Baross u. 13, Hungary.

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LACERTILIA

ANOLIS CAROLINENSIS (Green Anole). **BEHAVIOR.** On 24 September 1992, in the Cherokee National Forest at the confluence of Coker Creek and the Hiwassee River (Hiwassee River Mile 55.8), Polk County, Tennessee, we noted a deserted nest of the bald-faced hornet (*Vespula maculata*). It measured 13 cm in length and 40 cm in circumference. The nest was attached to the woody stem of a climbing hydrangea (*Decumaria barbara*) in a small tree ca. 2 m above the ground. A green anole (*Anolis carolinensis*) was peering from the nest's entrance. The nest was removed intact, placed in a plastic bag, and returned to the University of Tennessee-Knoxville. Dan M. MacDonald and Delia F. Truett removed a male anole (166 mm TL, 60 mm SVL, 5.01 g) from the nest. The nest was then placed in a covered aquarium. The next day a female anole (130 mm TL, 48 mm SVL, 3.30 g), emerged from the nest. Interaction between the paper wasp (*Polistes rubriginosus*) and *Anolis carolinensis* has been reported (Meyerriecks 1960. Copeia 1960:60). This observation suggests that these anoles may have been using hornet larvae as a food resource or the nest as a refugium. We found an active, large group of bald-faced hornets in a similar nest along the Hiwassee River the following week, indicating hornets are active during this season. Whether hornets were present when the anoles invaded the nest is unknown. We thank Arthur C. Echternacht and David A. Etnier for critically reviewing this note.

Submitted by **MARK H. HUGHES**, Department of Zoology, M313 Walters Life Sciences Building, The University of Tennessee-Knoxville, Tennessee 37996-0810, USA, and **PAUL W. PARMALEE**, Department of Malacology, Frank H. McClung Museum, The University of Tennessee-Knoxville, Tennessee 37996-3200, USA.

ANOLIS TROPIDOGASTER (NCN). **BEHAVIOR.** The diet of many lizards includes a large proportion of insects and arachnids (Spiller and Schoener 1990. Oecologia 83:150-161), but no cleptoparasitic lizards are known. Here, we describe predation by *Anolis tropidogaster* of a paralyzed spider stolen from a pompilid wasp, *Priochilus captivum* (Fabricius). Females of *P. captivum* provision small vase-like mud nests, built on the ground, with a single paralyzed salticid spider and an egg, oviposited on the spider's abdomen. The larva uses the spider as food.

Observations were made between 0800 and 1100 h on 18 March 1991 (dry season) in a pasture near Rio Perequeté, Playa Leona Corregimiento, Chorrera, Panamá. The female wasp paralyzed an adult female salticid (*Beata cephalica*, 8.5 mm body length) at 0936 h and was dragging it to a nest 80-90 cm away. Suddenly, the wasp dropped the spider and flew swiftly ca. 1 m to attack the head of a male *A. tropidogaster*, standing on the ground. Five stings from the wasp elicited no visible response from the lizard. The wasp then returned to recover the spider. The lizard followed and snatched the spider from the wasp, swallowed it, and ran away. The wasp flew after the lizard, trying to sting it. The lizard hid among dry leaf litter on the ground. While we searched for the lizard, the wasp flew about her nesting site, presumably searching for the missing spider. We captured the lizard. The salticid was the only food item present in the stomach. The wasp escaped capture.

Several aspects of this observation provide insight into the feeding behavior of *A. tropidogaster*. 1) Apparently the lizard selectively preyed on the paralyzed spider, but not on the wasp, a larger prey item (8.5 vs ca. 17 mm). 2) The wasp promptly attacked the *Anolis*, but did not respond to our presence, or that of other lizards. Terrestrial teiid lizards were common in the area. In 40 h of observations we never saw teiids being attacked. Was the *Anolis* recognized by the wasp as a cleptoparasite that exploits the nesting habits of this pompilid wasp? A detailed analysis of the

feeding habits of *A. tropidogaster* is needed.

We thank A. Stanley Rand, Smithsonian Tropical Research Institute (STRI), and E. E. Williams, Harvard for identifying the lizard, for supplying information, and for constructive comments on the manuscript. We also thank STRI for providing research facilities, and A. Mena, Universidad de Panamá, for help in the field.

Submitted by **DIOMEDES QUINTERO A.*** and **ROBERTO A. CAMBRA T.**, Universidad de Panamá, Museo de Invertebrados G.B. Fairchild, Estafeta Universitaria, Panamá, República de Panamá. *Research Associate, Smithsonian Tropical Research Institute, Unit 0948, APO AA 34002-0948, USA.

CARLIA FUSCA (Brown Four-fingered Skink). **DISPLAY BEHAVIOR.** *Carlia fusca* is a diurnally active terrestrial skink and the most frequently encountered scincid in the extensive *Eucalyptus alba* savannahs of southern Western Province, Papua New Guinea. At about 1500 h on 24 May 1986 about 20 km northeast of the village of Wipim, an adult skink ran up the inclined trunk of a dead eucalypt to ca. 40 cm above the ground where it began to wave its tail slowly from side to side. No other skinks nor potential predators were visible. Whether this behavior was directed towards another skink, obscured from view, or towards us could not be determined. We observed this behavior from about 3 m for about 30 s when the lizard stopped displaying. Although numerous other *Carlia fusca* were observed and captured the behavior was not observed again.

Submitted by **MARK T. O'SHEA,** 46 Buckingham Road, Penn, Wolverhampton, WV4 5TJ, England.

VARANUS INDICUS (Mangrove Monitor). **DIET.** Between 1989 and 1991, road killed monitors (N = 18) were salvaged from the island of Rota (Commonwealth of the Northern Mariana Islands) and the Territory of Guam (N = 4). Five additional monitors from Guam (four in the mid-1980's) were incorporated into the data base. All specimens were frozen and later necropsied for stomach contents.

Of the 27 necropsied monitors, 24 were collected in non-urban situations similar to those that Dryden (1965. Micronesia 2:73-76) sampled. Dryden found (expressed as percent occurrence) that arthropods (28), an introduced gastropod, *Achatina fulica* (16.6), rats, *Rattus* sp. (11.5), terrestrial crabs (8.9), shrews, *Suncus murinus* (8.9), earthworms (8.9), and slugs (7.6) formed the bulk of the diet. We found shifts in the percentage occurrence of major prey classes. In our non-urban sample, major prey classes (expressed as percent occurrence) were arthropods (45.5), terrestrial crabs (13.6), scincid and gekkonid lizards and their eggs (27.2), and rats (9.1). Other prey categories in Dryden's sample were scincid and gekkonid lizards and their eggs (3.9), blind snakes, *Ramphotyphlops braminus* (1.3), and wild bird eggs, *Rallus owstoni* (3.8). An additional prey category in our sample was *R. braminus* (4.5).

Terrestrial crabs and rats were found in similar numbers in our study and that of Dryden (op. cit.). Numbers of arthropods and lizards were greater in our study, while introduced gastropods, earthworms, slugs, shrews, and wild bird eggs were not observed. Differences in prey categories were significantly different ($G = 168.2874$, $df = 9$, $P<0.05$). With the exception of earthworms, explanations can be generated for these missing categories. Populations of *A. fulica* have been greatly reduced in the Mariana Islands due to the introduction of the predaceous flatworm (*Platydemus manokwari*) (Muniappan 1987. FAO Plant Prot. Bull. 35:127-133). Populations of slugs have been greatly reduced by the introduction of *Bufo marinus* (Eldredge 1988. Univ. Guam Mar. Lab. Tech. Rep. 88). Shrew populations on Guam are currently very low due to the introduction of the brown tree snake, *Boiga irregularis*, and shrews have apparently never been introduced on Rota (pers. obs.). Recent observations on Guam indicate that monitors prey on wild birds and their eggs (pers. obs.), although they were not recorded as prey items. This predation continues despite very low population levels of birds due to predation by *B. irregularis* (Savidge 1987. Ecology 68:660-668).

Three monitors collected in urban situations (but not compared to Dryden's data) contained domesticated chicken eggs, squid (a common fishing bait), and aluminum butter wrappers.

On Guam, a new prey, *B. irregularis*, appeared in stomachs of *V. indicus* during another study (unpub. data). *Boiga irregularis* (not yet established on Rota) has reached extraordinary densities on Guam (Rodda, Fritts, and Conry 1992. Pac. Sci. 46:46-57).

Losos and Greene (1988. Biol. J. Linn. Soc. 35:379-407) characterized *V. indicus* as an opportunistic predator. The portrait painted here suggests that this is the case in the southern Mariana Islands. Monitor lizards appear to have shifted major prey classes reflecting changes in the available prey base.

We thank E. Taisacan and R. Cruz for assistance in this study. Portions of this study were supported by the Endangered Species Conservation Program, Project E-4, to Guam.

Submitted by **MICHAEL J. MCCOID***, Division of Aquatic and Wildlife Resources, P.O. Box 2950, Agana, Guam 96910, USA, and **GREGORY J. WITTEMAN**, P.O. Box 2468, La Jolla, California 92038, USA. *Present address: 10 Stratford Road, Edenton, North Carolina 27938, USA.

SERPENTES

CHARINA BOTTAE (Rubber Boa). **FOOD.** On 6 August 1991 a *Charina bottae* was collected as it crossed a dirt road in Wallsburg Canyon (40°19'9"N, 111°21'14"W), Wasatch County, Utah. The road runs adjacent to Main Creek, through a narrow riparian habitat consisting primarily of *Acer grandidentatum* and *Populus acuminata*. *Quercus gambelii* and *Artemisia tridentata* are the conspicuous plants surrounding the riparian strip. Within 30 min of capture the snake regurgitated a newborn *Thomomys talpoides* (northern pocket gopher). By the next morning the snake had regurgitated four more newborn *T. talpoides* (Fig. 1), presumably all siblings. The snake measured 400 mm SVL, 52 mm TL, and weighed 46 g after it had regurgitated the five *T. talpoides* ($\bar{x}$ SVL = 80.6 mm). The *T. talpoides* were identified by Clyde L. Pritchett and deposited at the Monte L. Bean Life Science Museum, Brigham Young University (BYU 13151-5). The snake was released at the site of capture.

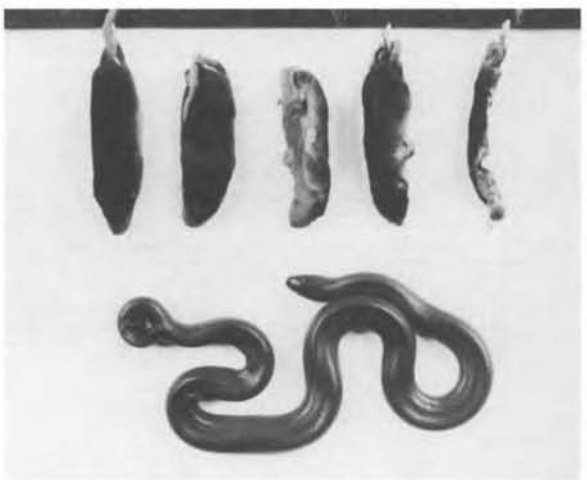


FIG. 1. *Charina bottae* and the five newborn *Thomomys talpoides* it regurgitated.

It is often suggested that *C. bottae* are nest raiders, but Van Denburgh (1922. The Reptiles of Western North America. p. 642) presented the only evidence of this. Van Denburgh (*ibid.*) reported that a *C. bottae* from coastal California had eaten six young mice. This documents *T. talpoides* as prey of *C. bottae* and indicates that these snakes raid nests, at least on occasion. It also demonstrates this species' ability to consume proportionately large meals.

Submitted by **BRECK D. BARTHOLOMEW** and **CYNTHIA LLEYSON**, 195 West 200 North, Logan, Utah 84321, USA.

CROTALUS VIRIDIS VIRIDIS (Prairie Rattlesnake). **DIET**. The following observations were made on 17 May 1992, in Elbert County, Colorado (T7S, R57W, S6). While marking fence lizards (*Sceloporus undulatus*) for a study of territory and home range conducted by John Ferner, an adult female pursued by HMS was struck from ambush by a prairie rattlesnake born the previous fall (it bore only a terminal button). The lizard was released immediately after the strike and it moved about 60 cm from the site of attack before dying (about 8 s after envenomation). Skunkbrush (*Rhus trilobata*) and rocks separated the snake's ambush station from the lizard's final location.

During examination of the dead lizard, HMS placed the carcass on a flat rock adjacent to the post-envenomation path. Photographs were taken, and the lizard was then placed back at its terminal location. While the prey was being photographed, the rattlesnake crawled into a rock crevice about 15 cm from its ambush station, apparently frightened by the observers.

All observers, except for DC, left the area. After about 10 min, the snake emerged from its burrow and began following the exact route taken by the lizard after envenomation. Tongue flicks were systematically directed to the substrate during this process. When the snake arrived at the flat rock mentioned above, many tongue flicks were aimed at the spot where the lizard had been placed, clearly implying that chemical cues were being used by the snake. During the snake's examination of this rock, a disturbance was created by two nearby fossil hunters upon discovering some shark teeth. The snake retreated to the burrow used earlier and another 10 min passed before the animal again emerged. This time the snake moved about 20 cm along the lizard's pre-envenomation pathway before returning to the post-envenomation route. Again the snake examined the flat rock extensively with tongue flicks for about two minutes before moving back to the main trail. After rejoining the trail, the snake moved to the lizard carcass and swallowed it while crawling backward to cover (Fig. 1).



FIG. 1. Yearling prairie rattlesnake (*Crotalus viridis*) swallowing a fence lizard (*Sceloporus undulatus*).

These observations give rise to several hypotheses. First, chemical cues were probably used to recover the lizard carcass (Henderson et al. 1983. Herpetologica 39:75-77). Although numerous studies exist of prey trailing by rattlesnakes, all have involved rodent prey, and we are aware of no previous account of rattlesnakes following lizard trails. Second, the snake appeared to discriminate between the lizard's pre-envenomation and post-envenomation trails, preferring the latter. While this sensory ability has been seen in rattlesnakes preying upon rodents (Lee et al. 1992. J. Herpetol. 26:95-98), we are aware of no previous work showing this with lizard prey. It is interesting that the rattlesnake struck and released the lizard. While releasing is routine when adult rodents are prey (Kardong 1986. J. Comp. Psychol. 100:304-314), lizards are typically held by captive snakes following the strike (DC, pers. obs.). The present rattlesnake was very small and thin, probably not more than 12 g, while the lizard was about 5 g; hence, the relative mass and velocity of the prey probably contributed to its release by the snake. Since previous observations of lizard-holding by rattlesnakes have involved adult snakes, the present case implies that releasing is not uncommon in neonates and yearlings (W. K. Hayes, pers. comm.; Klauber 1956. Rattlesnakes. Univ. Calif. Press, Berkeley, vol. 1, pp. 584, 601; Linscott 1948. Nat. Hist. Notes. 1:3), and that post-strike trailing behavior might be a regular component of their predation upon lizards. Finally, disturbing the snake during its post-strike trailing behavior did not cause the snake to forget its prey, showing the predator was capable of bridging a temporal hiatus created by threatening stimulation.

Submitted by **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309-0345, USA, and **HOBART M. SMITH** and **RUSSELL DEFUSCO**, Department of Environmental, Population, and Organismic Biology, University of Colorado, Boulder, Colorado 80309-0334, USA.

DENDROPHIDION BRUNNEUM (NCN). **REPRODUCTION** and **SIZE.** Data on oviposition and clutch sizes are lacking for most neotropical snake species. On 4 August 1992 the Instituto Nacional de Higiene y Medicina Tropical obtained a female *Dendrophidion brunneum* collected near Sacramento, Cantón Pallatanga, Provincia del Chimborazo, Ecuador (79° 02' W, 02° 10' S). The largely deforested area lies between 1200 and 1500 m above sea level in the western slopes of the Cordillera Occidental of the Andes. Potential natural vegetation is lower montane cloud forest, of which some stands remain.

The snake was gravid and died on 14 August 1992. Dissection revealed six soft-shelled eggs, one of which was damaged during removal. The eggs averaged 28.8 x 12.1 mm in size (28.0-29.9 x 10.4-13.4 mm, N = 5) and had a mean mass of 3 g (N = 5). The dead snake measured 1014 mm TL (SVL = 633 mm, tail = 381 mm) and weighed 51.3 g after the removal of the eggs.

This specimen exceeds the maximum total length of 96 cm reported by Lieb (1988. Herpetologica 44(2):162-175) and is the first record of *D. brunneum* for the province of Chimborazo. It is deposited in the collection of the Instituto Nacional de Higiene y Medicina Tropical (INHMT 2745).

We are grateful to Carl S. Lieb for confirming our identification and reading the manuscript, and to Alfredo Davila, Director General of the INHMT, for institutional and logistical support.

Submitted by **ULRICH KUCH**, c/o Herpetologische Sektion Forschungsinstitut und Naturmuseum Senckenberg, Senckenberganlage 25, D-60325 Frankfurt, Germany, and **ANTONIO FREIRE L.**, Departamento Ofídios, Instituto Nacional de Higiene y Medicina Tropical "Leopoldo Izquieta Pérez," Casilla 3961, Guayaquil, Ecuador.

TRIMORPHODON BISCUTATUS QUADRUPLEX (Zorcuata). **SIZE**. An exceptionally large individual was found dead on the edge of a dirt road in Nicaragua: Rivas; between Parque Nacional Chococente and Río Ochomogo, 18 December 1992. The specimen

(UF 87167) is a female measuring (in mm): total length 1665, head 47, SVL 1402, tail 263 (relative tail length ratio: 0.156), and contains 8 eggs measuring 19-23 mm. Published size records include 104.1 cm for *T. b. vilkinsoni* (Conant and Collins 1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.), and 121 cm for the species in general (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston, Massachusetts, 336 pp.). Scott and McDiarmid (1984. Cat. Amer. Amphib. Rept. 353:1-4) did not give actual measurements for the species, but stated that its size "is often greater than 1.5 m in total length." The largest *T. biscutatus quadruplex* was from Honduras (Wilson and Meyer 1985. The Snakes of Honduras. Milwaukee Publ. Mus., 2nd. ed., 150 pp.), measuring 1564 mm TL; the Nicaraguan specimen is 101 mm longer, and thus the largest one recorded for the species.

My visit to Nicaragua was made by invitation of the Minister of Natural Resources, Jaime Incer; permits to collect in Nicaragua were issued by Milton Camacho, Instituto Nicaragüense de Recursos Naturales y del Ambiente (IRENA), which also partially funded the research.

Submitted by **JAIME D. VILLA**, Department of Biological Sciences, Florida Atlantic University, Boca Raton, Florida 33431-0991, USA.

GEOGRAPHIC DISTRIBUTION

Instructions for contributors to Geographic Distribution appear in volume 24, number 2.

CAUDATA

BOLITOGLOSSA COMPACTA (NCN). COSTA RICA: PUNTARENAS PROVINCE: Canton Coto Brus: Zona Protectora Las Tablas, Finca Jaguar, trail to Panamá, 2000 m. 15 June 1990. Karen R. Lips and Steven D. Werman. Verified by David B. Wake (CRE 5121). Previously known from N slope of Cerro Pando, Bocas del Toro and Cerro Respingo, Chiriquí, Panamá; an extension of 5–10 km west. First record of this species in Costa Rica (Wake, Brame, and Duellman 1973, Los Angeles Co. Nat. Hist. Mus. Contribs Sci. 248:1–19).

Submitted by **KAREN R. LIPS**, University of Miami, Department of Biology, P. O. Box 249118, Coral Gables, Florida 33124, USA.

BOLITOGLOSSA MINUTULA (NCN). COSTA RICA: PUNTARENAS PROVINCE: Canton Coto Brus: Zona Protectora Las Tablas, Finca Jaguar and environs, 1800–2100 m. June 1990–November 1992. Karen R. Lips, Craig Guyer, and Steven D. Werman. Verified by Jay M. Savage (CRE 5351–56, 5234–35, 5121–25); Finca Las Alturas, 15 km NNE San Vito along trail to Cerro Echandi, 1500 m. 1 July 1991. Karen R. Lips and David P. Bickford. Verified by Jay M. Savage (CRE 5285); Jardín Botanico Wilson, Las Cruces, 5 km SE San Vito along Rio Jaca,1100 m. 15–18 February 1992. Karen R. Lips. Verified by Jay M. Savage (CRE 5324). Previously known from Panama on N slope of Cerro Pando, Bocas del Toro, and Cerro Punta, Chiriqui. These specimens extend the range 40 km SW and are the first published records from Costa Rica (Wake, Brame and Duellman 1973, Los Angeles Co. Nat. Hist. Mus. Contrib. Sci. 248:1–19).

Submitted by **KAREN R. LIPS**, University of Miami, Department of Biology, P. O. Box 249118, Coral Gables, Florida 33124, USA.

BOLITOGLOSSA NIGRESCENS (NCN). COSTA RICA: PUNTARENAS PROVINCE: Canton Coto Brus: Parque Internacional La Amistad, near Cerro Frantzius, 1800–2000 m. 14–17 July 1990. Karen R. Lips, Craig Guyer, Sharon M. Hermann. Verified by Jay M. Savage (CRE 5179, 5236, UCR 10720–21); Zona Protectora Las Tablas along Rio Coton, 1700 m. 18 October 1992. Karen R. Lips and Christian Hartmann. Verified by Jay M. Savage (CRE 5357). Previously known from the Cordillera Central of Costa Rica and Volcan Barú, Chiriquí, Panamá. Extends range 125 km SE of nearest Costa Rican locality and 30 km N of nearest Panamanian locality (Hanken and Wake 1982, Herpetologica 38(2):272–287).

Submitted by **KAREN R. LIPS**, University of Miami, Department of Biology, P. O. Box 249118, Coral Gables, Florida 33124, USA.

GYRINOPHILUS PORPHYRITICUS (Spring Salamander). USA: NORTH CAROLINA: Surry Co: 5.3 km NNE Mountain Park, unnamed tributary to Mitchell River. 7 March 1993. Larva. J. C. Beane, A. B. Somers, and Kelly Eanes. Verified by W. M. Palmer. North Carolina State Museum of Natural Sciences (NCSM 32058). New county record; fills gap between Wilkes and Stokes counties (NCSM files).

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, North Carolina 27611–7647, USA, and **ANN BERRY SOMERS**, Department of Biology, University of North Carolina at Greensboro, Greensboro, North Carolina 27412–5001, USA.

NOTOPHTHALMUS VIRIDESCENS (Eastern Newt). USA: Tennessee: Humphrys Co: roadside brook along Tumbling Creek Road, ca. 2 km E Rt. 13. 28 March 1993. C. S. Moran and H. Parker. Verified by B. T. Miller. Middle Tennessee State University (MTSU 54C–58C). New county record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Thesis, Univ. Tennessee, Knoxville. 290 pp.).

Submitted by **CHRISTOPHER S. MORAN** and **HERSCHELL PARKER**. Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS (Central Newt). USA: WISCONSIN: Door Co: Peninsula State Park, Sec .12, T31N, R27E. 6 August 1977. J. Trick. Verified by T. Erdman. Richter Museum of Natural History, University of Wisconsin-Green Bay (UWGB 10, 87); Sec. 16, T31N, R27E. Eft stage. 19 July 1992. D. J. Watermolen. Verified by P. A. Cochran. Milwaukee Public Museum (MPM 25827). New county record, documenting occurrence more than 80 km from nearest locality plotted by Vogt (1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Publ. Mus. 205 pp.), although Eiffert (1963, Journeys in Green Places: The Shores and Woods of Wisconsin's Door Peninsula, Wm. Caxton Ltd., Sister Bay) contains an anecdotal account of a newt in a Door County forest.

Submitted by **DREUX J. WATERMOLEN**, Wisconsin Department of Natural Resources, P. O. Box 10448, Green Bay, Wisconsin 54307, USA, and **GARY S. CASPER**, Milwaukee Public Museum, 800 W. Wells Street, Milwaukee, Wisconsin 53233, USA.

OEDIPINA GRANDIS (NCN). COSTA RICA: PUNTARENAS PROVINCE: Canton Coto Brus: Finca Jaguar, W slope of Cerro Pando, 1900 m. July 1990. Karen R. Lips and Craig Guyer. Verified by Jay M. Savage (CRE 5213, 5322, 5336); Finca Las Alturas, Trail to Cerro Echandi, 1500 m. Karen R. Lips and David P. Bickford. Verified by Jay M. Savage (CRE 5276–5278). Previous records from N slope of Cerro Pando, Bocas del Toro, Panamá (1800–1980 m); extends range 30 km west; first records for Costa Rica (Brame and Duellman 1970, Los Angeles Co. Nat. Hist. Mus. Contrib. Sci. No. 201:1–8).

Submitted by **KAREN R. LIPS**, University of Miami, Department of Biology, P. O. Box 249118, Coral Gables, Florida 33124, USA.

PLETHODON GLUTINOSUS (Northern Slimy Salamander). USA: Tennessee: Scott Co: wooded hillside in Scott State Forest, 150 m N Rt. 297, 0.75 km E boundary with Fentress County. 18 April 1993. C. S. Moran and S. R. Webster. Verified by B. T. Miller. Middle Tennessee State University (MTSU 76C, 77C). New county record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Thesis, Univ. Tennessee, Knoxville. 290 pp.).

Submitted by **CHRISTOPHER S. MORAN** and **STEVEN R. WEBSTER**. Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

ANURA

CHACOPHRYS PIEROTTI (Chacoan Toad). ARGENTINA: LA RIOJA: Chamical, National Way 38, 25 km S Punta de los LLanos. 22 February 1990. J. A. Scolaro. Verified by J. M. Cei. Museo Regionale di Scienze Naturali, Torino, Italy (MRSN A57). Extends range ca. 200 km NW from previous known distribution (Cei 1980, Amphibians of Argentina, Monit. Zool. Ital., N.S., Monogr. 2:609 pp.). Found in a salt flat related with nearby halophic lagoon systems, during a warm afternoon after a heavy rain.

Submitted by **JOSE A. SCOLARO**, Laboratorio de Herpetologia, Centro Nacional Patagónico, CONICET, Casilla de Correo 69, (9120) Puerto Madryn, Argentina.

HYLA LANCASTERI (Spiny Treefrog). COSTA RICA: PUNTARENAS PROVINCE: Canton Coto Brus: Zona Protectora Las Tablas, W foot of Cerro Pando along headwaters of Río Coton, Finca Jaguar, 1950 m. July 1990–November 1992. Karen R. Lips. Verified by Jay M. Savage (CRE 5208–5212, 5228, 5229–5300). First record for species along Pacific slope drainage in Costa Rica. Previously recorded from Cartago Province, Costa Rica, and Chiriquí and Bocas del Toro Provinces, Panamá. Extends range 100 km W and into Pacific slope drainage of Costa Rica from Panamanian Cerro Pando specimens (Trueb 1968, Copeia 1968(2):285–299; Myers and Duellman 1982, American Mus. Novitates 2752:1–32).

Submitted by **KAREN R. LIPS**, University of Miami, Department of Biology, P. O. Box 249118, Coral Gables, Florida 33124, USA.

TESTUDINES

CLEMMYS MUHLENBERGII (Bog Turtle). USA: NORTH CAROLINA: Surry Co: 5 km NNE Mountain Park. 3 April 1993. J. R. Everhart, J. C. Beane, A. B. Somers, and Surry County Natural Areas Inventory volunteers. Verified by W. M. Palmer. North Carolina State Museum of Natural Sciences (NCSM 32068, 32069, both shells). New county record. Fills part of gap between records from Alleghany and Wilkes counties to the west and Forsyth County to the east (NCSM files). Salvage permits provided by the North Carolina Wildlife Resources Commission.

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, North Carolina 27611–7647, USA, **ANN BERRY SOMERS**, Department of Biology, University of North Carolina at Greensboro, Greensboro, North Carolina 27412–5001, USA, and **J. RICHARD EVERHART**, Route 1, Box 672, State Road, North Carolina 28676, USA.

KINOSTERNON OAXACAE (Oaxaca Mud Turtle). MEXICO: OAXACA: 9 km E Santiago Astata on Rt. 200 (15°58'N, 95°35'W). 19 July 1988; San Pedro Huamelula (16°02'N, 95°40'W). 21 July 1988. John L. Carr and Walter W. Dimmick. Verified by John B. Iverson. A DOR and 5 shells respectively (none collected), documented with slides deposited at USNM. Extends range ca. 90 km ENE of nearest reported localities (Iverson 1986, J. Herpetol. 20:119–123).

Submitted by **JOHN L. CARR**, Conservation International, 1015 18th Street NW, Suite 1000, Washington, D. C. 20036, USA.

TERRAPENE ORNATA ORNATA (Ornate Box Turtle). USA: TEXAS: Parmer Co: 16.2 km S Friona on Road 214. 10 July 1992. R. L. Holland and H. M. Smith. Verified by David Chiszar. UCM Color Slides 65–66. First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M Press, College Station. 434 pp.), leaving but three of the 26 counties in the Panhandle from which it is not yet recorded.

Submitted by **RICHARD L. HOLLAND**, Science Department, Boulder High School, 1604 Arapahoe Avenue, Boulder, Colorado 80302, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado, 80309–0334, USA.

LACERTILIA

ANOLIS LINEATOPUS LINEATOPUS (Liguanea Bush Anole). JAMAICA: Manchester Parish: Christiana: Villa Bella, ca. 1000 m. 27 February 1993. Glenn Mitchell and James Lazell. Verified by Ernest E. Williams. MCZ A-11604–6. Extends range 11.5 km NNW Williamsfield and 15.5 km ENE Balaclava into the virtual center of the known range of *A. l. neckeri* (Underwood and Williams 1959, Bull. Inst. Jamaica Sci. Series 9:1–48). Abundant at the site, which consists of a wholly disturbed horticultural and agricultural landscape. Typical of the Liguanea Plain populations, showing no hint of *A. l. neckeri* influence, and thus further complicating the already distressingly complex questions of relationships within the *Anolis lineatopus* group posed by Underwood and Williams (1959).

Submitted by **JAMES LAZELL**, The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835, USA.

EUMECES OBSOLETUS (Great Plains Skink). USA: MISSOURI: Christian Co: Busiek Wildlife Area, Sec. 15, T25N, R21W. 16 April 1993. Stephen G. Thornhill. Verified by Garrett J. Lahey. Bobby Witcher Memorial Collection, Avila College, Kansas City, Missouri (BWMC 04993). New county record; extends known range ca. 55 km (34 mi) NE of the nearest previously-documented locality in state (Toal 1991, Herpetol. Rev. 22:135)

Submitted by **STEPHEN G. THORNHILL**, Burns and McDonnell, P. O. Box 419173, Kansas City, Missouri 64141, USA, and **ROBERT POWELL**, Department of Natural Sciences, Avila College, Kansas City, Missouri 54145, USA.

HEMIDACTYLUS GARNOTII (Indo-Pacific Gecko). USA: FLORIDA: Pinellas Co: Largo, 4 block area 0.29 km N Fla. Rt. 688 and ca. 0.64 km W Fla. Rt. 595, Secs. 1–2, T30S, R15E. 22 December 1992, 19 January 1993, and 4 February 1993. D. M. Crawford and L. A. Somma. Verified by David L. Auth. Florida Museum of Natural History (UF 87231–35). Five adult females captured at night on outside walls of apartment buildings and business establishments in urban surroundings. This species is common at these localities and often seen in company with *Hemidactylus turcicus*. Each adult oviposited two eggs (N=10) during 22–65 days of captivity. Five eggs (UF 87236) were preserved and deposited with the adult specimens. First county record; extends range ca. 117 air km north along Florida's Gulf coast from population in Charlotte County, ca. 198 air km south of record in Citrus County, and ca. 164 air km west of nearest inland populations in Orlando, Orange County (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third ed., Houghton Mifflin Co., Boston, Massachusetts. 450 pp.; Stevenson and Crowe 1992, Herpetol. Rev. 23:90). This significantly documents the rapid spread of this parthenogenic exotic, which currently ranges along Florida's east coast from St. Augustine in St. Johns County south to Miami in Dade County, throughout much of the Everglades, Florida Keys, and Tortugas in Monroe County, and up the southern portion of Florida's peninsular

Gulf Coast (Steiner and Lamb 1982, Herpetol. Rev. 13:25; Wilson and Porras 1983, Univ. Kansas Mus. Nat. Hist. Spec. Publ. 9:1–89; Frankenberg 1984, J. Herpetol. 18:1–7; Voss 1985, Florida Sci. 38:174; Lazell 1989, Wildlife of the Florida Keys. Island Press, Washington, D.C. 253 pp.; Conant and Collins, op. cit.).

Submitted by **DANIEL M. CRAWFORD**, 13521 120th Lane North, Largo, Florida 34648, USA, and **LOUIS A. SOMMA**, Department of Zoology, University of Florida, Gainesville, Florida 32611, USA.

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). USA: FLORIDA: St. Johns Co: Madeira Heights, Sec. 21, T7S, R30E. 24 January 1993. Paul Wise. Verified by D. L. Auth. UF 86816. New County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles, and Crocodilians. Windward Publ., Miami, Florida. 191 pp.)

Submitted by **MARK A. WISE**, St. Augustine Alligator Farm, 999 Anastasia Boulevard, St. Augustine, Florida 33811, USA.

LEPIDODACTYLUS LUGUBRIS (Mourning Gecko). NICARAGUA: ZELAYA: Pearl Key (Cayo de Perlas), ca. 75 km NNE Bluefields, coll. 10 Aug. 1991 by J. D. Villa. TCWC 69454–55. Verified by J. R. Dixon. Two voucher specimens out of a large number of lizards seen but not collected. The lizards were active at night throughout Pearl Key (the largest of a series of keys about 5 km off the Atlantic coast of Nicaragua between Tasbuapani and Bluefields) in coconut palms and trees up to 4 m above ground; none were seen on the ground or active in daylight. Eggs were found in what appear to be several communal nests which included two other lizards species. The eggs hatched over about 15–90 days, indicating that they may have been laid over a period of time, probably by more than one female. The species appears to be a recent introduction to the Atlantic coast of Nicaragua (Henderson et al. 1976, Herpetol. Rev. 17:173), where it is rapidly expanding. Although the Keys are uninhabited, they are visited by residents from nearby communities, who probably transport the lizards inadvertently in their canoes. This record extends the range of the species from the nearest known localities, Great Corn Island and Bluefields, by 50 and 75 km respectively.

Submitted by **JAIME D. VILLA**, Department of Biological Sciences, Florida Atlantic University, Boca Raton, Florida 33431–0991, USA.

LEPIDOPHYMA OCCULOR (Jalpan Tropical Night Lizard). MEXICO: SAN LUIS POTOSI: Tamán. 30 March 1989. Rafael Aguilar Cortez. Verified by Robert L. Bezy. Coleccion Herpetológica de la Escuela Nacional de Estudios Profesionales Iztacala (ENEPI 2946). Taken from the walls of a small (ca 2 m deep) cave along the Rio Moctezuma. The species was previously known from four localities in Queretaro and San Luis Potosí (Bezy 1984, Contrib. Sci. Nat. Hist. Mus. Los Angeles Co. 349:1–16). Extends range 45 km E from the area of Landa de Matamoros, and (more significantly) from thorn scrub of the semi-arid Jalpan Valley region (Dixon et al. 1972, Southwest. Nat. 16:225–235) through the eastern front dominated by *Brosimun alicastrum, Dendropanax arboreus, Pithecellobium arboreum, Pouteria glauca*, and *Protium copal* (Rzedowski 1978, Vegetación de Mexico. Editorial Limusa, Mexico, 432 pp.).

Submitted by **JOSÉ L. CAMARILLO R.**, Laboratorio de Investigacion Herpetológica, CYMA, Edificio UIICSE, ENEPI, Universidad Nacional Autonoma de México, A. P. 314, Tlalnepantla, Estado de México, México.

LIOLAEMUS ELONGATUS PETROPHILUS (Stone-loving Lizard). ARGENTINA: CHUBUT: Dique Ameghino Village (43°50'S, 67°20'W). 12 March 1990. J. A. Scolaro. Verified by J. M. Cei. Centro Nacional Patagónico, Colección Herpetológica (CNP-CH 431). New record; extends range ca. 450 km S of previous known distribution (Cei 1986, Reptiles del Centro, centro-oeste y sur de la Argentina, Jus. Reg. Sc. Nat. Torino, Italy, Monogr. 4:527 pp.). Found between stone cliffs on the northern side of the Chubut River canyon.

Submitted by **JOSE A. SCOLARO**, Laboratorio de Herpetología, Centro Nacional Patagónico, CONICET, Casilla de Correo 69, Puerto Madryn 9120, Argentina.

SCELOPORUS VARIABILIS TEAPENSIS (Rosebelly Lizard) MEXICO: OAXACA: municipality of San Juan La Lana, Santiago Jalahui (17°27'10"N, 95°46'09"W). 25–26 September 1990 (MZFC 5414); 15 November 1990 (MZFC 5415); 24 January 1991 (MZFC 5416). Alejandra Rendón. Verified by Oscar Flores-Villela. New municipality record; most northwestern records for the subspecies (Sites and Dixon 1982, Copeia 1982(1):14–27); partially fills hiatus in northwestern part of the state, 80 km NW of locality 19 in Sites and Dixon (op. cit.), and confirms the continuous distribution for this species as proposed by these authors.

Submitted by **ALEJANDRA RENDON ROJAS** and **FERNANDO MENDOZA QUIJANO**, Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México, Apartado Postal 70–399, México Distrito Federal 04510, México.

SERPENTES

CROTALUS VIRIDIS HELLERI (Southern Pacific Rattlesnake). MEXICO: BAJA CALIFORNIA SUR: 14.8 km (by road) NW (via Mexican Rt. 1) Vizcaino Junction. 4 November 1989. Bryan L. Starrett and Patrick T. Sweeney. Verified by L. Lee Grismer. Natural History Museum of Los Angeles County, Section of Herpetology Photographic Collection (LACM PC1224). Extends range 10 km S and 11.5 km W of nearest known locality, 26.5 km (by paved road) SSW El Arco, Baja California Norte (Ottley and Hunt 1981, Herpetol. Rev. 12:65).

Submitted by **BRYAN L. STARRETT**, Herpetology Section, Phoenix Zoo, 455 North Galvin Parkway, Phoenix, Arizona 85003–3431, USA.

ELAPHE GUTTATA (Corn Snake). USA: Texas: Polk Co: DOR on US Rt. 287, 2.7 mi S jct. Farm Market Road 1872. 2 May 1993. D. P. Lawson, M. B. Keck, and W. B. Jennings. Verified by J. A. Campbell. UTACV R–34641. New county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station. 434 pp.).

Submitted by **DWIGHT P. LAWSON**, **MICHAEL B. KECK**, and **W. BRYAN JENNINGS**, Department of Biology, The University of Texas at Arlington, Arlington, Texas 76019, USA.

ENULIUS SCLATERI (NCN). COSTA RICA: PUNTARENAS PROVINCE: Canton Coto Brus Las Cruces, 5 km SE of San Vito, OTS Jardín Botanico Wilson (JBW) grounds, 1250 m. Collection date undnown. Luis Diego Gomez. Verified by Jay M. Savage (CRE 5303). Most specimens collected from Atlantic lowlands or Central Valley region of Costa Rica. Third specimen from Puntarenas Province; extends range 55 km ESE from closest locality in Palmar Norte, Puntarenas (Savage and Villa 1986, Herpetofauna of Costa Rica, SSAR Contrib. Herpetol. 3, 207 pp.).

Submitted by **KAREN R. LIPS**, Department of Biology, University of Miami, P. O. Box 249118, Coral Gables, Florida 33124, USA.

HETERODON PLATIRHINOS (Eastern Hognose Snake). USA: Illinois: DeKalb Co: 1 km E Kirtland. 26 May 1954. Jerry Stubbs. Verified by Richard Stupka. Northern Illinois University at DeKalb (NIU-HDW 352). First county record (Smith 1961, Amphibians and Reptiles of Illinois, Illinois Nat. Hist. Survey Bull. 28(1):1–298). Previously reported from adjacent Lee and LaSalle counties.

Submitted by **HARLAN D. WALLEY**, Department of Biology, Northern Illinois University, DeKalb, Illinois 60115, USA.

LAMPROPELTIS TRIANGULUM (Milk Snake). USA: FLORIDA: Okaloosa Co: Sec. 15, T2S, R25W. 23 March 1993. S. L. Collins, K. J. Irwin, and J. T. Collins. Verified by J. E. Simmons. KU Color Slide 10691. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part One. The Snakes. Second ed. Windward Publishing, Miami, Florida. 176 pp.).

Submitted by **JOSEPH T. COLLINS**, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA, **SUZANNE L. COLLINS**, School of Education, University of Kansas, Lawrence, Kansas 66045, USA, and **KELLY J. IRWIN**, 2218 West 2nd Street, Topeka, Kansas 66606, USA.

LEPTOTYPHLOPS DULCIS DULCIS (Plains Blind Snake). USA: TEXAS: Guadalupe Co: railroad by McQueeny Lake dam, 3 km WNW Seguin. 7 April 1990. M. Hogg and D. Stanford. WTSU 13823–4. Jct. Rts. 464 and 1620, 2 km W Seguin. 7 April 1990. D. Stanford. WTSU 14016; Mills Co: Caraway Ranch, 3 km E Goldthwaite. 21–22 April 1977. J. Bertl, R. Brantley, T. Ellerbrook, F. Killebrew, and G. Morris. WTSU 3003, 3240, 3280, 3335–8, 3407–11, 3524–6. All verified by Flavius Killebrew. New county records (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M Press, College Station. 434 pp.).

Submitted by **KATHLEEN B. BLAIR**, Department of Biology and Geosciences, West Texas State University, Canyon, Texas 79015–0808, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309–0334, USA.

LEPTOTYPHLOPS DULCIS DISSECTUS (New Mexico Blind Snake). USA: TEXAS: Potter Co: Rt. 1061, 34 km NW Rt. 66 in Amarillo. 30 June 1970. F. Killebrew and Sikes. WTSU 923; Tascosa Road, Amarillo. 5 May–23 June 73. F. McKown and S. Shank. WTSU 1912–5. All verified by Flavius Killebrew. New county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M Press, College Station. 434 pp.).

Submitted by **KATHLEEN B. BLAIR**, Department of Biology and Geosciences, West Texas State University, Canyon, Texas 79015–0808, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309–0334, USA.

MASTICOPHIS MENTOVARIUS MENTOVARIUS (Sabanera). NICARAGUA: ZELAYA: Krukira, approx. 40 km S Puerto Cabezas, 20 Dec. 1991. J. D. Villa, E. J. Petuch, R. Solórzano. TCWC 70207. An adult female with 10 eggs in early stage of development (33–35 mm long), killed while basking on a road at the edge of a gallery forest by a local resident just outside Krukira, who claims that the species is common in the area. Verified by J. D. Johnson. First record of the species in the Departamento de Zelaya and in the Atlantic coast of Nicaragua. The specimen fits well Johnson's definition of *M. m. mentovarius* (Johnson 1977, J. Herpetol. 11:287–309; 1982, Cat. Amer. Amphib. Rept. 295:1–4) in scutellation and color, but falls well outside its distribution map. Previously-known Atlantic coast distribution includes Belize and extreme western Honduras. Extends range approx. 285 airline km from nearest Nicaraguan locality reported by Johnson (1977) and approx. 245 airline km from nearest Honduran locality reported by Wilson and Meyer (1985, The Snakes of Honduras, Milwaukee Publ. Mus., 2nd ed., 150 pp.). Permit to collect in the Miskito Keys National Park issued by Milton Camacho, Instituto Nicaragüense de Recursos Naturales y del Ambiente (IRENA); research partially funded by the Caribbean Conservation Corporation and by IRENA.

Submitted by **JAIME D. VILLA**, Department of Biological Sciences, Florida Atlantic University, Boca Raton, Florida 33431–0991, USA.

RAMPHOTYPHLOPS BRAMINUS (Braminy Blind Snake). MEXICO: VERACRUZ: Municipality of Veracruz, Playa Macambo (19°12'32"N; 96°07'08"W) at sea level. 30 December 1992. Collected by Mario Mancilla. Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México (MZFC 05480). Verified by O. Flores-Villela. Found under log in a trailer park. Previously Mexican records were based on specimens from introduced populations in Baja California Sur (Murphy and Ottley 1979, Herpetol. Rev. 10(4):119), Jalisco (Dundee and Flores-Villela 1991, Herpetol. Rev. 22(1):26), Sinaloa, Michoacán, and Guerrero on the Pacific coast, and inland from Querétaro and Morelos (Dixon and Hendricks 1979, Zool. Verhandel, 173:1–39). Establishes the species in Veracruz, as was suspected by Pérez-Higareda and Smith (1991. Ofidiofauna de Veracruz. Instituto de Biología, Universidad Nacional Autonoma de México Publicaciones Especiales 7, 122 pp.).

Submitted by **FERNANDO MENDOZA QUIJANO, MARIO MANCILLA MORENO**, and **ALEJANDRA RENDON ROJAS**, Museo de Zoología, Facultad de Ciencias, Universidad Nacional Autonoma de México, Apartado Postal 70–399, México, D. F. 04510, México.

RHADINAEA FLAVILATA (Pine Woods Snake). USA: FLORIDA: Walton Co: Sec. 28, T2S, R21W. 27 March 1993. K. J. Irwin and M. Whiles. Verified by J. E. Simmons. KU 220921. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part One. The Snakes. Second ed. Windward Publishing, Miami, Florida. 176 pp.) and partially fills the range hiatus as shown in Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third ed. Houghton Mifflin Co., Boston, Massachusetts. 450 pp.).

Submitted by **KELLY J. IRWIN**, 2218 West 2nd Street, Topeka, Kansas 66606, USA, **SUZANNE L. COLLINS**, School of Education, University of Kansas, Lawrence, Kansas 66045, USA, and **JOSEPH T. COLLINS**, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA.

TANTILLA CORONATA (Southeastern Crowned Snake). USA: FLORIDA: Okaloosa Co: Sec. 8, T2N, R23W. 22 March 1993. S. L. Collins, K. J. Irwin, and J. T. Collins. Verified by J. E. Simmons. KU 220922. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part One. The Snakes. Second ed. Windward Publishing, Miami, Florida. 176 pp.).

Submitted by **SUZANNE L. COLLINS**, School of Education, University of Kansas, Lawrence, Kansas 66045, USA, **JOSEPH T. COLLINS**, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA, and **KELLY J. IRWIN**, 2218 West 2nd Street, Topeka, Kansas 66606, USA.

TROPIDOCLONION LINEATUM (Lined Snake). USA: TEXAS: Carson Co: White Deer, Pophan Street. 1 August 1985. S. Grange. WTSU 13991. Hemphill Co: Canadian. 7 June 1978. William B. Rogers. WTSU 5277. Hutchinson Co: Borger, 1128 Elmore Street. 3 September 1987. Mary Gail Lewis. WTSU 1157. Borger, 110 Garrett Street. 4 October 1985. Barry Loving. WTSU 13763. Borger, Nursing Home. 5 January 1985. Terry McKinney. WTSU 13990. Fritch, 609 South Ridgeland Street. 3 September 1977. Burgi and Robert Lehmann. WTSU 3572–3. Stinnett, 15 November 1979. James Thompson. WTSU 6022. Stinnett, 1015 Stewart Street. 16 September 1979. Betty May. WTSU 5981. 3.2 km W Stinnett. 10 October 1985. Rod Goodwin. WTSU 14104–5. Lipscomb Co: Darrouzett, Main Street at Santa Fe Avenue. 21 October 1981. Robert Lewis. WTSU 14522. Oldham Co: Rt. 1061, 46.3 km W jct. Rt. 66. 1 July 1970. J. A. Steed. WTSU 968. Boys Ranch. 11 August 1991. Eddie Taylor. WTSU 14433. Randall Co: Amarillo, jct 45th Street and Bell Avenue. 15 and 24 April 1979. Mark Hinman. WTSU 5683, 5816. 4.8 km S Amarillo, Rt. 87. 11 September 1984. Jay P. Long. WTSU 10292. Camp Don Harrington, Rt. 1541, 5.7 km N Rt. 217. 6 July 1966, 30 September 1969, and July 1974. C. Newman,

K. Brown and D. Brooks. WTSU 2440–1, 7936. South Washington Street, E Canyon. 30 May 1988. Matt Craig. WTSU 12278. 1.6 km E Canyon, Rt. 217. 1 September 1977. J. Carter. WTSU 3587. 2.4 km S Canyon, 188 km W Rt. 87. 15 May 1985. Debbie Criswell. WTSU 13634. 6.5 km W Canyon, Rt. 1062. 26 April 1987. D. D. Bradshaw. WTSU 10008. 0.4 km E Ross, Rt. 1151. 22 September 1987. Jeff Whatley. WTSU 12381. 1.6 km N Umbarge. WTSU 9677. All verified by Flavius Killebrew. All county records, filling in much of the range of the species in the Texas Panhandle (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M Univ. Press, College Station, 434 pp.).

Submitted by **KATHLEEN B. BLAIR**, Department of Biology and Geosciences, West Texas State University, Canyon, Texas 79015–0808, USA, **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309–0334, USA, and **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309–0345, USA.

UROTHECA MYERSI (NCN). COSTA RICA: PUNTARENAS PROVINCE: Canton Coto Brus: Finca Las Alturas, 15 km NNE of San Vito, 1500 m. 19 June 1990. Karen R. Lips and Steven D. Werman. Verified by Jay M. Savage (CRE 5110). Third specimen of this species; others found from Chiriqui Grande (CRE 10095) and south of Villa Mills (LACM 137604) of the Cordillera de Talamanca; first specimen found below 2000 m. Extends the range of this species 100 km SE; first record for this province (Savage and Lahanas 1989, Copeia 1989(4):892–896).

Submitted by **KAREN R. LIPS**, University of Miami, Department of Biology, P. O. Box 249118, Coral Gables, Florida 33124, USA.

VIRGINIA STRIATULA (Rough Earth Snake). USA: FLORIDA: Walton Co: Sec. 28, T2S, R21W. 27 March 1993. K. J. Irwin and M. Whiles. Verified by J. E. Simmons. KU 220923. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part One. The Snakes. Second ed. Windward Publishing, Miami, Florida. 176 pp.) and partially fills the range hiatus as shown in Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third ed. Houghton Mifflin Co., Boston, Massachusetts. 450 pp.).

Submitted by **KELLY J. IRWIN**, 2218 West 2nd Street, Topeka, Kansas 66606, USA, **SUZANNE L. COLLINS**, School of Education, University of Kansas, Lawrence, Kansas 66045, USA, and **JOSEPH T. COLLINS**, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA.

The Occurrence Of *Hemidactylus mabouia* On The United States Mainland

The old world tropical house gecko (*Hemidactylus mabouia*) has been introduced to parts of South America and the Caribbean (Kluge 1969; Schwartz and Henderson 1985). This gecko was only recently discovered in the United States from the Florida Keys (Crawl Key) (Lawson et al. 1991). Here we present eight records of *H. mabouia* from peninsular Florida including Everglades National Park.

All collections were made by the authors. Specimens from Everglades National Park were collected under Department of the Interior National Park Service Permit 910039 issued to W. E. Meshaka. Arnold G. Kluge graciously identified and verified specimen AUM 33631. Sexes and snout-vent lengths in mm are provided for all voucher specimens. Specimens collected by BPB and JBH are deposited in Auburn University Museum (AUM). Specimens collected by WEM will be deposited in he U.S. National Museum of Natural History.

Broward Co: Pompano Beach, Day's Inn at Martin Luther King Jr. Dr. and NW 31 Ave. 14 November 1992. AUM 33632. Immature 46 mm. Collected on small building on hotel grounds. Observed four additional individuals on hotel and adjacent small buildings.

Dade Co: South Miami, vicinity of U.S. Rt. 1 & SW 80 Street. 28 August 1990. AUM 33630. Male, 60 mm. Collected on a warehouse wall.

Dade Co: Miami, 2.2 km E Miami International Airport. 8 July 1992. AUM 33631. Male, 59 mm. Observed over 20 individuals on buildings and trees.

Dade Co: Everglades National Park, Royal Palm Hammock. 4 May 1992. USNM 216113. Male, 66 mm. Collected on building.

Dade Co: Everglades National Park, Long Pine Key. 6 July 1992. USNM 216489. Immature, 32 mm. Collected on campground bathroom wall. Frequently observed.

Dade Co: Kendall, vicinity of SW 88 Street and SW 87 Avenue. 9 January 1993. USNM 217057. Female, 52 mm. Collected on house.

Dade Co: Key Biscayne. 2 February. USNM 217330-217331. Immatures, 25 & 27 mm respectively. Collected under board and under bark of Australian pine (*Casuarina* sp.).

Monroe Co: Flamingo. 4 July 1992. USNM 216467. Female, 59 mm. Collected on building wall. Frequently observed.

At many of our sites, *Hemidactylus mabouia* have been repeatedly observed and collected. Our collections include hatchlings, immatures, adults of both sexes, and females containing shelled eggs. These findings strongly indicate that *H. mabouia* is established in the southeastern tip of peninsular Florida.

From our ongoing collections of exotic herpetofauna from south Florida, we have found *Hemidactylus turcicus* to be much less common than *H. mabouia* despite the former species having been known from Key West since 1915 (Fowler 1915) and from Miami since 1936 (Barbour 1936). We offer two explanations for this observation. First, there is evidence that *H. mabouia* is capable of year-round reproduction in south Florida (pers. observ.) as in Brazilian populations (Vitt 1986), whereas *H. turcicus* is a seasonal breeder in both Louisiana (Rose and Barbour 1968) and Texas (Selcer 1986). Greater fecundity in one species could accelerate colonization rates and time of establishment thereby causing it to spread faster than a morphologically similar, less fecund species. Secondly, misidentification of specimens is possible because of superficial resemblance between *H. mabouia* and *H. turcicus*. Without voucher specimens as proof of identification, rates of geographic expansion and geographic range could be attributed to the wrong species.

Our data support the claims that *H. mabouia* is both more common in Florida and may have been in Florida longer than previously thought.

Acknowledgments.—We thank Craig Guyer, Daren A. Herndon, and Kirsten E. Nicholson for their comments regarding this manuscript.

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BOOK REVIEWS

Snakes of the *Agkistrodon* Complex: A Monographic Review, by Howard K. Gloyd and Roger Conant. 1990. Society for the Study of Amphibians and Reptiles, Contributions to Herpetology Number 6, vi + 614 pp. 52 plates, including nine ancillary papers by various contributors. Hardcover. US $75. Library of Congress Catalogue Number 89-50342. ISBN 0-916984-20-6.

This book is splendidly produced on 60-pound (text) and 80-pound (black-and-white and color plates) acid-free paper. It is of large format (8.5 X 11") with the text arranged in two columns. A beautiful frontispiece from a watercolor by David M. Dennis depicts representatives of the four genera included in the volume. The work is lavishly illustrated with 32 color plates, 20 black-and-white plates, 60 text figures, and 28 maps. This volume was issued to commemorate the First World Congress of Herpetology held in Canterbury, England, in 1989.

Gloyd and Conant have written a magnificent volume on a widespread and important group of snakes, the *Agkistrodon* complex, which occurs in north temperate and tropical America and Eurasia. These authors have added substantially to our knowledge of these snakes and have masterfully synthesized what is known of the biology of the *Agkistrodon* complex. They treat the four genera of this complex in detail: *Agkistrodon* (10 species), *Calloselasma* (monotypic), *Deinagkistrodon* (monotypic), and *Hypnale* (three species). This book is one of the few herpetological works that can truly be considered a "classic" from the date of its first appearance.

Kraig Adler, who has served as editor for the SSAR Contributions to Herpetology, nicely summarizes the history of the book in the "Editors Note" (pp. iii-iv). As he points out, this monograph has been exceptionally long in its development and completion. A period of some 60 years has elapsed since it was first conceived and executed. In the interim, Gloyd and Conant, individually and jointly, have contributed greatly to herpetology in general and have described or named about a third of all the taxa of the *Agkistrodon* complex (11 of the 34 taxa treated in this monograph). The genus *Deinagkistrodon* and the species *Hypnale walli* were named by H. K. Gloyd. Appropriately, several taxa bear the names of the authors of this monograph, namely, *A. piscivorus conanti* and *A. bilineatus howardgloydi*.

In preparing this book, the authors examined in excess of 6000 preserved specimens (mostly Gloyd), maintained a considerable number of live animals (mostly Conant), and conducted field investigations in the habitats of all four genera (mostly Conant). The authors display an intimate knowledge of these snakes that sets this monograph apart from most others. This work is truly a labor of love.

In some respects, this long-awaited monograph represents a sequel to Gloyd's (1940) "The Rattlesnakes, Genera *Crotalus* and *Sistrurus*: A Study in Zoogeography and Evolution." However, the *Agkistrodon* monograph is more complete, treating taxa in greater detail, and covers a more diverse array of biological topics. The thoroughness of this book is evinced by the 1880 entries in the bibliography.

The preface and introduction are followed by 15 chapters dealing with the systematics of this group, a general summary (in English, Chinese, Japanese, Russian, and Spanish!), a postscript section with comments on various topics, literature cited, an appendix containing Chinese geographical names, and plates (32 black-and-white, 20 color). The last 92 pages contain a collection of nine shorter papers on various aspects of the biology of *Agkistrodon* and related genera.

The Introduction carefully details materials studied, methodology, and provides a useful glossary. A helpful discussion of locality records, place names, and distribution maps is presented.

The section "Taxonomic Status of the *Agkistrodon* Complex" outlines the composition and distribution of the four genera included in the monograph: *Agkistrodon, Calloselasma, Deinagkistrodon*, and *Hypnale*.

Next follows a section providing a checklist and keys to the taxa included in the *Agkistrodon* complex. The keys are remarkably easy to use and allow identification to the subspecies level. A series of systematic sections follow including generic accounts followed by consideration of the various species and subspecies in each genus. Throughout, the text is supported by excellent illustrations of osteology and scutellation. Distribution maps denote the ranges of each taxon.

The order of presentation for subspecies or monotypic species accounts is as follows: scientific name and author, common name, reference to plates or figures, chresonymy, type locality, vernacular names, definition and diagnosis, scutellation, hemipenis, coloration and pattern, form and size, distribution, specimens examined, and ecology and natural history. Each of these accounts is a skillful synthesis of various aspects of the biology of each species. Other miscellaneous sections such as "Erroneous and additional localities," "Range limits and peripheral localities," "Uses by mankind" are added where appropriate. In total, detailed accounts are provided for 34 species or subspecies of the *Agkistrodon* complex, including the problematical *A. affinis*, which may be synonymous with *A. blomhoffii*.

In the chapter entitled "Postscript," Conant treats two new taxa described between the time of Gloyd's death (1978) and the final cutoff date for the monograph (end of 1986). These new taxa are *A. shedaoensis* and *A. halys boehmei*; both are considered valid taxa by Conant. This section also contains interesting discussions on various Asian taxa, field work, taxonomic problems in need of study, and the status of the genus *Gloydius*.

A series of nine ancillary papers at the end of the book covers a wide array of topics and nicely supplements the main body of the book. The paper "Ritualized behavior in *Agkistrodon* and related genera" by Charles C. Carpenter and James C. Gillingham summarizes and describes courtship, male combat, caudal luring, and interspecific defensive behaviors. "Chromosomes of *Agkistrodon* and other viperid snakes" by Charles J. Cole describes the karyotypes of *Agkistrodon, Deinagkistrodon*, and other vipers. In "The fossil history of the genus *Agkistrodon* in North America," Roger Conant discusses the geological time frame in which these snakes made their first appearance and the possible geological events that

influenced the evolution and distribution of this group of snakes in the New World. "The Palearctic species of *Agkistrodon*" by Howard K. Gloyd provides a detailed history of the discovery and often complicated and confused nomenclature of Old World species of *Agkistrodon*. David L. Hardy in "Venoms and envenomation: a selected bibliography of the recent literature on *Agkistrodon* and its allies" provides a comprehensive listing of the literature dealing with the venom properties of snakes in the *Agkistrodon* complex; the alphabetical bibliography is conveniently cross-referenced by species. "General skull, bone, and muscle variation in *Agkistrodon* and related genera" by Kenneth V. Kardong succinctly and clearly describes the dentition, osteology, and myology of these snakes and establishes the taxonomic distinctiveness of the four genera of agkistrodontines. Edmond V. Malnate in "A review and comparison of hemipenial structure in the genus *Agkistrodon* (*sensu lato*)" provides a detailed morphological description of hemipenial structure; interestingly, on the basis of this analysis, *Agkistrodon* and *Hypnale* are paraphyletic (Fig. 2, p. 587). "Immunologic relationships in *Agkistrodon* and related genera" by Sherman A. Minton considers the relationships of these snakes by comparing immunoelectrophoretic and radial immunodiffusion patterns of six species of *Agkistrodon* (*sensu lato*) with other agkistrodontines, other vipers, and colubrid snakes. Minton's research supports the notion that the Asian and American species of *Agkistrodon* (*sensu lato*) form a monophyletic group. Thomas R. Van Devender and Roger Conant discuss the evolution of American *Agkistrodon* in "Pleistocene forests and copperheads in the eastern United States, and the historical biogeography of New World *Agkistrodon*" and attempt to reconstruct the range of the copperhead during the last Ice Age, the Wisconsin Glacial Age, and the Holocene, using paleovegetational maps and the fossil record for *A. contortrix*.

My criticisms of this book are few. Overall, I find the production, organization, writing, and editing to be superior. However, readers would have benefited from a list of illustrations. The discussion of phylogeny and zoogeography perhaps suffers the most from not being subjected to recent ideas in systematics and biogeography. This shortcoming is not lost on Conant, who almost apologetically notes that the approach taken is "old-fashioned." A somewhat dubious phylogenetic tree (Fig. 60) indicates half a dozen or so independent lineages arising from a common "center of dispersal." Perhaps the most perplexing omission in the book is the absence of an index.

These minor criticisms aside, I have only the highest praise for this work. Besides being the ultimate reference on the *Agkistrodon* complex, I appreciate it not only for its scientific merit, but as a work of art. Remarkably, Conant (Conant and Collins 1991) produced another major work within a year of the *Agkistrodon* monograph, namely, *A Field Guide to Reptiles and Amphibians of Eastern and Central North America*.

The Preface, written by Roger Conant, refers to this work as "Gloyd's monograph." Conant meticulously distinguishes between his and Gloyd's contributions to the present volume. The long friendship and productive collaboration of Gloyd and Conant is an inspiration. The herpetological community owes Roger Conant a debt of gratitude for seeing this monumental work through to completion. In this age of flagrant self-promotion, most of us might take a lesson from this most modest man. Gloyd and Conant complement each other in many respects, but share a number of attributes including a conscientious attention to detail, an obvious perseverance, a clear fascination of their subject that is transferred to the reader, an enviable grasp of the literature, and a keen writing ability.

Conant notes the unfortunate fact that papers on natural history have in the last several decades become more difficult to publish in mainstream journals. The *Agkistrodon* monograph provides a wealth of solid natural history information. In assessing the value of this contribution, I can do no better than to quote Greene (1986), who states "Good natural history is a source of timeless, priceless information for the biological sciences. It inspires theory as well as provides crucial data for answers to comprehensive, synthetic problems in ecology, ethology, evolution, and conservation biology." The Gloyd and Conant monograph clearly accomplishes these goals.

Conant also laments "This may well be the last of the generic revisions, in the classic manner first developed by Alexander G. Ruthven." Although no doubt there has been a trend for many modern studies to scorn this approach, I hope that Conant is wrong. There is a need for solid biological works such as that of Gloyd and Conant, and hopefully their contribution will provide the impetus and inspiration for further studies of this kind. However, it is doubtful whether the auspicious combination of persons with such drive and dedication and the opportunity to conduct such research will ever come together again.

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Snake Life History in Kyoto, by Hajime Fukada. 171 pages, clothbound. Available from publisher: Impact Shuppankai Co. Ltd., 2-30-14 Hongo, Bunkyoku, Tokyo 113, Japan (price ¥7,000 by international postal order [about US $57]).

This delightful little book summarizes a lifetime's study of Japanese snake populations by Hajime Fukada. Professor Fukada, who was the founding president of the Herpetological Society of Japan and is now retired from Kyoto University of Education, is well known for his detailed investigations of ten species of snakes, most of them studied at a field site just southwest of Kyoto over the period 1954 to 1969. This work was supplemented by some observations at other sites and on captive animals. The list includes seven colubrid species (*Achalinus spinalis, Amphiesma vibakari, Dinodon orientalis, Elaphe climacophora, E. conspicillata, E. quadrivirgata, Rhabdophis tigrinus*) and three viperids (*Agkistrodon blomhoffii, Trimeresurus flavoviridis, T. okinavensis*).

Inspired by Frank Blanchard's studies of snake populations in the 1930s, Fukada has covered abundance and seasonal activity patterns, food habits, reproduction, growth, longevity, body temperatures, hibernation, and a miscellany of other topics including the nuchal gland of *Rhabdophis*, speeds of locomotion on land and in water, and heart rates. There is much here of interest to a general herpetological audience. Although many of the data have been published previously, mostly in Japanese journals, in this book the information is in English (with Japanese abstract) and neatly integrated into a highly readable whole. With 54 figures and 81 tables, there is an enormous amount of basic biological information summarized in a small amount of space.

This book also introduces a clever form of herpetological cinematography. In the free margin of the book there is a series of snake cartoons which, if one thumbs through the book quickly, appear to crawl up and down the page. Finding the correct speed

at which snakes move in table 76, with a little calculation one can figure out how fast to turn the pages to get the silhouette to slither just right! This is Fukada's way to hint at the sheer fun he has had in devoting his life to the study of snakes. The book is a fitting testament to his enviable pleasure.

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Michigan Frogs, Toads, and Salamanders: A Field Guide and Pocket Reference, by James H. Harding and J. Alan Holman. 1992. The Michigan State University Cooperative Extension Service, East Lansing, Michigan. 144 pp. Available from: The Michigan State University Museum, East Lansing, Michigan 48824-1045, USA. US $11.95.

This is the third, and last, publication in a general series on the amphibians and reptiles of Michigan. The other two volumes covered the snakes (Holman et al. 1989) and turtles and lizards (Harding and Holman 1990).

Like the preceding volumes, this small book is a practical guide for the general public to aid in identifying Michigan herpetofauna. It is organized in a manner that makes this easy for one with no prior knowledge. A check list of species known to reside in the state is presented that not only lists species, but also gives their higher taxonomy (class, order, family). The common names are given first for each amphibian, making it more useful for the layman. Two pages are provided on how to distinguish Michigan anurans from salamanders. A page is devoted to very good drawings of adult anurans, salamanders and their larvae and important identifying characters used in the text are denoted on these. This is supported by a three page glossary of selected terms. The definitions are to the point and easily understood. Unfortunately, no identification key is provided.

Following are 23 species accounts: *Necturus maculosus, Siren intermedia, Ambystoma laterale, A. maculatum, A. opacum, A. texanum, A. tigrinum, Notophthalmus viridescens, Plethodon cinereus, Hemidactylium scutatum, Bufo americanus, B. woodhousii, Acris crepitans, Pseudacris triseriata, P. crucifer, Hyla versicolor, H. chrysoscelis, Rana clamitans, R. catesbeiana, R. pipiens, R. palustris, R. septentrionalis,* and *R. sylvatica.* The accounts are condensed, containing brief sections on identification (a description of the amphibian), similar species with characters to separate them, distribution (including a map of the distribution in Michigan) and status within Michigan, habitat, and habits (reproductive biology, feeding habits). The serious reader might desire additional information in these accounts but what is presented is concise and accurate, and it was never the purpose of the book to present a complete life history of each species. A brief bibliography is included at the end of the book which includes major books on North American or Upper Midwest amphibians. Also included is a list of available recordings of anuran breeding calls.

After the individual species accounts are sections discussing general aspects of the biology of amphibians (including evolution and fossil history, higher taxonomy, morphology, body functions, foods and feeding behavior, and reproduction), conservation, methods of study, and care in captivity. Like the species accounts, these sections are short, but to the point. Although brief, the table of contents is adequate; however, the lack of an index is a serious flaw.

The book is well illustrated, as it should be for such an endeavor. Each species is covered by color photographs of adults, often larvae and eggs, and some breeding habitats. Among the more interesting photographs are those featuring a spermatophore of *Ambystoma laterale* and a comparison of a normally colored *Rana clamitans* with a blue color-morph. Most of the color photographs are of appropriate size and excellent quality. However, some have been reduced to the point that quality has been lost. Another annoying feature of some photographs is that the figure caption has been printed on the photograph, thus reducing its quality. In some of those photographs which have been reduced in size, the caption is difficult to read. The book is paperback with an adequate binding and good quality paper.

Despite the few problems mentioned above, this is a very good book that admirably fulfills its purpose. The authors should be congratulated for their effort. I highly recommend this publication, and also the other two books of the series, for anyone interested in the herpetofauna of the Upper Midwest.

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Biomedical and Surgical Aspects of Captive Reptile Husbandry, 2nd Edition. by Fredric L. Frye, D.V.M., M.S., 1991. Krieger Publishing Company, Inc., PO Box 9542, Melbourne Florida, 32902, USA. ISBN 0-89464-310-X, 2 volumes, 635 pp. US $289.

This edition of Dr. Frye's publication is comprised of two volumes containing 17 chapters, 1850 color photographs, and 180 radiographs. The large size (10" X 14") and weight (5.4 kg) alone are enough to make this an unusual contribution to reptile veterinary literature. The first edition was published in 1981 and was the most complete treatise of reptile medicine available at that time. Since then, at least eight texts and a large number of scientific articles have been published to augment that information. The references at the end of most chapters attest to that. The current volumes are proof that if one has a sincere interest in a field, a flair for photography, and a willing publisher, a niche can be found for presentation of material. There still is no other single source of information about reptile medicine and husbandry that is similar to Dr. Frye's.

Volume I includes chapters on captive husbandry, a practical guide for feeding captive reptiles, fungal, actinomycete, bacterial, rickettsial, and viral diseases, pathologic conditions related to the captive environment, radiology and imaging, hematology as applied to clinical reptile medicine, and applied clinical nonhemic parasitology of reptiles. The chapters in volume II are on ophthalmic conditions, reproduction, developmental anomalies, anesthesia, surgery, comparative histology, euthanasia and necropsy, common pathology and diseases, and antibiotic therapy.

In chapter one, an attempt is made to give a brief overview of the diversity of each order in terms of habitat, feeding strategies, and reproductive characteristics. Little to nothing is said about taxonomic relationships within orders. Chelonians, are referred to as turtles, tortoises, and terrapins and not subdivided further. Nor is any systematic accounting given for families of Squamata or Crocodylia. Thus, the chapter is a perfunctory introduction to taxonomy of the Reptilia. Chapter 2 contains information on

husbandry of captive reptiles. It covers a wide range of topics and is therefore somewhat uneven in its treatment of them. There is reference to very specific thermal requirements of some reptiles which is in contrast to more general descriptions in other portions. Interestingly, this chapter contains phrases such as "agamid" and "lacertid lizard," references to groups of animals that weren't hinted at in the introductory section on taxonomy. There is a nice sequence of photos showing placement of transponder ID chips in various animals. Other photos, such as those of tortoises drinking, aren't particularly relevant. The section on clinical methods seems out of place in this chapter and is very basic information, of little use.

The chapter on nutrition is titled "Nutrition: A Practical Guide for Feeding Captive Reptiles" (although in the table of contents the word Nutrition has been omitted). It includes guidelines and general diet information covering a wide variety of species. A potentially serious shortcoming is the lack of emphasis on feeding balanced diets. Many examples of food items are provided, but no mention is made of the proportions that should make up a diet. Rather than present what would be appropriate levels of nutrients in reptile diets the chapter drifts into the effects of improper nutrition. For instance the section on mineral imbalances starts out as a cohesive discussion of calcium/phosphorus balance but neglects to integrate or emphasize the need for ultraviolet light of the appropriate spectrum even in the face of a balanced diet. It then wanders into the clinical and pathologic appearance of animals with calcium-phosphorus imbalances. Then, rather than include information on how to adjust or formulate diets to include adequate amounts of Ca, P, and D3, the reader is referred to a 1971 publication for information. Sentences such as "With a failure of any one of these factors, the end result is identical in that the calcium is not absorbed from the intestine and the calcium is resorbed" left this reviewer scratching her head for an explanation. An attempt is made to present the syndrome called rickets in a scientific but simplified manner, but ends up reading like double-speak. Although ultraviolet light is mentioned, there is no indication that it is crucial in conversion of 7-dehydrocholesterol to cholecalciferol in the dermis and epidermis. If one didn't already know why vitamin D was important in bone matrix formation one still wouldn't know after reading this description. The author uses the term secondary nutritional hyperparathyroidism to compare it to renal rickets without having introduced it before and then does not explain it. Veterinarians and physiologists won't be at a loss, but considering the level of scientific explanation in this chapter it seems that it is geared more towards the novitiate or student. The section on excessive Vitamin D and A would leave one with the impression that soft tissue mineralization is always a result of oversupplementation, a factor that has been disputed by other researchers. Vitamin D deficiency merits two paragraphs in this section with one of the paragraphs being grossly wrong when it states: ". . . calcium carbonate, and similar natural calcium-rich materials are suitable alternatives" (for vitamin D). In the section on gout there is a non-sequitur paragraph pointing out that the ingestion of D-serine causes renal damage in the American alligator. Several pages are devoted to treatises on invertebrate culture, including techniques for feeding, raising, breeding, and medical treatment of some, all of which should be useful information. This is followed by a section on cultivation of hydroponic grass and legume sprouting. The section on obstipation and constipation contains instructions that could be devastating to snakes if not followed exactly. The use of dioctyl sodium sulfosuccinate is recommended without explaining that if not diluted it can cause severe necrosis of oral tissues of snakes.

Chapter 4, "Fungal, Actinomycete, Bacterial, Rickettsial and Viral Diseases," covers non-parasitic infectious diseases in a brief manner. The introductory section has interesting facts and an overview of general methodology for diagnosis. There is a section attempting to provide insight into reptile immunology which covers the recent literature fairly well. Descriptions of common and some uncommon infectious diseases follow. Noticeably absent, considering the relevance of the disease to large reptile collections, is a discussion of paramyxovirus. Also contained in this chapter is a table listing drug doses.

"Pathologic Conditions Related to the Captive Environment" is a chapter detailing syndromes seen when captive systems have failed. Conditions ranging from dry gangrene of digits in lizards to outright electrocution are covered. It is well documented with photographs.

The chapter on "Radiology and Imaging" was coauthored by Drs. Alex Rubel, Walter Kuoni, and Frye. Good illustrations showing positioning, normal radiographic anatomy, and abnormalities are presented. There are also illustrative materials on magnetic resonance imaging. It in concise and cohesive.

"Hematology as Applied to Clinical Reptile Medicine" covers blood collection techniques with very good photographs showing appropriate positioning. In the section on blood cell counts there is no mention of the techniques of using eosinophil Unopette and RBC Unopette systems for performing WBC and RBC counts, methods that have been used by many zoo labs for years. There are tables listing sizes of RBC's and granulocytes of many different reptiles, red blood cell counts, differential white blood cell counts, and many good photographs of various blood elements from a variety of species. Plasma electrolytes and selected constituents of blood are also listed in table form. All of this information is useful as reference material. It would have been better if table 7-10 indicated whether plasma or serum was used to determine the biochemical (T.P, glucose, urea, uric acid) values, but at least the PCV, and hemoglobin values can be used. The text on hemoparasites is also accompanied by good photographs.

Chapter 8, "Applied Clinical Nonhemic Parasitology of Reptiles," provides a brief section on methods before launching into protozoal parasites. Amoebiasis is well presented, including treatment. Unfortunately, there is no separation between the treatment and control of amoeba section and descriptions of the rest of the possible protozoal diseases. The discussion about cryptosporidium was well done, including the photographs of the appearance of the organisms in a gastric wash. The photographs of various nematode ova would be enhanced by including actual sizes, otherwise they provide useful illustrations for the practitioner. Unlike the previous table on drug doses, the one in this chapter, which lists the common parasiticides, is well referenced. Overall, I would predict that this chapter would be the one most used on a daily basis.

"Ophthalmic Conditions," chapter 9, covers a wide range of syndromes and has many photos to illuminate them, although some are of limited use. There are also references to proprietary names of drugs without ingredients being listed, which could be inconvenient for persons not acquainted with USA veterinary products.

"Reproduction in Reptiles" includes descriptions of courtship and mating behaviors, and discussions on sex determination and identification of sex. Temperature dependent sex determination is well covered prior to presentation of pathological or medical conditions associated with reproduction. The author only refers to using oxytocin for induction of oviposition, neglecting to mention recent work with the more potent product, arginine vasotocin. There are examples of Dr. Frye's folksy, friendly manner in this chapter with statements such as "this is an example of immaculate deception, rather than immaculate conception" and later when describing prolonged intromission uses the phrase *cum staminae serpentis*!

The chapter on developmental anomalies is obviously one of the favorites of the author. It is well illustrated, concise, and covers a broad range of anomalies. There are multiple photographs of most conditions.

Anesthesia in reptiles begins with a good discussion on why hypothermia is not an acceptable method for anesthesia. The description of phencyclidine hydrochloride would be better in an historical perspective section since the drug is no longer available or legal for use. The rest of the chapter provides valuable information on various methods of anesthesia.

The chapter on surgery is well written and has several good sequences of photographs going step by step through various procedures. Surgical concerns that are peculiar to reptiles, such as special instruments, suture patterns, shell cutting and fixation are well discussed. The section on venomadenectomy has a strong emphasis on the reasons for advising against it and for precautions to take subsequent to such surgery.

Taken together, chapters 14-16 cover comparative histology, euthanasia, necropsy, and pathology. The photos included here are by far the best quality in the two volumes and comprise 84 of the 146 pages. Descriptions of the tissue sections and lesions is extensive. Organ systems are thoroughly covered in the histology section. The necropsy chapter has examples of viscera in situ providing good orientation for the reader, and is accompanied by a logical, easy-to-follow techniques section and description of organ appearance and location. The chapter on pathology covers many subjects. Neoplasia makes up the bulk of the written portion. Species affected by particular types of tumors are listed along with descriptions of cases, appearances, and histological characteristics. The organization makes it easy to use as a reference tool.

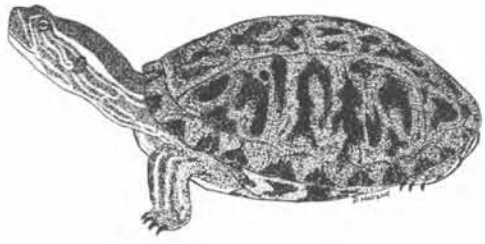
The last chapter, on antibiotic therapy, is by Dr. Doug Mader. It is well written, contains much factual information, and is well referenced. It includes subjects such as the use of potentially toxic drugs as topical medications, possible sequela, and precautions that should be employed when using them. Two tables are presented, one listing drugs which have had doses determined by pharmacokinetic research, and the other which lists empirically derived doses. This allows the reader to be fully informed as to the realities of the state of the "science" of reptile therapeutics. The theory of metabolic scaling is presented in as understandable a manner as possible. It offers a rational approach for determining new drug dosages. The references for this chapter are easy to access and are all noted in the text.

Overall the text of these volumes is not uniform in style or content. It seems that Dr. Frye hasn't decided who his audience is. In some areas very advanced scientific information is presented. This is contrasted with many areas of very basic information, incomplete discussions, and some misinformation. Some chapters meander from one topic to another without being broken up by subheadings, while others have too many subheadings interspersed in the text. The references at the end of the chapters seem extensive, but would be easier to use if the actual references were listed separately from the additional reading list. It appears that the additional reading citations inflate the reference list by a significant proportion. For instance, in one chapter there were 46 citations in the text, but 89 listed at the end. The concept of "additional readings" would also be more useful if they were divided by subject matter rather than by author. Also, one chapter numbers the references, while the others don't. In the text, there are numerous duplications of information and identical statements repeated in several chapters and there are frequent spelling errors such as ketoconazole being spelled three different ways within a span of three pages.

The photos in these volumes, while larger and more numerous than in previous volumes, have many errors. Some of the photos are identical to the previous edition except enlarged by 25-30%. Fully 15% of the photos are mislabeled, out of focus, repeated elsewhere in the text, not illustrative of the intended lesion, or have incorrect information in the legends. As the author has pointed out, the format of the photo layouts is very inconvenient. Many times the photos are pages away from the accompanying text, and many of the color plates have no page numbers. Some of the photos are on pages that are only half used. Considering the cost of these books it seems that the photos are being used to inflate the page numbers and take up space. The exceptions to these comments are in the chapters on histology and necropsy where the photos are of uniformly high quality and have almost none of the mistakes found elsewhere in the book.

Overall, if one is looking for a broad-based reference to reptile husbandry and medicine that is easy reading this would be the text to get. This is not to say that the work merits the exorbitant price being charged or that it isn't fraught with errors, misstatements, or superficial and irrelevant information. It is unfortunate that Krieger Publishing didn't advertise in advance that identical volumes were going to be sold by another publisher for half the price. In view of that fact, this reviewer is obligated to recommend against buying the Krieger product.

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Trachemys scripta elegans. Illustration by Dan Holland.

PUBLICATIONS RECEIVED

Systematics of the West Indian Lizard Genus *Leiocephalus* (Squamata: Iguania: Tropiduridae), by Gregory K. Pregill. 1992. The University of Kansas Museum of Natural History Miscellaneous Publication No. 84. 69 pp. Softcover. $4.00 US.

A phylogenetic analysis of the 21 extant and six fossil species in this important West Indian iguanian group. In addition to detailed character descriptions there is a section dealing with biogeography and series of species accounts including type data, synonymies, diagnoses, and remarks. Appendices include an apomorphy list, character state change table, and specimens examined.

Goanna, the Biology of Varanid Lizards, by Brian Green and Dennis King. 1993. New South Wales University Press, Kennsington. 102 pp. Softcover. AUS $19.95 (approx. US $15.00). Available in North America through International Specialised Book Services, 5804 N.E. Hassalo Street, Portland, Oregon 97213-3644, USA.

An overview of the biology of varanid lizards with emphasis on the many Australian species, and on *Varanus rosenbergi* in particular. Chapters deal with taxonomy and phylogeny, feeding, breeding, behavior, thermal biology, respiration, water relations, energy, and conservation. The material presented includes general information as well as tabular and graphical representations of more detailed and specific data, chiefly physiological. The book also features selected references and eight pages of color plates.

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Herpetological Review is a peer-reviewed quarterly that publishes, in English, articles and notes of a semi-technical or non-technical nature, as well as book reviews, institutional features, commentaries, regional and international herpetological society news, research requests of SSAR members, and letters from readers directed to the field of herpetology. Articles reporting the results of experimental research, descriptions of new taxa, or taxonomic revisions are not published in *HR*, but should be submitted to the *Journal of Herpetology* (see inside front cover for Editor's address). *HR* especially encourages the submission of articles of broad interest to the herpetological community.

Authors should submit an original and two copies of manuscripts. Manuscripts should be typewritten, double-spaced, on 21.5 x 28 cm (8.5 x 11 inch) white paper. Refer to this issue of *HR* for style and format information, including correct format for literature citations. More detailed information for submissions to Geographic Distribution, Life History Notes, and Recent Population Changes appear in a recent issue of *HR* under their respective headings.

Originals of illustrative material (e.g., tables, photographs, or diagrams) should be submitted with the text, with appropriate precautions taken to ensure delivery without damage. Illustrations should be discussed in the text and numbered sequentially with Arabic numbers. References to illustrations should be placed in parentheses at the end of sentences. Original photographs should be submitted as black and white glossy prints.

For further guidelines, authors should consult the *CBE Style Manual* (5th edition, 1983, Council of Biology Editors, Inc., 9650 Rockville Pike, Bethesda, Maryland 20814, USA).

Submissions for Life History Notes, Geographic Distribution, Herpetological Husbandry, Recent Population Changes, Regional Society News, and Legislation & Conservation Alert should be sent directly to the appropriate section editor (see inside front cover for names and addresses). Review copies of books should be sent to the Book Review Section Editor (name and address on inside front cover). Manuscripts intended for publication as Feature Articles, Techniques Articles, Points of View, as well as news notes and other material, should be sent to the Editor. Deadline for receipt of meeting announcements, news notes, and related material is two months prior to each issue (e.g., 1 January for March issue).

The receipt of a manuscript by an editor will be promptly acknowledged. At present, there is little lag time between acceptance of a manuscript and its publication. Although the advice and assistance of external reviewers will be sought for all feature articles, the Editor has final responsibility for deciding whether a manuscript is suitable for publication. Notes submitted for publication in Geographic Distribution and Life History Notes ordinarily will be reviewed by the Section Editor only. The Editor and Section Editors reserve the right to edit a manuscript, but substantial alterations will not be made without permission of the primary author.

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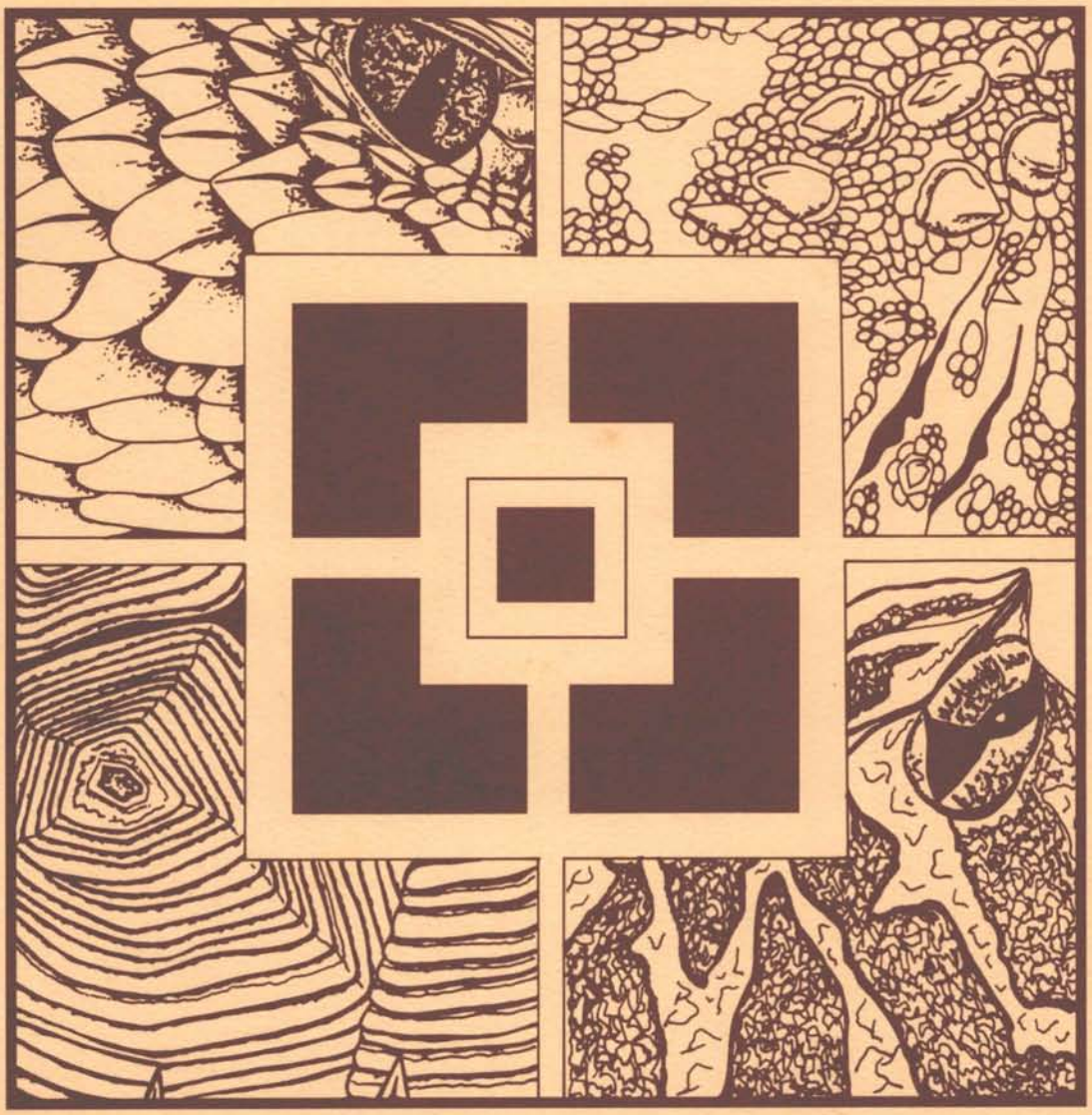
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NEWSNOTES

Amphibian Species Of The World Update

In 1989, copyright for *Amphibian Species of the World* (Frost 1985) was transferred from the Association of Systematics Collections to the Herpetologists' League (Checklist Committee: R. McDiarmid—Chair, E. Brodie, Jr., J. Campbell, D. Frost, S. Edwards, J. Savage). Frost has steadily updated and augmented the electronic manuscript as a curatorial tool and for eventual preparation of a second edition under the same algorithm used for the first edition. Because synonymies are being added and my time is limited, compilation is slow. Nevertheless, those with curatorial and/or research needs for taxonomic information may request the "working" manuscript on diskette. Due to historical constraints, the manuscript (currently 3.7 Mb) is not in a data-base format, but rather in WordPerfect 5.1; the DOS version for restoring the backup diskettes is 5.0. Please send a $10 handling and diskette fee, along with a letter justifying your need, including a signed statement to the effect that the information will not be resold, or published without attribution or in large sections, as well as a statement of preferred diskette size (if other than 1.44 Mb, 3.5 inch). Write: *Darrel Frost, Compiler—Amphibian Species of the World ed. 2, Department of Herpetology and Ichthyology, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024, USA.*

Request For Slides

The response to our previous request for *Thamnophis* slides to illustrate our book, tentatively entitled *The Garter Snakes: Systematics and Natural History* (Rossman, Ford, and Seigel: University of Oklahoma Press), was beyond our expectations, and we are indeed grateful to all of those who have already generously provided us with slides. Not all the taxa have been covered, however, and we still need good "typical" representatives of the following: *T. atratus aquaticus, T. cyrtopsis ocellatus* (Edwards Plateau), *T. e. eques, T. eques virgatenuis, T. m. melanogaster, T. melanogaster linearis, T. p. proximus, T. proximus rubrilineatus* (Edwards Plateau), *T. proximus alpinus, T. s. sauritus, T. sauritus sackenii, T. scaliger, T. v. validus, T. validus isabelleae, T. validus thamnophisoides*. We do have slides of some of these taxa, but for any of a number of reasons (the coloration isn't "typical," part of the animal is out of focus, etc.) we would like to obtain more satisfactory ones. Finally, if anyone has an outstanding slide of any of the taxa not listed above that he/she would like to see published, we certainly are open to the possibility of "upgrading." Please send slides or inquiries to: *Douglas A. Rossman, Museum of Natural Science, 119 Foster Hall, Louisiana State University, Baton Rouge, Louisiana 70803, USA.*

New Journal Announced

In June 1993, the International Herpetological Symposium, Inc. will begin publication of a new, peer-reviewed journal, *Herpetological Natural History*. It will be devoted to all aspects of natural history of amphibians and reptiles.

The editorial staff of *Herpetological Natural History* seeks original manuscripts that provide new theoretical and/or empirical insights within the broad topics of behavior, ecology, evolution, and life history. Both field and laboratory studies are welcomed. Review papers that synthesize previous studies also will be considered. Papers will be published as either feature articles or notes. A book review section will appear in forthcoming issues.

Herpetological Natural History initially will be published semiannually. Authors should expect accepted papers to be published within 6 to 12 months. Manuscripts and requests for information should be directed to: *Gordon W. Schuett, General Editor, Herpetological Natural History, Department of Zoology & Physiology, University of Wyoming, Laramie, Wyoming 82071, USA.*

Subscription to *Herpetological Natural History* is $20/yr. International surface postage included; air mail quotes provided upon request. Payment, by check or money order in U.S. dollars, should be made out to International Herpetological Symposium, Inc., and directed to: *David Hulmes, Treasurer, International Herpetological Symposium, Inc., 361 Van Winkle Avenue, Hawthorne, New Jersey, 07506, USA.*

Charles Stearns Grant-In-Aid For Herpetological Research At The California Academy Of Sciences

The Department of Herpetology is pleased to provide limited financial aid—mostly to cover round trip transportation and limited per diem expenses—to graduate students who wish to visit our collections to support research in systematics.

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Proposals are due by 15 October 1993, with notification by 1 December 1993. Grantees are expected to complete their Academy visit by 15 September 1994. Please call 415-750-7037 for further information.

Send proposals to: *Herpetology Research Grants, Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118-4599, USA.*

Second World Congress Of Herpetology Travel Awards And Donations

In an effort to obtain travel funding for young herpetologists to attend the upcoming World Congress, the American Society of Ichthyologists and Herpetologists, the Herpetologists' League, and the Society for the Study of Amphibians and Reptiles have applied to the National Science Foundation for an International Travel Grant. Should the total proposal be funded 15 travel awards of $1855 would be available for distribution. NSF's decision on funding the grant may not be known until sometime this summer but in order to make the awards early enough to benefit those attending, applications are being solicited now and will be accepted until 1 August 1993. Awards will be restricted to graduate students, post-doctoral students and young professionals (35 years or less in age) who are members of one of the above herpetological societies.

SSAR Announces a Facsimile Reprint of the Herpetological Classic

THE GILA MONSTER AND ITS ALLIES

by Charles M. Bogert and Rafael Martín del Campo

with a new preface by Charles M. Bogert and a retrospective essay by Daniel D. Beck

•

THIS MONOGRAPH, FIRST PUBLISHED IN 1956, IS STILL THE ONLY comprehensive treatment of the genus *Heloderma*, which comprises the world's only venomous lizards. The book covers all aspects of the animals' biology and venomology. (CONTENTS: classification and distribution; food and feeding habits; bodily functions, behavior, and activities; life history; ecology; venom apparatus and the venom and its effects; bites inflicted on humans; helodermatids and humans; and a bibliography.) Numerous figures, maps, and tables are included, as well as 20 plates of photographs of helodermatid lizards and their habitats.

For this reprint, Charles M. Bogert prepared an extensive and wide-ranging preface (his last scientific contribution before his death in 1992) that gives the history of his collaboration with Rafael Martín del Campo in writing the original book. This preface provides information that is intended to update the book in the areas of fossil history and distribution; the origin, evolution, and dispersal of venomous lizards; the evolution of dentition and venom apparatus; the role of venoms in food acquisition and defense; and the evolution of venomous squamates.



The book also includes a retrospective essay by Daniel D. Beck, author of the most recent studies on the ecology and behavior of *Heloderma*, which evaluates the Bogert and Martín del Campo monograph. Dale Belcher has compiled a comprehensive index.

The color frontispiece is copied from a watercolor of a Gila monster drawn by the noted wildlife artist, David M. Dennis. A special edition of this print, suitable for framing (measuring 9 by 11 inches) and *limited to 100 numbered copies*, is available; these have been *individually signed* by Charles Bogert and David Dennis.

Specifications: 282 pages, 4 portraits of authors, 58 photographs, 35 figures, 5 tables, 2 maps. Clothbound in library-grade buckram, format 7 by 10 inches. To be published August 1993.



***HELODERMA SUSPECTUM* COPE. 1869**
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At present, any travel awards are contingent on the aforementioned International Travel Grant being funded by NSF. However, organizations and individuals are encouraged to send additional donations for this purpose. Checks should be made out to the Herpetologists' League and earmarked for World Congress Travel Awards and sent to the above address. The selection committee will award all funds received.

Poster Commemorates Jamaican Iguana Survival

The Fort Worth Zoo is offering a beautiful full-color poster of the Jamaican iguana, *Cyclura collei*, which was unveiled at the recent International Symposium and Workshop on the Conservation of the Jamaican Iguana held in Kingston, Jamaica, 22-24 February 1993. The poster is being distributed in Jamaica to heighten public awareness for the plight of this critically endangered lizard. Once feared extinct, the Jamaican iguana was rediscovered in 1990, and a small remnant population still clings to existence in the undisturbed forests of the remote Hellshire Hills. Superb in color quality, this 17 x 22 in. poster features three photographs of the Jamaican iguana and its habitat.

A limited number of posters are available for $10 each plus $2.50 for postage and mailing tube. Proceeds generated by the sale of the posters will directly support the ongoing field research and conservation efforts in Jamaica. To order please send a check or money order for $12.50 payable to the FORT WORTH ZOOLOGICAL ASSOCIATION. Mail to: *Rick Hudson, Reptile Department, Fort Worth Zoo, 1989 Colonial Parkway, Fort Worth, Texas 76110, USA.*

MEETINGS

Societas Europaea Herpetologica 7th Ordinary General Meeting

The Societas Europaea Herpetologica (S.E.H.) will hold its 7th Ordinary General Meeting 15-19 September 1993 in Barcelona, Spain. The meeting site will be the Facultat de Biologia, Universitat de Barcelona. Scheduled plenary lectures include I. Darevsky (*The rock lizards of the Caucasus: the present state of the problem*), J. W. Arntzen (*European newts: a model system for evolutionary studies*), G. Mancino (*Cytogenetics, developmental biology and evolutionary biology in amphibians*), E. Olmo (*Results and perspectives in the study of the karyology of scincomorphs*), L. F. López-Jurado (*Origin, colonization, adaptive radiation, intrainsular evolution and specific substitution processes in the fossil and living lizards of the Canary Islands*), F. B.

SSAR Meeting Highlights

Dates: 7–12 August 1993
Place: Indiana University, Bloomington, Indiana

Keynote Lecture: "Feeding Strategies of Monitor Lizards," by Walter Auffenberg (Florida State Museum). An in-depth, illustrated lecture on the behavior and ecology of the Komodo, Gray's, and Bengal monitors.

Symposium: "Reptilian Behavioral Ecology: A Tribute to Charles C. Carpenter." *Organizers*: James Gillingham and Thomas Jenssen. *Participants*: Robin Andrews, Gordon Burghardt, Geoffrey Carpenter, David Chiszar, William Cooper, Justin Congdon, David Duvall, Gary Ferguson, Neil Ford, Brent Graves, Neil Greenberg, Victor Hutchison, Beth Leuck, Jeffrey E. Lovich, James B. Murphy, Catherine Marler, Joseph Macedonia, Matthew Rand, Stephen Secor, Judy Stamps, Richard Tokarz, and Kent Vliet.

Symposium: "Vision and Visual Cues in the Behavior of Amphibians and Reptiles." *Organizers*: Richard King and John B. Phillips. List of Speakers not yet finalized.

Herpetological Travelogue Slide Shows: Aaron Bauer (Australia, New Zealand, and New Caledonia), Stephen D. Busack (Spain), Thomas Fritts (Galapagos Islands), and C. J. McCoy (Belize). 30-minute, profusely illustrated lectures.

Oral and Poster Presentations: Several concurrent sessions each day. Abstract form in *Herpetological Review*, December 1992 issue, page 97.

Student Paper Awards: Seibert Prizes to be awarded to the two best student papers ($250 first prize, $150 second prize).

"The Great Reprint Scavenge." (For Students Only!). Professionals are asked to clear unwanted duplicate reprints out of their offices (and get free raffle tickets as a "thank you"). Only students will be permitted to sort through the stacks.

Audiovisual Shows: "Herps of the West" (newly updated), "Amphibians of the Appalachians" (updated 1992), and "Herpetology Past and Present."

Field Trips: "Herping with Joe Collins."

Social Activities: Welcoming Reception, the Annual SSAR Auction, Gourmet Beverage Tasting, local tours, and raffle.

Exhibit: Tour of the Indiana University Axolotl Facility, a national facility founded by R. R. Humphrey that breeds and maintains genetic stocks of axolotls for research and teaching.

Live Exhibit: Herps of the Region (Sponsored by the Hoosier Herpetological Society).

Costs: Registration: $50 student, $70 regular; after 15 June, $70 student, $95 regular. Lodging at Indiana University Union (meeting site); $55/day (single) to $88/day (4 persons/2 beds). Air-conditioned dorms are $18/day (double occupancy) and $23.50/day (single occupancy).

Further Details, Call for Papers, and Abstract Form: See the December 1992 issue of *Herpetological Review* (page 97) or on request from Craig E. Nelson, Department of Biology, Indiana University, Bloomington, Indiana 47405 (telephone 812-855-1345, fax 812-855-6705).

Sanchiz (*Phylogenetic and faunistic history of the European batrachians*), and S. Renous (*The ontogeny of locomotion in marine turtles*).

Workshops include Genetics and Systematics, Marine and Freshwater Turtles, Conservation, Biogeography, and Ecoethology. A field excursion to the Parc Natural dels Aiguamolls de l'Empordà is planned; this is a wetland area located northeast of the Iberian Peninsula 150 km from Barcelona.

For registration information, contact: *BRP - Barcelona Relaciones Públicas, Edificio Layetana, C/. Pau Claris, 138, 7.°, 4.a, E-08009, Barcelona, Spain. Tel. (3) 215 72 14, FAX (3) 215 72 87.*

ARTICLES

Where's Waldo (And The Snakes)?

Estimates of relative abundance of animals are often based on visual search methods such as transect counts or time-constrained searching (Campbell and Christman 1982). If different searchers are used to count animals in each of the areas under study, it is tacitly assumed that the searchers do not vary among themselves in their ability to detect the target species. While ornithologists have proposed numerous methods to correct for interobserver differences (Ralph and Scott 1981), this problem generally has been ignored by herpetologists (Jones 1986). For example, a recent symposium volume (Szaro et al. 1988) included eight papers on reptiles and amphibians that utilized visual search methods to determine relative abundances, but I found no mention in any of their methods sections of tests, experimental design modifications, or statistical corrections for interobserver variability.

Snakes usually occur at such low densities, and surveys are so limited in number, that it is difficult to statistically identify the sources of variation in detectability (Fitch 1987; Turner 1977). Brown tree snakes, *Boiga irregularis*, can reach densities in excess of 50 snakes/ha (Rodda et al. 1992), and we have been able to amass hundreds of censuses for some transects in Guam. In visual sampling of the brown tree snake, interobserver variability is one of the strongest identified sources of variability in census counts (Rodda and Fritts 1992). Thus, we can statistically adjust for the differences among searchers in their abilities to find snakes. However, it takes several months of calibration surveys to quantify each observer's bias, and the calibration results have shown that some observers are relatively ineffective for snake searching. Therefore, it would be useful to have a simple method for predicting the abilities of snake searchers. In this paper I describe one potential screening method (hereafter called the Waldo test) and compare its assessment of visual searching ability with relative snake sighting ability.

The Waldo test uses drawings created for entertaining children with visual searching tasks (Handford 1988, 1989). Waldo, a boy with distinctive glasses and a red striped shirt and hat, is located at an unpredictable location on drawings that include many other colorful people and objects. Using a standardized set of written instructions, I asked snake searchers with known snake detection proficiencies to determine the amount of time it took them to find the mildly cryptic figure (Waldo) in each of the drawings. If a participant had seen a drawing before, I discarded that trial. This eliminated only two of 184 reported times (each of eight searchers found Waldo in 23 drawings). To control for order of presentation effects, the drawings were searched in a fixed order. Because drawings varied in complexity, I ranked the times for each drawing independently, and then normalized the ranks using the Blom method (SAS Institute 1988) before determining the mean normalized rank for each searcher.

The eight searchers had each logged at least 25 h of visual snake searching, distributed irregularly over the 14 best-studied transects for the brown tree snake in Guam. During the 692 h of searches (1988-1992) 1117 snakes were captured. The 236 individual nightly capture totals were weighted by the number of search hours they represented and subjected to a two-way analysis of variance. The two factors considered were searcher and transect-year (each transect-year combination was considered separately to accommodate progressively changing population densities). The searcher effect was highly significant ($F=4.76$, $df=7,199$, $P=0.00006$). When adjusted for the varying mix of transects searched, the least squares fit to the model for each searcher's average sighting rate was correlated with their mean scores on the Waldo searches (Fig. 1; $r=0.693$, $df=6$, $P=0.057$).

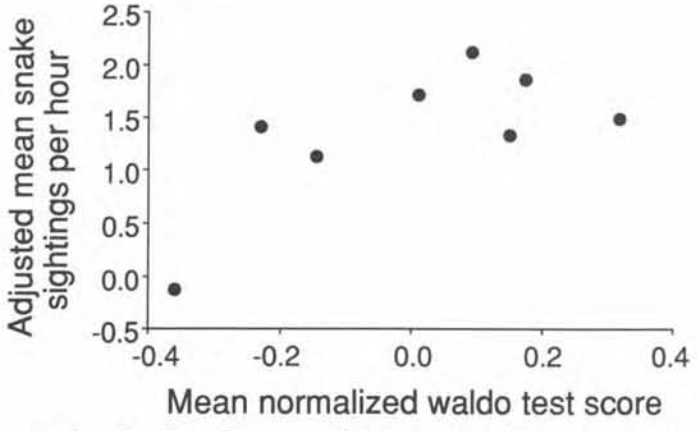


FIG. 1. Correlation between performance on the Waldo test and snake sighting rate ($r^2=0.48$, $P=0.057$).

The nearly significant correlation suggests that visual searching skills may have some common ground between finding snakes and finding Waldo. The correlation explains slightly less than half of the total variance ($r^2 = 0.48$), and other important attributes of being a successful visual snake searcher (e.g., motivation, alertness under trying field conditions, etc.) must account for the majority of a person's snake searching skill. Nonetheless, it is worth noting that assignment of the person with the lowest Waldo score to some other duty would have increased the average sighting rate and improved the reliability of estimates of snake density.

During the execution of the Waldo tests I noted difficulties in self-timing. An independent timer will administer future tests. I hope this first attempt at predicting observer bias in visual searching tasks will inspire others to quantify interobserver variability and identify suitable measures for screening herpetological searchers.

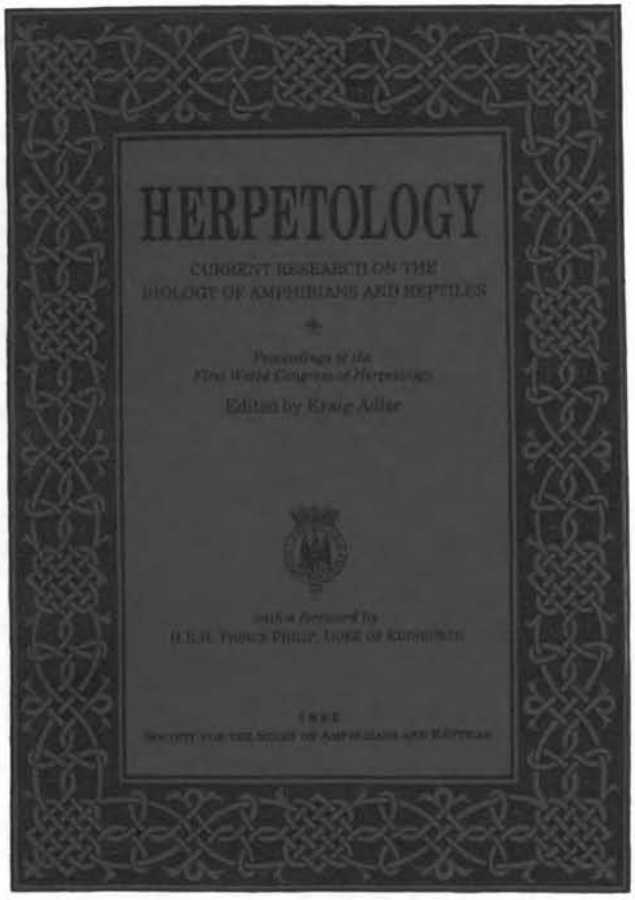
Acknowledgments.—I wish to thank anonymous individuals who took the Waldo test and performed the numerous snake censuses. Steve Corn, Daryl Karns, Tom Fritts, and Bruce Bury suggested improvements to the manuscript. Funding for this work was provided by the U.S. Fish and Wildlife Service through the Arizona Cooperative Fish and Wildlife Research Unit and the National Ecology Research Center.

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Viable Triploid Hybrids Between A Large Frog, *Rana catesbeiana*, And A Small One, *Rana septentrionalis*

The largest North American frog, the bullfrog (*Rana catesbeiana*), is related to one of the smallest, the mink frog (*Rana septentrionalis*). Hybrids between them, produced by artificial insemination in the laboratory, show characteristic syndromes and die before feeding (Elinson 1977, 1991; Kao and Elinson 1985). However, hybrids occasionally survive (Elinson 1977). I report here that viable hybrids are triploid and that they metamorphose at a larger size than do *Rana septentrionalis*.

When eggs from a *R. septentrionalis* female (Erin, Ontario) were fertilized with sperm from a *R. catesbeiana* male (Quebec), most of the embryos had very large heads (macrocephaly). A few appeared more normal, and six began feeding and growing. Chromosome preparations from corneas of four metamorphosed frogs showed that two were triploid (3N=39) and the other two were likely triploid (Fig. 1). Isozyme patterns for lactate (LDH) and isocitrate (IDH) dehydrogenase were run for these frogs, and the relative gene dosages indicated that all were triploids with a diploid set of *R. septentrionalis* chromosomes and a haploid set of *R. catesbeiana* chromosomes.

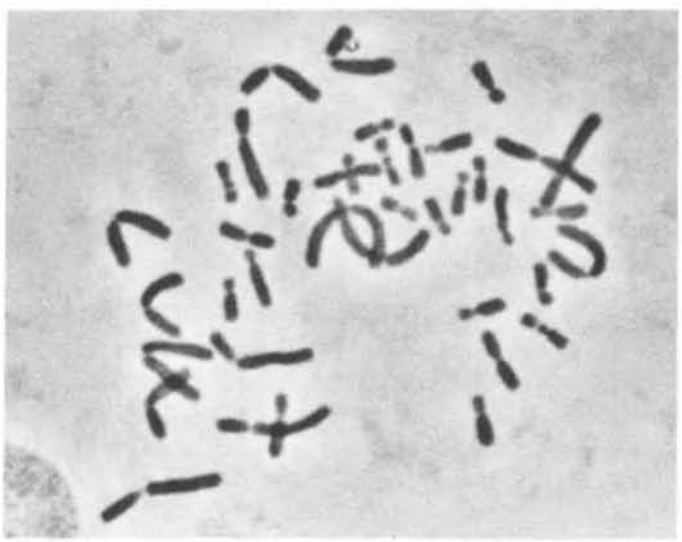


FIG. 1. Chromosome spread from a hybrid showing the triploid number (39) of chromosomes.

Triploids originate due to the occasional production of diploid eggs (Richards and Nace 1977; Wright et al. 1976), and the additional haploid set of maternal chromosomes permits hybrid viability (Bogart 1972; Elinson and Briedis 1981). Reexamination of isozyme patterns of viable hybrids, reported previously (Elinson 1977), suggests that they too were triploid (Fig. 2).

The addition of a haploid set of *R. catesbeiana* chromosomes in the hybrids appears to have increased the size at metamorphosis. Diploid *R. septentrionalis* and triploid hybrids were raised under similar conditions, although the *R. septentrionalis* tadpoles were kept at higher densities (2-3 times) for the first five months. Metamorphic climax, as indicated by forelimb emergence, occurred at 231 ± 39 days (N = 14) for *R. septentrionalis* and 249 ± 16 days (N = 5) for the hybrids. At completion of tail resorption, *R. septentrionalis* froglets were 3.0 ± 0.2 g and 2.3 ± 0.5 cm (N = 9), while hybrids were 3.7 ± 0.4 g and 5.2 ± 1.6 cm (N = 5).

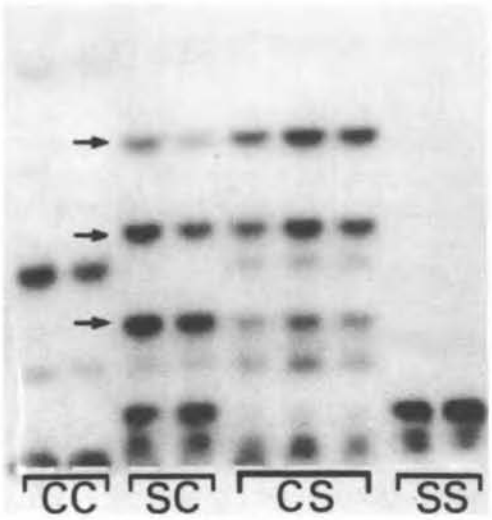


FIG. 2. Zymogram of lactate dehydrogenase (LDH). This gel shows LDH patterns for nine feeding tadpoles (19 days old) of the following types: *R. catesbeiana* ♀ x *R. catesbeiana* ♂ (CC); *R. septentrionalis* ♀ x *R. catesbeiana* ♂ (SC), *R. catesbeiana* ♀ x *R. septentrionalis* ♂ (CS), *R. septentrionalis* ♀ x *R. septentrionalis* ♂ (SS). Hybrid bands, consisting of subunits from both species, are indicated by arrows. Note that in SC tadpoles, the intensity of the hybrid bands is highest nearer the origin, while in CS tadpoles, the reverse is true. This skewing of the patterns is expected if the hybrid tadpoles contain a diploid set of chromosomes from their mother and a haploid set from their father. For instance, SC tadpoles would have a diploid set of *R. septentrionalis* chromosomes, and the pattern would be skewed towards *R. septentrionalis* (SS). The reverse is true for CS tadpoles.

Literature values for lengths of frogs at metamorphosis are 2.9–4.0 cm for *R. septentrionalis* and 4.3–5.9 cm for *R. catesbeiana* (Schueler 1975; Wright and Wright 1949). Our lab-raised *R. septentrionalis* were small compared to literature values, but the triploid hybrids fell in the range expected for *R. catesbeiana*. The larger size of the hybrids at metamorphosis could be due to better raising conditions, to triploidy, or to *R. catesbeiana* genetic contribution. A better controlled study would be required to sort out these factors, but it seems reasonable to hypothesize that *R. catesbeiana* genetic material can increase the metamorphic size of *R. septentrionalis*. These hybrids would be useful in investigating genetic control of growth and size in frogs.

Acknowledgments.—I thank Peter Pasceri for technical assistance and Marjorie Burnett (Laboratory of Analytical Systematics, Royal Ontario Museum, Toronto) for isozyme analysis. Supported by NSERC, Canada.

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POINTS OF VIEW

The Need For Status Information On Common Herpetofaunal Species

The loss of biotic diversity is a matter of great concern to biologists and land management agencies. Much effort is directed at conserving individual species, and considerable thought has been directed at developing criteria for categorizing endangered and threatened species (e.g., Mace and Lande 1991). Much debate centers on rarity (Arita et al. 1990; Drury 1974; Kattan 1992; McCoy and Mushinsky 1992; Rabinowitz et al. 1986). Few authors have discussed commonness, however. Kattan (1992) placed it on the "wide – broad – large" end of Rabinowitz et al.'s (1986) geographic range – habitat specificity – local population size continuum. Out of eight categories using the Rabinowitz scale, only one reflects commonness (McCoy and Mushinsky 1992). However, a species could be perceived as common if it fell outside this category, such as a species that is widespread with a large local population size, but with restricted habitat specificity.

The Dilemma of Common Species.—In the United States, regulations generally do not address the management of habitats for wildlife and plants, except in specialized areas such as critical habitats for federally protected endangered and threatened species, parks, refuges, or wildlife management districts. Instead, management usually involves game or commercially important species, or species threatened with extinction. Consequently, relatively few species are the subject of direct population monitoring, and a high percentage of available time and effort is expended on those few species. With relatively small amounts of habitat protected and most funding directed at task-oriented research on a few species, the biological status of apparently common species may be overlooked.

A second problem is that biologists as well as the general public find it difficult to agree on what is a common species. Dictionaries (e.g., Webster's II New Riverside Dictionary, Berkeley Books, New York, 1984) use words such as "widespread," "familiar," and "occurring frequently" to define "common." Inasmuch as researchers know of species that are widespread but not common, are common but not familiar, and are not common but occur frequently, the meaning becomes somewhat ambiguous. A widespread and abundant species could suffer a 50% population decline, yet it still might be perceived as common to many people. We suggest that biologists should only use the word common to denote a species that can reasonably be expected to be observed or collected in its natural habitat, assuming that appropriate sampling techniques are used in appropriate habitats at appropriate times of the year. The word common may be used as a general observation of relative abundance but it should not be used in a conservation context unless a specific definition is provided.

A third problem involves perception and personal bias. Perceptions of commonness usually are based more on subjective personal experience than actual data. Inasmuch as habitats are changing rapidly and few biologists have experience with wide-ranging species throughout their ranges, the biological status of a species may change far more rapidly than our perceptions of its status. Biologists should not be too quick to suggest that a species is common and widespread without some basis other than subjective impressions or on data taken 20 years ago.

One result of biased or inaccurate perception is that there may be little attention devoted to the effect of various management practices on supposedly common species. Major changes in vegetation and faunal composition can occur as a result of management goals which do not favor common species. For example, landscapes with dense woody understories become more open with frequent prescribed fires. Eastern box turtles (*Terrapene carolina*) tend to occur in wooded environments. If fires are frequent, box turtle populations tend to decline and some populations might be extirpated. The risk of extirpation is especially high initially because first fires burn much hotter than subsequent fires. Thus, a manager with preconceived ideas of what are or are not common species may initiate management programs that actually lead to the inadvertent loss of a possibly declining species.

Is a Species Common? The Role of Museum Specimens.—Intuitively, it seems reasonable that in a region with a diverse scientific community, such as North America or more specifically, Florida, the commonness of an animal might be reflected by its representation in museum collections. As a result of our studies on box turtles (Franz et al. 1992), we decided to review national museum collections to determine the extent of recent box turtle collecting activity. Our examination helps to illustrate the problems of determining the present distribution, much less status, of a species lacking long-term population data, but generally perceived to be common.

We examined Florida box turtle records in all major U.S. museums (Appendix 1). We did not examine private collections or collections in schools or small regional museums. We recorded 842 specimens, of which 425 (50.5%) were deposited in the Florida Museum of Natural History (UF). Most non-UF specimens were collected prior to 1960 whereas UF collections peaked in the 1950's and 1970's (Fig. l). Most specimens resulted from the efforts of a few collectors in specific areas. For example, the large number of box turtle records at UF in the 1970's resulted largely from collections made by a single individual and are concentrated in only a few regions of the state.

We tabulated the year of collection within each county when data were available. For four counties (Hardee, Hendry, Martin, Union), we found no box turtle records. We divided the data into two categories, pre- and post-1970, and then calculated percentages within each category (Fig. 2). In 34 of 63 (54%) Florida counties with records, few box turtles (0-25%) were collected in the last 22 yrs. In 13 (21%) counties, between 26% and 49% of records occurred < 22 yrs ago whereas the majority of specimens were collected within the last 22 yrs in only 16 (25%) counties.

In most of the high percentage counties, few specimens were involved (Fig. 2). In addition, collecting biases are evident. For example, the large number of box turtles from Alachua County coincides with the presence of the University of Florida and an active herpetological community through the years; most of the large number of box turtles from Dade County were collected when Miami was a popular destination for northern tourists and prior to the intensive urbanization of 1960's. Thus, although the box turtle was common in museum collections, museum records give little reliable indication of the present distribution of box turtles in Florida.

In accounts in both the popular and scientific literature, the eastern box turtle (*T. carolina*) is a common species in eastern North America (Carr 1952; Conant and Collins 1991; Ernst and Barbour 1989; Pritchard 1979) and in Florida (Ashton and Ashton 1985; Moler 1988). A check of the Florida literature (Enge and Dodd 1992), however, reveals that virtually nothing on the biology of this turtle is available except for a few notes. The present status of Florida's "common" box turtle is unknown despite population declines elsewhere (Schwartz et al. 1984; Stickel 1978; Williams and Parker 1987), substantial international and domestic trade (New York Zoological Society 1991; Rea 1992) and extensive habitat destruction in Florida (Cerulean 1991).

What is Needed? Monitoring Protocols.—We suggest that many species perceived to be common, such as Florida's box turtles, may actually be declining. For example, populations of herpetological species once thought common, such as tortoises (*Gopherus agassizii, G. polyphemus*) and many frog species, or that are now generally perceived as common, such as the red-eared slider (*Trachemys scripta*) and snapping turtle (*Chelydra serpentina*), have declined in many areas. The disappearance of many frog populations offers a clear example of dramatic and unexpected declines over a short time period (Blaustein and Wake 1990; Livermore 1992; Wyman 1990). Rather than ignore common species until problems become glaringly apparent, a new approach is necessary.

The lack of historic population data makes it difficult to establish the causes of population declines, interpret them (Pechmann et al. 1991), or recommend management-related research. On the other hand, the long-term studies of once common species such as desert tortoises (Berry 1986) and many sea turtle populations (e.g., Bjorndal 1980) have allowed careful scrutiny of population trends (Crouse et al. 1987). With established monitoring programs begun in the 1970's, biologists were immediately aware of rapid declines and therefore in a better position to initiate conservation action, sometimes on an emergency basis.

In times of scarce economic resources, it is unrealistic to suggest that all species should be monitored, and we recognize that there are problems underlying the assumptions of using vertebrate indicator species to monitor population trends and habitat quality (Landres et al. 1988). The extirpation of or serious population declines in common species may not indicate the extent of impact on other species or identify the source of the problem. However, the decline or absence of common species in appropriate habitats gives an indication of questions that need to be addressed.

We suggest that biologists from academia, resource management agencies, and private conservation organizations need to develop monitoring protocols that include entire herpetofaunal communities and common species, in addition to species known to be in need of conservation management. Monitoring protocols should include site selection, identification of species and communities to be monitored and surveyed, and survey techniques. Species should be censused using standardized, quantified, population surveys (see Heyer et al. 1993 for example). Certain populations should be targeted for short-term monitoring, whereas other populations should be studied on a long-term basis (see Likens 1988). Effects of various management practices on common species also need to be considered.

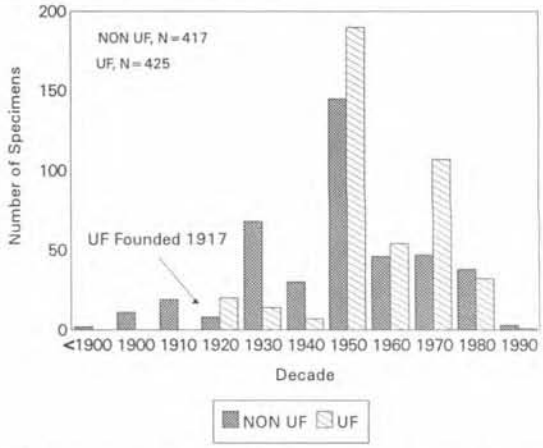


FIG. 1. The number of Florida specimens of the eastern box turtle in North American museum collections tabulated by decade of collection. UF = Florida Museum of Natural History.



FIG. 2. Florida specimens of the eastern box turtle in North American museum collections by county. A star = between 0-25% of the specimens were collected after 1970; circle = between 26-49% of the specimens were collected after 1970; square = > 50% of the specimens were collected after 1970.

As might be expected (although not expressly demonstrated), museum collections by themselves are unreliable to determine present status and distribution. Likewise, the use of technological innovations, such as GAP analysis (Scott et al. 1993), and regional databases such as those developed by the Natural Heritage Programs of The Nature Conservancy, must be used cautiously and are no substitute for field inventories. However, museum specimens record valuable information on historical distribution and other biological data. While we do not advocate unnecessary collecting, museum holdings need to be continuously augmented. Many governmental regulations require species inventory and

ecological assessment outside traditional academic research. During the course of such work, survey protocols should incorporate the collection of museum voucher specimens of even common species, especially in areas slated for destruction. In some cases, high quality photographic vouchers may serve as substitutes as long as photographs are deposited in museums with public access. All public lands should be surveyed for biological diversity. Finally, biologists should make the effort to preserve museum quality road kills, or animals that die from natural or other causes.

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Appendix I

Records for box turtles in Florida were examined from the following collections: American Museum of Natural History, Archbold Biological Station, Auburn University, California Academy of Sciences, Carnegie Museum, Cornell University, Field Museum of Natural History, Florida Museum of Natural History, George Mason University, Illinois Natural History Survey, Los Angeles County Museum, Louisiana State University,

Milwaukee Public Museum, Museum of Comparative Zoology, Museum of Vertebrate Zoology, National Museum of Natural History, North Carolina Museum of Science, Northeast Louisiana University, Ohio University, Southern Illinois University, Texas A&I University, Texas A&M University, Tulane University, University of Alabama, University of Central Florida, University of Colorado, University of Connecticut, University of Georgia Museum of Natural History, University of Illinois, University of Kansas, University of Kentucky, University of Michigan Museum of Zoology, University of South Florida, Yale-Peabody Museum.

A Consideration Of Iguanian Lizards And The Objectives Of Systematics: A Reply To Lazell

In the December, 1992, issue of this journal, Lazell (1992) commented on several issues of systematic philosophy and practice, as well as on the particulars of iguanian lizard taxonomy. Most of the general issues that Lazell addressed (e.g., "practical" utility versus scientific utility of classifications; paraphyly versus monophyly; overall similarity versus synapomorphy; definition versus diagnosis; taxonomy based on rankings of "key" characters versus taxonomy reflecting recovered evolutionary history) have all been resolved in the leading systematics journals (e.g., *Systematic Biology*), and, therefore, should not warrant further discussion here. However, Lazell's manuscript included a novel iguanian classification that represents a step backward for systematics, and because his manuscript survived peer review it must be that Lazell's viewpoint is shared by at least some proportion of the readership of *Herpetological Review*. It is for these reasons that we respond.

Systematic philosophy.—The signal difference between Lazell and leading systematists is in his rejection or misunderstanding of the fundamental importance of evolutionary history to systematics and of a set of logical techniques, collectively referred to as phylogenetic systematics or cladistics, that are used to estimate this history of evolution. The phylogenetic approach is predicated on the assumptions that (1) characteristics of ancestors are passed to their descendants in the same or modified form, and (2) the "nested" distribution of shared derived characters (synapomorphies) among taxa can be used to infer pattern of descent (Henning 1966). The most controversial aspect of cladistics for precladistic systematists is that phylogenetic (= cladistic) taxonomies report unambiguously the recovered patterns of evolutionary relationships among taxa.

The older paradigm of systematics (labelled, ironically, "evolutionary systematics"), here exemplified by Lazell's approach, is to employ overall similarity and "good" characters that meet some arbitrary criterion of taxonomic "utility," regardless of whether the groups recognized on this basis are logically consistent with evolutionary history. Further, in this approach some characters confer "family" rank on particular groups while others warrant only "subfamilial" or "generic" rank, regardless of the evolutionary relationships of the lineages under consideration. This approach is typical of systematics before the middle 1970's in that it represents a search for a hierarchy of kinds (=classes) of organisms that was then considered heuristic for the study of evolution. This approach was subsequently rejected by most systematists because they recognized that a *defined* hierarchy of kinds of organisms is logically unrelated to the evolutionary hierarchy and actually is detrimental to the study of evolutionary processes. More fundamentally, it was recognized that taxa (lineages and the historical groups that they can become) cannot be *defined* by rules because they are not sets in any rigorous (intensional) sense (Ghiselin 1981; Hull 1978, 1981; Wiley 1989). Because traditional, nonevolutionary classifications (those preferred by Lazell) make no distinction between invented abstractions (paraphyletic groups) and those entities that are discovered (monophyletic groups), they are anathema to scientific utility and inquiry. Alternatively, if classifications are based exclusively on the pattern of evolutionary history (that is, based on cladistic principles), we can use them to help study many things about historical processes, such as the evolution of behavior, life history, anatomy, physiology, and karyology, as well as historical biogeography. This lack of a firm evolutionary base in "evolutionary" systematics is the fundamental flaw that limits its scientific value (de Queiroz 1988) and which led many evolutionary bioloigsts to conclude that systematics was irrelevant to scientific inquiry. The larger issue, then, is not, as Lazell would have it, the efficiency of systematics as a button-sorting activity, but whether systematics is to be part of evolutioary biology. Most evolutionary biologists have already voted; it is no coincidence that the upsurge of interest in systematics comes as the same time that cladistics, a taxonomic approach with a firm philosophical base, has taken the stage.

Lazell's viewpoint is well illustrated by his discussion of the nature of higher taxa. He considers higher taxa to be "words, not organisms" that are "arbitrarily delimited by humans" but he still allows that they can "originate." Does he really mean to claim that sets, abstractions that extend from their definitions, can have histories? Could one talk about the unitary past and present of the set of "my car and three geese" or "reptiles excluding the closest living relatives of crocodilians and including the closest fossil relatives of mammals?" Further, although nonhistorical science, like physics and ecology, deals with classes of entities and their classes of interactions, historical science, as exemplified by systematics, generally deals with unitary entities (e.g., species and monophyletic taxa such as Mammalia and *Brachylophus*), their component parts, and their histories.

Paraphyletic groupings hinder science because they are neither scientifically useful classes, abstractions whose definitions (intensions) extend from hypotheses of natural regularities (like "herbivores" or "gold"), nor are they unitary or historical entities. As a more germane example, the historical entity that we call Iguania (iguanian lizards) would still exist if humans had failed to discover it. It is objectively real because it is the manifestation of what a single ancestral species has become through evolution, represented at this point in time by about 1000 living and uncounted numbers of fossil species. On the other hand, if a set is defined by Lazell such as "all iguanians that lack zygodactyl feet" (i.e., Lazell's concept of Iguanidae = former "Iguanidae" + former "Agamidae"), that set of species owes its "existence" not to historical descent or objective reality, but to Lazell's definition. Therefore, if Lazell decides in the future that his classification is no longer useful, the abstraction that he currently refers to as "Iguanidae" will disappear because, as an abstraction, it never really existed. Regardless of how Lazell constructs definitions in support of his paraphyletic classifications, some of his "iguanids" will continue to share a more recent common ancestor with chameleons than with other of his "iguanids." We cannot conceive of any overriding utility that could justify this misrepresentation of recovered evolutionary history.

Characters and character analysis.—With respect to our character analysis of iguanians, Lazell suggests that we reached erroneous conclusions in part because of our eschewing differential *a priori* character weighting and intuition based on perceptions of general similarity. He also faults us for not offering "proof" of our conclu-

sions. "Proof" is not within the realm of science (Popper 1968, 1979) so we must claim only that we have offered evidence for our conclusions. Lazell's view of what constitutes a "good" character is difficult to address because he is not interested in the phylogenetic information content of characters, only in their "utility" for button-sorting. Moreover, because his concept of character weighting has to do with ease of observation (based on his subjective opinion) rather than on the reliability of the character with respect to phylogenetic signal, his views are far removed from mainstream discussions of differential charcter weighting (e.g., Carpenter 1988; Farris 1969; Hecht and Edwards 1977; Wheeler 1986). Nevertheless, because most proponents of "evolutionary systematics" do not take Lazell's extreme position on classifications and characters, it is illustrative to see what several of Lazell's statements would mean in an evolutionary context.

Lazell mentions that a character that he would weight heavily is a derived aspect of tongue morphology, reticular papillae on the foretongue (Schwenk 1988), shared by anoles and chamaeleonids (*sensu* former "agamids" and chameleons). However, if this feature were taken as unassailable evidence of a chamaeleonid-anole grouping, this would not support the recognition of an "Iguanidae" (in his sense or the older one), because this feature would support the conclusion that anoles are more closely related to chamaeleonids than they are to such genera as *Polychrus* (which certainly shares a *gestalt* with anoles, as well as a number of derived characters — Frost and Etheridge 1989; Williams 1988). Lazell's discussion of other chamaeleonid characters is confused and misleading, with little regard for evaluating appropriate organismal life stages (= semaphoronts) or for alternative lines of evidence.

Lazell's assertion that acrodonty is an unacceptable basis on which to group "agamids" (i.e., chamaelonids without zygodactyl feet) and chameleons is untenable. This dentition character has been considered a "useful" (and phylogenetically informative) feature for 70 years (Camp 1923), and although some have suggested that acrodonty in iguanian lizards may have arisen convergently (e.g., Williams 1988), no one previous to Lazell has ever argued that the alternative conditions (pleurodonty and acrodonty) were part of an observable continuum. Even though we would not argue that it is impossible for the putative synapomorphies shared by agamines, leiolepidines, and chameleons to be evolutionarily convergent, Lazell's published comments make the characterization of this set of features appear much more difficult than it actually is. Although the dental condition in former agamids (= leiolepidines and agamines) and chameleons is almost universally referred to as "acrodont" (i.e., teeth attached to the top of the dentigerous bones) as opposed to "pleurodont" (i.e., teeth attached to the sides of the dentigerous bones), the character posited to carry phylogenetic information is that in chamaeleonids the lateral teeth cease to be replaced in adults and become fused to the underlying bone (= oligophyodonty - Edmund 1969). Lazell is correct that many "acrodont" iguanians actually have near-pleurodont or pleurodont tooth attachments. However, that Lazell has discovered some individual lizards that have anterior lateral teeth unfused to underlying bone means to us merely that he has looked at young individuals and, regardless, this certainly does not support his thesis of a pleurodont (non-oligophyodont)-acrodont (oligophyodont) continuum. That there is variation in the size, shape, and position of the teeth on dentigerous bones we do not dispute. However, this is irrelevant to this particular discussion. If dental condition is so variable, why have we never seen "pleurodont" iguanians (the former "Iguanidae") with "acrodont" (oligophyodont) fused dentition or adult "acrodont" iguanians in which dental fusion does not take place?

The broader issue of the necessity of gaps in transformational characterizations for phylogenetic analysis has been taken up by others (e.g., Stevens 1991) and although it is widely believed that cladistics depends on features of no variation, or at least with self-evident gaps separating characters, this is not true (Farris 1990). If evolution and ontogeny are real processes, it follows logically that many features (all of them, if we knew all of the intermediates) must be distinguished for analytical purposes by imposed *defined* distinctions. The issue therefore devolves not on the gaps, but on whether systematists idealize their data and how they characterize hypothesized transformations for analysis. In this regard we agree with Lazell that systematists should be careful not to make problems for themselves through careless character individuation, although we dispute his particulars. Regardless, we think that cladists who publish character descriptions and data matrices where they can be examined and discussed, are making more of a contribution to evolutionary biology than systematists who base taxonomies on personal opinion or on characters of idiosyncratic "rank" value rather than on the preponderance of evidence of evolutionary history.

With respect to the condition of maxillary contact behind the premaxilla, Rieppel (1984) has also noted variation, so Lazell may be correct that this feature is not particularly informative. We have not looked at all specimens available of the Chamaeleonidae (particularly those taxa patristically distant from the "basal" taxa as hypothesized by Moody (1980), Rieppel (1986), and Klaver and Böhme (1986)), and we appreciate that all characters vary (this being a corollary of taxa being real entities). Nevertheless, it remains to be seen, when this variation is included in an analysis, if contact is synapomorphic for the group.

Even if Lazell were correct that the characters of dentition and maxillary contact are not defensible as evidence, there are other lines of support for a monophyletic Chamaeleonidae (former "agamids" + chameleons); they share a mandibular anatomy that is unlike than in *any* other lizard, as well as unique features of tongue anatomy and function (Schwenk 1988; Schwenk and Bell 1988; Smith 1988). Further, if the immunological distances published by Joger (1991) are accepted as evidence of chamaeleonid monophyly, Lazell is left only with the observation of individual variation in some characters (which does not reject them as homologues) and the assertion that his paraphyletic taxonomy illustrates something that he thinks is important but cannot be placed within the context of evolutionary biology.

Along these lines, Lazell may not like the phylogenetic hypothesis (that is, the grouping) that extends from an assumption of homology of septa in the guts of iguanids, because these septa are intraspecifically variable (even though this hypothesis of homology is congruent with other lines of evidence), but he needs to present evidence that the occurrence of these structures is due to convergence rather than to common descent. Simply claiming that we (and Iverson 1980) may be wrong does not make Lazell right. Further, to make progress we must accept at least some level of variation in characters due to age, size, and sex, as well as that due to subsequent evolutionary changes, including reversal. If not, we must be prepared to exclude feathers as a bird synapomorphy solely because eggs lack them, reject hemipenes as a squamate synapomorphy because roughly 50% of the organisms in this clade (the females) lack them, and reject nasolabial grooves as a synapomorphy of plethodontid salamanders because these grooves vary in depth, shape, and development.

Iguanian taxonomy.—Although an extensive discussion of the history of iguanian systematics is beyond the scope of this paper,

a short review is useful. Since 1923 (Camp 1923), only four "family-level" iguanian taxonomies have been accepted by one or more workers[1]: (1) the three-family arrangement, based on subjective evaluations of similarity and "key" characters, that is most familiar to readers—Iguanidae (nonacrodont iguanians), Agamidae (non-chameleon acrodont iguanians), and Chamaeleonidae; (2) the four-family arrangement of Moody (1980, 1983), in which the three living acrodont groups were accorded the nomenclatural status of families, Uromastycidae[2] (=Leiolepididae), Chamaeleonidae, and Agamidae, with the pleurodont iguanians retained in the traditional "Iguanidae"; (3) the nine-family arrangement of Frost and Etheridge (1989), which is based explicitly on recovered evolutionary history; and (4) the arrangement of Lazell (1992), in which chameleons are placed in one family, Chamaeleonidae, and the remaining acrodont iguanians are placed with the pleurodont iguanians in another family, the Iguanidae, this arrangement, like #1, based on subjective notions of overall similarity and "key" innovations[3].

No one has yet provided evidence for a monophyletic Iguanidae in either Lazell's sense (#4) or the older one (#1, 2) (e.g., Böhme 1990; Etheridge and de Queiroz 1988; Frost and Etheridge 1989; Lazell 1992; Miles and Dunham 1992; Moody 1980, 1982; Pilustrelli and Moody 1991), although evidence has been produced that suggests that the former "Iguanidae" is paraphyletic (e.g., Frost and Etheridge 1989; Moody 1982; Schwenk 1988; Williams 1988). Therefore, retaining a taxonomy that suggests relationships on the basis of *no* evidence of monophyly (the older arrangement), in contrast to *some* evidence for the paraphyly of this "taxon" (although these lines of evidence may be in mutual disagreement), cannot be considered "conservative" in any scientific sense *(contra* Böhme 1990; Pilustrelli and Moody 1991; Miles and Dunham 1992).

Moody's (1980, 1983) classificatory novelties (alternative #2) were in the recognition of two monophyletic groups as families (Uromastycidae (=Leiolepidinae of Frost and Etheridge) and Agamidae (= Agaminea of Frost and Etheridge)), which had traditionally been included within the former Agamidae, and the recognition of the Madagascan oplurine "iguanids" as the Oplurinae; otherwise it is logically consistent with the iguanian classification of Camp (1923) as modified by Romer (1956). Subsequently, Borsuk-Bialynicka and Moody (1984) recognized a fossil taxon, Priscagaminae, which caused them to reconsider the Uromastycidae to be a subfamily of the Agamidae, in effect re-embracing the traditional "family-groups" nomenclature of Camp (1923). Estes et al. (1988) and Frost and Etheridge (1989) showed that the "Priscagaminae" were a paraphyletic assemblage and could not be included in the former Agamidae without rendering it paraphyletic with respect to the chameleons and leiolepidines. Further work has been unable to resolve unambiguously the reality of a group composed of agamines + leiolepidines (i.e., the traditional Agamidae), with some evidence pointing to this group being paraphyletic with respect to chameleons (Smith 1988), and some evidence pointing to it being monophyletic (Joger 1991).

In the case of Lazell's iguanian classification (#4), promoting a classification based on *gestalt* and "key" characters, particularly when it is contrary to a body of unambiguous counter evidence of evolutionary history, is inconsistent with scientific practice. Indeed, if there is any classificatory scheme of the Iguania that *embraces* paraphyly and places itself outside of evolutionary biology by ignoring evidence of evolutionary relationship, it is Lazell's. This leaves only one taxonomy of those proposed under the conventions of the International Code (Anon. 1985) that is consistent with rigorous evolutionary biology, which is our nine-family arrangement. Lazell's innuendo about the motivations of scientists aside, we would have preferred not to recognize nine iguanian families. But, the fact remains that this is a conclusion consistent with the evidence of evolutionary history, unlike the other arrangements.

With respect to Lazell's concept of "utility," we do not understand why the informal groups (e.g., sceloporines, anoloids, iguanines) that have served Lazell so well for so long (by his own admission) are not worthy of formal recognition (these groups being delimited originally by Etheridge 1959, 1964, 1966; Savage 1958; Etheridge *in* Paull et al. 1976; Etheridge and Williams 1985; and Etheridge and de Queiroz 1988; only further supported by Frost and Etheridge 1989). Guyer and Savage (1992) discussed the issue of formal versus informal classifications in the context of anole systematics. They noted that the scientific issue is not one of formality versus informality, but whether the taxonomy informs or misinforms about evolutionary relationships. We suggest that both Lazell's and the earlier gradistic classifications of iguanians misinform about recovered evolutionary relationships. We consider the nine major iguanian groups that we recognized as families to be "useful" because they are logically consistent with recovered evolutionary history. They could not have been discovered if they had not been identifiable and there is no evidence that these groups are particularly closely related. Moreover, although some authors (e.g., Schwenk 1988) have presented legitimate evidence that at least the polychrotids[4] might be nonmonophyletic, parsimony suggests that all of the groups that Lazell accepts informally and we recognize formally are all historical entities (i.e., monophyletic). The taxonomy that we proposed (Frost and Etheridge 1989), albeit relatively unresolved, promotes progress because it does not suggest relationships for which there is no supporting evidence, nor does it hide ignorance under the canard of "utility." Further, the unrooted trees on which our taxonomy rests exclude a large number of possible inter-group relationships from consideration. We question what scientific purpose a nonhistorical collection such as "Iguanidae" (in Lazell's sense or the older one) would serve. Is the "utility" of such a group that it makes it easier for us to misinform students, or possibly worse, misinform ourselves about the evolutionary history that we wish we knew? The lack of resolution among major iguanian groups is real, however. We would prefer to have achieved a more resolved taxonomy and we hope that evidence will be discovered that will resolve the current impasse. Progress will not happen, however, if workers abandon the attempt to recover evolutionary history, or limit the evaluation of scientific hypotheses to subjective opinion (e.g., "For me that is simply not good enough for even subfamilial separation." —Lazell 1992:109).

In summary, Lazell's taxonomic opinions have little to do with evolution specifically or science generally. If they did, they would have been taken up when the arguments about parsimony, overall similarity, and subjective character weighting were timely. Fortunately, those workers who prize stability over progress and button-sorting taxonomies over those based on recovered evolutionary history will find it difficult to overturn the progress made over the last 25 years.

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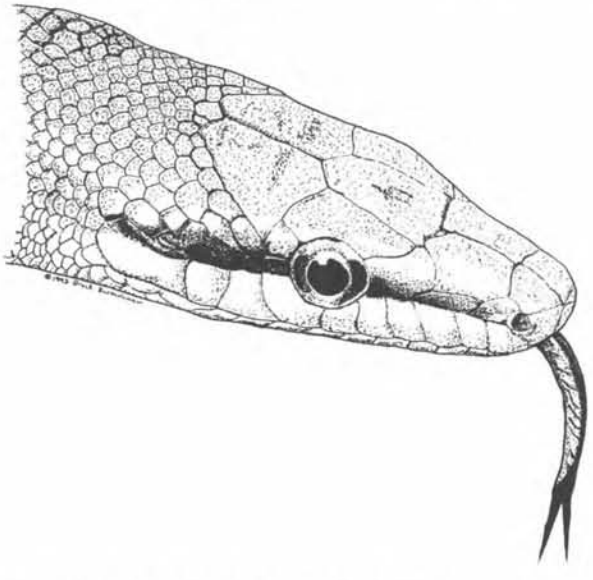
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[1]Another classificatory system which is logically consistent with recovered history, but outside of the conventions of the International Code of Zoological Nomenclature (Anon., 1985) has been suggested (de Queiroz and Gauthier 1990; Norell and de Queiroz 1990). We do not address this approach because this iguanian taxonomy has not been comprehensively presented and because the issue of abandoning the International Code is outside of the scope of this paper.

[2]The first modern published use of Uromastycidae was by Böhme (1982) who followed Moody's (1980) dissertation.

[3]Camp (1923) recognized a Section Rhiptoglossa (following Wiegmann [1834] and Cope [1900]) which included only the chameleons, with the former Agamidae and Iguanidae placed in an admittedly paraphyletic Section Iguania (= Pachyglossa of most earlier authors). The Rhiptoglossa was implicitly synonymized with the Iguania by Romer (1956). Camp's sections equate to Lazell's iguanian families.

[4]Böhme (1990) has noted that the correct formation of the family-group name must be Polychrotidae, rather than Polychridae.



Gonyosoma oxycephala. Illustration by Breck Bartholomew.

TECHNIQUES

Field Evaluation Of Using Passive Integrated Transponder (PIT) Tags To Permanently Mark Lizards

Identifying individuals permanently is an important step in any long-term study of vertebrate populations. Techniques vary, however, and some methods may be better than others. Permanently marking lizards presents difficulties that may compromise study objectives. Ideally, the marking techniques should not affect survivorship or behavior of the animal, should be permanent, should allow for individual identification, should be usable on lizards of different sizes, should be easily read, and should not create undue stress or pain to the individual (Ferner 1979; Lewke and Stroud 1974; Ricker 1956). Avoiding undue stress or pain is often important when working with endangered species.

Lizards have been marked by painting numbers or letters on the dorsum, attaching colored tape to tails, attaching aluminum bands to thighs, and by clipping toes (Ferner 1979). All these techniques present problems for satisfying criteria necessary for long-term marking (Le Boulenge-Nguyen and Le Boulenge 1986; Stoddart 1970; Woodbury 1956). In addition, no estimates of tag loss have been made for these techniques.

The use of passive integrated transponder (PIT) tags alleviates many of the problems inherent with other methods (Camper and Dixon 1988). PIT tags are glass-encased electromagnetic coils and microchips implanted under the skin or in the body cavity. Each PIT tag is encoded with a unique alphanumeric code that is read by generating a low-frequency electromagnetic signal with an external reader; the signal energizes the transponder at close range (1–5 cm), which causes it to transmit its code back to the reader (Camper and Dixon 1988; Fagerstone and Johns 1987). PIT tags are passive units and expected longevity of the tags are 15–20 yrs.

Equipment consists of PIT tags, a modified 3-cc plastic syringe, 12-gauge stainless-steel needles, and a PIT-tag reader. The syringes we received from the supplier were large and impractical for field use. We modified a plastic 3-cc syringe by replacing the plastic plunger with a length of brass wire that serves as a mechanical plunger to push PIT tags out of the needle. Groups of needles were loaded with PIT tags and carried into the field. PIT tags were held in place inside the needles by coating tags with antiseptic ointment. The ointment also served as an antibacterial agent that was injected into the lizard along with the tag.

Since 1988, we have been studying a population of blunt-nosed leopard lizards (*Gambelia sila*) on the Elkhorn Plain, San Luis Obispo Co., California (Germano et al., ms. in review). The blunt-nosed leopard lizard is a state and federally listed endangered species. Although toe-clipping has been used by other researchers to permanently mark blunt-nosed leopard lizards (Montanucci 1965; Tollestrup 1982; Uptain et al., *in press*), it was believed that another method should be tried that would cause less misidentification of individuals due to natural marking, would not mutilate individuals, and that would allow assigned numbers to be more easily and accurately read. Here we report on the efficacy of marking lizards with PIT tags during a long-term field study.

In August 1989 we began PIT-tagging lizards, and over the course of four years we marked 581 blunt-nosed leopard lizards (Table 1). When a lizard was first encountered, it was weighed and

measured, sex was determined, and reproductive status and age class (young or adult) were recorded. Individuals also were marked with a numeral on their dorsum using a felt-tipped pen, and injected with a PIT tag.

The area in which tags were injected varied over the course of the study because of tag loss or destruction. In 1989 we injected lizards (N = 52) subcutaneously in the dorsum just anterior to the tail with the needle facing towards the head. We later found that the skin was too tight in this area and that the tags tended to break through the skin. In 1990 and 1991 for all lizards (N = 172), and in July 1992 for hatchling lizards (N = 81), we injected tags subcutaneously in a lateral fold of skin on the torso by inserting the needle at a point just posterior to the shoulder and sliding the needle into the fold (Fig. 1). We believed that tag loss would be reduced in this area. However, tag destruction under the skin in several adults in 1991 led us to inject adults intra-abdominally starting in April 1992. We also found that well-fed hatchling lizards in July 1992 had tight skin over all their body, and we began injecting hatchling lizards intra-abdominally in August 1992.



FIG. 1. Blunt-nosed leopard lizard that is being injected subcutaneously with a PIT tag using a modified 3-cc syringe and a 12-gauge needle.

The rate of loss or malfunction of PIT tags in blunt-nosed leopard lizards was 8.4% for first recaptures and 4.1% for all recaptures (Table 1). Twenty tags were lost in lizards and three tags malfunctioned during 3.5 years of tagging. Of the 20 tags that were lost, 17 lizards lost tags that were injected subcutaneously and three lizards lost tags injected abdominally. These individuals were known to have had tags because either they still had marker-pen numerals on their backs or a scar was evident at the point where the tag had been inserted. Based on scarring, tags lost subcutaneously either worked their way back out of the point of entry (N = 6) or the tag broke through the skin where the tag resided (N = 11). Ten of the 11 tags that broke through the skin occurred in hatchling lizards marked in July 1992. These lizards were injected subcutaneously along the lateral fold, but because of a high abundance of food in this month, the lizards were well fed and their skin was tight over all their body. This prompted us to begin injecting all lizards intra-abdominally.

Three PIT tags malfunctioned during the study; two tags were in adult males and one was in a hatchling male. All had been injected subcutaneously. In the adults, one tag cracked and the other tag was completely broken, and only small pieces of glass were found under the skin. Male blunt-nosed leopard lizards are territorial (Montanucci 1965; Tollestrup 1983) and are very aggressive towards each other, often biting each other's flanks (Montanucci 1965). Both broken tags in adults may have been damaged during male combat. We found that one of the males with a broken tag had scars on its head that were not evident before the tag was damaged. The inoperable tag in the hatchling was intact, but each end of the glass housing was cracked.

TABLE 1. Number of *Gambelia sila* PIT-tagged, number recaptured, and number of tags lost from August 1989 – November 1992.

Total Tagged	No. Lizards Recaptured At Least Once	Total Recaptures	% Tags Lost / Lizard	% Tags Lost / Recapture
581	273	558	8.4%	4.1%

We have not found estimates of tag loss in lizards for other types of tags, but the loss of PIT tags is higher than what is desirable. Twenty of the 23 losses were due to tags that were injected subcutaneously. Loss may be decreased by injecting the tag into the body cavity, although we still found some loss of tags. Injecting tags intra-abdominally could damage internal organs; however, this method of PIT-tag attachment has been used with several species of captive lizards (Camper and Dixon 1988) and with free-ranging Sacramento mountain salamanders (*Aneides hardii*) as small as 40 mm SVL (N. Scott, Jr., pers. comm.) without apparent ill effects. We also have injected PIT tags intra-abdominally into 10 adult blunt-nosed leopard lizards that are in captivity, and all appear normal. Beginning in August 1992, we started injecting PIT tags into the body cavity of hatchling blunt-nosed leopard lizards as small as 50 mm SVL.

Unlike other techniques for tagging lizards, the PIT tag method is expensive. PIT tag readers cost about $950.00 for the least expensive model. In addition, each tag costs from $4.75 to $6.00 depending on the quantity ordered. The price of readers and tags may decrease in the future as this system is used more widely.

Loss of information in population studies is due to lost tags or illegible marks. Errors in data for marked animals derive from errors in applying, reading, or recording codes. The PIT tag method overcomes some of these problems for marking lizards, but our field evaluation of tag loss in blunt-nosed leopard lizards suggests that tags must be placed inside the body to decrease the rate of tag loss.

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HERPETOLOGICAL HUSBANDRY

Earthworms: A Balanced Diet For Small Snakes?

Earthworms are included in diets of many reptiles, including some small snakes that seem to prey upon them almost exclusively. In captivity, species of *Storeria, Diadophis, Thamnophis, Carphophis,* and *Virginia* have been maintained on diets comprised solely of earthworms for periods of up to several years. Yet there is little published evidence that earthworms represent a complete and balanced diet for these small snakes.

A complete diet as defined by nutritionists is one which will allow growth and reproduction of the species in question. The following observations on the captive breeding of *Virginia valeriae valeriae* suggest that commercially raised earthworms do represent a balanced diet for this species.

Two gravid female *V. valeriae* were captured in northern Virginia in July 1989. One female aborted 8 young in August 1989, and the other delivered 8 live young later that month. Worms were made available to the young snakes at all times, and no other food items were offered. Worms were obtained locally.

Three escapes, a death of unknown cause, and an accident reduced the number of young to three females, which reached an average total length of 21.6 cm by one year of age. We found no data regarding the size of wild *V. valeriae* at one year of age, but our data are comparable to those for wild *V. striatula* of the same age (Clark 1964). Details on the husbandry and breeding of *Virginia valeriae valeriae* are outlined in Rossi and Rossi (1992).

All three females copulated from 28 March to 6 April 1991 with a male collected in Florida. One female died in dystocia on 30 June 1991 with six dead, nearly full term embryos (N = 6, SVL = 63.6 mm, TL = 77 mm). The second female gave birth to five young (2 dead, 3 live) on 1 July and the third female gave birth to four young (1 dead, 3 live) on 2 July 1991. High natal mortality in captivity has been observed in a number of wild caught females of this species (pers. observ.; Morris and Walsh 1991).

Litter sizes were similar to those reported for wild populations of this species (Anderson 1965; Collins 1982; Dundee and Rossman 1989; Minton 1972; Smith 1961). At two years and two months of age, the two remaining females had reached an average total length of 25.0 cm. Conant and Collins (l991) report that 25 cm TL is typical for adult *V. valeriae*. These observations indicate that earthworms represent a complete diet for *V. valeriae*, and may be applied to captive maintenance and breeding programs of other small, worm-eating reptiles.

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LIFE HISTORY NOTES

Instructions for contributors to Life History Notes appear in volume 24, number 1.

ANURA

BUFO BOREAS (Boreal Toad). **PREDATION.** The distribution and abundance of *Bufo boreas* in Colorado has declined considerably in the last 20 yrs (Corn et al. 1989. U. S. Fish and Wildl. Serv. Biol. Rep. 80(40.26), 56 pp; Carey, *in press*. Conserv. Biol.). Predation, although a natural occurrence that is unlikely to have caused this decline, may be a serious threat to some remaining populations of *B. boreas*. On 13 May 1992, between 1230 and 1430 h, I observed six dead adult *Bufo boreas* at a glacial pothole pond in Rocky Mountain National Park, Larimer County, Colorado, USA (Kettle Tarn, Lat 40° 30' N, Lon 105° 31' 48" W, elevation 2810 m). Most of these were partial carcasses found amongst hummocks of dried sedges (*Carex*) along the shore. In two cases, I found the head of a toad with the dorsal skin and hind legs attached. A pair of ovaries, full of mature ova, was within 50 cm of one of these carcasses (Fig. 1). Three other carcasses consisted only of pairs of ripe ovaries. The sixth dead toad was a large female (SVL = 92 mm), found intact under water at a depth of 50 cm. Breeding had begun at this site (I observed at least 11 recent egg masses), but I found only one live toad during this visit. This may have been because cool temperatures (air 9°C), intermittent thundershowers, and strong winds reduced activity by toads.

The partial carcasses of *B. boreas* indicate a vertebrate predator. Olson (1989. Copeia 1989:391-397) observed ravens (*Corvus corax*) eating *B. boreas* at breeding aggregations in Oregon. Her description of carcasses (head, dorsal skin, limbs, and eggs from gravid females) was similar to toad remains at Kettle Tarn. Raccoons (*Procyon lotor*) and possibly striped skunks (*Mephitis mephitis*) also prey on toads by eviscerating them (Groves 1980. Amer. Midl. Nat. 103:202-203; Schaaf and Garton 1970. Herpetologica 26:334-335). Both *P. lotor* and *M. mephitis*, however, are rare at high elevations in Colorado, except near human developments (Armstrong 1972. Univ. Kansas Mus. Nat. Hist. Monogr. 3:1-415). Because of the nature of the carcasses, the probable lack of mammalian predators, and the presence of *C. corax* (I observed a raven flying overhead carrying an object in its beak when I arrived at the pond), the identity of the predator at Kettle Tarn is likely *C. corax*.

Predation may occur at high rates in some breeding aggregations of *Bufo*. Olson (op. cit.) observed > 60% mortality (59 individuals) of *B. boreas* in two days at one of her three Oregon sites, Groves (op. cit.) found 46 partially eaten *B. americanus* in one small pond in Maryland, and Schaaf and Garton (op. cit.) found about 50 dead *B. americanus* at a pond in Illinois. The predation rate on breeding females at Kettle Tarn may have been >20%. At least 18 egg masses were deposited at this site in 1992, and at least 5 of the dead toads found 13 May were females; therefore, the minimum mortality estimate was 22% (5 of 23) in one instance. The population of *B. boreas* at Kettle Tarn is one of the largest remaining in the southern Rocky Mountains (pers. observ.), so high mortality, even to a "natural" cause, is a serious concern.

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FIG. 1. Remains of a *Bufo boreas* from Kettle Tarn, Rocky Mountain National Park. The head, dorsal skin, and hind legs are on the left; ovaries are on the right. Numbers on the scale are cm.

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CROCODYLIDAE

ALLIGATOR MISSISSIPPIENSIS (American Alligator). **DIET.** On 15 June 1988, I found an 8.75 cm long *Dasyatis americanus* (Atlantic southern stingray) tail spine embedded in the heavy dorsal muscle behind the alligator's jaw hinge of an adult male, 3.14 m long, *A. mississippiensis*. The spine could have been embedded by the large stingray flipping its tail upwards over the alligator's head and driving it downwards to the alligator's neck when the ray was grabbed by its body or wing. The alligator was captured in tidal marshes on the eastern side of St. Catherines Island, Liberty Co., Georgia. This size spine corresponds to a >1.0 m wide *D. americanus* (John Crawford, UGA Marine Extension Service Skidaway Island, Georgia 31411, pers. comm.). On 24 June 1990, a second *D. americanus* spine, 4.8 cm long, was found protruding from the tongue of a 1.58 m female *A. mississippiensis*. The spine was driven into the buccal aspect of the tongue and protruded out the ventral skin surface. The defensive strike probably occurred while the smaller stingray was being bolted and swallowed. The positions of both of these spines strongly suggest that the alligators had been struck by the stingrays in retaliation to being seized by the predator. Both spines were found without sheathing suggesting they had been embedded for some time. The alligators appeared to be of normal weight and in good health. No signs of infection about the spine were evident.

Feeding habits of alligators vary according to size class, habitat selection, and prey availability and suitability (Chabreck 1972. Proc. Ann. Southeast. Asoc. Game and Fish Comm. 25:117-124.). Blue crabs (*Callinectes sapidus*) and horseshoe crabs (*Limulus polyphemus*) are common in St. Catherines Islands' tidal waters. *A. mississippiensis* which rake their jaws through the mud and sand of the saltmarshes while foraging for blue crabs (Tamarack 1989. Proc. 8th Meeting IUCN Crocodile Specialist Group, Quito, Ecuador 86:105-118) undoubtedly encounter rays.

Submitted by **JAMES L TAMARACK**, New York Zoological Society's Wildlife Survival Center, St. Catherines Island, Route 1, Box 207-Z, Midway, Georgia 31320, USA.

ALLIGATOR MISSISSIPPIENSIS. (American Alligator). **NEST MATERIAL.** The optimal incubation temperature for an alligator is 31.7°C with a range of 29.4°C to 32.8°C. Incubation temperatures above 33.9°C cause hatching success to fall off rapidly (Joanen et al. 1987, *In* G. J. W. Webb, S. C. Manolis, P. J. Whitehead (eds.), Wildlife Management: Crocodiles and Alligators, pp. 533-537. Surrey Beatty and Sons, Sidney, Australia.). Decaying vegetation in crocodilian nests may insulate the nest from extreme heat as well as produce heat (Magnusson et al. 1989, *In* C. A. Ross (ed.), Crocodiles and Alligators, pp. 118-135. Facts on File, New York.). Organic material in the nest of the American alligator contributes to microbial degradation of the egg shell, facilitating hatching (Ferguson 1981. Science 214:1135-1137; Ferguson 1981. Experientia 37:252-254).

On 23 June 1991 we observed an unusual alligator nest on a sanitary landfill, Recovery One, Inc., New Orleans, Orleans Parish, Louisiana. The nest (ca. 2 m diam x 0.8 m high) was composed almost entirely of layers of various plastic bags (Fig. 1). A few curious items included a flip-flop sandal, a 10 cm high plastic baby doll, and a yellow plastic vegetable oil container. Less than 5% of the nest material was organic. A 2-m (total length) female guarded the nest closely. The temperature in the egg chamber was 36.7°C on 13 August 1991 at 1800 h. On 1 September 1991, we excavated the nest and found a clutch of 36 eggs. Most embryos died early during development, or the eggs were infertile. Seven developed embryos measured approximately 5 cm, 8 cm, 9 cm, and 22 cm (N = 4). The four largest embryos were in the final stages of development.

On 5 July 1992 a second nest was found 4.6 m from the 1991 nest. The egg chamber temperature was 35.0°C at 1800 h. This clutch consisted of 39 eggs, none of which hatched. All of the eggs died in the early stages of development. We attribute the high incubation temperatures to the lack of organic material in the nests. It is not known whether there would be enough microbial degradation in either of these garbage nests to facilitate hatching.

We thank Robert A. Thomas for reviewing the manuscript.



FIG. 1. The nest of an *Alligator mississippiensis* consisting of plastic bags and other garbage.

Submitted by **JENNIFER O. COULSON**, Louisiana Nature & Science Center, P. O. Box 870610, New Orleans, Louisiana 70187-0610, USA, and **THOMAS D. COULSON**, Louisiana State University Medical Center, 1100 Florida Avenue, New Orleans, Louisiana 70119, USA.

LACERTILIA

ANOLIS CAROLINENSIS (Green Anole). **SOCIAL PATHOLOGY.** On 15 August 1992, while conducting a behavioral study of *Anolis carolinensis* along the Augusta Canal, 3 km west of Augusta, Richmond County, Georgia, we observed a pathological social interaction which had three functional parts that were sequenced as follows.

At 1632 h a small adult male *A. carolinensis* (SVL 50 mm) ran down a 1.2 m high concrete wall in pursuit of a smaller conspecific male (SVL 42 mm). The 50 mm male grabbed the 42 mm male by the nape of the neck in a typical pre-copulatory hold and attempted to copulate. The 42 mm male struggled and escaped, but was chased and secured with another neck hold. Again the larger lizard attempted to copulate. The smaller lizard countered with vigorous struggling, while extending his dewlap. Twice the smaller male briefly escaped and was recaptured by the larger male. During this time (13 min) the males had moved from the wall to the ground.

At 1645 h the larger male shifted his nuchal hold to a deep mouth grip on the side of the smaller male's throat. The larger animal violently shook the smaller male in short repeated bursts and periodically slammed the smaller male's head on the ground. As the smaller male's attempts to escape became more feeble, the larger male moved his grip, using quick full-mouth bites, to the smaller male's head. At 1655 h the smaller male appeared dead.

At 1656 h the larger male attempted to swallow the corpse head-first, but was able to only partially engulf the head. By 1705 h the larger lizard had dragged his victim up the 1.2 m wall. While maintaining a head hold, the 50 mm male straddled the 42 mm corpse and walked toward a clump of vegetation on the backside of the wall. Before they disappeared into the underbrush, we attempted to noose the subjects, resulting in both being dropped to the ground. Although the male attempted to flee, he did not release the dead male's head, not when he was subsequently noosed, nor when he was transferred to a plastic bag.

Social contact between conspecific anoles has three general intents: (1) courting and copulation; (2) contesting over territorial rights; and (3) possibly cannibalism (Mitchell 1986. Soc. Study Amphib. Rept. Herpetol. Circ. 15:1-37). The behavior in the above narrative contains obvious perversions of all three intents: (1) the copulatory attempt was homosexual; (2) the aggression went beyond the displacement of a rival and ended in death; and (3) the cannibalistic response was made to a conspecific too large to eat (Fig. 1).

We offer two interpretations of the perpetrator's behavior. It was: (1) a dysfunctional response by a sexual-aggressive deviant, perhaps suffering from a physiological pathology, or (2) a representative propensity for behavioral extremes by a particular age-sex class. Should the latter be true, there may be demographic repercussions. On the study area in August and September, the low weedy vegetation, a microhabitat not usually frequented by territorial males, teemed with hatchlings and small juveniles, as well as occasional small adult males. If small adult males are prone to aggressive/cannibalistic behavior (e.g., Jenssen et al. 1989. Anim. Behav. 38:1054-1061), then the reward would be an immediate meal and (if a male were eaten), fewer competitors the following spring.

These observations were made possible by a faculty participation grant to TAJ as a contract (DE-AC09-76SR00-819) between the United States Department of Energy and the University of Georgia's Savannah River Ecology Lab.



FIG. 1. Pathological *Anolis carolinensis* and his victim.

Submitted by **THOMAS A. JENSSEN,** Biology Department, Virginia Tech, Blacksburg, Virginia 24061, USA, and **KATHERYN A. HOVDE,** Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29802, USA.

ANOLIS CHLOROCYANUS (Hispaniolan Green Anole). **AQUATIC ACTIVITY.** At least three species of *Anolis* are known to engage in aquatic activity, including feeding behavior (Mattison 1989. Lizards of the World. Facts on File, New York, 192 pp.). Schwartz and Henderson (1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. University of Florida Press, Gainesville. xvi + 720 pp.), however, documented no such tendencies among West Indian anoles. On three separate occasions at two different locations in the Dominican Republic we have observed *Anolis chlorocyanus* utilizing water as a refuge. In January 1986 and March 1988 along the edge of a spring-fed pool near Neiba, Baoruco Province, we noted 10-15 subadults and adult females, but no adult males at either time, on emergent vegetation. When approached, these lizards quickly jumped into the water. Many would swim along the surface to vegetation farther from shore, but others dove into the water and often remained beneath the surface, clinging to submerged vegetation for periods of time up to at least 1.5 min. No evidence of aquatic foraging was observed, although numerous insects were found on the vegetation and aquatic arthropods were common among the submerged portions of plants. Swimming consisted of lateral undulations of the body and tail with tightly adpressed limbs. In June 1991 along a spring-fed irrigation system near Boca de Cachon, Independencia Province, we observed a single subadult dive from a shoreline rock into the water. We never saw the lizard surface in spite of intensive efforts to locate it again. It may have drifted a considerable distance with the current or emerged among nearby dense aquatic vegetation. At both sites, *A. chlorocyanus* was commonly encountered in non-aquatic habitats, implying that the use of water as a refuge is a facultative phenomenon.

Submitted by **ROBERT POWELL** and **JOHN S. PARMERLEE, JR.,** Department of Natural Sciences, Avila College, Kansas City, Missouri 64145, USA.

CARLIA BICARINATA (Bicarinate Four-fingered Skink). **PARTIAL ALBINISM.** An albino juvenile *Carlia bicarinata* was collected at 1400 h on 26 May 1986 from a savannah path 2 km E of Wipim Village in the southern Trans-Fly region of Western Province, Papua New Guinea. This species is normally a golden brown lizard with a broad dark lateral stripe, bordered by two narrower longitudinal stripes of yellow or cream, running from the snout, through the eye, and onto the tail. The albino juvenile was almost grey-green anteriorly fading to white posteriorly and on the tail. The dark lateral stripe, though still present, was much less evident between the lighter stripes. The eyes were not pink. Particularly conspicuous due to the light coloration of the skink, was a collection of ectoparasitic red mites in the axial pits of the forelimbs. This specimen will be deposited in the collection of the Natural History Museum, London (BMNH).

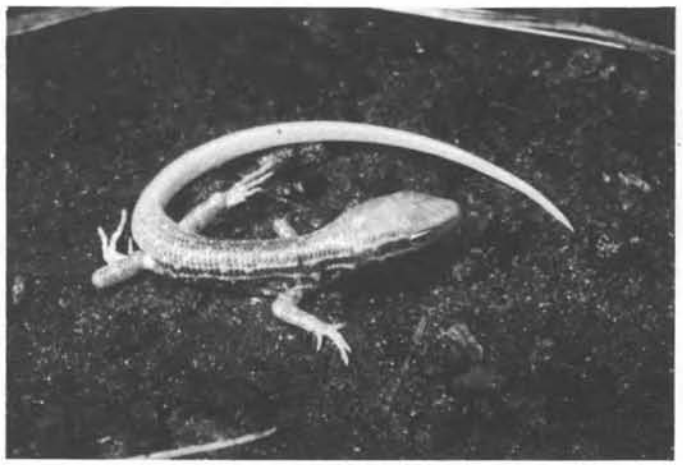


FIG. 1. Partial albino juvenile *Carlia bicarinata*, Western Province, Papua New Guinea.

Submitted by **MARK T. O'SHEA,** 46 Buckingham Road, Penn, Wolverhampton, WV4 STJ, England.

SERPENTES

AGKISTRODON PISCIVORUS CONANTI (Florida Cottonmouth). **PREY.** On 10 September 1992 at 2100 h, I collected a Florida cottonmouth (SVL 92.5 cm; TL 18.5 cm; wet mass 837 g) immediately after it had been hit by a vehicle on Hwy 71, 1.3 mi N of Blountstown, Calhoun County, Florida. The following day I palpated the snake carcass and extracted a partially digested *Ophisaurus ventralis* (SVL 22.2 cm; TL 60.7 cm; wet mass 76 g). The carcass of the eastern glass lizard was in three pieces: the body and anterior 1/4 of the tail, and the remainder of the tail in two pieces. It is not known whether the snake consumed the glass lizard whole, or whether it had swallowed an autotomized tail after consuming the body.

In their review of the diet of all three subspecies of *Agkistrodon piscivorus*, Gloyd and Conant (1990. Snakes of the *Agkistrodon*

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Complex. SSAR, Oxford, Ohio) found reports of cottonmouths consuming four species of lizards: *Anolis carolinensis, Eumeces inexpectatus, Eumeces laticeps*, and *Scincella lateralis*. Although the eastern glass lizard is commonly eaten by other North American snakes (e.g., *Micrurus fulvius*; Jackson and Franz 1981. Herpetologica 37:213-228), I believe this is the first report of its consumption by a cottonmouth.

I thank Dale R. Jackson for commenting on the manuscript and for alerting me to the coral snake paper.

Submitted by **JOHN G. PALIS,** Florida Natural Areas Inventory, 1018 Thomasville Road, Suite 200-C, Tallahassee, Florida 32303, USA.

HETERODON PLATIRHINOS (Eastern Hognose Snake). **DIET.** *Heterodon plahrhinos* feeds primarily on toads and other amphibians, but also has been reported to consume reptiles, insects, fish, birds, mammals, earthworms, isopods, centipedes, spiders, and snails (Ernst and Barbour 1989. Snakes of Eastern North America. George Mason Univ. Press, Fairfax, Virginia, 282 pp.).

On 7 July 1992, we captured a melanistic *Heterodon platirhinos* (65 cm SVL) crossing a gravel road ca. 0.4 km N of Flamingo Bay on the Savannah River Site, Aiken Co., South Carolina (for location, see Gibbons and Semlitsch 1991. Guide to the Reptiles and Amphibians of the Savannah River Site. Univ. of Georgia Press, Athens, 131 pp.). While performing its death-feigning behavior it regurgitated a millipede (Xystodesmidae: *Sigmoria laticurvosa*) and a beetle (Scarabaeidae: *Phyllophaga aemula*). Both of these animals are abundant in this area. This appears to be the first record of an eastern hognose snake consuming a millipede. Because there was no evidence of a *Bufo* sp. in the regurgitated material, we do not believe that the millepede was secondarily ingested. Several authors report beetles or insects in the diet (Edgren 1955. Herpetologica 11:105-117; Wright and Wright 1957. Handbook of Snakes of the United States and Canada, Vol. I. Cornell University Press, Ithaca, New York, 564 pp.). In addition, Hamilton and Pollack (1956. Ecology 37:519-526) report a centipede in the diet of *H. platirhinos*.

We thank Richard L. Hoffman for identifying the millipede and beetle, and J. Whitfield Gibbons and Chris J. Hudson for reviewing the manuscript. This work was supported by contract DE-AC09-76SR00-819 between the U.S. Department of Energy and the University of Georgia's Savannah River Ecology Laboratory.

Submitted by **MARK S. MILLS** and **S. REBECCA YEOMANS,** Department of Zoology, University of Georgia, Athens, Georgia 30602, USA, and Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29802, USA.

LAMPROPELTIS GETULUS (Eastern Kingsnake). **PREDATION FATALITY.** On 26 September 1991, on Saint Catherines Island, Liberty County, Georgia, we discovered a dead 1.55 m (TL) *Lampropeltis getulus* along the margin of a dirt road through sandhill habitat. The snake's head and neck were firmly held underground in a 3.5 cm wide burrow. Removal of the snake from the burrow was difficult. There was a palpable mass in the neck, and an elliptical turtle egg was removed through the snake's mouth. The egg was intact though it broke during removal. There were nine more intact eggs in the nest cavity and three broken eggs were retrieved from the snake's stomach. Six undamaged eggs (length 3.5–3.8 cm) were artificially incubated but failed to develop.

Knight and Loraine (1986. Brimleyana 12:1-4) suggest that *L. getulus* may search out and consume the contents of multiple turtle nests. We could not identify the eggs to species but the nest and eggs were consistent with either of two resident emydid turtles on St. Catherines Island, *Trachemys scripta* or *Deirochelys reticularia*. Apparently the snake swallowed the fourth egg inside the chamber and was unable to back out of the root-obstructed entrance hole. The egg failed to break and the snake struggled until it died from asphyxiation.

Submitted by **JAMES L. TAMARACK**, New York Zoological Society's Wildlife Survival Center, St. Catherines Island, Route 1 Box 207-Z, Midway, Georgia 31320, USA, and **BRIAN DOHERTY**, 1925 Nth 75 Ct., Elmwood Park, Illinois 60635, USA.

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Recommended citation for new distribution records appearing in this section is: Phillips, C. A. 1991. Geographic Distribution. *Ambystoma maculatum*. Herpetol. Rev. 22:133.

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). USA: ILLINOIS: Fayette Co: 4 km W Rt. 128 on 3050N & 0.5 km S (39° 10'41"N, 88°51'31"W). 25 May 1992. J. E. Petzing. Verified By R. A. Brandon. Southern Illinois University at Carbondale (H–4110). County record; habitat is oak-hickory forest bordered by fields on N, E, & W.

Submitted by **ALLAN K. WILSON**, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA.

AMBYSTOMA OPACUM (Marbled Salamander). USA: MISSOURI: Montgomery Co: Danville Wildlife Area, ca. 3 km SSE Danville. SW 1/4, SE 1/4, NE 1/4, Sec. 6, T47N, R5W. 9 September 1992. Brian S. and Kellie Jayne Edmond. University of Missouri, Columbia (UMC 2107C). Verified by D. E. Metter. Active on land near pond at campground at night; new county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

AMBYSTOMA OPACUM (Marbled Salamander). USA: OHIO: Hamilton Co: Crosby Twp: Sec. 1, Paddy's Run Road, 400 m S Hamilton County border. 13 September 1992. Christopher T. McCarty, Anthony McCarty, and Jeffrey G. Davis. Verified by John W. Ferner. Cincinnati Museum of Natural History (CMNH 3641 and 3642). Pfingsten and Downs (1989, Salamanders of Ohio. Ohio Biol. Surv. Bull. New Ser. Vol. 7 (2): xx + 315 pp. + 29 pls.) show this species as occurring in the county based on a literature record, but did not indicate a voucher; new county record.

Submitted by **JEFFREY G. DAVIS**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amey Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA, and **CHRISTOPHER T. McCARTY**, 1121 Brough Avenue, Hamilton, Ohio 45015, USA.

AMBYSTOMA TIGRINUM (Tiger Salamander). USA: IDAHO: Owyhee Co: Sec. 7, T3S, R5W. 4 October 1990. Mark Vinson. Verified by Chuck Peterson. Idaho Mus. Nat. Hist. (IMNH 498). County record and significant range extension (Nussbaum et al. 1983, Amphibians and Reptiles of the Pacific Northwest, Univ. Press Idaho, Moscow, 332 pp.; Stebbins 1985, A Field Guide to Western Reptiles and Amphibians, Houghton Mifflin Co., Boston, Massachusetts, 336 pp.).

Submitted by **MARK VINSON**, USDI, Bureau of Land Management Aquatic Ecosystem Laboratory, Fish and Wildlife Department, Utah State University, Logan, Utah 84322–5210, USA.

AMBYSTOMA TIGRINUM (Tiger Salamander) USA: MISSOURI: Johnson Co: Warrensburg. April 1961. Paul Anderson. Verified by Joseph T. Collins (KU 89195). New county record within a hiatus in the range in western Missouri and eastern Kansas as shown by Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.) and extends the range ca. 30 mi SE of nearest known locality in Jackson County, Missouri (Johnson 1987, Amphibians and Reptiles of Missouri. Missouri Dept. of Conservation, Jefferson City, 368 pp.).

Submitted by **KEVIN R. TOAL**, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045–2454, USA.

AMBYSTOMA TIGRINUM TIGRINUM (Eastern Tiger Salamander). USA: NORTH CAROLINA: Moore Co: 4.2 km S Foxfire Village & 6.3 km SSE Foxfire Village. 21 November 1992. J. C. Beane and S. L. Alford. Verified by A. L. Braswell. North Carolina State Museum of Natural Sciences (NCSM photos JCB 92–2545 and JCB 92–2546). Two adult males taken AOR; photographed and released due to threatened status in state. New county record. Brimley (1907. J. Elisha Mitchell Sci. Soc. 23:150–156) recorded this species from Moore County, but that locality is now a part of Lee County. A. t. tigrinum has now been recorded from eleven counties in North Carolina, many of those represented only by old literature or "sight" records. In recent years, the species has been documented from six counties; only four of those have confirmed breeding sites (NCSM files).

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, North Carolina 27611, USA, and **STANLEY L. ALFORD**, North Carolina Zoological Park, Route 4, Box 83, Asheboro, North Carolina 27203, USA.

EURYCEA LONGICAUDA GUTTOLINEATA (Three-lined Salamander). USA: NORTH CAROLINA: Richmond Co: 11.3 km WSW Ellerbe. 21 November 1992. J. C. Beane and S. L. Alford. Verified by A. L. Braswell. North Carolina State Museum of Natural Sciences (NCSM 31992). Adult taken AOR. New county record (NCSM files).

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, North Carolina 27611, USA, and **STANLEY L. ALFORD**, North Carolina Zoological Park, Route 4, Box 83, Asheboro, North Carolina 27203, USA.

HEMIDACTYLIUM SCUTATUM (Four-toed Salamander). USA: NORTH CAROLINA: Richmond Co: 12.7 km WNW Ellerbe. 21 November 1992. J. C. Beane and S. L. Alford. Verified by A. L. Braswell. North Carolina State Museum of Natural Sciences (NCSM 32001). Adult taken AOR; new county record (NCSM files).

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, North Carolina 27611, USA, and **STANLEY L. ALFORD**, North Carolina Zoological Park, Route 4, Box 83 Asheboro, North Carolina 27203, USA.

PLETHODON GLUTINOSUS (Northern Slimy Salamander). USA: ILLINOIS: Fayette Co: NW 1/4 Sec. 7, T8N, R1W, Ramsey Lake State Park. 19 April 1992. M. Bavetz. Verified by Ronald A. Brandon. Southern Illinois University Department of Zoology Collection (SIUC H–4116). County record (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **MARK J. BAVETZ**, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA.

PLETHODON YONAHLOSSEE (Yonahlossee Salamander). USA: NORTH CAROLINA: Surry Co: 3.2 km SW Low Gap. 13 September 1992. J. C. Beane, A. B. Somers et al. Verified by W. M. Palmer. North Carolina State Museum of Natural Sciences (NCSM 31861). One of four adults observed at same locality. New county record; extends range ca. 12.6 km E of nearest records in Alleghany County (NCSM files). Funding for field work resulting in this discovery was provided by the Surry County Natural Areas Inventory; we thank Porter Lowe and William Hoge for private land access.

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, North Carolina 27611, USA, and **ANN BERRY SOMERS**, Department of Biology, University of North Carolina at Greensboro, Greensboro, North Carolina 27412–5001, USA.

ANURA

ASCAPHUS TRUEI (Tailed Frog). USA: WASHINGTON: Pacific Co: tributary of Willapa River, 2.5 km S Rt. 6 (SW 1/4 Sec. 2, T12N, R8W). 15 August 1992. M. J. Adams. Verified by R. B. Bury. U.S. Biological Survey Collection, Fort Collins, Colorado (VS/FC 7054). First record for county and for the Willapa Hills. Fills ca. 140 km gap in coastal distribution (Nussbaum et al. 1983, Amphibians and Reptiles of the Pacific Northwest. Univ. Idaho Press, Moscow, 332 pp.). The Willapa Hills have been heavily logged. However, on the tributary where the frog was collected there is a stream buffer-zone (ca. 100 m each side) and much of the timber surrounding its headwaters is uncut. These factors may have helped preserve this population (Corn and Bury 1989, Forest Ecol. Management 29:39–57.).

Submitted by **MICHAEL J. ADAMS**, U.S. Fish and Wildlife Service, National Ecology Research Center, 4512 McMurry Avenue, Fort Collins, Colorado 80525–3400, USA, and **ALBERT G. WILSON, JR.**, Department of Zoology, Washington State University, Pullman, Washington 99164–4236, USA.

BUFO TERRESTRIS (Southern Toad). USA: LOUISIANA: Sabine Co: 10 km N Lake Hornbeck. 6 July 1929. AMNH 32662–63; Calcoasieu Co: 10 km N Lake Charles. 5 July 1929. AMNH 32648. All specimens collected by C. E. and M. D. Burt. All verified by L. Lee Grismer. New county records and first records from W Louisiana. Extends the range westward ca. 160 km (Blem 1979, *Bufo terrestris*, Cat. Amer. Amphib. Rept. 223.1–223.4; Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.). In addition, on the night of 31 May 1992, two DOR Louisiana *Bufo terrestris* were found but not collected; one near Peason, Sabine County, and the second near Reeves, Allen County.

Submitted by **ERIK W. A. GERGUS**, Department of Biology, College of Sciences, San Diego State University, San Diego, California 92182–0057, USA.

HYLA AVIVOCA (Bird-voiced Treefrog). USA: LOUISIANA: Tensas Parish: Big Lake State Wildlife Refuge (NW 1/4 of NW 1/4 of Section 6, T13N, R9E). 7 June 1990. Lance Gorham and Ed Trahan. Verified by Douglas A. Rossman. Northeast Louisiana University Museum of Herpetology (NLU 70369). New parish record; significant range extension into NE Louisiana along the Tensas River drainage. (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State University Press, Baton Rouge, Louisiana, 300 pp.).

Submitted by **LANCE E. GORHAM** and **STEVE JENSEN**, Department of Biology, Northeast Louisiana University, Monroe, Louisiana 70201, USA.

HYLA CINEREA (Green Treefrog). USA: KENTUCKY: Trigg Co: Land Between The Lakes, E side of Kentucky Lake at river mile 49.0, S side of Jones Creek just E of where it enters Jones Creek Bay (36°40'46"N, 88°02'59"W). 10 June 1992. John Koons and Floyd Scott. Verified by David H. Snyder. Austin Peay State University Museum of Zoology (APSU 4597). Adult male among emergent vegetation at side of stream, many more calling around head of bay. New county record and first record from Kentucky portion of Tennessee River drainage basin (Kentucky State Nature Preserves Commission, Natural Heritage Program, Element Occurrence Records).

Submitted by **A. FLOYD SCOTT**, Department of Biology and Center for Field Biology, Austin Peay State University, Clarksville, Tennessee 37044, USA, and **JOHN KOONS**, Department of Natural and Physical Sciences, Jackson State Community College, Jackson, Tennessee 38301, USA.

HYLA CINEREA (Green Treefrog). USA: TENNESSEE: Stewart Co: Land Between The Lakes (LBL), Rushing Creek Campground, E shore of Kentucky Lake at river mile 50.0 on N side of small stream that enters Skunk Hollow Bay (36°40'11"N, 88°03'04"W), adult male in dead black willow tree (*Salix nigra*). 7 June 1992. John Koons. Austin Peay State University Museum of Zoology (APSU 4580); LBL, E side of Kentucky Lake at river mile 54.2 on S shore of Clay Bay (36°36'36"N, 88°01'48"W), adult male on ground just above waterline at base of wooded hillside (many more calling from emergent vegetation around head of bay). 11 June 1992. Floyd Scott. APSU 4581. Both specimens verified by David H. Snyder. First records for LBL and Stewart County, and first records E of Tennessee River in Tennessee (Snyder 1972, Amphibians and Reptiles of Land Between The Lakes, Tennessee Valley Authority, Golden Pond, Kentucky, 90 pp.; Redmond 1985, A Biogeographic Study of Amphibians in Tennessee, Doctoral Thesis, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **A. FLOYD SCOTT**, Department of Biology and Center for Field Biology, Austin Peay State University, Clarksville, Tennessee 37044, USA, and **JOHN KOONS**, Department of Natural and Physical Sciences, Jackson State Community College, Jackson, Tennessee 38301, USA.

HYLA CINEREA (Green Treefrog). USA: TEXAS: Kaufman Co: East bank Cedar Creek, 0.8 km N US Rt. 175, 3.5 km SE US Rt. 175–FM 1391 jct. in Kemp. 13 September 1992. John S. McCord, Jr. Verified by William J. Voss. Fort Worth Museum of Science and History (FWM 10987). New county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press. College Station, Texas. 434 pp.); completes distribution records for counties immediately SE of Dallas County (Cobb and Cobb 1991, Herpetol. Rev. 22(1):27–28 and Roberts and Shilling 1991, Herpetol. Rev. 22(3):102.).

Submitted by **JOHN S. McCORD, JR.**, 1624 Martha Drive, Bedford, Texas 76022, USA.

HYLA SQUIRELLA (Squirrel Treefrog). USA: TEXAS: Nueces Co: Mustang Island: Port Aransas, grounds of University of Texas Marine Science Institute. 19 September 1992. John S. McCord, Jr., Eric N. Smith, Karin S. Castañeda. University of Texas at Arlington collection of Vertebrates (UTA A–38890–93). Verified by Jonathan A. Campbell; and Fort Worth Museum of Science and History (FWM 10990–94). Verified by William J. Voss. New county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station, Texas. 434 pp.); fills gap between Kleberg and San Patricio counties at the southern portion of this frog's range in Texas. UTA specimens were one adult female (with eggs) and an adult male found in leaf axils of garden palms near faucet (2030 h), and two juveniles active on low vegetation over a small puddle in second growth and grass (2130 h). The FWM specimens (two adult males, one gravid female, and three juveniles) were active at night on walls and windows between 0.1 and 2 m above ground.

Submitted by **JOHN S. McCORD, JR.**, 1624 Martha Drive, Bedford, Texas 76022, **KARIN S. CASTAÑEDA** and **ERIC N. SMITH**, Department of Biology, The University of Texas at Arlington, Arlington, Texas 76019, USA.

PSEUDACRIS CLARKII (Spotted Chorus Frog). USA: TEXAS: Mills Co: West side of Texas Rt. 16, 1.4 km S Texas Rt. 16–FM 218 jct. in Priddy. 30 May 1992. John S. McCord, Jr. Verified by Wesley A.

M. Hathaway. Fort Worth Museum of Science and History (FWM 10916–18). All specimens were males collected from a small chorus that was first heard about 1915 h on a cloudy day before sunset. New county record; partly fills a distributional gap in a three county area of central Texas (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station, Texas. 434 pp.).

Submitted by **JOHN S. McCORD, JR.**, 1624 Martha Drive, Bedford, Texas 76022, USA.

RANA CLAMITANS MELANOTA (Green Frog). USA: MISSOURI: Pike Co: under rocks at edge of slow stream that forms the northern boundary of Traynor and Traynor Farms, ca. 5.5 km NW Curryville, N 1/2, NE 1/4, NW 1/4 Sec. 18, T53N, R4W. 23 August 1992. Brian S. Edmond. University of Missouri, Columbia (UMC 1322A & 1323A). Verified by D. E. Metter. New county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

SYRRHOPHUS CYSTIGNATHOIDES CAMPI (Rio Grande Chirping Frog). USA: TEXAS: Nueces Co: Mustang Island, Port Aransas, grounds of the University of Texas Marine Science Institute, at loading dock beside Security Office. 17 September 1992. Fort Worth Museum of Science and History (FWM 10988); Mustang Island, Port Aransas, grounds of the University of Texas Marine Science Institute, beneath Dormitory A. 18 September 1992. (FWM 109089). Both collected by John S. McCord, Jr. Both verified by William J. Voss. Many of these frogs were heard calling, both on the Institute grounds, as well as in Port Aransas proper. That choruses heard were this species' was confirmed when FWM 10989 began calling in a markedly similar fashion from its bag after being collected. New county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press. College Station, Texas, 434 pp.); adds authenticity to an additional introduced population (*sensu* Dundee 1991. Herpetol. Rev. 22(4):122) roughly intermediate between the lower Rio Grande and one in Houston and San Antonio (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.).

Submitted by **JOHN S. McCORD, JR.**, 1624 Martha Drive, Bedford, Texas 76022, USA.

XENOPUS LAEVIS (African Clawed Frog). USA: COLORADO: Summit Co: SE side of US Rt. 6, 14.5 km NE Keystone, 3150 m elev. (39°53'33"N, 105°56'58"W). 5 June 1990. S. T. Bacchus (UF Photograph 86757 by K. Richter). Verified by Hobart M. Smith. State record; released, possibly recently. The colonized range of this introduced species in the United States has been reported for California and Arizona (Stebbins 1985, A Field Guide to Western Reptiles and Amphibians. 2nd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.; Mooney et al. 1986, pp. 250–272. *In* H. A. Mooney and J. A. Drake (eds.), The Ecology of Biological Invasions of North America and Hawaii. Springer-Verlag, New York). Found partially hidden under a submerged log in a tiered series of relic beaver ponds along the North Fork of the Snake River in the Arapaho Basin. The specimen did not have conspicuous claws. The water in the upper levels of the beaver pond complex remained partially frozen on this date, with a consistency of slush; however, during the extended photo session the frog swam freely in the frigid water, periodically burrowing headfirst into mats of aquatic vegetation. During 1–2 June 1991 the site was revisited by Bacchus and Moler, but no frogs were found.

Submitted by **SYDNEY T. BACCHUS**, Institute of Ecology, University of Georgia, Athens, Georgia 32602–2202, USA; **KLAUS RICHTER**, Parks, Planning and Resources Department, 3600–136th Place SE, Bellevue, Washington 98006–1400, USA; and **PAUL MOLER**, Wildlife Research Lab, Florida Game and Fresh Water Commission, 4005 South Main Street, Gainesville, Florida 32601, USA.

TESTUDINES

CLEMMYS INSCULPTA (Wood Turtle). CANADA: ONTARIO: Simcoe Co: Nottawasaga River, Minesing Swamp, 9 km N Angus (44°24'04"N, 79°53'19"W). 12 July 1992. Robert L. Bowles, Carolyn King, Harry Hall, et al. Royal Ontario Museum, Toronto (ROM 22638-39; photographs; protected species under Ontario Game and Fish Act). Verified from photos by W. F. Weller and R. D. MacCulloch. First verified record for county; observed previously in Minesing Swamp by R. H. Curry in June 1988, ca. 3 km to SSW. Fills significant gap in known distribution in southern Ontario (Logier and Toner 1961, Check List of the Amphibians and Reptiles of Canada and Alaska. Life Sciences Division, Contr. 53, Royal Ontario Mus., 92 pp.; Oldham and Weller, unpubl. computer database of Ontario specimen and observation records). In conjunction with localities near Lake Huron (ca. 115 km to W), near E shore of Lake Simcoe (ca. 70 km to NE; ROM 22640), and E of Algonquin Provincial Park (ca. 265 km to NE), represents a northern limit record at this longitude in southern Ontario.

Submitted by **ROBERT L. BOWLES**, 374 Grenville Avenue, Orillia, Ontario L3V 7P7, Canada.

PELODISCUS SINENSIS (Chinese Softshell). USA: GUAM: Mariana Islands, Umatac Municipality, between Umatac Bay and confluence of Madog and Laelae rivers. January 1992. Anonymous donation to Steve Nussbaum. Verified by Thomas H. Fritts. Michael J. McCoid Collection (MJM 3096; deposited at USNM). While there have been a number of sightings of this species in eastern and southeastern Guam (McCoid, Herpetol. Rev., *in press*), this specimen represents the first verified record for the island and indicates that the species may be fairly widespread in central and southern Guam.

Submitted by **EARL W. CAMPBELL III**, Ohio Cooperative Fish and Wildlife Research Unit, 1735 Neil Avenue, Columbus, Ohio 43210, USA, and **MICHAEL J. McCOID**, Route 1, Box 143, Edinburg, Texas 78439, USA.

PHRYNOPS WILLIAMSI (Williams' South American Sideneck Turtle). ARGENTINA: CORRIENTES: Departamento Ituzaingó, Puerto Valle (27°36'S, 56°26'W) on the Paraná River bank. 19 January 1990. A. Giraudo. Verified by M. S. De La Fuente. Herpetological Collection of Dept. Biodiversidad y Ecología, Universidad Nacional de Córdoba, Argentina (C–288). A hatchling, taken as an egg in a group of five when its nest was predated by a bird (Aramidae); when handled, four of them immediately hatched. First record for the Provincia de Corrientes; confirms presence in the province as suggested by Rhodin and Mittermeier (1983, pp. 58–73 *In* Rhodin and Miyata, eds., Advances in Herpetology and Evolutionary Biology, Publ. Mus. Comp. Zool., Harvard), but within the Paraná River basin. Second Argentine province, species previously recorded for Misiones (Richard and De La Fuente 1987, published 1992, Acta Zool. Lilloana, 41:357–364). Extends range ca. 260 km air line from the nearest verified population at Misiones, Arroyo Urugua-i (MACN–12589/12595). Thanks to the Secretaría de Ciencia y Tecnologia Provincia de Córdoba for financial support.

Submitted by **MARIO R. CABRERA**, Departamento Biodiver-

sidad y Ecología, Universidad Nacional de Córdoba, Vélez Sarsfield 299, 5000 Córdoba, Argentina.

LACERTILIA

ANELYTROPSIS PAPILLOSUS (Mexican Blind Lizard). MÉXICO: HIDALGO: Municipality of Chapulhuacan, Cerro de la Joya, 4 km SSW Arroyo Blanco (21°07'N, 98°54'W) 400 m elev. 29 May 1992. Efraín Hernández and Fernando Mendoza. Museo de Zoología, Facultad de Ciencias, UNAM, MZFC 05388, (155 mm SVL, 180 mm TL) and MZFC 05389 (150 mm SVL, 205 mm TL). Verified by O. Flores-Villela. Found under large sedimentary boulders in tropical deciduous forest although the microhabitat was sheltered and moist. *Leptotyphlops dulcis myopicus* was collected in similar nearby habitat which suggests syntopy. First record for the state of Hidalgo and a southern range extension of 18 km SE and 30 km SW from records in nearby extreme eastern Querétaro and San Luis Potosí, respectively; confirms prediction of Campbell (1974, Cat. Amer. Amph. Rept. 156:1-2) that this species would be found in adjacent northern Hidalgo.

Submitted by **FERNANDO MENDOZA QUIJANO**, Museo de Zoología, Facultad de Ciencias, UNAM Apdo. Post. 70-399, México, Distrito Federal 04510, México, **EFRAÍN HERNÁNDEZ GARCIA**, Calandria No. 23-1, Unidad Independencia, Contreras, México, Distrito Federal 10100, México, and **WALTER SCHMIDT BALLARDO**, Adolfo Prieto No. 819, Col. del Valle, México, Distrito Federal 03100, México.

CNEMIDOPHORUS EXSANGUIS (Chihuahuan Spotted Whiptail). USA: NEW MEXICO: Rio Arriba-Taos county line: Carson National Forest, 3.2 km above (presumably W of) Servilleta. 14 May 1937. Collector unknown. Verified by W. G. Degenhardt. UMMZ 84290 (3 specimens). County is indeterminate, however, this locality is the northernmost for the species and extends range ca. 50 km N from SE Rio Arriba County (Stuart 1991, Cat. Amer. Amphib. Rept.: 516.1–516.4).

Submitted by **JAMES N. STUART**, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA.

CNEMIDOPHORUS SEXLINEATUS VIRIDIS (Prairie Racerunner). USA: TEXAS: Hall Co: old railroad bed 0.4 km W US Rt. 287, 1.6 km S middle of Red River bridge. 29 September 1992. H. M. Smith. Verified by Richard L. Holland. UCM 56620. First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M Press, College Station, Texas, 434 pp.); partially fills hiatus between panhandle and other records.

Submitted by **HOBART M. SMITH**, Department of EPO Biology and Museum, University of Colorado, Boulder, Colorado 80309–0334, USA.

EUMECES FASCIATUS (Five-lined Skink). USA: MISSOURI: Pike Co: in forest on southern half of Traynor and Traynor Farms, ca. 5.5 km NW Curryville, NE 1/4 NW 1/4 NW 1/4 Sec. 18, T53N, R4W. 21 August 1992. Brian S. Edmond. University of Missouri, Columbia (UMC 633L). Verified by D. E. Metter. New county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

EUMECES MULTIVIRGATUS MULTIVIRGATUS (Northern Many-lined Skink). USA: COLORADO: Kiowa Co: 1.6 km S Cheyenne County line along US Rt. 287. 22 July 1992. Richard L Holland & Hobart M. Smith. Verified by David Chiszar. UCM 56614. First county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, 120 pp.); extends known range of species eastward ca. 95 km into the southeastern corner of the state.

Submitted by **HOBART M. SMITH**, Department of EPO Biology and Museum, University of Colorado, Boulder, Colorado 80309–0334, USA, and **RICHARD L. HOLLAND**, Science Department, Boulder High School, 1604 Arapahoe Avenue, Boulder, Colorado 80302, USA.

EUMECES OBSOLETUS (Great Plains Skink). USA: COLORADO: Cheyenne Co: 15.2 m N County Rd A, 1.6 km E US Rt. 287. 22 July 1992. Richard L. Holland & Hobart M. Smith. Verified by David Chiszar. UCM 56615. First county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, 129 pp.); partially fills hiatus between NE and SE records in Colorado (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.).

Submitted by **RICHARD L. HOLLAND**, Science Department, Boulder High School, 1604 Arapahoe Avenue, Boulder, Colorado 80302, USA, and **HOBART M. SMITH**, Department of EPO Biology and Museum, University of Colorado, Boulder, Colorado 80309–0334, USA.

HEMIDACTYLUS MABOUIA (Tropical House Gecko). USA: FLORIDA: Monroe Co: Bahia Honda Key, Bahia Honda State Recreation Area. 26–27 June 1991. A. Bauer, R. Günther & D. King. Verified by K. de Queiroz. Zoologisches Museum, Berlin (ZMB 48893, 48920, 49204–5, 50805). Adults and juveniles collected on walls of buildings and on path near eastern end of key. Extends known range in the Florida Keys 25 km southwest from only other U.S. record on Crawl Key (Lawson et al. 1991, Herpetol. Rev. 22:11–12). Increases to nine the number of lizard species recorded from Bahia Honda (Anonymous, no date, Vertebrates Identified in Bahia Honda State Recreation Area, Publ. Florida Dept. of Natural Resources, Tallahassee).

Submitted by **RAINER GÜNTHER**, Zoologisches Museum, Museum für Naturkunde der Humboldt-Universität zu Berlin, Invalidenstraße 43, D(O) 1040 Berlin, Germany, **AARON M. BAUER** and **DAVID KING**, Biology Department, Villanova University, Villanova, Pennsylvania 19085, USA.

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). USA: TEXAS: Pecos Co: KOA Campground, N of Interstate 10–US 385/US 290 (Dickinson Street) jct. in Fort Stockton. 1 August 1992. Kevin W. C. Pajak and John S. McCord, Jr. Verified by William J. Voss. Fort Worth Museum of Science and History (FWM 10928). New county record; extends range 53.8 km NE Brewster County (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press. College Station, Texas, 434 pp.).

Submitted by **KEVIN W. C. PAJAK**, 8991 Meadowbrook Way, Buena Park, California 90621, USA, and **JOHN S. McCORD, JR.**, 1642 Martha Drive, Bedford, Texas 76022, USA.

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). USA: TEXAS: De Witt Co: Yorktown, inside former Yorktown Theatre Building, jct. Texas Rts. 72 and 119. 28 August 1992. James D. Ponder. Verified by James R. Dixon. Texas Cooperative Wildlife Collection (TCWC 70017). New county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station, Texas, 434 pp.).

Submitted by **R. KATHRYN VAUGHAN**, Department of Wildlife and Fisheries Sciences, Texas A & M University, College Station, Texas 77843, USA.

HEMITHECONYX CAUDICINCTUS (African Gecko) CAMEROON: GAROUA: North Cameroon. Collected by Mouchet. No date. Muséum National d'Histoire Naturelle, Paris 8749; Cameroon. No collector and no date. MNHN 8687; Cameroon. Collected by Stauch. No date. MNHN 1967–249 and 250; North Cameroon, Garoua, "Ecole de Faune." Collected by Hubert Planton. 15 March 1992. MNHN 1992–5245. All verified by Georges Pasteur. New country record (Loveridge 1947, Bull. Mus. Comp. Zool. Harvard 98:1–469; Perret 1963, Rev. suisse Zool. 70(3):47–60). Previously known from "Nigeria west to Senegal."

Submitted by **IVAN INEICH**, Muséum National d'Histoire Naturelle, Laboratoire de Zoologie (Reptiles et Amphibiens), 25 Rue Cuvier, F–75005 Paris, France.

SCELOPORUS UNDULATUS CONSOBRINUS (Southern Prairie Lizard). USA: TEXAS: Knox Co: 1.6 km W Munday, Road 222. 2 October 1983. G. Wallins. West Texas State University (WTSU 9527); Moore Co: Blue West Recreation Area, Lake Meredith. 21 May 1983. J. Vines. WTSU 9557; Potter Co: Amarillo area. WTSU 10802, Rivera Park, 16 km N Amarillo. 17 & 28 April 1987. B. Loving. WTSU 8312. 4.8 km N Bushland, Road 2381. 16 March & 5 April 1981. R. Walsh, B. Hayes, & T. James. WTSU 6687–9. Road 1061, 9 km W Road 2381. 16 November 1969. T. Rush. WTSU 263–264, Plum Creek Recreation Area, Lake Meredith. 20–22 September 1979, 21 May 1983, 25 April 1987. K. Brewer, B. May, T. Payne, M. L. Simmons, J. and J. Vines and W. Willis. WTSU 5944, 6003, 6092–4, 6127–31, 10608, 14289. All verified by Edwin L. Bell. First county records (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station, 434 pp.).

Submitted by **KATHLEEN BLAIR**, Department of Biology and Geosciences, West Texas State University, Canyon, Texas 79015–0808, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309–0334, USA.

SCELOPORUS UNDULATUS GARMANI (Northern Prairie Lizard). USA: TEXAS: Hansford Co: Rue and Rex Sanders Ranch, Road 2387, 7.8 km N jct. with Road 15. 22 August 1978. Flavius C. Killebrew. Verified by Edwin L. Bell. West Texas State University (WTSU 5863). First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station, 434 pp.).

Submitted by **KATHLEEN BLAIR**, Department of Biology and Geosciences, West Texas State University, Canyon, Texas 79015–0808, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309–0334, USA.

SCELOPORUS UNDULATUS HYACINTHINUS (Northern Fence Lizard). USA: PENNSYLVANIA: Schuylkill Co: Middle Creek, 3.2 km N Tremont, Frailey Twp. 2 August 1992. Craig A. Heinsohn. CM 125799. Verified by C. J. McCoy. Female, 73 mm SVL, 90 mm tail length. New county record (McCoy 1982, Amphibians and Reptiles in Pennsylvania. Carnegie Mus. Spec. Publ. 6). Extends range ca. 32 km NE from nearest locality in Lebanon County. Two other females were found by Heinsohn in the same county, one near Lincoln, Tremont Township, 5 September 1991, and one near Middle Creek, Frailey Township, in June 1992; both were released.

Submitted by **EDWIN L. BELL**, P. O. Box 15234, Albright College, Reading, Pennsylvania 19612–5234, USA.

SCINCELLA LATERALIS (Ground Skink). USA: MISSOURI: Pike Co: in forest on western boundary line of Ranacker Wildlife Area, ca. 4 km S Frankford. NW 1/4, NW 1/4, SW 1/4 Sec. 13, T54N, R4W. 22 August 1992. Brian S. Edmond. University of Missouri, Columbia (UMC 634L); in pasture (on edge of woods) of NE portion of Traynor and Traynor Farms, ca. 5 km NW Curryville. NE 1/4, SW 1/4, NW 1/4 Sec. 18, T53N, R4W. 22 August 1992. Brian S. and Kellie Jayne Edmond. UMC 635L. Both verified by D. E. Metter. New county records (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

SERPENTES

ELAPHE EMORYI (Great Plains Rat Snake). USA: KANSAS: Sheridan Co: Ks. Rt. 23 at State Wildlife Area. 7 June 1992. Travis W. Taggart. Verified by Joseph T. Collins. KU 220601. New county record (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

ELAPHE GUTTATA EMORYI (Great Plains Rat Snake). USA: TEXAS: Hansford Co: Gibbner Ranch, 16.2 km N Spearman, Road 760. 12 August 1978. F. C. Killebrew. Verified by Richard L. Holland. West Texas State University (WTSU 5004). First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A & M University Press, College Station, 434 pp.).

Submitted by **KATHLEEN BLAIR**, Department of Biology and Geosciences, West Texas State University, Canyon, Texas 79015–0808, USA, **JAMES R. STALEY II**, Colorado Division of Wildlife, Central Region, 6060 Broadway, Denver, Colorado 80216, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309–0334, USA.

HETERODON PLATIRHINOS (Eastern Hognose Snake). USA: PENNSYLVANIA: Schuylkill Co: 1.6 km W Port Clinton on the old Schuylkill Canal towpath. 17 May 1992. Edwin L. Bell. Verified by C. J. McCoy. CM 125767. Melanistic female with orange crossbars; 778 mm SVL, 103 mm tail length. Previously reported from surrounding counties: Berks, Northumberland, and Carbon (McCoy 1982, Amphibians and Reptiles of Pennsylvania, Carnegie Mus. Spec. Publ. No. 6).

Submitted by **EDWIN L. BELL**, P.O. Box 15234, Albright College, Reading, Pennsylvania 19612–5234, USA.

LAMPROPELTIS GETULA CALIFORNIAE (California Kingsnake). MÉXICO: SONORA: Isla San Esteban, Gulf of California. 13 September 1990. Kent R. Beaman and L. Lee Grismer. Verified by Tom Van Devender. Arizona-Sonora Desert Museum, Tucson, Arizona. LACM voucher photographs 140090, 140091. First known live records of this species from Isla San Esteban; adult male and female from Arroyo Limantur on E side of island on eve of a storm; currently alive in the Centro Ecologico de Sonora, Hermosillo, Sonora, México (Murphy and Ottley 1984, Distribution of Amphibians and Reptiles on Islands in the Gulf of California. Ann. Carnegie Mus. 53:207–230.). Previously only known on island from a shed skin found 21 October 1986 by Rogelio Molina-Freaner (presented in paper by Lara and Lawler at 1987 SSAR/HL meeting).

Submitted by **GUILLERMO LARA-GONGORA**, Apartado Postal 57–305, México, Distrito Federal cp 06501, México, **KENT R. BEAMAN**, Section of Herpetology, Los Angeles County Natural

History Museum, 900 Exposition Boulevard, Los Angeles, California 90007, USA, **L. LEE GRISMER**, Department of Biology, San Diego State University, San Diego, California 92182, USA, and **HOWARD E. LAWLER**, Arizona-Sonora Desert Museum, 2021 North Kinney Road, Tucson, Arizona 85743, USA.

NERODIA RHOMBIFER (Diamondback Water Snake). USA: MISSOURI: Pike Co: crossing road in bottoms, just S Ted Shanks Wildlife Area Visitor Center, ca. 1 km SE Ashburn. SW 1/4, NE 1/4 Sec. 18, T55N, R2W. 4 October 1992. Brian S. Edmond. University of Missouri, Columbia (UMC 774S). Verified by D. E. Metter. New county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

NERODIA SIPEDON SIPEDON (Northern Water Snake). USA: MISSOURI: Pike Co: on banks of creek that forms the NW boundary of Traynor and Traynor Farms, ca. 5.5 km NW Curryville. NE 1/4, SE 1/4, SE 1/4 Sec. 12 , T53N, R5W. 21 August 1992. Brian S. Edmond. University of Missouri, Columbia (UMC 771S); crossing road in bottoms, just S Ted Shanks Wildlife Area Visitor Center, approximately 1 km SE Ashburn. SW 1/4, NE 1/4 Sec. 18, T55N, R2W. 4 October 1992. Brian S. Edmond. UMC 775S. Both verified by D. E. Metter. New county records (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

RAMPHOTYPHLOPS BRAMINUS (Brahminy Blind Snake). USA: FLORIDA: Pinellas Co: St. Petersburg, between 22 Avenue N & 28 Avenue N, 0.31 air km W Interstate Rt. 275 & ca. 0.10 air km E of Seaboard Coast Line Railroad, NE corner Sec. 11, T31S, R16E. 6 November 1992, 11 November 1992. D. M. Crawford. Verified by David L. Auth. Florida Museum of Natural History (UF 86601, 86602, 86603, 86604 & 86605). Five subadults beneath bricks, discarded rug and trash can lid in isolated hardwood hammock surrounded by urban and suburban development. Six additional subadults are being kept alive in the personal collection of D. M. Crawford. Eleven individuals sighted but evaded capture. All found among ant colonies (probably *Monomorium* sp.) beneath anthropogenic debris. First county record; extends range ca. 177 air km N of record in Ft. Myers, Lee County, along the west coast of Florida (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed., Houghton Mifflin Co., Boston, Massachusetts, 450 pp.), and ca. 111 air km ENE of nearest record in Avon Park, Highlands County, southcentral Florida (UF 81952–3), thus making this the northernmost record in Florida. Other U.S. records of this secretive, parthenogenic exotic include Coral Gables, Hialeah, Homestead, Miami (Dade County), Lake Okeechobee (Palm Beach County), and Key West (Old Town) and Big Pine Key (Monroe County), Florida (Delorey and Mushinsky 1987, Herpetol. Rev. 18:56; Ehrig 1990, Herpetol. Rev. 21:41; Wilson and Porras 1983, Univ. Kansas Mus. Nat. Hist. Spec. Publ. 9:1–89; Wynn et al. 1987, Amer. Mus. Novit. 2868:1–7), and Boston, Massachusetts (Wallach et al. 1991, Herpetol. Rev. 22: 68).

Submitted by **DANIEL M. CRAWFORD**, 13521-120th Lane North, Largo, Florida 34648, USA, and **LOUIS A. SOMMA**, Department of Zoology, University of Florida, Gainesville, Florida 32611, USA.

REGINA GRAHAMII (Graham's Crayfish Snake). USA: MISSOURI: Pike Co: crossing road in bottoms, just S Ted Shanks Wildlife Area Visitor Center, ca. 1 km SE Ashburn. SW 1/4, NE 1/4 Sec. 18, T55N, R2W. 10 August 1992. Brian S. Edmond. University of Missouri, Columbia (UMC 769S). Verified by D. E. Metter. New county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

RHADINAEA MONTECRISTI (NCN). HONDURAS: COMAYAGUA: Cordillera de Montecillos, 1.7 km N and 0.1 km W Cerro San Juanillo, elev. 1960 m. 18 June 1991. P. Holm. Verified by Gustavo A. Cruz. Universidad Nacional Autonoma de Honduras (UNAH 2742). Extends known range of species E by ca. 100 km; previously known only from extreme NW El Salvador and SW Honduras (McCranie and Wilson 1991, Cat. Amer. Amphib. Rept. 524:1–2). Specimen (adult female, live mass 11.7 g, SVL 309 mm, tail 123 mm; ventrals 173, subcaudals 78) was active on leaf litter in mature cloud forest. It is syntopic with *R. godmani* (UNAH 2717) at this locality.

Submitted by **PETER HOLM**, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA.

STORERIA OCCIPITOMACULATA OCCIPITOMACULATA (Northern Redbelly Snake). USA: MISSOURI: Pike Co: under flat rock at JC & SM Edmond home, ca. 7 km NNW Curryville. NE 1/4, NW 1/4, NE 1/4 Sec. 5, T53N, R4W. 23 August 1992. Brian S. Edmond. University of Missouri, Columbia (UMC 772S). Verified by D. E. Metter. New county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

STORERIA OCCIPITOMACULATA (Redbelly Snake). USA: OKLAHOMA: Cherokee Co: near Scraper. 14 April 1962. W. A. Carter. East Central Univ. Biol. Coll. (ECU 1986); 17.7 km E Tahlequah. 1 May 1970. W. A. McCracken. ECU 1990. Verified by W. A. Carter and J. H. Black. These vouchers verify previous reports in Cherokee County (Secor and Carpenter 1985, Distribution Maps of Oklahoma Reptiles. Okla. Herp. Soc. Spec. Publ. 3:1–57); Atoka Co: 29 km NE Atoka. 2 October 1989. B. Pitman. ECU 2346; Pittsburg Co: Collins Wildlife Refuge. 11 November 1989. A. Black. ECU 2347. Verified by W. A. Carter and J. H. Black. New county records; extend known distribution W in Oklahoma (Secor and Carpenter, op. cit.). Rossman and Erwin (1980, Brimleyana 4:95–102) and Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.) indicate two subspecies occur in Oklahoma—*S. o. occipitomaculata* in NE Oklahoma and *S. o. obscura* in SE Oklahoma, where it integrades with *S. o. occipitomaculata*. Subspecific status of these specimens was not determined.

Submitted by **CHARLES B. SHANS**, Department of Biology, East Central University, Ada, Oklahoma 74820, USA.

TANTILLA GRACILIS (Flathead Snake). USA: MISSOURI: Montgomery Co: on small glade near road, 0.5 km SE campground, Danville Wildlife Area, ca. 3 km SSE Danville. SW 1/4 NW 1/4 SW 1/4 Sec. 5, T47N, R5W. 30 September 1992. Brian S. and Kellie Jayne Edmond. University of Missouri, Columbia (UMC 773S). Verified by D. E. Metter. New county record and first Missouri specimen collected N of Missouri River (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

THAMNOPHIS RADIX RADIX (Eastern Plains Garter Snake) USA: Montgomery Co: NW 1/4 Sec. 3, T10S, R5W, at rest stop on I–55. 11 April 1992 M. Bavetz. Verified by Ronald A. Brandon. Southern Illinois University Department of Zoology Collection (SIUC R–2359) County record; fills gap in SW Illinois between Madison and St. Clair counties (McNaughton 1976, Herpetol. Rev. 7(3):124) and SW edge of the range in Illinois as shown in Smith (1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298), and Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.).

Submitted by **MARK J. BAVETZ**, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA.

VIRGINIA VALERIAE (Smooth Earth Snake). USA: MISSOURI: Pike Co: in forest of NE portion of Traynor and Traynor Farms, ca. 5 km NW Curryville, SE 1/4, NW 1/4, NW 1/4, Sec. 18, T53N, R4W. 22 August 1992. Brian S. and Kellie Jayne Edmond. University of Missouri, Columbia (UMC 770S). Verified by D. E. Metter. New county record (Johnson 1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Conserv., Jefferson City, 368 pp.).

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

BOOK REVIEWS

Second World Congress Of Herpetology Literature Review

With the Second World Congress of Herpetology in Adelaide, South Australia approaching it seems appropriate to provide *Herpetological Review* readers, and Congress-goers in particular, with a brief overview of recent books and booklets on the Australian herpetofauna. In the last decade Australia has probably produced more herpetological titles per capita than any other nation. Three of the most recent country-wide herpetofaunal guides by Hal Cogger, Harry Ehmann, and Mike Tyler are reviewed fully below. A number of other recent titles have been reviewed in *Herpetological Review* in the past. The following is an annotated list of some of the major (and not so major) Australian herpetological titles that have appeared since about 1980 (a few works from the late '70's are also included). Children's books and general works with only small sections on herpetology have been excluded and only the most recent editions of books are listed. Serendipitously, 64 titles are listed, one for each year since the publication of Edgar Waite's landmark *The Reptiles and Amphibians of South Australia*. The list provided is by no means complete, but it may serve at least as an introduction to the literature resources available to participants in the World Congress who want to maximize their appreciation of the unique Australian herpetofauna during their stay in Adelaide.

General Herpetologcal References (Amphibians and Reptiles)

COGGER, H. G. 1992. Reptiles and Amphibians of Australia, 5th edition. Ithaca: Cornell University Press. 775 pp. Hardcover. Species accounts for all Australian species, with color photos and shaded range maps. Introductory sections on general herpetological topics, extensive bibliography. Reviewed in this issue of HR.

COGGER, H. G., E. E. CAMERON, and H. M. COGGER. 1983. Zoological Catalogue of Australia, vol. 1, Amphibia and Reptilia. Canberra: Australian Government Publishing Service. 313 pp. Hardcover. Comprehensive technical guide with synonymies and literature guide for all Australian amphibians and reptiles.

GRIFFITHS, K. 1984. Reptiles and Frogs of Australia. Sydney: View Productions. 96 pp. Hardcover. Picture book.

HOSER, R. T. 1989. Australian Reptiles and Frogs. Sydney: Pierson and Co. 238 pp. Hardcover. Species accounts with color photos and shaded range maps for approximately 200 species. Includes sections on habitat types, photography, conservation, and captive care and husbandry. Reviewed by S. A. Minton, 1990, HR 21(4):97-98.

KENNEDY, M. (ed.). 1990. Australia's Endangered Species. Brookvale: Simon and Schuster Australia. 192 pp. Hardcover. Provides brief species accounts with shaded maps and some color photos for 39 endangered amphibian and reptile species. Complete listing of threatened and endangered species also given.

SCHMIDA, G. 1985. The Cold-Blooded Australians. Sydney: Doubleday Australia. 208 pp. Hardcover. Regional approach to representative fishes, amphibians, and reptiles. Reviewed by R. D. Bartlett, 1988, HR 19(4):88.

Frogs

TYLER, M. J. 1982. Frogs, 2nd edition. Sydney: Collins. 256 pp. Softcover. Biology of frogs with color photos and state checklists.

TYLER, M. J. (ed.) 1983. The Gastric Brooding Frog. London: Croom Helm. 163 pp. Hardcover. Collection of contributions on *Rheobatrachus silus*, with black and white photos and bibliography of the species.

TYLER, M. J. 1984. There's A Frog in My ~~Throat~~ Stomach. Collins: Sydney. 52 pp. Softcover. Non-technical book on *Rheobatrachus silus*, with color photos.

TYLER, M. J. 1989. Australian Frogs. Ringwood: Viking O'Neil. 220 pp. Hardcover. Biology of Australian frogs with emphasis on certain species. With black and white and color photos, extensive bibliography and many tables.

TYLER, M. J. 1992. Encyclopedia of Australian Animals: Frogs. Pymble: Angus and Robertson. 109 pp. Hardcover. Species accounts for all Australian frogs, with color photos and shaded range maps. Reviewed this issue of HR.

Reptiles (General)

BRADSHAW, S. D. 1986. Ecophysiology of Desert Reptiles. North Ryde: Academic Press Australia. 324 pp. Hardcover. Arid zone reptiles, with an emphasis on Australian lizards, especially agamids. Black and white photos and figures, extensive bibliography.

COGGER, H. G. 1989. Australian Reptiles in Colour, 2nd revised edition. Port Melbourne: Treasure Press. 112 pp. Hardcover. General overview of representative reptiles with color photos.

EHMANN, H. 1992. Encyclopedia of Australian Animals: Reptiles. Pymble: Angus and Robertson. 495 pp. Hardcover. Species accounts for all Australian reptiles, with color photos and shaded range maps. Reviewed this issue of HR.

HEATWOLE, H. F., and J. TAYLOR. 1987. Ecology of Reptiles. Chipping

Norton: Surrey Beatty and Sons. 325 pp. Hardcover. Detailed review of Australian reptile ecology, with extensive bibliography and some color plates.

WEIGEL, J. 1988. Care of Australian Reptiles in Captivity. Gosford: Reptile Keepers Association. 144 pp. Softcover. Guide to all aspects of captive care of commonly kept species, with black and white and color photos.

WILSON, S. K., and D. G. KNOWLES. 1988. Australia's Reptiles, A Photographic Reference to the Terrestrial Reptiles of Australia. Sydney: Collins. 447 pp. Hardcover. Species accounts, color photos, and shaded range maps for almost all reptile species.

Turtles

CANN, J. 1978. Tortoises of Australia. Sydney: Angus and Robertson. 79 pp. + 60 pp. pls. Softcover. Species accounts with many color photos and a section on captive care.

Crocodiles

HERMES, N. 1989. Crocodiles, Killers in the Wild. Frenchs Forest: Child and Associates. 64 pp. Hardcover. Chiefly (color) photography book.

WEBB, G., and C. MANOLIS. 1988. Australian Freshwater Crocodiles. Winnnellie: G. Webb Pty. Ltd. 32 pp. Softcover. Short overview of biology with color photos.

WEBB, G., and C. MANOLIS. 1988. Australian Saltwater Crocodiles. Winnnellie: G. Webb Pty. Ltd. 32 pp. Softcover. Short overview of biology with color photos.

WEBB, G., and C. MANOLIS. 1989. Crocodiles of Australia. Frenchs Forest: Reed Books. 160 pp. Hardcover. Covers biology, attack, human use, research, etc., with color photos.

Lizards

GREER, A. E. 1989. The Biology and Evolution of Australian Lizards. Chipping Norton: Surrey Beatty and Sons. 264 pp. Systematics, ecology, physiology, reproduction, etc. of Australian lizards. With line drawings, color photos, extensive bibliography and many tables.

SWANSON, S. 1987 [reprinted 1990]. Lizards of Australia, revised edition. North Ryde: Angus and Robertson. 160 pp. Softcover. Species accounts and color photos of selected species, with sections on captive care and photography.

Snakes (and Venoms)

CANN, J. 1986. Snakes Alive! Snake Experts and Antidote Sellers of Australia. Kenthurst: Kangaroo Press. 176 pp. Softcover. History of snake handlers in Australia, with many black and white photos.

COVACEVICH, J., P. DAVIE, and J. PEARN. (eds.). 1987. Toxic Plants and Animals, A Guide for Australia. South Brisbane: Queensland Museum. 504 pp. Softcover. Includes 12 papers on amphibians and reptiles, especially elapids, with emphasis on pharmacological and medical aspects of venoms and toxins. With many black and white photos and figures.

GARNET, J. R. 1981. Venomous Australian Animals Dangerous to Man. Parkville: Commonwealth Serum Laboratories. 88 pp. Species accounts with shaded maps and some black and white illustrations for some dangerously venomous species. Also includes venom and treatment information.

GOW, G. F. 1983 [reprinted 1991]. Snakes of Australia, revised edition. North Ryde: Angus and Robertson. 118 pp. + 48 pls. Softcover. Species accounts with color photos and a section on snake bite.

GOW, G. F. 1984. Australia's Dangerous Snakes. Sydney: Angus and Robertson. 80 pp. + 24 pp. pls. Softcover. Species accounts with color photos and shaded range maps and a section on snake bite.

GOW, G. F. 1989. Graeme Gow's Complete Guide to Australian Snakes. North Ryde: Angus and Robertson. 171 pp. Hardcover. Species accounts with keys, color photos and shaded range maps. Sections on snake bite and general biology of Australian snakes.

KREFFT, G. 1984 (reprint of 1869 edition). The Snakes of Australia. Brisbane: Lookout Publications. xxv + 100 pp. + 12 pls. Hardcover. Facsimile reprint with color plates. Reviewed by K. Adler, 1989, HR 20(1):21, 24.

LONGMORE, R. 1989. Snakes, Atlas of Elapid Snakes of Australia, revised edition. Australian Flora and Fauna Series No. 7. Canberra: Australian Government Publishing Service. 115 pp. Spiral bound. Biogeographic atlas of elapids with color photos and climatic parameters for all Australian species.

MIRTSCHIN, P., and R. DAVIS. 1983. Dangerous Snakes of Australia, revised edition. Adelaide: Rigby. 208 pp. Hardcover. Species accounts with venom information and color photos for dangerously venomous species. Extensive section on snake bite, venom, etc.

PEARN, J., and J. COVACEVICH. (eds). 1988. Venoms and Victims. South Brisbane: Queensland Museum Press. 136 pp. Softcover. Includes six papers on amphibians and reptiles, with an emphasis on venoms. Black and white and color photos, keys.

SHINE, R. 1991. Australian Snakes: A Natural History. Ithaca: Cornell University Press. 223 pp. Hardcover. Ecology and general biology of Australian snakes, with tables and extensive color photographs and figures. Reviewed by W. S. Brown, 1992, HR 23(4):125-127.

State and Regional Guides: New South Wales, Victoria, Tasmania, Australian Capitol Territory

COVENTRY, A. J., and P. ROBERTSON. 1991. The Snakes of Victoria. East Melbourne: Department of Conservation and Environment. 70 pp. Softcover. Keys, color photographs, and point locality maps for all Victorian snakes.

GRIFFITHS, K. 1987. Reptiles of the Sydney Region. Winmalee: Three Sisters Productions. 120 pp. Softcover. Color photos and shaded range maps for reptiles of greater Sydney.

JENKINS, R., and R. BARTELL. 1980. A Field Guide to Reptiles of the Australian High Country. Melbourne: Inkata Press. 278 pp. Hardcover. Keys and color photographs covering the reptiles of the highland areas of Victoria, New South Wales, and the Australian Capitol Territory.

MARTIN, A. A., and M. J. LITTLEJOHN. 1982. Tasmanian Amphibians. Fauna of Tasmania Handbook no. 6. Hobart: University of Tasmania. 52 pp. Softcover. Keys to adults, eggs, larvae, and calls, black and white photos and point locality maps.

SMITH, S. J. 1990. Checklist of the Vertebrate Animals of Tasmania. Hobart: St. David's Park. 50 pp. Species list for the state.

SWAN, G. 1990. A Field Guide to the Snakes and Lizards of New South Wales. Winmalee: Three Sisters Productions. 224 pp. Softcover. Color studio photos and point locality maps for all New South Wales squamates.

WEIGEL, J. 1990. Australian Reptile Park's Guide to Snakes of

South-East Australia. Gosford: Australian Reptile Park. 103 pp. Softcover. Keys and color photos of snakes of Victoria, Tasmania and parts of New South Wales, South Australia and Queensland with sections on first aid and venom extraction.

Queensland and Northern Territory

COVACEVICH, J. 1980. The Snakes of Brisbane. Queensland Museum Booklet No. 4. 20 pp. Softcover. Booklet with keys and line drawings.

FRITH, C., and D. FRITH. 1987. Australian Tropical Reptiles and Frogs. "Prionodura" Paluma via Townsville: Tropical Australia Graphics. 71 pp. Softcover. Color photos and shaded maps for over 100 species from northern Queensland, Northern Territory and Western Australia.

INGRAM, G., and R. J. RAVEN. (eds). 1991. An Atlas of Queensland's Frogs, Reptiles, Birds and Mammals. Brisbane: Queensland Museum. 391 pp. Softcover. Point locality maps based on Queensland Museum collections, with acetate overlay maps showing altitude, drainage basins, national parks and major towns.

NIX, H. A., and M. A. SWITZER. 1991. Rainforest Animals, Atlas of Vertebrates Endemic to Australia's Wet Tropics. Canberra: Australian National Parks and Wildlife Service. 112 pp. Spiral bound. Point localities for 33 species of endemic Queensland rainforest lizards and frogs, with color photos and mean bioclimatic parameters for known sites.

TYLER, M. J., and M. DAVIES. 1986. Frogs of the Northern Territory. Darwin: Conservation Commission of the Northern Territory. 77 pp. Softcover. Point locality maps, color photos and keys by zone within the NT. Species lists for major centers also provided.

South Australia

HOUSTON, T. F. 1978. Dragon Lizards and Goannas of South Australia. Adelaide: South Australian Museum. 84 pp. Softcover. Keys, line drawings and paintings along with point locality maps for South Australian agamids and varanids.

SCHWANER, T. D. 1985. Snakes in South Australia. Adelaide: South Australian Museum. 8 pp + 8 pp. plates. Softcover. Short summary of natural history with color plates.

TWIDALE, C. R., M. J. TYLER, and B. P. WEBB. (eds.). 1976. Natural History of the Adelaide Region. Adelaide: Royal Society of South Australia. 189 pp. Softcover. Very little on amphibians and reptiles, but a good overall guide to geology, hydrology, vegetation of greater Adelaide.

TYLER, M. J. 1977. Frogs of South Australia, 2nd ed. Adelaide: South Australian Museum. 50 pp. Softcover. Black and white photos and regional keys.

TYLER, M. J. 1978. Amphibians of South Australia. Adelaide: D. J. Woolman. 84 pp. Softcover. Systematically arranged keys, color photos, and some maps.

WAITE, E. 1993 (reprint of 1929 edition). The Reptiles and Amphibians of South Australia. Society for the Study of Amphibians and Reptiles. 290 pp. Hardcover. Forthcoming SSAR facsimile reprint of the first South Australian state guide, with new material added.

Western Australia

BUSH, B. 1981. Reptiles of the Kalgoorlie-Esperance Region. Esperance: Brian Bush. 46 pp. Softcover. Species accounts and color photos of some of the reptiles of south central Western Australia.

STORR, G. M., L. A. SMITH, and R. E. JOHNSTONE. 1981. Lizards of Western Australia I. Skinks. Nedlands: University of Western Australia Press. 200 pp. Softcover. Systematic work (no natural history) with keys, shaded maps, and color photos. Reviewed by H. C. Seibert, 1983, HR 14(4):126-127.

STORR, G. M., L. A. SMITH, and R. E. JOHNSTONE. 1983. Lizards of Western Australia II. Dragons and Monitors. Perth: Western Australian Museum. 114 pp. Softcover. Systematic work (no natural history) with keys, shaded maps, and color photos.

STORR, G. M., L. A. SMITH, and R. E. JOHNSTONE 1986. Snakes of Western Australia. Perth: Western Australian Museum. 187 pp. Softcover. Systematic work (no natural history) with keys, shaded maps, and color photos. Reviewed by H. K. Voris, 1989, HR 20(1):19.

STORR, G. M., L. A. SMITH, and R. E. JOHNSTONE. 1990. Lizards of Western Australia III. Geckos and Pygopods. Perth: Western Australian Museum. 141 pp. Softcover. Systematic work (no natural history) with keys, shaded maps, and color photos.

TYLER, M. J., L. A. SMITH, and R. E. JOHNSTONE. 1984. Frogs of Western Australia. Perth: Western Australian Museum. 109 pp. Softcover. Point locality maps and color photos for all frogs of Western Australia. Keys to adult frogs by zone within the state.

Island Territories

COGGER, H. G., R. SADLIER, and E. CAMERON. 1983. The Terrestrial Reptiles of Australia's Island Territories. Australian National Parks and Wildlife Service Special Publication 11. 80 pp. Softcover. Keys, habitats, reproduction, and basic biology of the reptiles of Christmas Island, Cocos Islands, Norfolk Island, and Ashmore Reef. With color photos of animals and habitats.

Meeting Proceedings

BANKS, C. B., and A. A. MARTIN. 1981. Proceedings of the Melbourne Herpetological Symposium. Melbourne: Zoological Board of Victoria. 199 pp. Softcover. 35 papers covering all fields of Australian herpetology, with black and white figures and photos.

GRIGG, G., R. SHINE, and H. EHMANN. 1985. The Biology of Australasian Frogs and Reptiles. Chipping Norton: Surrey Beatty and Sons. 527 pp. Hardcover. 63 papers covering all fields of Australian herpetology, with black and white and color figures and photos. Reviewed by S. A. Minton, 1989, HR 20(1):24-25.

INGRAM, G. (ed). 1990. Proceedings of the Australian Bicentennial Herpetological Society. Memoirs of the Queensland Museum 29(2):i-ii + 299-540. 27 papers covering all fields of Australian herpetology, with black and white figures and photos.

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Triturus montandoni (male). Romania: Predeal. Illustration by Dan Cogalniceanu.

Reptiles and Amphibians of Australia, 5th ed., by Harold G. Cogger. 1992. Cornell University Press, Ithaca, New York. ISBN 0-8014-2739-8. 775 pp. $97.00 U.S. (Hardcover).

Seventeen years have elapsed since the publication of the first edition of Hal Cogger's classic work on the Australian herpetofauna. In the intervening period the number of described taxa in Australia has increased at an almost unbelievable rate. The first edition of the book (1975) treated 664 species, whereas the fourth (1986) included 865. The current version details over 950 amphibian and reptile taxa.

Each subsequent edition of Cogger's book has incorporated new taxa and reflected nomenclatural shifts occasioned by the ever more voluminous alpha systematic and phylogenetic work on the Australian herpetofauna. The fifth edition, however, is the first to deviate from its predecessors radically with respect to the layout style established in the original work. The effect is striking and, although there are some drawbacks, the net result is an improvement over older editions.

The main improvement in the new edition of the book is in the photography. The last edition of the book presented 224 color photos, arranged eight per plate. An additional 658 black and white photos, usually on neutral background were presented (three to eight per page) clustered at the back of the book. In the fifth edition each photograph appears within one or two pages of the text account of the same species. I counted 831 color photos and one black and white photo (*Varanus semiremex*) representing 738 species. The photographs, taken mostly by the author, range in quality from good to superb, with most hovering around "excellent." A few, such as that of *Eroticoscincus* (yes, that's its name) *graciloides*, are not particularly well cropped, and one photo of *Ramphotyphlops braminus* appears twice (pp. 590-591 and p. 732), apparently inadvertently. Most specimens illustrated, however, are presented attractively on naturalistic substrates and the photographs are well-centered and clearly show the diagnostic features of the animals. Unfortunately a reasonable number of photos spread onto two pages and are partially obscured by the binding. A few pages (e.g., pp. 324-325) feature photos that overlap one another. Although this style of presentation has become quite popular it does nothing to improve the transfer of information and detracts from the general layout quality.

The vast majority of all photographs are new to this edition. For example, of 98 color photographs of gekkonid lizards, only seven appeared in the fourth edition, and each of these has been improved as a result of larger, higher-resolution reproduction. In other parts of the book, however, photos are unnecessarily large and waste space. Keys have also been improved substantially by the addition of several hundred line drawings that illustrate many diagnostic features. Most of these are of high quality, but a few appear faded or are mislabeled and in at least five keys indicated figures are lacking or the existing figures are not correctly cited.

Little of the text has changed from the fourth edition. Introductory sections dealing with nomenclature, distribution, specimen identification, conservation, habitat, collecting methods, captive maintenance, specimen preservation and snakebite are largely unaltered, although accompanying line drawings have been color tinted and new maps have been provided. Species accounts retain the format of older editions, with sections for description, distribution and habit (readers wanting detailed information on natural history will need to refer to other sources, as only very limited, often superficial data are provided here). Many minor emendations to the accounts have, however, been made, and the accompanying maps for many species have been updated to reflect range extensions and the effects of changes in species concepts. Maps retain the outline ranges used in earlier editions, but the switch from solid black to gray shading permits state boundaries to be seen and thus facilitates orientation. In at least 20 instances, however, the mapped distributions do not closely match the accompanying text or the specimens illustrated are stated to come from localities from outside the ranges as given by the text and/or maps. In a few cases the map nomenclature does not match the text (e.g., on page 677, species currently placed in the genus *Rhinoplocephalus* are mapped as *Unechis* and *Cryptophis*).

Thirty-three new or newly resurrected taxa are included with distribution maps (but no photos) in an appendix, bringing the book up to date at least through early 1991. As in the previous two editions, the species of Australia's Ocean territories are also treated in a separate appendix.

A glossary with more than 240 terms is provided as are general and family references including approximately 625 entries incorporating both broader or more significant systematic and natural history papers, books and monographs, and all papers in which new Australian taxa have been described since 1982. This cutoff allows one to use the reference list as a complement to Cogger et al. (1983), which cites earlier systematic and natural history literature. Many recent papers, especially those dealing with range extensions or the natural history of one or a few species have been omitted, however, and the literature section provided should in no way be construed as a complete overview of the last decade of Australian herpetological research.

Like many systematists, I find myself at odds with Cogger with regard to certain issues, such as the generic allocation of certain species and the recognition of certain names originally proposed in the controversial publications of Wells and Wellington. In these matters, however, the author clearly states that his opinions may differ from others, mentions opposing views, and quite rightly reminds the reader that nomenclature is a fluid reflection of our state of systematic knowledge. A few minor faults, such as the lack of umlauts on German names cited, pagination errors in the literature cited, and the misspelling of scientific names on some photo captions are irksome, but typos are generally few and far between. Although every student of the Australian fauna is likely to have suggestions for some minor improvements, most would agree that errors of omission are as minimal as the magnitude of the task would allow and errors of commission are virtually nonexistent.

Despite the recent release of many fine Australian herpetological books, Cogger's *Reptiles and Amphibians of Australia* remains the essential reference on the fauna of the island continent. The standard established by the latest edition of this work is extraordinary. I regard this book as the single best national (or continental, for that matter) guide to amphibians and reptiles in the world. At nearly $100 this book is still a bargain and should be on the shelves of all general herpetological libraries (although for those who can wait until their next trip to Australia, the version released there is considerably less expensive). The release of the fifth edition of this book is especially timely, coming just one year before the Second World Congress of Herpetology in Adelaide. All delegates who want to maximize their appreciation of the outstanding herpetofauna of Australia should consider this book as required reading.

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Cogger, H. G., E. E. Cameron, and H. M. Cogger. 1983. Zoological

Catalogue of Australia, vol. 1, Amphibia and Reptilia. Canberra: Australian Government Publishing Service, 313 pp.

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Encyclopedia of Australian Animals: Frogs, by Michael J. Tyler. 1992. Angus & Robertson, Pymble, N.S.W. ISBN 0-2071-5996-3. 109 pp. $A29.95 (Hardcover).
Encyclopedia of Australian Animals: Reptiles, by Harald Ehmann. 1992. Angus & Robertson, Pymble, N.S.W. ISBN 0-2071-7379-6. 495 pp. $A49.95 (Hardcover).

These volumes contribute further to the impressive record of first-rate herpetological publications by Australian authors, here assisted by the resources of the National Photographic Index of Australian Wildlife to provide nearly complete coverage of Australian frogs and reptiles in a standardized format. Neither book has keys nor often more than cursory descriptions, though the superb photographs can serve in many cases; instead, the emphasis is on natural history information (particularly in Ehmann). Each species account provides one to several paragraphs on biology (Tyler includes descriptions of tadpoles, where known), followed by summary statements of size, habitat, abundance, and status, plus a shaded distribution map. Common names (often new) are provided, as are useful etymologies. Most accounts occupy a half page, and text, photographs, and maps are neatly set together. Genera and families are characterized briefly, often in ecological terms that effectively expand the rationale for recent taxonomic partitioning.

Comparisons with the 5th edition of Cogger's (1992) guide, reviewed above, are inevitable, and may be helpful to those seeking to brush up on the Australian herpetofauna prior to attending the Second World Congress. In general, Tyler's and Ehmann's books complement Cogger very nicely; together with Greer's (1989) excellent volume on lizards and Shine's (1992) masterful treatise on snakes they comprise a minimum reading list on Australian herpetofaunal diversity.

There is close correspondence in nomenclature between Tyler and Cogger; Tyler chooses not to recognize *Metacrinia* and *Paracrinia* as monotypic genera, while retaining *Philoria* as monotypic by delegating three species to *Kyarranus*. A few taxa in the speciose hylid genus *Litoria* are treated differently by Tyler and Cogger, but there is little chance of real confusion arising. Nomenclatural differences are more pronounced between Ehmann and Cogger, particularly in reference to skinks and elapid snakes, and could lead to confusion when trying to use both books. Basically, Ehmann recognizes 30 fewer skink species and 10 more snakes than does Cogger, and he eschews the lizard genera proposed by Wells and Wellington. Thus, Ehmann retains *Phyllodactylus* (for *Christinus* of Cogger), *Leiolopisma* (*Pseudemoia*), *Sphenomorphus* (*Glaphyromorphus*, *Eulamprus* in part), and *Tropidophorus* (*Gnypetoscincus*), and does not separate *Eroticoscincus* from *Nannoscincus*, nor *Saproscincus* from *Lampropholis*. Ehmann also includes *Lucasium* in *Diplodactylus*, and *Lophognathus* in *Amphibolurus*. More confusingly, there is considerable divergence in the use of generic names among elapid snakes. Ehmann recognizes *Cryptophis* and *Glyphodon* for species placed by Cogger in *Rhinoplocephalus* and *Furina*, respectively, and he expands *Denisonia* to include *Suta suta*, and *Elapognathus* to include *Drysdalia* spp. He also incorporates in *Rhinoplocephalus* species placed by Cogger in an expanded genus *Suta*, and retains *Disteira* in *Hydrophis*. Clearly there is still need for agreement on the genera of Australian elapids, if only to help with getting the right antivenom!

Another measure of the maturation of faunal studies can be had from comparisons of contemporary distribution maps; assuming equal care in their compilation and interpolation, these should achieve similarity as the database improves. That this is yet to be achieved for most of Australia west of the Great Dividing Range is evident in the present works. I assessed mapped distributions in Tyler and Ehmann as being essentially the same as given by Cogger, somewhat different, or very different, in the latter instances as being either more or less extensive. For 190 species, Tyler's maps display a normal distribution of variation from Cogger's, scoring 8.4, 23.2, 43.7, 22.6, and 1.6% (from very much less through equal to very much greater). Ehmann's maps are more detailed and more conservative than are Cogger's (scoring 14.3, 27.8, 44.2, 12.5, and 1.1%, n = 622); typically they depict more fragmented distributions, often shown as being slightly more extensive in coastal regions and considerably restricted in the interior of the continent. Based on my field experience in northern and western Australia I feel that Ehmann's maps better represent actual distributions. Some of Ehmann's maps are very different indeed from those in Cogger (e.g., *Ctenotus decanurus, Egernia depressa, Tympanocryptis uniformis*); while it is sometimes evident that a name is being applied to different animals (e.g., *Egernia richardi*), in most cases the departures reflect a familiarity with outlying records and detailed knowledge of the species' requirements and the terrain on Ehmann's part.

The photographs are a primary feature of both volumes of the Encyclopedia, representing the best efforts of dozens of individual contributors to the ambitious Index project. If an Australian frog or reptile has ever been photographed alive, it is likely to be represented. Tyler illustrates all but 7 of 197 species of frogs, including 26 not figured by Cogger. In general photographs in Tyler are sharp and well cropped, and usually somewhat larger than those in Cogger, although the latter often illustrates individual variation, and where appropriate shows diagnostic features of the ventral coloration. Ehmann figures all but 32 species of reptiles (including 11 typhlopids for which line drawings of head scalation are provided, and 9 hydrophiids), compared to 129 species which are not illustrated by Cogger (who does depict 6 species not shown in Ehmann). Nearly half of the photographs in Ehmann are the work of the author, and with the exception of poor prints of *Ephalophis greyi* and *Hydrelaps darwiniensis* they are of excellent quality. A few photographs are poorly cropped or are inexplicably reproduced at less than the usual size, but overall the illustrations alone are well worth the modest price of either volume.

While Tyler provides some information on natural history for virtually every Australian frog, Ehmann's book contains a real wealth of such material, in my view rendering it far more than simply an illustrated compendium. Nearly every account has new information, much of it identified as being based on personal observation. Ehmann has clearly sought to understand distributions in ecological terms, drawing in soils, topography and prey ecologies as well as the standard climatic and vegetational descriptors. He presents literally hundreds of fascinating insights that could serve as a guide to much of the next generation of research on the biology of Australian reptiles. These notes and comments would be invaluable for any fauna, but are especially meritorious in the Australian context, where precious few sources can or do provide much information on basic natural history.

Tyler and Ehmann can rightly be proud of these careful contributions, which do credit to the Encyclopedia. The volumes are virtually free of typographic errors, and are well assembled and securely bound, enough so to withstand the repeated reference they deserve. Both books should be on the shelves of anyone interested in the Australian fauna; students of reptile behavior and ecology could also profit from a close reading of Ehmann's insightful species accounts.

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Venomous Reptiles of North America, by Carl H. Ernst. 1992. Smithsonian Institution Press, 470 L'Enfant Plaza, Suite 7100, Washington, D.C. 20560. 236 pp. Hardcover. $35.00 U.S. ISBN: 1-56098-1148.

In this book, Ernst sets for himself the formidable goal of reviewing the natural history of the venomous reptiles of North America. This task proves to be a double-edged sword. The reader is offered a truly impressive amount of detailed, current information which is, for the most part, well organized and presented. This same emphasis on detail, however, results in some stylistic limitations.

The author is careful to explain his restriction of the book's scope to natural history, or "the life of the reptile in the wild." Accordingly, papers on morphology, physiology, biochemistry, and other "technical papers" are excluded. With the possible exception of the taxonomic and phylogenetic relevance of crotalid vertebral morphology, which the author discusses without ever describing the vertebrae, these exclusions do not detract from the work. Venom is discussed only in terms of yield and toxicity; venom biochemistry is described only when several distinct venom "morphs" occur, as with *Crotalus scutulatus*.

The book covers the Gila monster, *Heloderma suspectum*; the sea snake *Pelamis platurus*; the coral snakes (*Micruroides euryxanthus* and *Micrurus fulvius*); and the 17 species of North American crotalids. For each species the author summarizes information on the following topics: recognition, karyotype, fossil record, distribution (supplemented with generalized distribution maps), geographic variation, confusing species, habitat, behavior, reproduction, growth and longevity, food and feeding, venom and bites, predators and defense, populations, and "remarks" which normally focus on presumed relationships. The length of the species accounts varies considerably (from three pages for the twin-spotted rattlesnake, *C. pricei*, to 20 pages for the western rattlesnake, *C. viridis*) depending on the number of subspecies discussed and the extent of our knowledge of the species' natural history.

The illustrations are one of the weakest points of the book. There are 33 black-and-white illustrations. Several species are not covered by these, and many of the figures included do not clearly demonstrate the characteristic features of the species. Line drawings of the scalation patterns, or close up photographs of the heads would have been useful. An additional 55 color plates illustrate each species discussed, and many of these are both informative and aesthetically pleasing. A reasonable number, however, are washed-out, and many depict the snakes upon artificial backgrounds that seem inappropriate for a book devoted to natural history. Overall, the information content of the illustrations is less than it should have been. For example, nowhere are the characteristic supraocular "horns" of *C. cerastes* clearly illustrated.

The book is well written, and the number of typographical errors is fairly low. There are a few noticeable errors and omissions. When discussing the defensive musk of the copperhead, a typo leaves the author seemingly in agreement with the folktale claim of an aroma like cucumbers; in the subsequent account of the cottonmouth no mention is made of a defensive musk, although this behavior has been previously described (Burkett 1966). In some instances, especially when detailing predators, the lack of citations leaves it unclear if the information presented is simply the opinion of the author.

It would have been of benefit to have some of the detail presented in the individual species accounts put into a broader context in a generalized introduction or conclusion. The author is certainly capable of providing this information; but the introduction to the Viperidae is very brief (and focuses mainly on the pit organ), and the general introduction only touches on selected points. Throughout the species accounts of the rattlesnakes, the author discusses previous phylogenetic studies. Three of these, using morphology, venom biochemistry, and scale microdermatoglyphics yielded contradictory results, yet nowhere are the results of these studies summarized. The index, consisting almost exclusively of the scientific names of the snakes discussed, is far too brief for the amount of information in the book. As such, a reader wanting to know which snakes are preyed upon by raccoons is forced to read the "predators and defense" section of each species account.

While these difficulties detract from the book, they in no way minimize its value. This book does not have the easy-page-turning style that one finds in works like Shine's *Australian Snakes: A Natural History*, but it was not intended to. What the book does is provide a wonderful resource to workers wanting detailed, current information on the natural history of these snakes. The species accounts cover some 160 pages of generously spaced text; these are supported by a 50-page bibliography! The vast majority of the papers cited in the bibliography are recent works, since the author uses the bench-mark works of Wright and Wright (1957) and Klauber (1972) to reference the older literature.

Ernst's book will be of considerable value to anyone interested in the natural history of the venomous reptiles of North America, and given the relatively modest price of this work, it will undoubtedly find a broad audience.

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WRIGHT, A. H., and A. A. WRIGHT. 1957. Handbook of Snakes of the United States and Canada. Comstock Publ. Assoc., Ithaca, New York. 2 vols., 1105 pp.

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Snakes of the United States and Canada: Keeping Them Healthy. Volume 1. Eastern Area, by John V. Rossi. 1992. Krieger Publishing Company, Malabar, Florida. xiii + 209 pp. 100 color plates, 17 b/w photographs, 43 maps. Clothbound. ISBN 0-89466-590-0. $42.50 U.S.

The explosion of herpetoculture over the past fifteen years or so has led to a consequent rise in the number of titles addressing the captive husbandry of amphibians and reptiles (e.g., Mattison 1982, 1988; Mehrtens 1987; Ross and Marzec 1990). The present volume is the latest contribution to this growing list.

Rossi's work is divided into four sections which address general care, individual species accounts, venomous snakes, and "disasters." Each section is further divided to address a number of other topics. For example, in the general care section housing, temperature requirements, cleanliness, lighting, food, behavior, hibernation, egg incubation, and diseases are discussed. Species care is a section comprised of individual species accounts with specific recommendations and guidelines for each taxon. The venomous snake section is a composite of general observations and comments and individual species accounts. The disasters section includes anecdotal accounts of actual or potential problem areas in husbandry that the author has encountered. The accounts are obviously intended to alert the reader to similar problems with their animals. Additionally, the four sections are followed by appendices for professional and regional herpetological societies and references, an index of common names, and a subject index.

The general care section addresses most of the basics of the captive maintenance of snakes. I was impressed that the author recommends a standard quarantine period for new arrivals to a live collection. Although quarantine periods are standard procedure for zoos and other institutions that maintain live snakes, this practice is rare in private collections. Further, Rossi stresses consistent disinfection technique, another practice that is frequently neglected. This is an area than cannot be overemphasized as many of the ills of captive snakes can be directly traced to poor disinfection procedures. Cleanliness *is* godliness in captive snake husbandry.

The individual species accounts cover 51 taxa. Although the title implies that taxa covered are from the eastern half of the United States and Canada, it is apparent that only forms from east of the Mississippi River are covered. With the exception of *Lampropeltis t. triangulum* and *L. t. elapsoides*, only forms at the species level are addressed. Each species account includes information on captive care and breeding and each has a boxed capsule summary of important care factors and a range map. It is obvious that Rossi has had considerable experience with the majority of forms covered. He offers some unique insights into the husbandry of many of the smaller, more secretive snakes found in this area. The husbandry requirements of such snakes merit more investigation than is currently occurring and I applaud Rossi for dealing with many of these species in detail.

Dr. Rossi has certainly engaged in an ambitious project (with the implication that an additional volume or volumes will follow). Unfortunately, this first work does not bode well for future volumes, if the current style, editing, and content are retained. The problems with this book are many and occur throughout the book.

My primary complaint lies with editing and copy editing, or rather, the lack thereof. Although Rossi attempts a conversational style of writing, poor editing has contributed to many examples of tortured phrasing that limit the author's ability to get his point across. The following are a few examples: "As ectotherms, animals which derive the majority of their body heat from outside the body, (formerly known as cold blooded animals,...);" "watch out if you are using pegboard as it will sometimes trap too much moisture and make the cage very damp. This restricts ventilation, and thereby increases humidity because evaporated water is trapped. Many professional herpetologists keep a humidifier running in their snake rooms throughout the winter...to avoid these problems;" "It only takes one lucky shot for a mouse to nail a snake in an eye or inside of the mouth." The image that comes to mind for the latter sentence, a terrified mouse with a gun, is, I am sure, not what Rossi intended. Additional examples of poor editing are found in irritating switches between lowercase and capitalized common names throughout the book (sometimes in the same sentence), non-use of hyphens (metal rimmed, wild caught, five lined, etc.) throughout, misspellings ("*getulua*" instead of "*getula*", "excatly" instead of "exactly", "*Storiea*" instead of "*Storeria*", "discalium" instead of "dicalcium", etc.), and another irritating trend of allowing the author to refer to species accounts several pages ahead, thereby forcing the reader to flip ahead to that section, read to what Rossi is referring, then return to the previous account. All of these errors, in addition to certain factual ones and misleading statements by the author, make this book a very difficult read for knowledgeable herpetoculturists.

Also, I have a number of disagreements as to statements of fact, misleading statements, and philosophy. The most worrisome to me is the idea—promoted by Rossi—that the only hope for the continued survival of snakes is through captive breeding. As he states in his preface, "But with the massive global habitat destruction going on now, the more people that [*sic*] are exposed to these creatures, the better off these animals will be in the future when the experience and awareness we gain now will result in the production of captive bred snakes. In the not too distant future captive snakes may be the only snakes!" Although Rossi is certainly correct in determining the major cause of certain snake declines, captive breeding is not and will not be the answer to protecting endangered taxa. In rare cases, well-conceived and well-managed captive breeding programs may serve as a useful adjunct to preservation and conservation of such species. However, the sort of willy-nilly approach that the author appears to advocate is, to me, virtually useless for conservation purposes. Indeed, it is dangerous to imply a degree of impending extinctions that is totally false. This is environmental alarmism at its worst and it affects other sections of the book.

For example, Rossi has included a very disturbing section titled "Releasing Snakes." He directly encourages the deliberate release of captives into wild populations, ostensibly for the purpose of augmenting those populations. This is incredibly naive at best, and dangerous at worst. As I have outlined previously (Rundquist 1978), the state of our knowledge regarding deliberate introduction of exotic taxa (and this includes individuals from other populations of a species) and the effects on native forms is still too meager to advocate any such tinkering. The risk of unknown and unknowable genetic effects is great as are the baffling possibilities presented to population geneticists and others studying interpopulational variation should these specimens appear in the course of their studies.

Further, the possibility of introducing pathogens to populations unequipped to deal with them is also large. The upper respiratory syndrome that has caused such concern to those working with desert tortoises (*Gopherus agassizii*) in the southwestern U.S. now appears to have surfaced in gopher tortoises (*G. polyphemus*) in the southeastern U.S. and most likely was introduced there from captive desert tortoises or other captives exposed to this disease. The potential for snakes is the same, particularly with such devastating illnesses as paramyxovirus. Rossi states his justification for release as follows: "Theoretically, since most of their behaviors are instinctive rather than learned (at least at first), there should be few problems for healthy snakes to adjust." How much of *any* snake's behavioral repertoire is instinctive or learned is unknown at this time and it is extremely dangerous to promote any sort of release until all parameters for a species' survival are understood. What little information is available suggests that survivorship of released captives is very poor (D. Chiszar, pers. comm.).

This conservation via captive breeding theme also is evident in several species accounts. Rossi states in the indigo snake account that "of the thousands of snakes that were present at the first National Breeders' Expo..., there were no Indigos because of strict over regulation," as if captive breeding would have solved the problem of habitat destruction for this species. There were no *Drymarchon* at this gathering because the snake is federally and state protected, not over regulated. That protection has helped preserve the remaining wild populations, to which unorganized captive breeding would make *no* contribution.

There are many other problems with this book that, unfortunately, I do not have the space to address. Suffice to say that I cannot recommend it, particularly at the high price at which it is being marketed. Krieger and Rossi would be well-advised, though, in future volumes to pay much closer attention to basic editing and to have the various sections reviewed by knowledgeable herpetoculturists and herpetologists prior to publication.

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PUBLICATIONS RECEIVED

Sea Snakes, by Sneed B. Collard III, illustrated by John Rice. 1993. 32 pp. Hardcover. Bell Books, Boyds Mills Press, Honesdale, Pennsylvania. Distributed by St. Martin's Press.

This is a book for young readers desiring basic biological information about sea snakes. The book is illustrated both with color drawings and underwater photographs of mostly good quality. Much of the text is devoted to dispelling certain myths about sea snakes or informing the reader of some of the more fascinating aspects of sea snake natural history, such as their geographic distribution, diving ability, venoms, salt excretion, locomotion, commercial use, and reproduction. A seven-year old budding herpetologist's reaction: "I like it a lot; I learned a lot I didn't know."

Altitudinal Ecology of *Agama tuberculata* Gray in the Western Himalayas, by Robert C. Waltner. 1991. The University of Kansas Museum of Natural History Miscellaneous Publication No. 83. 74 pp. Softcover. $5.00 US.

A comparison of the ecology of low (690 m) and high (2165 m) altitude populations of *Agama tuberculata* in northern India. Parameters considered include morphology, growth, diet, activity, temperature relations, reproduction, survivorship, and biomass. In addition to providing altitudinal comparisons, this study is significant in that it represents one of relatively few detailed autecological studies on Asian agamid lizards.

Interpretive Atlas of Texas Lizards, by Ralph W. Axtell. 1986-1992, et. seq. Privately published by and available from the author (Ralph W. Axtell, 2814 Rock Hill Road, East Alton, Illinois 62024, USA). Individual accounts available separately.

Twelve accounts, issued at irregular intervals and totalling 212 pages, have been published to date. Species covered thus far are *Coleonyx brevis, Sceloporus cyanogenys, S. p. poinsettii, S. graciosus arenicolus, S. variabilis marmoratus, S. grammicus disparilis, S. olivaceus, S. magister, Phrynosoma modestum, Crotaphytus collaris, C. reticulatus*, and *Cophosaurus texanus*. Accounts range from four pages for *Sceloporus graciosus arenicolus* to 42 pages for *Sceloporus olivaceus*. The accounts include the author's interpretation of Texas distribution, dispersal mode and distributional status (whether contracting, expanding, or static), population density, elevational range, doubtful or unnatural records, extinct or extirpation prone populations, potential records, reptiles with similar distributions, and suggestions for future work. Voucher records from most U.S. museums and collections are listed by county. The format is 8.5 x 11-inch looseleaf pages that are three-hole punched for easy placement into a binder. Detailed dot maps (in color) with hypothetical range limits are provided for each species.

ERRATA

In the note by Luke J. Thirkhill and Bryan L. Starrett reporting a range extension for *Crotalus willardi* (HR 23(4):124), the authors' address should read P.O. Box 9043, Scottsdale, Arizona 85252, USA.

In the note by Sazima et al. (HR 23(4):120-121), the generic name of the snake involved was consistently misspelled due to a typesetting error. The correct spelling is *Rhadinaea bilineata*.

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Herpetological Review is a peer-reviewed quarterly that publishes, in English, articles and notes of a semi-technical or non-technical nature, as well as book reviews, institutional features, commentaries, regional and international herpetological society news, research requests of SSAR members, and letters from readers directed to the field of herpetology. Articles reporting the results of experimental research, descriptions of new taxa, or taxonomic revisions are not published in ***HR***, but should be submitted to the ***Journal of Herpetology*** (see inside front cover for Editor's address). ***HR*** especially encourages the submission of articles of broad interest to the herpetological community.

Authors should submit an original and two copies of manuscripts. Manuscripts should be typewritten, double-spaced, on 21.5 x 28 cm (8.5 x 11 inch) white paper. Refer to this issue of ***HR*** for style and format information, including correct format for literature citations. More detailed information for submissions to Geographic Distribution, Life History Notes, and Recent Population Changes appear in a recent issue of ***HR*** under their respective headings.

Originals of illustrative material (e.g., tables, photographs, or diagrams) should be submitted with the text, with appropriate precautions taken to ensure delivery without damage. Illustrations should be discussed in the text and numbered sequentially with Arabic numbers. References to illustrations should be placed in parentheses at the end of sentences. Original photographs should be submitted as black and white glossy prints.

For further guidelines, authors should consult the *CBE Style Manual* (5th edition, 1983, Council of Biology Editors, Inc., 9650 Rockville Pike, Bethesda, Maryland 20814, USA).

Submissions for Life History Notes, Geographic Distribution, Herpetological Husbandry, Recent Population Changes, Regional Society News, and Legislation & Conservation Alert should be sent directly to the appropriate section editor (see inside front cover for names and addresses). Review copies of books should be sent to the Book Review Section Editor (name and address on inside front cover). Manuscripts intended for publication as Feature Articles, Techniques Articles, Points of View, as well as news notes and other material, should be sent to the Editor. Deadline for receipt of meeting announcements, news notes, and related material is two months prior to each issue (e.g., 1 January for March issue).

The receipt of a manuscript by an editor will be promptly acknowledged. At present, there is little lag time between acceptance of a manuscript and its publication. Although the advice and assistance of three reviewers will be sought for all feature articles, the Editor has final responsibility for deciding whether a manuscript is suitable for publication. Notes submitted for publication in Geographic Distribution and Life History Notes ordinarily will be reviewed by the Section Editor only. The Editor and Section Editors reserve the right to edit a manuscript, but substantial alterations will not be made without permission of the primary author.

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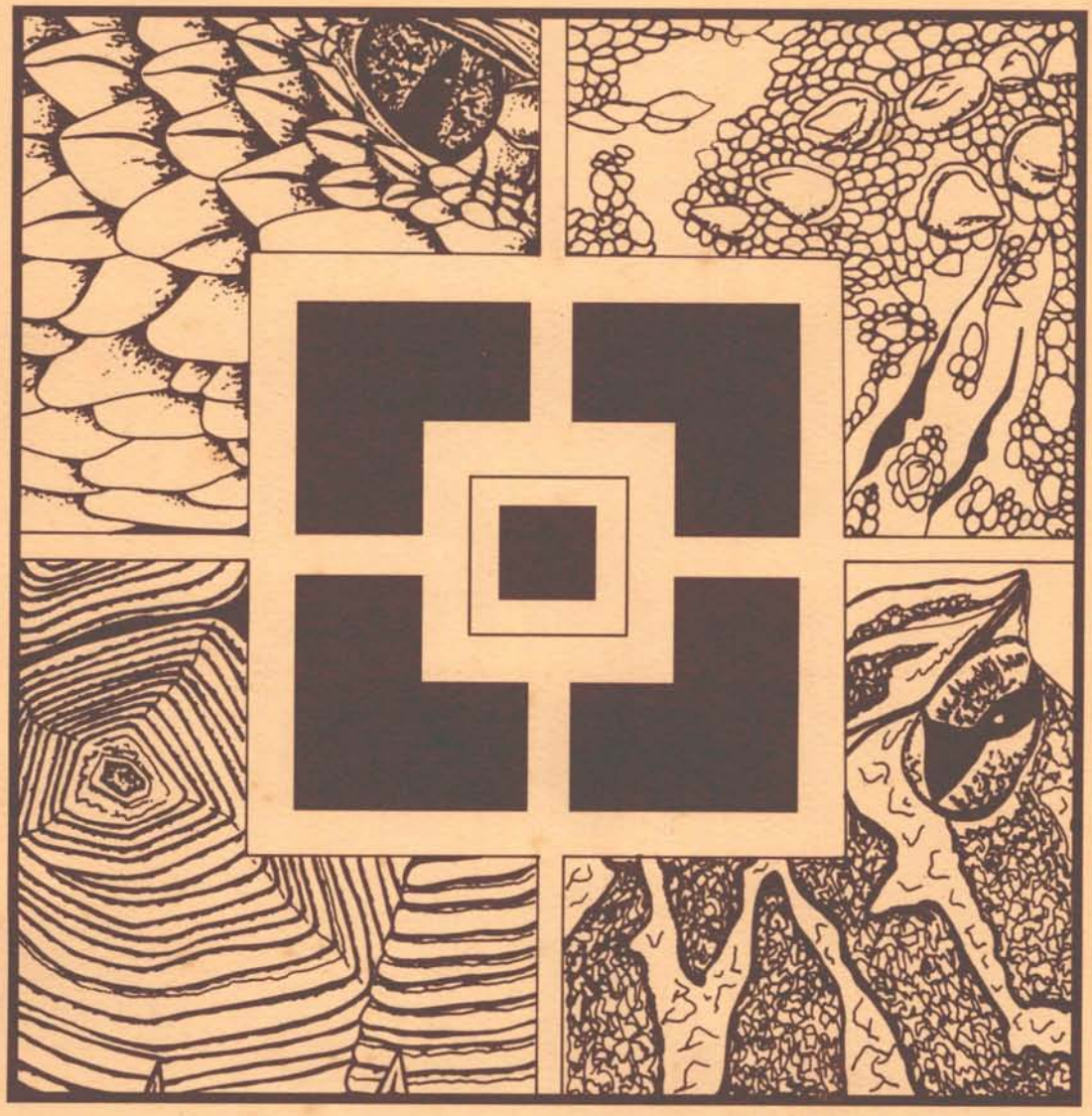
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INSTITUTIONAL PROFILE

Herpetology At Indiana University

Indiana University at Bloomington is located 40 miles south of Indianapolis. Much of the surrounding countryside is forested. The 2000-acre campus is heavily wooded and is often regarded as among the most beautiful in America. IU is the oldest state-established university west of the Allegheny Mountains, founded at Bloomington in 1820. It now serves nearly 94,000 students on eight campuses. The residential campus at Bloomington and the urban center campus at Indianapolis form its core. With 853 degree programs, the university attracts students from all 50 states and around the world.

The first natural historian on the faculty was Richard Owen who was followed on the faculty by the ichthyologist David Starr Jordan. Jordan eventually became president of Indiana University and later, Stanford. Jordan Hall (which houses the Department of Biology), Jordan Avenue, and IU's Jordan "River" are all named for him. Jordan was succeeded as head of Zoology by his collaborator in ichthyological explorations, Carl H. Eigenmann. Biologists played a key role in the development of the graduate programs at IU. Eigenmann became the first dean of the Graduate School. The second and fourth deans were geneticists Fernandus Payne and Ralph Cleland. Today the Graduate School awards approximately 300 Ph.D.'s and 500 master's degrees annually.

Some studies of local amphibians were carried out by Will Scott (an aquatic biologist) and Frank Young (an entomologist) and their students. The first faculty member hired who worked primarily with reptiles or amphibians was the embryologist Robert W. Briggs, famous for his work on amphibian development. He attracted as a coworker Rufus R. Humphrey who had retired from the University of Buffalo. Humphrey brought with him his colony of axolotls and worked at IU until his death in 1977. The axolotl colony continues under the direction of George Malacinski and is a major resource for studies in developmental genetics, both at IU and elsewhere.

Facilities

A number of university facilities and nearby resources are particularly attractive for students with interests in field research with amphibians and reptiles. These include a 300-acre woodland tract on the shore of Lake Monroe and the 90-acre Kent Farm research area. Moreover, southern Indiana contains a very large concentration of state parks and state and national forests. The Crane Naval Reserve alone includes 100 square miles of potential research sites and is well protected from public access (the periphery is patrolled by military police with attack dogs). Research facilities also include extensive animal quarters (including axolotl and turtle colonies and rooms for individual research projects), sophisticated molecular biology and microscopy installations, and a major computer facility .

IU's Library collections are among the 20 largest in the country. The Biology Library maintains approximately 1200 current journal subscriptions and includes some 95,000 volumes.

The Medical Sciences Library has 269 serials and 7500 volumes. Additional relevant materials are in several other libraries. On-line and CD-ROM literature searches are easily done. The Lilly Library of rare books contains many scarce herpetological classics, especially from early work in Latin America, as well as first editions of many classic items, including Darwin's *On the Origin of Species.*

Programs

Most of the students who are interested in herpetology work in the Evolution, Ecology, and Behavior Programs (EEB) in the Department of Biology. The Ph.D. and M.A. degrees in EEB can be obtained in the areas of ecology, population biology, or evolutionary biology. The 20 EEB faculty are engaged in research ranging from ecosystem, community function, and population biology to physiological ecology, plant systematics, and evolutionary genetics. There is an especially strong interdepartmental program in animal behavior.



FIG. 1. White River in Bartholomew County, Indiana. Seven species of turtles occur here. Photograph by Michael A. Ewert.

Research Programs

Robert Devoe (Optometry) studies motion detection by cells in the turtle retina. He uses intracellular recording and staining to measure responses to moving patterns and to identify the cells anatomically. He finds that about 34% of all cells recorded respond best to motion in a certain direction and much less well to motion in the opposite direction.

Michael A. Ewert (Biology) employs a comparative approach to his studies of development of reptilian (mostly turtle) eggs. He is most interested in ecological and evolutionary perspectives, especially as concerns developmental rate, correlates of energy expenditure, and environmental sex determination.

George Malacinski (Biology) studies the genetics and molecular embryology of early amphibian development. His research focuses on the establishment of egg polarity and its relationship to buoyant density differences in egg cytoplasm components, on the development of mesoderm differentiation, and on axolotl developmental genetics.

Anthony L. Mescher (Physiology) is interested in tissue interactions during development, especially amphibian limb regeneration. Currently he is investigating the hypothesis that nerves release transferrin and that this may be involved in the neural stimulation of regeneration in the amphibian limb.

Anton W. Neff (Physiology) is interested in the establishment of primary early embryonic patterns in vertebrates. He uses amphib-

ian embryos in his studies of the role of the egg cytoplasm and cytoskeleton in the establishment of dorsal-ventral polarity, of somitogenesis and the differentiation of myotomes, and of cardiogenesis.

Craig E. Nelson (Biology) is interested in evolutionary ecology, especially of amphibians and reptiles. Current and recent projects in his group focus on the adaptive nature of sex-determination in reptiles, on reptilian reproductive strategies, on mate choice by female frogs, and on the efforts of temporal and spatial heterogeneity on the structure of pond-breeding amphibian communities.



FIG. 2. Ledges along Sugar Creek in Park County. Many species of amphibians and reptiles are found in the rock outcrops that are common in southern Indiana. Photograph by Michael A. Ewert.

Paul Pietsch (Optometry) uses larval salamanders (genus *Ambystoma*) to make experimental inquiries into the biological basis for memory, perception and learning. Currently, and in collaboration with Carl Schneider of the Psychology Department of Indiana University of Pennsylvania, he is trying to find out how experimental alterations (e.g., eye transplants) in the visual system affect the larvae's visually evoked behavior.

John B. Phillips (Biology) studies the sensory specializations underlying behavior. Among his current foci are the sensory mechanisms underlying magnetic field and polarized light detection; the sensory basis of navigation and dispersal in vertebrates; and sexual selection and the evolution of mating systems. Much of his current work is with salamanders and turtles.

Henry D. Prange (Physiology) studies temperature regulation in reptiles and other animals, the respiratory physiology of hypoxia in axolotls and other bimodal breathers, and respiration of eggs and its relationships to sex determination in turtles.

William J. Rowland's (Biology) work combines ethological, ecological, and evolutionary approaches to investigate behavior. His work has focused especially on communication and reproductive behavior of fishes, mainly sticklebacks. His group has also addressed these questions in salamanders and lizards.

Dolores M. Schroeder (Physiology) studies structure-function relationships of the central nervous system by examining variations across a wide range of vertebrates. Her current focus is on the intrinsic mechanoreceptor of the spinal cord.

Barry Sinervo (Biology) is currently working on two related lizard life history problems that involve maternal investment: optimal offspring size and costs of reproduction arising from levels of maternal investment. He has developed several experimental manipulations (allometric engineering) of maternal investment per offspring and total investment that permit a causal analysis of natural selection on these traits in the wild. He has used these techniques on a wide range of size-related evolutionary problems that involve reptiles.

Fort Wayne Program

The Indiana University program at Fort Wayne, Indiana, is shared with Purdue University. IUPUFW offers a master's degree in biological science. Moreover faculty there usually have graduate-faculty status in the Indiana University system and can thus direct dissertations and serve on graduate committees for students working in Bloomington. IUPUFW facilities include the Crooked Lake Research Station and an animal care facility with good environmental controls and a staff already accustomed to caring for reptiles. Several faculty have strong herpetological research interests:

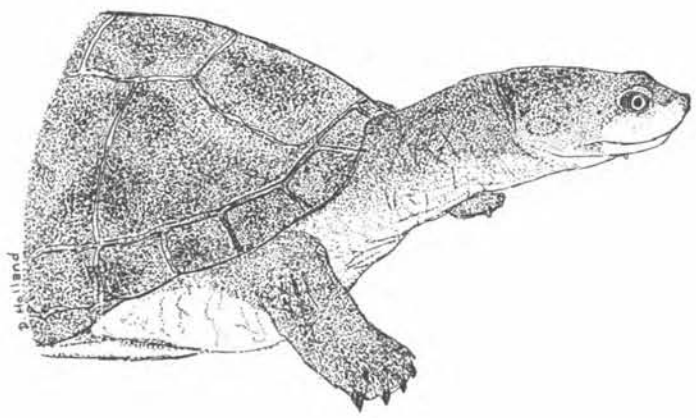
William E. Cooper (Biological Sciences) is interested in the behavioral ecology of squamates with special interests in both proximate and ultimate factors affecting social behavior, feeding, and defense. Currently he is working on the use of chemical cues in foraging behavior and pheromonal communication, and on the influence of foraging mode on the use of tongue-flicking to identify prey chemicals. He also studies female reproductive coloration, sexual selection, and comparative aspects of the foraging mode.

James O. Farlow's (Geosciences) research interest is dinosaur biology, especially the reconstruction of behavior and ecology. He studies the behavioral implications of dinosaur tracks and tooth structure and the relationships among body size, body temperature, and behavior.

Bruce A. Kingsbury (Biological Sciences) is interested in the physiological ecology of temperature regulation in alligator lizards, activity cycles, and habitat selection in lizards and turtles. He is currently doing field studies of foraging behavior in tropical gekkonid, phrynosomatid, and teiid lizards.

Frank V. Paladino (Biological Sciences) studies the physiological ecology of sea turtles with emphasis on temperature regulation, diving, and reproductive biology. He currently works with nesting and migration in leatherback turtles in Costa Rica.

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SSAR Meeting Highlights

Dates: 7–12 August 1993
Place: Indiana University, Bloomington, Indiana

Keynote Lecture: "Feeding Strategies of Monitor Lizards," by Walter Auffenberg (Florida State Museum). An in-depth, illustrated lecture on the behavior and ecology of the Komodo, Gray's, and Bengal monitors.

Symposium: "Reptilian Behavioral Ecology: A Tribute to Charles C. Carpenter." *Organizers*: James Gillingham and Thomas Jenssen. *Participants*: Robin Andrews, Gordon Burghardt, Geoffrey Carpenter, David Chiszar, William Cooper, Justin Congdon, David Duvall, Gary Ferguson, Neil Ford, Brent Graves, Neil Greenberg, Victor Hutchison, Beth Leuck, Jeffrey E. Lovich, James B. Murphy, Catherine Marler, Joseph Macedonia, Matthew Rand, Stephen Secor, Judy Stamps, Richard Tokarz, and Kent Vliet.

Symposium: "Vision and Visual Cues in the Behavior of Amphibians and Reptiles." *Organizers*: Richard King and John B. Phillips. List of Speakers not yet finalized.

Herpetological Travelogue Slide Shows: Aaron Bauer (Australia, New Zealand, and New Caledonia), Stephen D. Busack (Spain), Thomas Fritts (Galapagos Islands), and C. J. McCoy (Belize). 30-minute, profusely illustrated lectures.

Oral and Poster Presentations: Several concurrent sessions each day. Abstract form in *Herpetological Review*, December 1992 issue, page 97.

Student Paper Awards: Seibert Prizes to be awarded to the two best student papers ($250 first prize, $150 second prize).

"The Great Reprint Scavenge." (For Students Only!). Professionals are asked to clear unwanted duplicate reprints out of their offices (and get free raffle tickets as a "thank you"). Only students will be permitted to sort through the stacks.

Audiovisual Shows: "Herps of the West" (newly updated), "Amphibians of the Appalachians" (updated 1992), and "Herpetology Past and Present."

Field Trips: "Herping with Joe Collins."

Social Activities: Welcoming Reception, the Annual SSAR Auction, Gourmet Beverage Tasting, local tours, and raffle.

Exhibit: Tour of the Indiana University Axolotl Facility, a national facility founded by R. R. Humphrey that breeds and maintains genetic stocks of axolotls for research and teaching.

Live Exhibit: Herps of the Region (Sponsored by the Hoosier Herpetological Society).

Costs: Registration: $50 student, $70 regular; after 15 June, $70 student, $95 regular. Lodging at Indiana University Union (meeting site): $55/day (single) to $88/day (4 persons/2 beds). Air-conditioned dorms are $18/day (double occupancy) and $23.50/day (single occupancy).

Further Details, Call for Papers, and Abstract Form: See the December 1992 issue of *Herpetological Review* (page 97) or on request from Craig E. Nelson, Department of Biology, Indiana University, Bloomington, Indiana 47405 (telephone 812-855-1345, fax 812-855-6705).

SSAR BUSINESS

SSAR Election Results

Results of the recent SSAR election are as follows:

President-elect (to serve as President for 1994): Lynne D. Houck.

Secretary: J. Eric Juterbock (unopposed).

Treasurer: Douglas H. Taylor (unopposed).

Directors: David M. Green, Gregory K. Pregill.

Proposed Amendments To Bylaws

Two amendments to the SSAR bylaws are to be discussed at the 1993 Annual Meeting in Bloomington, Indiana, 7-12 August. In each case, the current wording needing amendment is printed with an overstrike, and the suggested replacement follows in brackets.

The first involves the list of and the duties of appointed officers, and the amendment will allow the needs of the Society to conform strictly to the Bylaws.

Article II. Section 1. b.

The appointed officers shall include an Editor of the official journal, an Editor of the Society Newsletter, ~~an Editor of miscellaneous publications~~ [Editors of other publications, as deemed necessary by the Board], and a Publications Secretary.

Article II. Section 6. c.

The ~~Editor of the miscellaneous~~ [Editors of the other] publications shall be responsible for all phases of the publication of monographs, facsimiles, and such special publications as may be issued by the Society. The ~~Editor is~~ [Editors are] responsible to the Board of Directors, to whom annual reports are made.

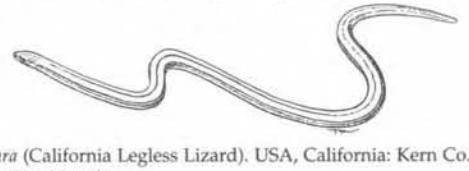
The second proposed amendment involves the timing of the return of ballots for both the annual election and the amendment of the Constitution and Bylaws; the amendment will clarify the date by which ballots must be returned.

Article IV. Section 4.

The Slate of Nominations shall be prepared in ballot form and circulated to the entire membership by the Secretary not later than one month after the annual meeting. Ballots, to be valid, must be returned to the designated recipient ~~within a three-week period of the~~ [by the due] date printed on the ballot.

Article IX. Section 4.

Within one month after the meeting the Secretary shall send a ballot on amendments to the entire membership. To be valid the marked ballots shall be returned to the Secretary ~~within a three-week period of the~~ [by the due] date printed on the ballot.



Anniella pulchra (California Legless Lizard). USA, California: Kern Co., Oiler Cyn. Illustration by Tim Manolis.

SSAR SEEKS NEW TREASURER

After six years as Treasurer, Doug Taylor has announced his retirement and the Society is seeking a replacement. The Treasurer is one of the critical officers in SSAR and, historically, has been intimately involved in innovative changes in the Society's programs. As such, this person is in a key position to influence the development of SSAR and of the herpetological community.

The Treasurer is responsible for planning the annual budget (currently about $175,000), for maintaining the membership list, and for handling all funds (dues payments, disbursements). The office has its own substantial budget, including funds for a part-time assistant and the purchase of computer equipment.

Interested persons should contact the chair of the Search Committee, Dr. Edward Moll, Department of Zoology, Eastern Illinois University, Charleston, Illinois 61920 (phone: area 217, 581-5410 office).

All inquiries will be held in strict confidence.

Illustrations Wanted For *HR*

The editorial staff is looking for high quality illustrations of herpetological subjects for possible publication in *Herpetological Review*. Original drawings should be of a scale that would permit reduction to approximately 30 x 90 mm or smaller. Of particular interest are drawings of material for which locality data or museum catalogue numbers are available; this information should be included with the drawings. Original art (or photocopies) should be packaged to ensure safe delivery and sent to the Editor (address on inside front cover).

Thanks To Reviewers

The Editor and the Society acknowledge, with considerable appreciation, the assistance of the following individuals in evaluating manuscripts for *Herpetological Review* during 1991-92. An * indicates consultation on two or more manuscripts.

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NEWSNOTES

Request For Nominations World Congress Of Herpetology

During the Second World Congress of Herpetology, to be held in Adelaide, Australia between 29 December 1993 and 6 January1994, half of the members of the Executive Committee and half of the members of the International Herpetological Committee will retire. Membership to both these committees is open to all herpetologists and should be as representative as possible of herpetological subdisciplines and the geographic distribution of herpetologists. Retiring members are eligible for re-election.

Nominations to fill the vacancies can be taken now until 29 August 1993. Nominations must be seconded either by any two members of either the Executive or International Herpetological Committees, or, in the case of the International Herpetological Committee, by the governing body of an Affiliated Organization. Where the number of nominations exceeds the number of vacancies then the election will be by open ballot (during the business meeting) of a format to be determined by the Executive Committee.

Present Executive Committee members (with asterisk retiring at SWCH): R. Avery, UK; W. Böhme, Germany; *D. G. Broadley, Zimbabwe; *R. L. Carroll, Canada (Treasurer); *G. Casas-Andreu, México; *H. G. Cogger, Australia; *J. C. Daniel, India; *I. S. Darevsky, Russia; W. E. Duellman, USA; T. R. Halliday, UK; *M. S. Hoogmoed, Netherlands (Secretary-General); K. Klemmer, Germany; *M. R. K. Lambert, UK; J. Lescure, France; J. M. Savage, USA; *P. E. Vanzolini, Brazil; M. H. Wake, USA; Y. L. Werner, Israel; R. Whitaker, India; *E. Zhao, China.

Present International Herpetological Committee members: R. A. Acuña Mesen, Costa Rica; P. Alberch, Spain; *J. -L. Amiet, Cameroon; N. Ananjeva, Russia; C. Andrén, Sweden; *H. Arnold, UK; A. M. Báez, Argentina; *I. Baran, Turkey; *W. Beçak, Brazil; *B. D. Bell, New Zealand; L. J. Borkin, Russia; S. D. Bradshaw, Australia; *W. R. Branch, South Africa; *E. R. Brygoo, France; J. Castanet, France; C. H. Daugherty, New Zealand; *A. Dubois, France; *J. R. Formas, Chile; D. R. Frost, USA; *C. Gans, USA; D. M. Green, Canada; *H. Heatwole, USA; *R. E. Honegger, Switzerland; *R. F. Inger, USA; U. Joger, Germany; *R. F. Laurent, Argentina; *M. J. Littlejohn, Australia; *S. H. Mao, Taiwan; L. R. Maxson, USA; R. W. McDiarmid, USA; *G. Nilson, Sweden; *G. Pasteur, France; E. R. Pianka, USA; J. B. Rasmussen, Denmark; *A. de Ricqlès, France; *O. Rieppel, Switzerland; Z. Rocek, Czech Republic; *B. Sanchíz, Spain; *Y. Sawai, Japan; R. Shine, Australia; M. P. Simbotwe, Zambia; *Z. Spinar, Czech Republic; I. R. Swingland, UK; *L. P. Tatarinov, Russia; *F. Tiedemann, Austria; R. C. Tinsley, UK; L. Trueb, USA; *M. J. Tyler, Australia; R. Wassersug, Canada; *G. R. Zug, USA.

SEIBERT AWARDS FOR BEST STUDENT PAPERS

AT LAST YEAR'S MEETING IN EL PASO, TEXAS, THE SSAR established two prizes to be awarded for the best student papers presented at each annual meeting. These awards are named in honor of Henri C. Seibert, Professor of Zoology Emeritus at Ohio University, who served the SSAR as its President, Treasurer, and Publications Secretary at different times over a period of nearly 30 years. He also played a key role in the transformation of The Ohio Herpetological Society into the SSAR.



Over the years, Henri Seibert has helped hundreds of young herpetologists throughout the world by patiently answering their numerous queries, by putting them into contact with others having similar interests, and by generally encouraging their interest in herpetology. Many SSAR members fondly remember the helpful advice they received years ago from Henri Seibert and some can even trace their present career to his gentle encouragement.

ENDOWMENT TO BE ESTABLISHED

To maintain the Seibert Awards in perpetuity, SSAR has decided to establish an endowment of US$10,000 for this purpose. All donations to SSAR are income-tax deductible and may be addressed to:

Dr. Douglas H. Taylor, SSAR Treasurer,
Department of Zoology, Miami University,
Oxford, Ohio 45056, USA.

Make checks payable to "SSAR" and mark "For Seibert Fund." We encourage all SSAR members—especially Henri's many friends and correspondents around the world—to contribute to this worthy fund.

Venue.—Individuals or groups who wish to propose sites for the Third Congress (to be held 1996-1999) should submit one-page-maximum proposals indicating meeting and housing facilities, names of persons who might serve as local Organizing Committee, and special attractions of the site (until 15 November 1993).

Nominations and venue proposals should be submitted to the Secretary-General: *Dr. Marinus S. Hoogmoed, Nationaal*

Natuurhistorisch Museum, Postbus 9517, 2300 RA Leiden, The Netherlands.

Sale Of UMMZ Publications

The Museum of Zoology at the University of Michigan is having a sale on its in-print publications, including many authored by L. C. Stuart. *Miscellaneous Publications, Occasional Papers, Publications of the Laboratory of Vertebrate Biology, Circulars, Special Publication 1* ("How Humans Evolved: The Uniquely Unique Species" by R. D. Alexander), and all publications not part of any of the preceding series are included. Sale terms: 5-10 publications, 30% off, and over 10 publications, 50% off of price listed in current catalogue of publications. Shipping and handling charges additional. Sale ends 31 December 1993. Quantities limited; first come/first served. For current catalogue and order form please write:

Publications
Museum of Zoology
1109 Geddes Rd.
The University of Michigan
Ann Arbor, Michigan 48109-1079, USA.

National Center For The Conservation And Management Of Amazon Turtles

The National Center for the Conservation and Management of Amazon Turtles (CENAQUA) is a Brasilian government funded project in operation since 1979 as part of IBAMA (Brasilian Fish and Wildlife Service). The objectives of the project are to establish permanent stations for the protection of nesting areas, basic research, captive rearing, and environmental education jointly with the river communities. The focal species are the Amazon river turtle or tartaruga (*Podocnemis expansa*), tracajá (*P. unifilis*), and iaçá (*P. sextuberculata*). These species are most utilized for food by the riverine communities and suffer the greatest pressure during the nesting season, not just for their meat but also for their eggs.

Recently, the project has been elevated to the status of a center, which is more autonomous and more stable. With this, more positions were opened for technicians working with freshwater turtles and a separate floor with office, laboratory, and computer facilities was built for the center in Goiás. Journals, reprints, and other general information are needed for the library. This year they will be constructing and equipping field laboratories at four sites in different parts of the Amazon. Herpetologists with laboratory or field equipment which is outdated or no longer in use, or with duplicate journal sets, reprints, or books should consider making a donation to the library and laboratories. Library materials can be shipped to the Smithsonian, which has a service for mailing to Third World libraries (Smithsonian International Exchange Service, 1111 North Capitol St., N.E., Washington, D.C. 20560, USA). If you have substantial amounts of laboratory equipment, arrangements can be made for free air transport to Brasil on Varig Airlines. For information concerning air shipments, contact:

Vitor Hugo Canterelli
CENAQUA/IBAMA Rua 229 #95
Goiânia, Goiás, Brasil
FAX 62-225-0770.

Herp-Net Installs High-Speed Access Line

The Herpetology Online Network has installed high-speed access for 9600/14,400/38,000 bps V.32, V.42bis modems on 215-698-1905. Standard speeds of 300-2400 bps should continue to access Herp-Net via the bank of phone lines connected to 215-464-3562.

Herp-Net is a computer based information network serving herpetologists, veterinarians, hobbyists, conservationists, and others interested in reptiles or amphibians. Any communicating computer or terminal can access Herp-Net by direct dial 24 hours per day.

News, submissions, or information requests may also be faxed to 215-464-3561 or mailed on IBM disks or paper to: Mark Miller, System Administrator, Herpetology Online Network, P.O. Box 52261, Philadelphia, Pennsylvania 19115, USA.

Request For Reprints

Florida resident and SSAR member Larry David Wilson's reprint library was completely lost in 1992 as a result of Hurricane Andrew. The library had only recently been rebuilt in the aftermath of a fire. Larry's friends are soliciting assistance in rebuilding his reprint library. Authors who may still have reprints pertaining to Neotropical herpetology, or other herpetologists with duplicate material are urged to send these to:

Larry David Wilson
Department of Biology
Miami-Dade Community College - Kendall Campus
Miami, Florida 33176, USA.

Request For Assistance

I am currently investigating the conservation genetics of threatened populations of black rat snakes (*Elaphe obsoleta*) and fox snakes (*E. vulpina*) in Ontario, Canada. For comparative purposes we require blood (from live specimens) or tissue (from roadkilled specimens) secured from populations located outside of Ontario. If you are interested in the conservation of these snakes and are willing to assist me by (1) sampling snakes in the field or, (2) directing me to known hibernacula, I would like to hear from you before the spring of 1993.

Please note that my blood sampling protocol is simple, non-destructive, and is currently approved by Federal, Provincial, and University Animal Care Committees. Only small amounts of blood (0.1 cc) or tissue (1-2 g) are required and live specimens can be released immediately after sampling. All sampling will be done under State permit(s) where required by law.

The results of this research will be of practical value to natural resource managers and conservation biologists involved in the protection and recovery of these and other snake species generally, but will be particularly applicable to those populations contributing to the study. For further information please contact:

Kent Prior
Department of Biology
Carleton University
1125 Colonel By Drive
Ottawa, Ontario
Canada K1S 5B6
Tel. (613) 788-2600 ext. 3866
FAX (613) 788-4497.

Information Request

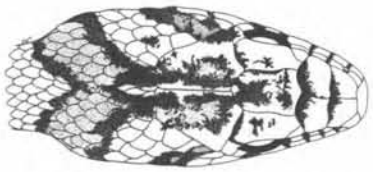
The Wildlife Clinic of Tufts University School of Veterinary Medicine is compiling a database on the health parameters of native wildlife species. We currently have partial information on over 175 species, but we need your help. Although natural history information is readily available, we are having difficulty in finding information in the scientific literature on the hematology and clinical chemistry of many native mammals, birds, and herps.

If you have such information in your files, would you consider sharing it with the broader wildlife community? Even if you only have laboratory values for one individual of one species, this constitutes valuable information. We are also interested in finding out about any literature on the subject that you might be familiar with. We will compile all available information and make it widely available. For their participation, anyone contributing data will receive full attribution and a copy of the database.

Once our database is a bit more complete we will make it available to veterinarians, wildlife rehabilitators, and wildlife biologists by posting it on electronic networks such as Econet, and making available both hard copy and diskette versions at our cost.

Data can be contributed as hard copy, or 3.5-inch diskettes in any standard word processing format or as ASCII files. Please send data to:

Mark Pokras, DVM
Tufts Wildlife Clinic
200 Westboro Rd.
North Grafton, Massachusetts 01536-1895, USA
Tel. (508) 839-7918
FAX (508) 839-7930.



Thamnophis sumichrasti. USNM 7079(a). Illustration by J. W. Tamplin.

MEETINGS

16th Annual All Florida Herpetological Conference

The All Florida Herpetological Conference will be held Saturday, 17 April 1993 at the University of Florida in Gainesville. The event is cosponsored by the Florida Museum of Natural History and the Gainesville Herpetological Society. Talks will cover a wide range of subjects, from autecology to captive breeding of amphibians and reptiles. The evening barbecue will be held at the Florida Museum of Natural History. For program and registration information, write or call:

Dr. David L. Auth
Division of Herpetology
Florida Museum of Natural History
University of Florida
Gainesville, Florida 32611, USA
Tel. (904) 392-1721.

1993 Annual Meeting: The Society For Northwestern Vertebrate Biology

The Society for Northwestern Vertebrate Biology (SNVB) will hold its annual meeting Thursday, March 18 through Friday, March 20, 1993 at the Red Lion Inn in Astoria, Oregon. This meeting will have a heavy emphasis on the status of amphibians in the Northwest. Two symposia of invited papers will be held: Declining Amphibian Populations and Amphibian Monitoring in Western National Parks. Papers from the latter symposium will be submitted for publication either in an issue of *Northwestern Naturalist* or separately in the monograph series *Northwest Fauna*. This proceedings issue will be sent to all members of SNVB, but it will also be available for purchase. SNVB needs to have a rough idea of the number of copies needed, however. If you are interested in purchasing proceedings of the symposium, "Amphibian Monitoring in Western National Parks," or are interested in joining SNVB ($15 per year), drop a note to *Stephen Corn, U.S. Fish and Wildlife Service, 4512 McMurry Avenue, Ft. Collins, Colorado 80525-3400, USA; phone (303) 226-9464*. This expression of interest is not an order and will in no way constitute an obligation to purchase the proceedings.

Other amphibian-related activities planned at the SNVB meeting include a workshop on monitoring techniques, a live display of northwestern herpetofauna, and tentatively, a field trip to Long Island on the Willapa National Wildlife Refuge.

The meeting will also have open sessions for contributed papers and posters on any aspect of the biology of northwestern vertebrates. There will be a social (no-host bar) on Thursday evening.

For more information, or to submit an abstract for a contributed paper or poster, please contact *Larry Jones, Pacific Northwest Research Station, Forestry Sciences Laboratory, 3625 93rd Avenue, S.W., Olympia, Washington 98502, USA; phone (206) 956-2345*.

Third Latin American Congress Of Herpetology

The 3rd Latin American Congress of Herpetology (3rd CLAH) will be held at the Campinas State University, in Campinas, São Paulo, Brazil, 12-18 December 1993. The objective of the Congress is to promote and integrate the various aspects of research among scientists and students working in neotropical herpetology.

The official languages of the 3rd CLAH to be used in the mini-courses, conferences, and oral presentations will be Portuguese and Spanish. However, English and French will be accepted in poster presentations, workshops, symposia, and in some conferences and oral presentations.

Oral presentations will be arranged in topical sessions. Workshops will be pre-arranged and/or organized during the congress according to participants' interest. One-day trips and post-congress excursions are being planned. Participants are limited to two abstracts and their corresponding presentations with registration. Students' registration includes attendance in one mini-course. Abstracts should be submitted to the Organizing Committee in Brazil. The deadline for abstracts to be published is 30 June 1993. A second circular appeared in late February 1993, and was mailed only to registered participants or individuals who have requested to receive it.

For registration, mailing requests, abstract forms, or additional information please contact:

Dr. Rafael O. de Sá
Department of Biology
University of Richmond
Richmond, Virginia 23173
Tel. (804) 289-8542
FAX (804) 289-8482.

Fourth Symposium On Resources Of The Chihuahuan Desert Region: United States And México

Call for Papers: The Fourth Symposium on Resources of the Chihuahuan Desert Regions: U.S. and México will be held on the campus of the University of Texas at El Paso 30 September - 2 October, 1993. The theme for the Fourth Symposium will be "Conservation and Sustainable Development of Chihuahuan Desert Resources." The objectives are to 1) promote international cooperation among scientists, institutions, agencies, and organizations; 2) build on previous data by seeking to determine how resources are being used, managed, threatened, and depleted; 3) provide new information on sustainable approaches to ecological concerns and the preservation of Chihuahuan resources; 4) expose participants to the scope of current research activities in the region; and 5) allow for a clear understanding of future research and management priorities. Each presentation will be 18 minutes in length with two minutes for questions. Presentations can be made in either English or Spanish. Authors will have the option of submitting their paper for publication in the Symposium Proceedings. Session topics include: Vertebrate Zoology; Invertebrate Zoology; Ecology; Wildlife Biology; Botanical Sciences; Aquatic and Riparian Habitats; Geology, Paleontology, and Hydrology; and Anthropology, Archaeology, and Ethnology.

Abstracts: Each abstract must be typed double-spaced on an 8.5 x 11 inch sheet of paper. List the author(s), affiliation(s), and current address(es). Abstracts should not exceed 200 words. Please submit a diskette with a hard copy if possible. All abstracts must be postmarked no later than 15 June 1993. Send abstracts to: *Chihuahuan Desert Symposium, CRDI, P.O. Box 1334, Alpine, Texas 79831, USA, or call (915) 837-8370 for additional information.*



Second World Congress of Herpetology

29 December 1993 – 6 January 1994

For information please contact:
Michael J. Tyler, Department of Zoology,
University of Adelaide, Box 498,
GPO Adelaide S.A. 5001, Australia.
FAX: 61-8-223-5817

LEGISLATION & CONSERVATION ALERT

Call for information on the status of amphibians and reptiles: This column serves to update the herpetological community on the regulatory status and protection measures implemented for rare, threatened, and endangered amphibians and reptiles. We are in need of more information, especially at the State or Province level. Please send pertinent information to the Section Editor.

The following final and/or proposed listings, regulations, and general information have been announced by governmental regulatory agencies. Pertinent *Federal Register* (FR) citations are given for U.S. notices.

USA: Louisiana: The Louisiana legislature has passed a set of revised statutes that will regulate taking and sale of reptiles and amphibians in the state. These statutes take effect 1 July 1993. The content of the new regulations is largely a product of a 16-person task force including SSAR members Harold A. Dundee, Douglas A. Rossman, and Richard A. Seigel, plus representatives from the Louisiana Department of Wildlife and Fisheries, Louisiana Department of Agriculture and Forestry, commercial pet dealers, Louisiana Cooperative Extension Service, and the Louisiana Science Teachers Association. The regulations will be enforced by the Department of Wildlife and Fisheries and the Task Force will continue to act in an advisory capacity. Violations are punishable by fines. Alligators are covered by an independent set of regulations. A condensed summary follows:

- Wholesale/retail dealers and personal collectors must have a license. (Fee involved). Researchers must obtain a collecting permit (no fee).
- Authority to prohibit harvest rests with Louisiana Department of Wildlife and Fisheries.
- There are specific regulations for method of collection. Use of gasoline is prohibited, cover objects must be returned to original positions, traps must be labeled.
- Specific regulations are listed for *Rana catesbeiana*, *R. grylio*, and *Malaclemys terrapin*.
- A Reptile and Amphibian Research Fund is to be funded from fees collected.

All interested herpetologists should obtain a complete copy of the new Loulsiana regulations from the Department of Wildlife and Fisheries, P.O. Box 98000, Baton Rouge, Louisiana 70898-9000, USA.

USA: *Ambystoma californiense* (California tiger salamander). The U.S. Fish and Wildlife Service currently is evaluating the status of the California tiger salamander and has been petitioned to list it as an endangered species pursuant to the Endangered Species Act of 1973, as amended. Population declines have been attributed to loss of habitat to agriculture, urban development, and fish introductions.

Any herpetologists who have biological information useful to the USFWS's evaluation of this species should contact Mike Long, USFWS, 2800 Cottage Way, Room E-1823, Sacramento, California 95825-1846, Tel. (916) 978-4866. FR 57(224):54545-54546.

KURT A. BUHLMANN
SSAR Conservation Committee.

REGIONAL SOCIETIES

Directory Of U.S. Regional Herpetological Societies

The list below contains names and addresses of all regional herpetological societies in the U.S. as of October 1992. Additions or corrections to this list should be brought to the attention of the Regional Society Section Editor (name and address on inside front cover).

American Federation of Herpetoculturists
P.O. Box 1131
Lakeside, California 92040-0905, USA

Arizona Herpetological Association, Inc.
P.O. Box 39127
Phoenix, Arizona 85069-9127, USA

Arkansas Herpetological Society
c/o Glyn Turnipseed
418 North Fairbanks
Russellville, Arkansas 72801, USA

Bay Area Amphibian & Reptile Society
Palo Alto Junior Museum
1451 Middlefield Road
Palo Alto, California 94301, USA

Blue Ridge Herpetological Society
P.O. Box 727
Brookneal, Virginia 24528, USA

California Turtle & Tortoise Club
P.O. Box 7300
Van Nuys, California 91409-7300, USA

Central Florida Herpetological Society
P.O. Box 3277
Winter Haven, Florida 33881, USA

Central Illinois Herpetological Society
1125 West Oak
Peoria, Illinois 61614, USA

Central Kentucky Herpetological Society
P.O. Box 12227
Lexington, Kentucky 40581-2227, USA

Central Ohio Herpetological Society
217 East New England Avenue
Worthington, Ohio 43085, USA

Chicago Herpetological Society
2001 North Clark Street
Chicago, Illinois 60614, USA

Chihuahuan Desert Herpetological Society
Box 3AF
New Mexico State University
Las Cruces, New Mexico 88001, USA

Colorado Herpetological Society
P.O. Box 15381
Lakewood, Colorado 80215, USA

Connecticut Herpetological Society
c/o George Whitney DVM
860 Oakwood Road
Orange, Connecticut 06477, USA

Delaware Herpetological Society
c/o Ashland Nature Center
Brackenville & Barley Mill Road
Hockessin, Delaware, USA

Desert Tortoise Preserve Committee, Inc.
P.O. Box 453
Ridgecrest, California 93555, USA

East Texas Herpetological Society
P.O. Box 1561
Trinity, Texas 75862, USA

East Texas Regional Herpetological Society
c/o Kevin Thiemet
314 Lynch Drive
Bullard, Texas 75757, USA

Eastern Seaboard Herpetological League
c/o Dr. Michael Uricheck
77 Faber Avenue
Waterbury, Connecticut 07604, USA

El Paso Herpetological Society
7505 Dempsey
El Paso, Texas 79925, USA

Endangered Turtle Protection Foundation
P.O. Box 4617
Greenville, Delaware 19807, USA

Everglades Herpetological Society
P.O. Box 431242
Miami, Florida 33243-1242, USA

Florida Panhandle Herpetological Society
The ZOO
5801 Gulf Breeze Parkway
Gulf Breeze, Florida 32561, USA

Florida West Coast Herpetological &
Conservation Society
P.O. Box 2725
Dunedin, Florida 34697, USA

Gainesville Herpetological Society
P.O. Box 140353
Gainesville, Florida 32614-0353, USA

Georgia Herpetological Society
c/o Department of Herpetology
Zoo Atlanta
800 Cherokee Avenue SE
Atlanta, Georgia 30315, USA

Gopher Tortoise Council
c/o Patricia Ashton
611 NW 79th Drive
Gainesville, Florida 32607, USA

Great Lakes Herpetological Society
c/o Jeff Gee
4308 North Woodward
Royal Oak, Michigan 48072, USA

Greater Cincinnati Herpetological Society
Cincinnati Museum of Natural History
1720 Gilbert Avenue
Cincinnati, Ohio 45202, USA

Greater Dayton Herpetological Society
Dayton Museum of Natural History
2629 Ridge Avenue
Dayton, Ohio 45414, USA

Herpetology Online Computer Network
P.O Box 52261
Philadelphia, Pennsylvania 19195, USA

Herpetological Society of Southwest
Michigan
c/o Scott Averill
2557 Bristol, NW
Grand Rapids, Michigan 49504, USA

Hoosier Herpetological Society
P.O. Box 40544
Indianapolis, Indiana 46204, USA

Horned Lizard Conservation Society
P.O. Box 122
Austin, Texas 78767, USA

Idaho Herpetological Society
P.O. Box 6329
Boise, Idaho 83707, USA

Inland Empire Herpetological Society
c/o San Bernadino County Museum
2024 Orange Tree Lane
Redlands, California 92373, USA

International Gecko Society
P.O. Box 370423
San Diego, California 92137-0423, USA

International Iguana Society
Finca Cyclura
Route 3, Box 328
Big Pine Key, Florida 33043, USA

International Society for the Study of
Dendrobatid Frogs
c/o Ed Tunstall
2320 West Palomino Drive
Chandler, Arizona 85224, USA

Jacksonville Herpetological Society
P.O. Box 26468
Jacksonville, Florida 32226-6468, USA

Kansas Herpetological Society
Museum of Natural History - Dyche Hall
University of Kansas
Lawrence, Kansas 66045, USA

Kern County Herpetological Society
P.O. Box 762
Lebec, California 93243-0762, USA

Lehigh Valley Herpetological Society
P.O. Box 9171
Allentown, Pennsylvania 81805-9171, USA

Long Island Herpetological Society
117 East Santa Barbara Road
Lindenhurst, New York 11757, USA

Lubbock Turtle & Tortoise Society
c/o Joe Cain
5708 64th Street
Lubbock, Texas 79424, USA

Maryland Herpetological Society
Natural History Society of Maryland
2643 North Charles Street
Baltimore, Maryland 21218, USA

Massachusetts Herpetological Society
P.O. Box 1082
Boston, Massachusetts 02103, USA

Michigan Society of Herpetologists
321 West Oakland
Lansing, Michigan 48906, USA

Mid-Mississippi Valley Herpetological Society
c/o Mike Ladato
925 Park Place Drive
Evansville, Indiana 47715, USA

Minnesota Herpetological Society
J. F. Bell Museum of Natural History
10 Church Street SE
Minneapolis, Minnesota 55455, USA

National Turtle & Tortoise Society
P.O. Box 9806
Phoenix, Arizona 85068-9806, USA

Nebraska Herpetological Society
Department of Biology
University of Nebraska at Omaha
Omaha, Nebraska 68182, USA

New England Herpetological Society
P.O. Box 1082
Boston, Massachusetts 02103, USA

New Mexico Herpetological Society
Department of Biology
University of New Mexico
Albuquerque, New Mexico 87131, USA

New York Herpetological Society
P.O. Box 1245
Grand Central Station
New York, New York 10163-1245, USA

New York Turtle & Tortoise Society
183 Amsterdam Avenue, Suite 365
New York, New York 10023, USA

North Carolina Herpetological Society
North Carolina State Museum of Natural History
P.O. Box 27647
Raleigh, North Carolina 27611, USA

North Texas Herpetological Society
P.O. Box 470771
Fort Worth, Texas 67147, USA

Northeast Colorado Herpetological Society
c/o Roger Klingenberg
6247 West 10th
Greeley, Colorado 80361, USA

Northern California Herpetological Society
P.O. Box 1363
Davis, California 95617-1363, USA

Northern Nevada Herpetological Society
P.O. Box 21282
Reno, Nevada 89515-1282, USA

Northern Ohio Association of Herpetologists
Department of Biology
Case Western Reserve University
Cleveland, Ohio 44106, USA

Oklahoma Herpetological Society
Oklahoma City Chapter
c/o Carl Sandefer
Oklahoma City Zoo
5101 NE 50th Street
Oklahoma City, Oklahoma 73111, USA

Oklahoma Herpetological Society
Tulsa Chapter
c/o Linda Putnam
Tulsa Zoo
5701 East 36th Street North
Tulsa, Oklahoma 74115, USA

Oregon Herpetological Society
c/o WISTEC
P.O. Box 1518
Eugene, Oregon 974040 USA

Pacific Northwest Herpetological Society
P.O. Box 70231
Bellevue, Washington 98008, USA

Palm Beach County Herpetological Society
c/o Greg Longhurst
P.O. Box 125
Loxahatchee, Florida 33470, USA

Philadelphia Herpetological Society
c/o Mark Miller
9573 Walley Avenue
Philadelphia, Pennsylvania 19115, USA

Philadelphia Turtle & Tortoise Club
c/o Mark Miller
9573 Walley Avenue
Philadelphia, Pennsylvania 19115, USA

Rhode Island Herpetological Association
P.O. Box 29474
Providence, Rhode Island 02909, USA

Rocky Mountain Herpetological Society
c/o Charles Sarkisian
220 Pinehurst Drive
Monument, Colorado 80132, USA

San Diego Herpetological Society
P.O. Box 4036
San Diego, California 92104, USA

San Joaquin Herpetological Society
P.O. Box 1104
Clovis, California 93612-1104, USA

Shasta Snake Society
P.O. Box 171
Douglas City, California 96024, USA

South/Central Texas Herpetological Society
c/o Niels Saustrup
1405 Rabb Road
Austin, Texas 78704, USA

South Carolina Herpetological Society
c/o James L. Knight
P.O. Box 100107
Columbia, South Carolina 262602-3107, USA

South Marion Herpetological Society
P.O. Box 1817
Belleview, Florida 32652, USA

South Mississippi Herpetological Society
P.O. Box 1685
Gulfport, Mississippi 39564-1685 USA

Southern California Herpetology Association
P.O. Box 2932
Santa Fe Springs, California 90670, USA

Southern New England Herpetological Association
470 Durham Avenue
Madison, Connecticut 06443, USA

Southwestern Herpetologists Society
P.O. Box 7469
Van Nuys, California 91409, USA

St. Louis Herpetological Society
c/o Harry Steinmann
P.O. Box 220153
Kirkwood, Missouri 63122, USA

Susquehanna Herpetological Society
c/o Sam Burleigh
211 South Market Street
Muncy, Pennsylvania 17756, USA

Texas Herpetological Society
Hutchinson Hall of Science
31st at Canton
Lubbock, Texas 79410, USA

Troup County Association of Herpetologists
c/o C. W. Dodgen
801 Grant Street
La Grange, Georgia 30240, USA

Tucson Herpetological Society
P.O. Box 31531
Tucson, Arizona 85751-1531, USA

Turtle & Tortoise Education Adoption Media
3245 Military Avenue
Los Angeles, California 90034, USA

Upstate Herpetological Association
17 Providence Street
Albany, New York 12203, USA

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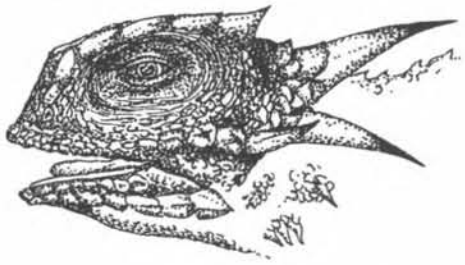
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Horned Lizard Conservation Society

The Horned Lizard Conservation Society (HLCS) is a non-profit corporation founded in November of 1990. The purpose of the society is to document and publicize the values and conservation needs of horned lizards (genus *Phrynosoma*), to promote horned lizard conservation projects, and to assist with horned lizard management initiatives throughout their ranges.

Horned lizard populations have apparently decreased throughout much of their historical range within the last fifty years. The factors responsible for these declines are probably many and complex. However, the declines themselves, as well as their causes, remain undocumented and subject to speculation. HLCS seeks to address this situation by gathering and organizing existing information, developing and supporting research on horned lizard ecological requirements and population demographics, developing strategies for the management of horned lizard habitat, and educating the public about the conservation needs of the genus.

Membership dues are: students $10, subscribing $10, regular $25, and contributing $50. Dues support research, conservation, and education efforts, and members receive the society's quarterly newsletter, *Phrynosomatics*. Formal group meetings are held quarterly in Austin, Texas. Those interested in joining HLCS or in receiving information should contact:

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POINTS OF VIEW

Viewpoint: A Reply To Collins (1991, 1992)

It seems that in every decade there is an attempt to "simplify" some complex biological problem by a wholesale change in procedures, the introduction of a new concept, or a brand-new paradigm. In some of these cases, where there is a rational basis for a change, a residue of beneficial ideas or techniques remains after the "new" item has been tried, tested, and then found to be unworkable as proposed. In others, wherein no new techniques are offered—merely a change in practice, or a different viewpoint (as in the present case)—little has been gained after the dust has settled. This history suggests that when dealing with complex biological problems, reductionism is not the proper approach.

The current suggestion of the wholesale raising of many North American amphibian and reptile subspecies to full species rank (on the basis of the "Evolutionary Species Concept") without providing data that would substantiate such change (Collins 1991), is reminiscent of the suggestion by Smith and Taylor (1950) that questionable type localities of Mexican reptiles and amphibians be arbitrarily determined. The ensuing replies (Dunn and Stuart 1951a, 1951b) left little question that this was a poor idea; such decisions should be based upon careful, monographic studies.

On the other hand, the promulgation of numerical taxonomy in the 1960's (Sokal and Sneath 1963), though later having been shown to be based upon false premises (at least in regard to the evolutionary significance of morphological differences), has promoted the development of numerous mathematical procedures and led to later developments of current computer techniques. Similarly, although not everyone (in fact, perhaps no one) follows the precepts of Hennig (1966) in every respect, his ideas began to have a beneficial effect on taxonomic procedure, particularly after the many discussions of cladistics versus evolutionary systematics in the journal *Systematic Zoology* in the 1970's.

I have no intrinsic opposition to the raising (or lowering) of species-level ranks, but I do believe that such actions require more study than looking at a published range map and checking a list of "definitive" features. In my experience the features used for subspecies recognition tend to differ from those used for species. Also, it should be remembered that whereas subspecies are defined upon geographic information and "differences" (remember the old 75% [or 85%] rule?), species are defined upon resemblances and *distinctions*—all of these presumed to be indicators of degrees of evolutionary relationships.

Also, having personally filled-in a number of apparent range gaps, I know that a gap on a map is not necessarily a gap in the range of an animal. Many animals are secretive or appear only under certain conditions of time and weather, and thus remain undiscovered for long periods. To cite one example indicated by Collins (1991:43), I am confident that the persisting "map-gap" in the range of *Scaphiopus holbrooki/hurteri* is not as shown (Conant and Collins 1991: map 273). In the mid-1950's I was attending the meeting of the Arkansas Academy of Science at Harding College, in the Arkansas River Valley near the edge of this "gap." A thunderstorm came up during the annual banquet, and when I walked out onto the campus after the dinner I could hear a large chorus of *Scaphiopus* calling from a small pond. Even then we knew that the contact zone between *holbrooki* and *hurteri* was a critical issue, so I laid my jacket and shoes on the grass, rolled up

my sleeves and pants-legs, and waded out. Unfortunately, I had no headlight and the spadefoots could see me in the moonlight, and ducked under as soon as I got near. So, I was unable to catch a single one. That's the only reason that part of the gap is still there. I can see no ecological reason that would prevent *Scaphiopus* from inhabiting the entire length of the valley—all the way to the Mississippi River—it is just that no knowledgeable herpetologist has been there at the critical time.

In a more philosophical vein, I will agree that the subspecies taxon has been badly used (misused, over-used) in many studies. In reference to snakes, with which I am most familiar, I also find some of the "subspecies" unconvincing in *Arizona, Cemophora, Diadophis, Elaphe,* and *Pituophis*. Perhaps some of the forms mentioned by Collins should be raised to species rank. It seems equally possible that some of them, or their (current) conspecific relatives, should not be recognized at any taxonomic level. But I would **NOT** presume to make these changes without presenting **ADEQUATE DATA**.

It is true, also, that the species category has been badly misused in some studies. It is clear that small, secretive snakes do not have large home ranges and tend to form small populations that differ from one another in varying degrees. This is particularly true in regions that have been subject to considerable environmental change during the Pleistocene or thereafter. It does not take much work to show that such populations "differ" from one another—particularly if the samples are small. However, it seems to me very difficult to show that they are on "different phylogenetic trajectories" (Frost and Hillis 1990:92), and I do not believe that an **apparent gap in** a distribution map plus a list of **presumed** morphological differences is an adequate procedure to confirm this—even if that definition of a species is accepted. Thus, I believe that both sides of the coin need to be extensively investigated: not only the validity of recognized subspecies, but also the validity of recognized species. Obvious starting points for the latter include close examination of the current taxonomy of *Geophis* and *Tantilla*.

My main objection to Collins's (1991) paper, however, is that no data are presented to support these changes in nomenclature. Rather than agreeing to "encourage the adoption of the taxonomic arrangement listed above" (Collins 1991), I would encourage workers to **investigate** the putative relationships of these taxa. If we follow Collins's recommendation, we merely substitute one unknown for another—to the detriment of the available information. At present we have some assurance that *Lampropeltis calligaster occipitolineata* bears some relationship to *L. calligaster*, but we would have no such assurance with his "*L. occipitolineata*," which might be more closely related to *L. getulus*, or to *L. triangulum*, or to some other species in so far as the nomenclature indicates. Even worse are the subspecies of some American snakes that are in Holarctic genera such as *Coluber* and *Elaphe*—or how about the cosmopolitan genus *Eumeces*? Isn't it better to know that these taxa have American relationships?

It is my belief that the subspecific category has many advantages when properly utilized (as a related, but different, geographic population). At worst it alleges that a population resembles one species more than it does another in certain (usually morphological) characters. At best it is a distinctive (NOT distinct) series of populations with recognizable suites of features that occupy defined ranges, and which often have different habits and ecologies. They may continue, perhaps in reduced fashion, to interbreed with their adjacent populations through broad or narrow areas of intergradation. But this latter should not be required blindly. Evolutionarily speaking, the Pleistocene was only yesterday. It is as easy to guess that the temporary barriers between incompletely differentiated populations extant today will be breached tomorrow as it is to **guess** at the past time that the separation took place "**forever.**" Certainly, both are easier than guessing at their "phylogenetic trajectories."

There are many more tools available now to test the relationships of animals than there were even a decade ago. We only need to consider the advances in electrophoretic techniques, in immunological comparisons, in karyology, and in the various methods utilizing DNA transformations to see this. I would hope that some of these and other methods would be brought to bear on the questions of species *versus* subspecies (and what about genera?), rather than blindly substituting one taxonomic category for another because some worker feels that the concept is "outdated."

After writing the above comments, I received *Herpetological Review* 23(1) and thought that Montanucci (1992) and Van Devender et al. (1992) had rather well demonstrated that Collins's action was in error. Later, upon reading his attack on these workers and their ideas in *Herpetological Review* 23(2), however, it became clear that Collins (1992) had missed the basic reasoning of their objections. Thus, I feel compelled to enter this unfortunate conflict.

First, it is not a question of people trying to push Collins off his "philosophical mountain" of the "Evolutionary Species Concept" (ESC)—in science anyone is welcome to believe any concept that they choose. It is his "recommendation" that everyone follow in his footsteps in the raising of these subspecies to species level WITHOUT PRESENTING ANY DATA to support this idea that is the problem. His admission that "Thus, my recent list (Collins 1991), which was prepared **without testing the validity** of the species in question . . ." is the crux of the matter. This is not the way that science works! New ideas must be **substantiated** to be acceptable to their audience. Now for some specifics:

1) Collins stated: "55 subspecies . . . were already diagnosed . . . in their original descriptions . . . if they had not been so diagnosed, they would not be recognized at all." Such a statement is patently untrue. Most taxa are currently recognized, not on the basis of their original descriptions (try Linnaeus 1758, or Cope 1861, for original descriptions!), but are based upon subsequent, careful revisionary (often monographic) studies. He is badly mistaken in his belief that perusal of original descriptions is an adequate method of determining the status of a taxon. And, it is **not logic** that is required in raising a taxon from subspecies to species rank, it is **adequate data.**

2) It would seem unnecessary to point out, as Collins (junior author of a field guide) should know better than most, that the small, generalized maps in field guides are **not** the "best available published maps" (Collins 1992:43; cf. Collins 1991:43). Indeed, such maps are **always** wrong in detail (Axtell 1965). The best distribution maps, ordinarily, are found in monographs (e.g., Duellman 1958) or in some subsequent zoogeographical or state-based work (e.g., Mount 1975), and there is no question that those in the *Catalogue of American Amphibians and Reptiles* are far superior to those in the field guides.

3) I find it more than passing strange that the taxonomic status of an animal is now determined by "majority vote" of "groups of herpetological specialists" (Collins 1990:1; 1992:43). It is more usual scientific practice for taxonomic changes to be made on the basis of the information provided in the publication that proposes them. Certainly, a group of "specialists" (or any other group sitting at a bar), or any author alone can determine how he/she will treat a taxon in their own publications (e.g., Lazell 1972). This, however, gives no additional validity to that usage; again it is the substantiation of this change by the provision of data, and the acceptance of this as adequate by other herpetologists, that count.

4) In spite of Collins's repeated protestations (1992: 43, 44, 45) that his use of the ESC to raise subspecies to species rank is "conservative," this simply is not true. If a person who proposes a taxonomic change does not have detailed knowledge of the taxa affected, this is *ipso facto*, **not a conservative action.** The conservative approach would be to **defer** any action.

5) Back to subspecies definitions (Collins 1992: 44-45). It seems clear that there is no room for subspecies in Collins's view of ESC—and perhaps not in any view of this recent proposal of taxonomic recognition. According to Collins, "If the characters that supposedly distinguish . . . [any subspecies] are not diagnostic, then its evidential support is flawed and it does not deserve *even* [emphasis mine] subspecific status." Obviously, on this basis if the animals are not 100% distinct, they do not deserve any name. And, if they are 100% different, they must be species. Again, there is some confusion between the use of "different" and "distinct." Subspecies have never been required to be distinct—only recognizably different. Perhaps Collins has noted from the comments of his critics that the concepts of the biological species and of subspecies are "outdated" only in the minds of some.

In summary, Collins's methodology is reminiscent of, and perhaps an attempt to return to, "Taylor Taxonomy." E. H. Taylor was a very active and long-lived herpetologist (in Collins's same institution at Kansas) whom I admired in many respects. His working method, however, led to a plethora of species descriptions—many of which were later shown to be invalid. I was able to observe this methodology a number of times. Taylor would set out a number of museum specimens for study, and would methodically observe, measure, and record the various morphological features of each specimen. If he came upon one that appeared different or otherwise interesting, he would consult the *original descriptions* of appropriate, presumably similar taxa, and compare those *descriptions* with the specimen in hand. If the specimen differed (or was distinguishable) from the characteristics described by the previous authors, it was obviously a different taxon, and so he described it as new. Collins's method is similar, but **without** the close examination of specimens.

A final word on Collins's (1992) view of science. In his final paragraph before his Summary, he states that it has been suggested that ". . . the herpetological community review my list . . . but if they do, it *must be by the same criteria that I used* . . ." (emphasis mine). This is an unusual request. Ordinarily critics are not constrained by limits put upon their comments—nor is it appropriate here, inasmuch as, to a large extent, it is his criteria that are in question. I propose that Collins's suggestion on the "adoption of the taxonomic arrangement" be rejected. As was noted in a somewhat similar case, I find his suggestion to be "without legal status ('incompetent, irrelevant, immaterial'": Dunn and Stuart 1951b), and do not consider it a constructive effort in herpetological taxonomy.

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A Consensus On The Spelling Of Certain Snake Family-Group Names

The publication of McDowell (1987) and other papers in that volume sparked a minor controversy over the spelling of names of snake family-group taxa formed from the Greek stem *ophis* which were emended without comment such that Thamnophiini became Thamnopheini, etc. Smith and Preston (1987) justified these emendations by claiming that *ophe-* and not *ophi-* was the correct stem for such names. The stated objective of the International Code of Zoological Nomenclature is to "... promote stability and universality in the scientific names of animals and to ensure that the name of each taxon is unique and distinct" (International Commission on Zoological Nomenclature 1985:3). To this end the Code contains many rules governing the formation and spelling of the names of taxa, and errors in formation must be corrected.

In a response to Smith and Preston (1987), Cannatella (1990) argued that according to the Code both *ophe-* and *ophi-* were acceptable because the forms *opheos* and *ophios*, from which the stem

is formed, were dialectical variants of the genitive singular, and either variant was accepted as valid Ancient Greek. Given that Article 32b states that the original spelling is to be maintained unless it is shown to be clearly incorrect, Cannatella concluded that names such as Thamnopheini were unjustified emendations, and therefore invalid, but available as junior objective synonyms.

In opposition to Cannatella (1990), Smith and Chiszar (1992) and Smith and Smith (1992), argued that Appendix D VII, Table 2 of the Code provided a counterexample in the word *krisis*. For purposes of family-group names the stem is given as *krise-*, not *krisi-*. Because Article 29b (dealing with determination of the stem) explicitly defers to Appendix D, these authors stated that *ophe-* was correct and *ophi-* was incorrect. They further argued that maintenance of the long-established spellings could be assured by appeal to the Commission, but that such intervention was not necessary because no confusion in application of names would result from the emendations.

The first author of this note (DCC) argued (in litt.) that Appendices A through E have the force of recommendations, not rules (International Commission on Zoological Nomenclature 1985:1) and therefore both stems are correctly formed. In a letter in response to a query by the second author (HMS), Philip Tubbs, Secretary of the International Commission on Zoological Nomenclature, offered the same opinion, vouchsafing for the Commission that the original spellings (in all cases with *ophi-* as the stem for family-group names) must be maintained; only by exercise of its plenary powers could the Commission require use of *ophe-* as the stem, and this it likely would not do. Therefore, we now agree that the spellings in common usage, with *ophi-* as the stem, should be maintained. Emendations such as Thamnopheini and Hydropheidae are unjustified emendations, but available as junior objective synonyms in the sense of the Code.

Issues such as this one explain the disdain with which many biologists sometimes view the efforts of taxonomists. Some of these efforts are necessitated by overly legalistic aspects of the Code, but perhaps many such issues need not be dealt with at all, at least in print. Given that recent efforts of the Commission (Savage 1990) indicate a move away from such exercises, systematists can turn their attention to more substantive issues.

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ARTICLES

Twin Hatchlings Of *Trimeresurus flavoviridis* (Viperidae)

Although some instances of twinning in reptiles have been reported (Bellairs 1981; Carpenter and Yoshida 1967; Shuette 1978; Singh and Thapliyal 1973; Tryon 1980), few of these accounts have been of normal twin hatchlings (Curtis 1950; Fukada 1978). Here, we describe twin hatchlings and their clutch-mates in *Trimeresurus flavoviridis*, in comparison with eggs and hatchlings of this species in the Okinawa Islands.

A female *T. flavoviridis* (SVL = 1080 mm, mass = 507.6 g) was collected in Itoman City, southern Okinawa Island on 11 June 1988. The specimen had the yellow ground color typical for this species. On 25 July 1988, the snake laid seven eggs and decreased its body weight to 322.0 g. Each egg was incubated in a separate container with wet cotton substrate at fluctuating temperature (range 21.8-30.8 °C).

The eggs measured 47-60 mm in length, 25-27 mm in width, and 22.9-28.8 g in mass. All eggs were of normal size compared with means (N, SD, range) for eggs (all measured within one day after oviposition) of *T. flavoviridis* in the Okinawa Islands: 56.0 mm (676, 7.8, 40-83) in length, 28.5 mm (676, 2.4, 22.5-36.0) in width, and 27.2 g (694, 5.3, 17.9-45.3) in weight.

Twins hatched from the longest, most slender, and heaviest egg in the clutch. The egg containing twins hatched on 4 September 1988, with the remaining six eggs hatching on 5-6 September. All eight hatchlings appeared normal in morphology and behavior. The twins had normal yellow ground color, with minor head pattern differences between the two (Fig. 1). Three of their hatchmates had a rare white ground color. Five hatchlings, including the twins, were sacrificed within one day of hatching.

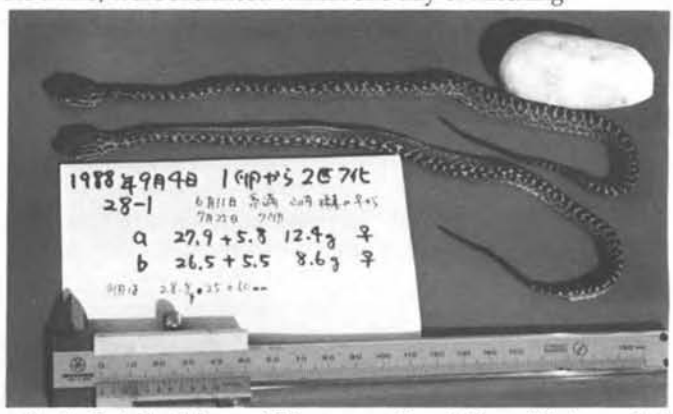


Fig. 1. Twin hatchlings of *Trimeresurus flavoviridis* and their egg shell.

TABLE 1. Measurements of eggs and hatchlings, including twins, of *Trimeresurus flavoviridis* from Itoman City, southern Okinawa Island. All measurements taken within one day following oviposition or hatching. WI = without internal organs; PB = proportions (%) / WI.

Egg No.	Egg weight	SVL	Tail length	Body weight		Yolk Body		Fat Body		Liver	
				Whole	WI	Weight	PB	Weight	PB	Weight	PB
	(g)	(mm)	(mm)	(g)		(g)		(g)		(g)	
1	28.8	279	58	12.4	7.21	2.67	37.0	0.61	8.46	0.34	4.72
1	28.8	265	55	8.6	6.18	0.32	5.2	0.49	7.93	0.26	4.21
Total				21.0	13.39	2.99	22.3	1.10	8.22	0.60	4.48
2	25.1	330	74	19.8	12.90	2.22	17.2	1.12	8.68	0.64	4.96
3	22.9	311	69	17.5	11.12	2.06	18.5	1.03	9.26	0.74	6.65
4	23.9	318	72	18.4	11.33	2.49	22.0	1.04	9.18	0.61	5.38
5	25.7	334	76	19.3							
6	25.1	330	66	18.9							
7	25.1	321	64	18.5							

Both twins were female and had the same number of body scale rows (33), and subcaudals (80), with seven subcaudals at the tail tip not separated in the larger twin. Ventral counts of the larger and the smaller twins were 229 and 226 (plus two small plates), respectively. These scale counts were within the ranges for this species (Koba 1962; Takara 1962).

The smaller twin (265 mm SVL, 8.6 g) was the smallest hatchling *T. flavoviridis* we have recorded in the Okinawa Islands (mean, N, SD, range of SVL and body weight: 331 mm, 315, 25, 265-403; 18.2 g, 314, 3.7, 8.6-31.5, respectively, inclusive of this clutch) and is smaller than others reported previously (see Kamura 1975; Koba et al. 1967; Takara 1962). Total body weight of the twins (21.0 g) was similar to the expected weight for a single normal hatchling (19.5 g), calculated from regressions between egg weight and hatchling weight of this species in the Okinawa Islands (Nishimura, unpublished). Weight proportions of fat body and liver to body weight without internal organs (WI) were similar among the twins, hatch-mates, and hatchlings in the Okinawa Islands (mean, N, SD = 9.45%, 29, 1.61; 5.61%, 29, 0.91, respectively) (Table 1). The larger twin had more yolk for its size than the smaller twin, and the proportion of the total weight of yolk body to the total WI of the twins was standard for a single hatchling of this species (mean = 18.5%, N = 26, SD = 10.4).

Other reports of twins in oviparous colubrids agree with our findings that this anomaly has been associated with the longest egg (Fukada 1978; Singh and Thapliyal 1973) and the earliest hatching within a clutch (Fukada 1978). These tendencies may be related to the fact that the longest (and most slender) eggs tend to be formed at the anterior or posterior end of the abdominal cavity in *T. flavoviridis* (Nishimura, pers. observ.).

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The "New" Herpetofauna of Guam, Mariana Islands

The movement and establishment of non-indigenous fauna and flora throughout the Pacific Basin are well recognized (Drake et al. 1989). Non-native plants, insects, terrestrial molluscs, freshwater fishes, and terrestrial vertebrates have become established on many islands, potentially causing substantial perturbations in ecosystems.

Since World War II, Guam (a territory of the United States and the southernmost major island in the Mariana archipelago) has enjoyed an enormous economic boom and is now a major shipping and air travel hub for the western Pacific. Because of this status, substantial amounts of cargo, goods, and people from the Pacific Basin and Rim pass through Guam. This increased movement of materials has been reflected in the number of extralimital species of amphibians and reptiles (15) that have been recorded on Guam since World War II and underscores the apparent ease with which non-indigenous species might reach Guam. Only two species have been recorded as having colonized Guam prior to World War II. Based on the available information, these introductions can be broadly classified as intentional or accidental. I herein report on these island records and the species' current status. There is a distinction made between those species released to establish populations (= intentional) and escaped/released pets or incidentally transported to Guam (= accidental).

Established Species

Bufo marinus (Marine Toad). Intentional. In 1937, a number of toads were released to control agricultural pests (Chernin 1979). Since then, the toad has spread island-wide and has reached sufficient densities to be regarded as a nuisance.

Litoria fallax (Eastern Dwarf Tree Frog). Accidental. In 1968, this species was first noted around the Won Pat International Airport. Eldredge (1988) speculated that this introduction was the result of escaped/released pets. At this time, the species has spread island-wide in association with wetlands.

Anolis carolinensis (Common Anole). Intentional. In the mid-1950's, anoles were introduced for insect control (Eldredge 1988). A second introduction of unknown magnitude occurred in the mid-1980's in the village of Mangilao. By the mid-1980's, this species had spread island-wide but is now restricted to urban situations due to predation by the introduced brown tree snake (*Boiga irregularis*). In October 1990, an adult male *A. carolinensis* was collected from the cargo hold of an aircraft where it had apparently survived a round trip from Guam to Indonesia.

Hemidactylus frenatus (House Gecko). Accidental. No date of introduction is known for this species, although Van Denburgh (1917) implied that it was present on Guam prior to 1906. At this time, H. *frenatus* is the most abundant gekkonid on Guam. It has been suggested that *H. frenatus* negatively impacts native gekkonids (Gibbons 1985; McKeown 1978; Zug 1991).

Carlia sp. (NCN). Accidental. No date of introduction is known for this species. The first specimens were collected on Guam in 1968. At this time, this species is the most abundant skink on Guam and occurs in all habitats. Coupled with habitat alteration, this species may be negatively impacting native skinks. Glen Ingram (pers. comm.) indicated that this species is unidentified although it most closely resembles *C. fusca*. A live specimen was observed (December 1991) in the passenger compartment of an aircraft outbound from Guam (R. Fisher, pers. comm.).

Boiga irregularis (Brown Tree Snake). Accidental. This snake was probably introduced on Guam shortly after World War II and has since spread island-wide reaching high densities (Rodda et al. 1992). Impacts on Guam have been substantial (Fritts et al. 1987; 1990; Fritts and McCoid 1991; in prep.; McCoid 1991; Savidge 1988). The snake is frequently encountered in port and airport situations and has been documented using surface shipping and aircraft to move to neighboring islands (Fritts 1987; McCoid and Stinson 1991).

Trachemys scripta elegans (Red-eared Slider). Accidental. Distributed in permanent bodies of water in south and central Guam (McCoid 1992a). Populations are probably the result of escaped/released pets.

Terrapene carolina triunguis (Three-toed Box Turtle). Accidental. Distributed in a few localities in central Guam (McCoid 1992b). If a population has been established, it is due to escaped/released pets.

Pelodiscus sinensis (Chinese Soft-shelled Turtle). Intentional. Established populations occur in southern (Inarajan area) and central (Fadian area) Guam. In the mid-1970's, attempts were made to commercially raise this species for local consumption and failure of these ventures resulted in this introduction. Reproduction has occurred in the southern population as a hatchling was observed in November 1990.

Status Unknown or Not Established

Kaloula picta (Narrow-mouthed Frog). Accidental. In 1990, a single specimen was retrieved live from the deck of a vessel just arrived from the Republic of the Philippines.

Pseudacris regilla (Pacific Treefrog). Accidental. In December 1989, a single live adult male was collected from inside a residence in central Guam. It is likely that this frog arrived on Guam from a recent shipment of Christmas trees from the U. S. Pacific Northwest.

Lamprolepis smaragdina (Green Tree Skink). Intentional. There was a failed attempt at introduction in the 1960's (Eldredge 1988). Reasons for failure may be related to the presence of the predatory *B. irregularis*. Successful introductions have been noted on Tinian and Saipan in the northern Mariana Islands.

Iguana iguana (Green Iguana). Accidental. In 1983 or 1984, an adult (1.8 m total length) was shot by a farmer in the Manengon Valley. Wildlife personnel on Guam had been receiving periodic reports of a "monster" sighted in cultivated areas. It is likely that this was an escaped/released pet that had been living on Guam for several years. The ability of this individual to persist on Guam is underscored by the establishment of this species in Hawaii (McKeown 1978). Identity of the specimen was verified by a photograph.

Gekko gecko (Tokay Gecko). Accidental. A single specimen was collected in 1983 from the U. S. Naval Magazine in association with palletized cargo from the Republic of the Philippines. Identity of the specimen was verified by a photograph.

Chrysemys picta elegans (Painted Turtle). Accidental. In 1990, a live individual was found in the passenger compartment of an aircraft. This was likely an escaped/released pet.

Emydid sp. Accidental. An unidentified species (not *Trachemys*) was captured in 1991 from central (Santa Rita area) Guam and inadvertently released before positive identification. It is likely that the presence of this species resulted from escaped/released pets.

Trionychid sp. Accidental. Sightings of a large soft-shelled turtle have been made in Fena Valley Reservoir in central Guam in

the late 1980's (G. Davis, pers. com.). Disk width places this species outside of the known disk range of the only other trionychid on Guam (*P. sinensis*).

The pre-western contact terrestrial herpetofauna consisted entirely of reptiles (*Varanus indicus, Ramphotyphlops braminus, Gehyra mutilata, G. oceanica, Nactus pelagicus, Lepidodactylus lugubris, Perochirus ateles, Lipinia noctua, Cryptoblepharus poecilopleurus, Emoia cyanura, E. caeruleocauda, E. atrocostata,* and *E. slevini*) (Rodda and Fritts 1992), but now includes additional elements such as freshwater turtles and amphibians.

Of the 17 extralimital species recorded on Guam, 14 are based on free-living individuals or populations. Nine of these species have become established on Guam. Of the four intentional introductions, three were successful. The non-marine herpetofauna of Guam now consists of 22 species (41% introduced). One of these introduced species, *Boiga irregularis,* has had a demonstrably negative effect on Guam's indigenous wildlife and two species (*Carlia* sp. and *Hemidactylus frenatus*) are suspected of negative impacts (Rodda and Fritts 1992). Three introduced species on Guam (*B. irregularis, Carlia* sp., and *Anolis carolinensis*), have historically demonstrated abilities to infest cargo and aircraft and potentially move to neighboring islands. As economic development and growth continues, the number of extralimital events in the Pacific Basin will also continue to grow. The establishment and devastation caused by *B. irregularis* on Guam is probably not going to be a singular event. It is likely that Saipan has an incipient population of *B. irregularis* and also has populations of *A. carolinensis, Carlia* sp., *Bufo marinus,* and *Trachemys scripta.* Tinian also has populations of *A. carolinensis, Carlia* sp., and *B. marinus.* Palau has an introduced unidentified *Carlia* and *B. marinus.* As a result of these and other faunal transplantation events, indigenous oceanic herpetofaunas are being replaced or augmented by widespread tramp species. Pacific island nations may wish to develop policies and techniques for the interdiction of non-native reptiles and amphibians. A number of U. S. federal agencies and U.S.-affiliated island governments have been cooperating in control of and containment policies and techniques for *B. irregularis,* and the Government of Guam no longer issues import permits for live reptiles or amphibians.

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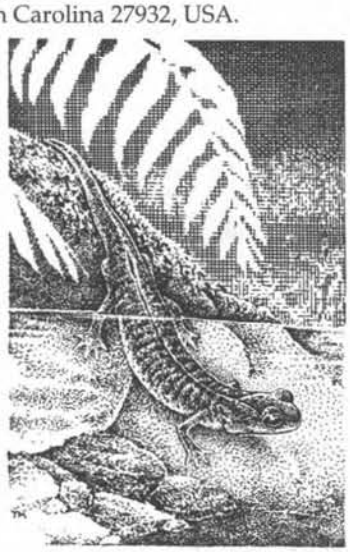
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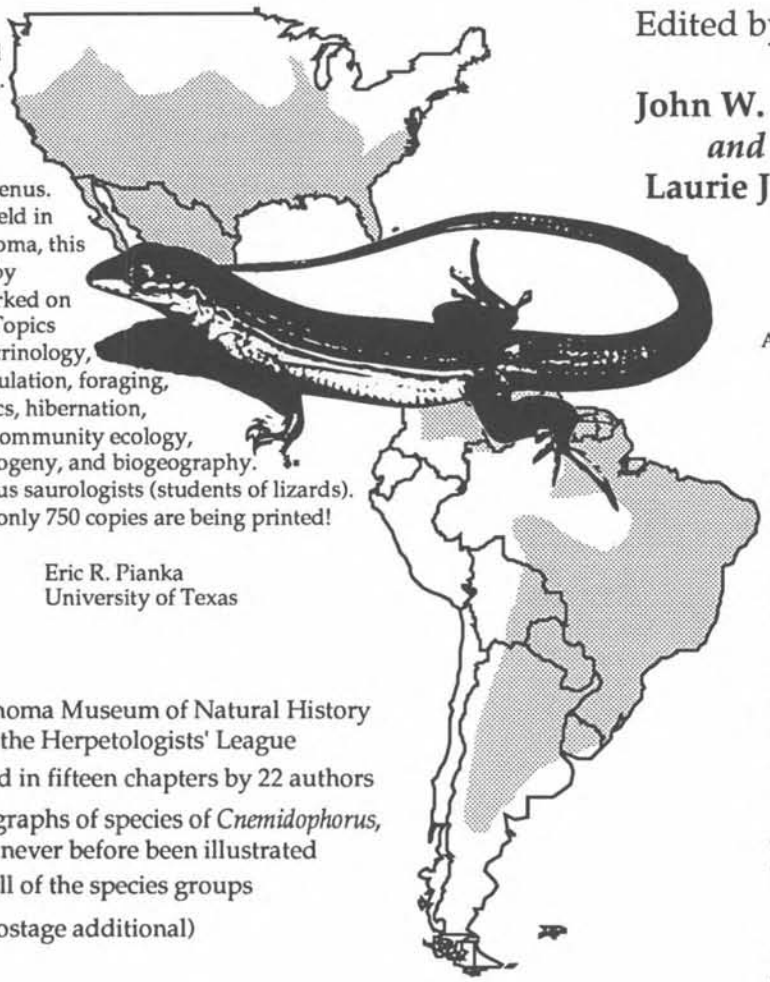


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TECHNIQUES

Tracking Hatchling Blanding's Turtles With Fluorescent Pigments

The early life history of hatchling emydid turtles is poorly documented (Iverson 1991) and practical and economical methods for demonstrating post-emergent behavior are generally lacking. In contrast with sea turtle species, studies of naturally incubated emydid and freshwater hatchlings in general have been limited to short-term, direct observation (Burger 1976) or manipulative field and laboratory studies with less than conclusive findings (Anderson 1958; Noble and Breslau 1938).

Blanding's turtles, *Emydoidea blandingi*, frequently nest from 0.1 to over 1 km from either their "home marsh" or other surface water (Congdon et al. 1983; Linck et al. 1989). We sought a method which would allow us to monitor the progress of hatchling Blanding's turtles away from protected, natural nests. Because we wanted to minimize disturbance to hatchlings, so as not to alter natural behavior, we utilized fluorescent powder demonstrated by ultraviolet light in darkness. Studies of a generally similar design have been successfully executed with adult tortoises (Blankenship et al. 1990), lizards (Fellers and Drost 1989) and rodents (Lemen and Freeman 1985).

Natural nests of *E. blandingi* in Massachusetts were protected shortly after completion with cylindrical vinyl-coated wire mesh cages (1 x 2.5 cm mesh). A circular trench was dug around each nest and a cage was placed in the trench (depth 30-45 cm) to discourage burrowing by predators. The trench was backfilled to ground level. Occasional diurnal soil temperatures taken 0.1 and 1 m outside the nest cages during incubation indicated soil temperatures inside and outside were identical.

Nests were checked for emergence at less than three day intervals beginning 15 August, 1990. Hatchlings of *E. blandingi* will burrow into the soil in the nest cage after emergence, presumably to avoid desiccation; often several individuals will be found dug in together (B. Butler, unpub. data). Hatchlings of other turtle species may not re-burrow after emergence (D. M. Carroll, pers. comm.), a fact that should be considered when using this technique. After the first *E. blandingi* emerged, we shaded remaining cages by placing weighted vegetation to one side of the cage roof.

All nests were monitored for hatchling emergence several times daily from 24 August through 16 September, 1990. Following emergence, hatchlings were measured (CL, PL) to the closest 0.1 mm with vernier calipers. Observation and tracking of hatchlings was performed continuously from 25 August through 18 September, 1990 and daily thereafter on a single, stationary hatchling until it was lost on 6 October following a 1 cm rainfall.

To avoid possible trauma due to marginal scute notching and its effect on behavior, we put indelible black ink marks on the plastron of each hatchling to identify its nest number utilizing plastral scutes in an additive numbering scheme. In this way, animals from different nests treated with the same color fluorescent pigment (see below) were distinguishable.

Hatchlings which had emerged and were active in nest cages from 0600-0900 h EDST were used experimentally for fluorescent-powder tracking. It was decided to do morning releases because hatchlings in nest cages were most active at this time of day and preliminary results indicated that they rapidly sought cover if released later in the day as ground temperatures increased. Emerged hatchlings which were inactive or reburied in the cages were removed, dusted, and released on subsequent mornings when active, or measured and released without being used experimentally. After being marked and measured, each animal was placed briefly in a canister of fluorescent powder (Radiant Color, Richmond, California). Colors used were the same as Fellers and Drost (1989). We attempted to avoid getting powder in the facial mucosa; the animals also tended to avoid this on their own. Pigment was rubbed lightly into the front leg scale beds as well as on the plastron and in leg pockets. Dusted animals were then placed (random orientation) next to the nest cage as the investigator moved away.

The typical initial hatchling response to the "dusting" treatment was to take several rapid steps after being placed down. This was followed by a variable period during which the animal appeared to look about prior to moving on. The dusting procedure did not seem to cause the animals distress and was presumed equivalent in terms of disruption of normal behavior to a hatchling stumbling over an obstacle in its path. Undusted, unnotched hatchlings released simultaneously with experimental animals did not show differential short-term behavior.

Hatchlings were allowed to travel undisturbed from release until after nightfall. Nocturnal tracking (after 2000 h) was then done with a long-wave (366 nm) ultra-violet lamp (model ML49, UVP, Inc., San Gabriel, California) and safety/UV-enhancing glasses (Fisher Scientific Co.). Experimental hatchlings were not exposed to white light at night, and we attempted to minimize their exposure to UV at close range. Depending on the number of extant hatchlings and their realized distance, tracking was continued as late as 0100 h. With this method observations were up to twelve hours out of phase with the actual movements of the hatchlings, which were essentially diurnal in this study.

Initial fluorescent tracking began at the nest (point of release) for "first day" animals, and subsequent trailing began at the point where the animal spent the previous night (generally an excavated or opportune form in the substrate). Following an individual trail only required minutes for short, readily discernible runs but took up to 2 h for extremely long or weak powder trails. Because of the variable time required to follow individual trails, and the variability in fluorescent powder trail quality, more animals were dusted and released than could possibly be followed by a single investigator using one UV lamp. Powder trails of poor quality were often abandoned in favor of those that could be followed with a reasonable effort or those in which considerable time had already been invested. With this strategy we were able to concentrate on animals which followed a variety of courses or behaviors and were able to minimize delays in the release of hatchlings from nest cages once emergence began.

Fluorescent plastic stake wire flags (Forestry Suppliers, Inc., Jackson, Mississippi) were placed in the ground at the beginning and end of a run as well as at points of significant behavior or course changes. Each flag was inscribed with date, time, nest number, release date, and fluorescent pigment color. Observer commentary was recorded on a portable cassette recorder. Distances and compass headings of hatchling movement were taken each morning from the flag positions. Compass headings were recorded in 22.5 degree increments (e.g., N, NNE, NE) and net straight line distance was measured using a 30 m tape.

Turtles which had been tracked to forms the previous evening were monitored periodically between 0600-1200 h so as to determine time and temperature of the ground when movement was resumed. Animals on the move whose trail was becoming difficult to read were given a second, superficial dusting with the same

color powder. In cases where the animal had not left its form by mid-morning a small amount of powder was sometimes placed at the entrance hole so the animal would walk through it on departure. Neither of these procedures seemed to distress hatchlings significantly but did make reading subsequent trails considerably easier. No turtles were disturbed while inactive in forms. Animals were tracked and monitored in this way over several days until they reached a wetland or became lost to the observer. Water temperature and habitat characteristics were noted at sites where animals entered water.

As noted by Fellers and Drost (1989), the blue pigment was the least easily demonstrated in trace quantities both due to its lower fluorescence and because many macro and microfungi and bacteria emitted similar color under UV. For this reason, blue was primarily used on initial releases to increase the number of animals we were able to track from one nest. Blue hatchlings were redusted with a different color while active if they became subject to prolonged tracking. The initial blue pigment was always readily detected on recolored turtles even after 10 days in the field, so recolored animals were not confused with other individuals.

Hatchling turtles undoubtedly retain less colored powder than do scaled night lizards (Fellers and Drost 1989), furred rodents (Lemen and Freeman 1985), or tortoises towing a reservoir of powder (Blankenship et al. 1990). Trail quality for our hatchlings was best on such substrates as loose sand or soil, mosses and lichens, leaf litter and grasses. Pigment deposition was reduced on hard-packed surfaces. Weak trails were particularly difficult to follow if the animal had traversed beds of brambles (*Rubus* sp.) or huckleberry (*Gaylussacia* sp.) because their low, dense foliage tended to reflect the UV light significantly, thereby interfering with readability of the powder trail. Full or near-full moon conditions also impeded trail reading in open moon-lit areas, and heavy morning dew also reduced trail quality. By using a large sample of animals without constraints as to their retrievability, we were able to offset their reduced pigment load capacity and their pigment loss resulting from minor fossorial activity. We found no evidence of predation on hatchlings due to their enhanced conspicuousness.

We considered alternative tracking methods including the use of radioisotope tracers (Bennett et al. 1970; Ward et al. 1976) and light-weight, short duration radio transmitters which are currently available. We feel that this economical but labor intensive method is more practical because radioisotope tracking requires special licensing, training, and equipment, and may be hazardous to subjects or investigators. Micro-radiotelemetry equipment is expensive and difficult to attach to hatchlings with certainty of not affecting natural behavior. Our method can be adapted to hatchlings of a number of turtle species and could be particularly useful with species which like *E. blandingi* may have nest site selection strategies (in terms of hatchling survival) which at our present level of understanding are unclear.

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Two New Simple Methods For Catching Small Fast Lizards

Methods commonly used to catch lizards include pit-fall traps, noose, and rubber bands (Simmons 1987). These methods are only partially successful with thin, small, fast-moving lizards such as *Cnemidophorus sexlineatus* and *C. hyperythrus* because these lizards seldom remain still and if they are noosed they can usually escape by slipping out of the noose. In recent studies on the endangered status of *C. hyperythrus*, a southern California coastal sage scrub dweller, it was essential to capture these lizards with efficiency (Brattstrom 1992; Rowlands 1992).

The first technique is similar to one first reported by Myers (1956) for use in collecting large fruit-eating teiids. A meal worm, or other insect, is tied on to monofilament line (4-pound test) by threading the monofilament end to end through the mealworm (Fig. 1). The loop can then be tied to a lizard pole (car or other radio antenna) and dangled in front of a lizard. When the lizard bites the mealworm the loop is flipped into the air. Usually the lizard stays on the mealworm; occasionally it lets go and it is necessary to catch the lizard in the air as it falls. Note that the lizard is not noosed, but rather it bites and holds on to the mealworm. With practice in catching hundreds of lizards we now have a 93% efficiency with *Cnemidophorus hyperythrus*. The technique works well with *C. tigris*, *Sceloporus*, and *Uta*. The dangling worm is also useful in luring crevice-dwelling lizards, such as *Sceloporus orcutti*, out of a crevice where they can then be caught by noosing. The meal worm

can be used over and over again. It is necessary to replace the meal worm only about every half hour.

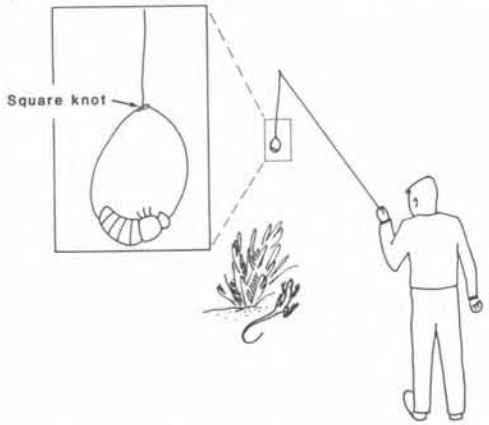


FIG. 1. Drawing showing method of catching lizards by tying an insect onto a loop. When a lizard bites the insect, the pole is jerked upward.

The second technique is to trap lizards in tubes placed near bushes. Lizards are purposefully chased into and then out of a bush. In the meantime, plastic or cardboard tubes, taped shut at one end, are placed on the opposite side of the bush (Fig. 2). Lizards leaving the bush apparently see a dark, hole-like place in which to escape and run into the tube where they can be removed easily. We use tubes of all lengths, diameters, and materials. PVC plastic pipe covered at one end with duct tape is especially useful. The method is most effective in open, flat areas and least effective in rocky areas where a lizard has more choices of escape routes.

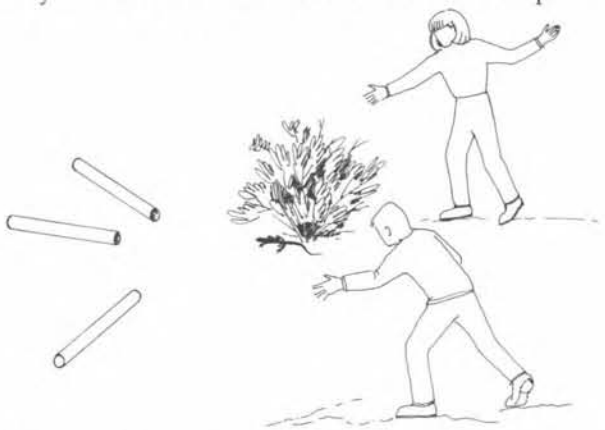


FIG. 2. Drawing showing method of catching lizards by chasing them into tubes placed behind a bush. Tubes have one end covered with tape.

Acknowledgments.—Drawings were done by Candace Irelan and the methods were developed under a California Department of Fish and Game contract (FG8597).

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Differential Retention Of Metal And Plastic Tags On The Black Sea Turtle (*Chelonia agassizi*)

Sea turtles are commonly marked with plastic or, more frequently, metal flipper tags. Tag loss is an unresolved problem that renders tagging efforts ineffectual and hinders the collection of data relating to various aspects of sea turtle natural history (Balazs 1982; Green 1979; Mrosovsky 1983). Tag retention may be affected by one or a combination of the following factors: the species of sea turtle, the type of tag used, the method of application, the flipper selected for application, the place of application on the flipper, and even the oceanic region frequented by the tagged individuals (see Mrosovsky 1983, for review).

In 1978, the Mexican Instituto Nacional de la Pesca (INP) in coordination with K. Cliffton of the Arizona-Sonora Desert Museum began the first systematic black turtle (*Chelonia agassizi*) conservation and research project at Colola and Maruata Bay in Michoacan, México. (Some consider the black turtle to be a subspecies of *Chelonia mydas*. We consider the black turtle to be a separate species and refer to it as *Chelonia agassizi* following Bocourt 1868). In 1982 the Universidad de Michoacan initiated a tagging program to assess nesting periodicity, fecundity, philopatry, and long distance movements of black turtles nesting on Colola beach.

We compared retention rates of plastic and metal tags applied to different flippers, in order to assess the effect of type of tag and flipper selected for application on tag retention in the black turtle. One hundred thirty-one nesting females were double tagged (one plastic and one metal tag) in 1988 (46) and 1989 (85) at Colola beach. Metal and plastic tags were assigned to the flippers randomly, as follows: left foreflipper: 36 metal, 36 plastic; right foreflipper: 33 metal, 29 plastic; left hindflipper: 27 metal, 46 plastic; right hindflipper: 35 metal, 20 plastic. Tags were of two types: monel size-l9 tags (National Band and Tag Co., USA); and plastic (41 mm x 35 mm, Allflex Tag Co., USA). On the foreflippers tags were placed on the trailing edge of the second or third proximal scute. On the hindflippers tags were placed on the trailing edge of the flipper proximal section. Both plastic and metal tags were clinched using standard tagging pliers, and flippers were not prepunched before tagging. Both types of tags had an identification number and a return address engraved on them.

Gravid black turtles deposit as many as seven clutches per season at about 12-14 day intervals (Alvarado and Figueroa 1989). Therefore, tag status was monitored continually throughout the season. During the 1988 and 1989 seasons (September-January), the 4.8 km nesting beach at Colola was patrolled on foot nightly

(2000-0530 h). In most cases turtles were tagged immediately after nesting.

The differences between the expected and observed tag loss for plastic and metal tags, and for each type of tag on the four flippers were tested using a G test (Sokal and Rohlf 1979). For all mean values a ± SE was estimated.

Of the 131 turtle double-tagged in 1988 and 1989, 113 (86.3%) were sighted at least once during each season. The average number of resightings per turtle was 3.6 ± 1.7 (range 1- 8). The average number of days between initial tagging and the first resighting was 28 ± 2.6 (range 0-83). The total number of tags lost from resighted individuals was 33 (29.2%) for metal and 6 (5.3%) for plastic (Table 1). The difference in performance between plastic and metal tags was significant (Gadj. = 18.92, 1 df, P<0.001). The difference in loss rate among the four flippers (Table l) was not significant for either the metal (G = 6.05, 3 df, P>0.05), or plastic tags (G = 4.49, 3 df, P>0.05).

Sea turtles lose monel metal flipper tags for several reasons, including tissue necrosis, abrasion, tearing, and faulty application (Balazs 1982). In the present study, the primary cause of loss of metal tags appeared to be tissue swelling around the tag, which may have resulted in the unclinching of the tags. Tissue necrosis and enlargement of the placement hole, common in the leatherback (*Dermochelys coriacea*) (Eckert and Eckert 1989), was seldom encountered in the black turtle. The high loss rate of metal tags within a season suggests the possibility of improper tag application as another cause of metal tag shedding. Because the thick, muscular foreflippers were not prepunched, it is possible that some of the metal tags did not lock properly. However, fleshy areas too thick to accommodate the locking mechanism of the tag were avoided. Furthermore, metal tags were shed independently of the flipper selected for placement.

TABLE 1. Metal and plastic tag loss rate. The difference in loss rate between plastic and metal tags was significant. The difference in loss rate among the four flippers was not significant for either the metal or plastic tags.

Location of Tag Application	Number of Tags Applied		Number of Tags Lost	
	Metal	Plastic	Metal	Plastic
Left Foreflipper	36	36	9	1
Right Foreflipper	33	29	12	2
Left Hindflipper	27	46	3	3
Right Hindflipper	35	20	9	0
Totals:	131	131	33	6

Double tagging of black turtles in the Galapagos Islands has also shown that plastic tags had better retention than metal tags. Green (1979) reports a 42% loss of monel tags and a 7% loss of plastic tags over a period of four years for 116 recaptured turtles.

The main problem with the use of plastic tags on the black turtle in this study was the obliteration of the numbers and legends embossed onto the tags due to abrasion and/or algal growth. Green (1979) reports a similar problem with the plastic tags used in the Galapagos Islands. Legibility of the numbers and address on the plastic tags used in Michoacan has been improved in recent years with deeper etching of numbers and letters, readable even when the color of the writing has faded or abraded away.

The results of our double-tagging study indicate that plastic tags are retained better than monel metal tags by the black turtles in the east Pacific, independent of the flipper selected for tag application. The possible effects of prepunching of the flipper before tag application are currently being evaluated.

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HERPETOLOGICAL HUSBANDRY

Courtship Behavior And Oviposition Of Captive *Acanthochelys pallidipectoris* Freiberg

Acanthochelys pallidipectoris (formerly *Platemys pallidipectoris*; usage following McBee et al. 1985 and Iverson 1992) is a pond turtle from the Chaco region of northern Argentina, Paraguay, and Bolivia (Ernst 1983; Ernst and Barbour 1989; Iverson 1992). The reproductive biology of the species is poorly known and courtship behavior is undescribed. Freiberg (1945), in describing this species, reported that it laid eggs on mud and sand banks. Richard (1991) described deposition of eggs by a wild-caught female. Here I describe the courtship and oviposition of a wild caught adult pair (male 133 mm straight-line CL, 325 g; female 137 mm straight-line CL, 402 g) of unknown origin, obtained via the pet trade in June, 1987.

The turtles were housed in a 1.2 m by 1.2 m fiberglass bin. Three quarters of the surface area was water and the other quarter a nesting area of mixed sand and topsoil. Turtles were fed live fish, beef, poultry, newborn mice, tadpoles (*Hyla chrysoscelis*), and mealworm larvae. Beef, chicken hearts, and mice were most readily eaten; other foods were accepted less often. Floating aquatic plants were provided, but were used as shelter rather than food.

Courtship behavior was first observed in early September 1990, and courtship activity continued sporadically until late November of that year. Male courtship behavior consisted of approaching the female from the rear with his head and neck extended across the length of the female's carapace. He then rubbed his head and neck back and forth on her carapace, while trying to maneuver the female into a position where he could more easily mount. Once mounted, he grasped the rim of the female's carapace with all four feet and began prodding her head and neck with his face, until the female folded them beneath her carapace. This made the female's vent more accessible. The average time of individual courtship behavior was thirty minutes, but ranged from fifteen to ninety minutes. Courtship was stimulated by a change of water in the enclosure.

Oviposition first occurred on 18 November 1990, when one egg was laid in the water. Two weeks later a second egg was also deposited in the water, and on 9 March 1991, a third egg was found in the water. This last egg was possibly retained by the female from an earlier clutch (Table 1). The eggs were incubated on damp vermiculite at 30°C. The incubator consisted of a Styrofoam box (30 x 30 x 20 cm). Temperature was maintained by an aquarium heater submersed in a container of water. All eggs were nearly spherical, chalky white, and brittle-shelled with small white crystal points dispersed over the surface. Within a few weeks, the eggs turned yellow and emitted a strong sulfurous smell, indicating spoilage, and no signs of embryonic development were visible by candling. The eggs were opened and shell thickness was measured (0.4 mm).

Courtship was again observed in the fall of 1991. The female was routinely palpated for the presence of hard shelled eggs. On 16 December 1991, 10 U.S.P. units of oxytocin were injected to induce oviposition; two eggs were laid 3.5 h later. After 83 days of incubation, small cracks appeared on the egg shells. The eggs were then opened, but no embryonic development had occurred. Presumably the eggs were infertile.

TABLE 1. Egg morphometrics of *Acanthochelys pallidipectoris*.

Oviposition Date	Length (mm)	Width (mm)	Weight (g)
18 Nov 1990	26	23	8.2
2 Dec 1990	25	22	8.1
9 Mar 1991	26	22	8.5
6 Dec 1991	28	23	9.2
6 Dec 1991	28	24	9.4

Iverson (pers. comm.) reports that "four eggs (averaging 24.5 X 22.2 mm) were laid in December 1991 by one or more of six captive females that averaged 144 mm CL and 369.2 g." Richard (1991) reported that on 26 September 1990 an adult female (159 mm CL and 400 g) laid five eggs (averaging 24.8 X 23.7 mm and 8.8 g).

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An External Support Device For Turtle Skull Repair

Many turtles are injured by roadside and recreational accidents (Bury 1978). Shell injuries have been repaired with various materials (Frye 1981). Leg injuries have also been treated successfully (Frye 1981). Skull injuries largely have been neglected because of the lack of a method of stabilizing the skull during recovery. The construction of a simple, external, supportive mask will often allow full recovery. Four turtles with similar head injuries have successfully recuperated under my care using this method.

The exemplary case involved a female *Terrapene carolina bauri* that was hit by a car on 12 July 1990. Injuries included minor abrasions to the plastron and carapace, and a broken plastral hinge. The mandible and maxillae were each fractured in three places. Other fractures occurred in the hyoid apparatus, premax-

illa, jugal, and quadratojugal. The limbs were not harmed. The turtle was examined immediately after the accident. Breathing was accomplished through the mouth, and coagulated blood appeared at the nares posterior to the angle of the mouth. The turtle could walk, although she favored the right foreleg. Dexamethasone $NaP0_3$ at the dosage of 0.125 mg/kg (all dosages found and modified from Jacobson et al. 1983, except for triamcinolone acetonide, succinyl choline chloride, isofluorane, and oxytocin) was administered intramuscularly in the rear leg to reduce swelling and discomfort, and surgery was scheduled for the next day.

The turtle was anesthetized with 20 mg/kg ketamine HCl and 3 mg/kg diazepam intramuscularly, and 0.5-1.0% isofluorane gas administered via a small mask crafted from an empty 10 ml plastic syringe cover. Intubation was not possible because of the injuries, so breathing was monitored visually, and the mouth was kept clean and dry with sterile cotton swabs. The skull bones were manipulated into an anatomically correct shape.

The upper part of the mask that crosses the skull was constructed from a single piece of 21 gauge stainless steel wire, and the heavier wire yoke encircling the lower part of the skull was made from 18 gauge wire (Fig. 1). The joints between the wires were twisted tightly, and the mask was anchored directly to the skin with cyanoacrylate. Other wires can be added to support specific areas depending on the damage. Radiographs taken before the turtle attained full consciousness revealed a fracture between the right scapula and postscapula which resulted in a right forward limp. Three eggs (ca. 3.6, 3.8, and 4.1 cm long) were clustered just anterior to the pelvis. The skull appeared stable except for spaces between the premaxillae and maxillae that may have been caused by swelling.

The manipulations produced blood loss and symptoms of shock. A lactated ringers solution was administered intraperitoneally to improve fluid volume and electrolyte balance. Dexamethasone $NaP0_3$ 0.125 mg/kg and triamcinolone acetonide 0.07 mg/kg (dosage modified from Kirk and Bistner 1981) were injected intramuscularly to reduce swelling and discomfort. The effects of triamcinolone acetonide last several times longer than that of dexamethasone. The turtle was observed often for infections during convalescence because anti-inflammatory drugs are known to compromise the immune system.

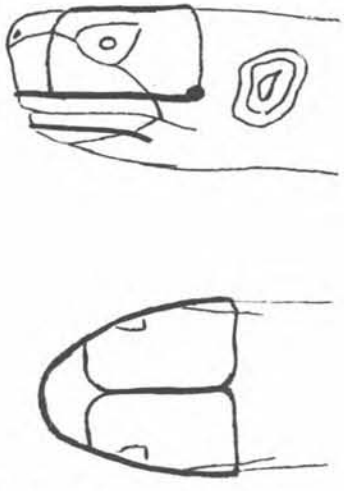


FIG. 1. Lateral and dorsal views of the wire mask used to support the turtle skull during convalescence. An optional brace on the lower jaw is also shown.

Gentamicin sulfate at a dosage of 5.0 mg/kg injected intramuscularly on the first day after surgery was continued at 2.5 mg/kg every 72 h for 10 days, and ampicillin at a dosage of 3.0 mg/kg was given orally once daily for 14 days. The turtle was tube-fed a mixture of three parts strained fruits and vegetables and one part strained chicken. A maximum of 10 g were taken per feeding. The eggs were aborted with oxytocin at a dosage of 5.0 units intramuscularly one month after surgery (dosage modified from Kirk and Bistner 1981). They were considerably smaller than recorded in the radiographs, and an attempt to incubate the eggs was not successful.

The turtle was kept in a terrarium at 30°C with a 12:12 LD cycle throughout the winter. The mask fell off after six months, and the skull appeared reasonably stable. The turtle ate on her own for the first time nine months after the accident and gained 112 g in the next 63 days. She was released 11 months after the accident.

Time and energy are the main concerns for successful completion of such a project. Presurgical radiographs would have increased the finesse of the operation. Anesthesia would have been more effective if succinylcholine chloride at a dosage of 0.25-0.5 mg/kg intramuscularly had been used in conjunction with ketamine HCl, but the dosage must be monitored carefully to avoid respiratory distress (Page and Mautino 1990). Cyanoacrylate should be used in a well ventilated area, and intubation should be used when possible to isolate the fumes from the patient.

Products Mentioned.—Ampicillin: Beecham Laboratories, P.O. Box 7929, Philadelphia, Pennsylvania 19101; Cyanoacrylate: Loctite Corp., Cleveland, Ohio 44128; Dexamethasone $NaP0_3$: Anthony Products Co., Arcadia, California 91006; Diazepam: Steris Laboratories, Phoenix, Arizona 85043; Gentamicin sulfate: Schering Corp., Galloping Hill Rd., Kenilworth, New Jersey 07033; Isofluorane: Anaquest Inc., 110 Allen Rd. Box 804, Liberty Corner, New Jersey 07938; Ketamine hydrochloride: Fort Dodge Laboratories Inc., Fort Dodge, Iowa 50501; Stainless Steel Wire: National Keystone Products, 616 Hollywood Ave., Cherry Hill, New Jersey 08002; Succinylcholine Chloride: Burroughs Wellcome, 3030 Cornwallis Rd., Research Triangle Park, North Carolina. 27709; Triamcinolone Acetonide: E.R. Squibb & Sons Inc., P.O. Box 5250, Princeton, New Jersey 08543.

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Survival, Weight Changes, And Shedding Frequencies Of Captive Scarlet Snakes, *Cemophora coccinea*, Maintained On An Artificial Liquid Diet

The difficulties of keeping many species of small snakes in captivity are well known. One of the problems most frequently encountered involves inducing such snakes to feed voluntarily on a diet which is both readily obtainable and capable of maintaining the snakes in good health over extended periods of time.

Although found throughout much of the southeastern United States and abundant in some parts of its range, the scarlet snake (*Cemophora coccinea*) has been relatively little studied, as a result of its secretive and semifossorial habits (Conant and Collins 1991; Nelson and Gibbons 1972; Palmer and Tregembo 1970; Williams and Wilson 1967). This species has seldom been kept or studied under captive conditions for extended periods of time, due primarily to its refusal to feed voluntarily on any of a number of types of food (Snyder 1945). It has been suggested that reptile eggs may form an important part of the diet of the scarlet snake (Dickson 1948; Minton and Bechtel 1958; Neill 1951; Williams and Wilson 1967). Palmer and Tregembo (1970) described the presence of what appeared to be solidified egg yolk in the stomachs of several preserved specimens, and described the feeding behavior of several captive scarlet snakes which were successfully offered the eggs of other snakes.

On the basis of these reports, and because of the difficulty of obtaining a ready supply of small reptile eggs to serve as food, we attempted to determine whether captive scarlet snakes could be maintained in good health on a liquid diet formulated from the yolk of chicken eggs. We report here the maintenance of several scarlet snakes on such a diet for periods ranging up to nearly 1.5 years in captivity. Data on body weight and shedding frequency are also provided for these individuals as a further indication of the ability of this feeding program to maintain these captives in good health, as well as to provide some additional basic biological information for this relatively little-studied species.

Scarlet snakes were collected on the United States Department of Energy's Savannah River Plant (SRP) near Aiken, South Carolina. Snakes were collected either crossing highways in the evening or in drift fence pitfall traps (Nelson and Gibbons 1972). Since snakes which died shortly after capture may have been injured prior to collection, data were excluded from any snake which did not survive at least 6 weeks after capture.

Twelve snakes were maintained under approximate temperature conditions of 18-20°C in a laboratory where they were exposed through a nearby window to the natural photoperiod for west-central South Carolina, with the exception of occasional instances when laboratory work required that lights be turned on in the room for several hours at night.

Snakes were housed in 3.8 liter glass jars which were filled to a depth of approximately 6 cm with dry pine or hardwood shavings. No drinking water was provided in the jars in which the snakes were housed. Three days per week (Monday, Wednesday, and Friday), snakes were removed and placed in smaller glass jars (approximately 0.5 liter) into which a liquid food mixture was poured to a depth of approximately 3-5 cm. The feeding mixture was prepared fresh each day by thoroughly mixing approximately equal amounts of separated chicken egg yolks and tap water which was slightly warm to the touch. A soluble commercial poultry vitamin powder (Vita-Lizer, Vineland Laboratories, Vineland, New Jersey) was stirred into the mixture at approximately 1-2 g per 500 ml.

Snakes were allowed to soak in the liquid food mixture for 1-2 hours. They were then rinsed with tap water and returned to their housing jars. Since snakes had no access to water other than when soaked in the liquid food mixture, all individuals drank the mixture readily soon after being placed in the feeding jars. It was imperative to handle the snakes gently after removing them from the feeding jars since rough handling at this time often caused them to regurgitate.

Body weights of each snake (± 0.1 g) were determined immediately prior to the first feeding of each week, and snout-vent lengths were measured (± 1 mm) at capture, by gently but firmly stretching the snake's body along a metric ruler. Snout-vent lengths and weights were also determined at the end of the period of captivity for five of the individuals. Statistical analyses were conducted using the Statistical Analysis System (SAS) procedures (Barr et al. 1976).

Of the 12 snakes, 2 escaped following failure to properly tighten the lids on their feeding jars, and 2 were released in good health at the end of the study. The remaining 8 snakes died after periods ranging from 66 to 536 days in captivity ($\bar{x}$ = 171 days). However, all but two of these snakes had increased in weight from the time of their capture, three more than doubling in body weight. Of the 5 individuals whose length and weight were recorded both at the time of capture and again at the end of the period of captivity, 4 showed increases in their weight/length ratios, during captivity, while one showed a very slight decrease (Fig. 1).

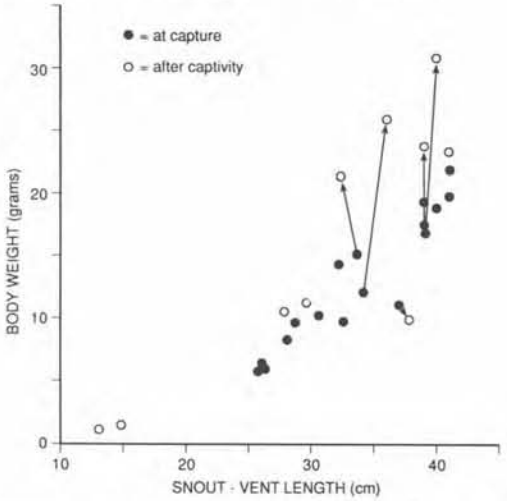


FIG. 1. Relationship between snout-vent lengths and body weights of wild-caught and captive scarlet snakes. Data for captives were based on final body weights and measurements taken after maintenance on an artificial liquid diet. Arrows connect points representing the same individual. This figure includes data for several wild-caught snakes in addition to the 12 snakes used in the present feeding study. No final length data were available for two captives that escaped unexpectedly and five of the captives were not measured at the time of capture.

Body weight changes of the captive snakes maintained on the liquid diet are summarized in Fig. 2. Only 2 of the 12 snakes studied lost weight on the liquid diet and 2 others gained less than 10% of their initial weights at capture. Of these 4 snakes, 3 were small juveniles (capture weight < 3.5 g), and all 4 snakes which showed low or no body weight gains did not live long in captivity (66-167 days). Of the 8 snakes that died in captivity, all but the 2 smallest juveniles showed initial weight gains, followed by subse-

quent weight losses, often immediately prior to death (Fig. 2). Regression analyses indicated that in the case of every snake but 2 (snakes #5 and #10, Fig. 2), there were highly significant ($P \leq 0.0003$) overall increases in body weight with increasing time in captivity. Coefficients of determination (r^2) ranged from 0.21 to 0.90. Low coefficients of determination were generally associated with snakes which first gained and then lost large amounts of weight immediately prior to their death. Overall weight gains ranged from 0.0015 to 0.12 g/day and averaged 0.042 g/day for the 10 snakes which showed significant regressions of body weight against time in captivity.

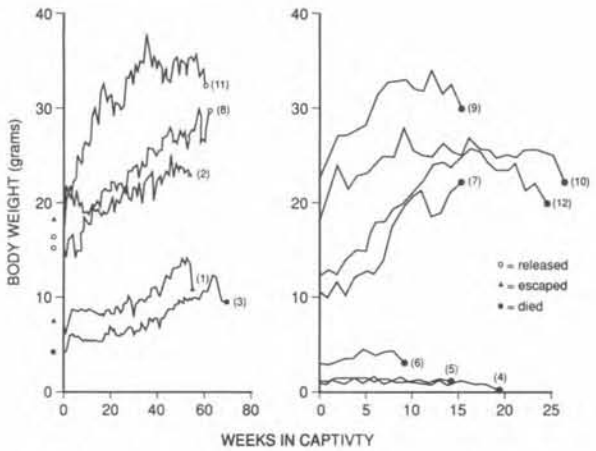


FIG. 2. Body weight changes of captive scarlet snakes maintained on an artificial liquid diet. Numbers in parentheses designate individual snakes as referred to in the text. Symbols to the left of the vertical axis are provided to aid in the identification of the origin of each individual's curve. Data are presented in two graphs in order to provide clearer representations of the weight changes of individual snakes.

The time intervals which elapsed between successive sheddings of the captive snakes are presented in Fig. 3. The frequency distribution of shedding intervals was skewed, with no tendency to show a bimodal distribution suggestive of either skipped or unobserved shedding events. Although the smaller snakes tended to show shorter intervals between sheddings (e.g., average intervals = 12 and 14 days respectively, for snakes #4 and 5 (Fig. 2), there were no significant relationships between either average snout-vent lengths or average body weights during a shedding interval and the duration of that interval. Thus, there was no significant tendency for larger and more slowly growing snakes to shed at different rates from those that were smaller and growing more rapidly ($F = 0.09$; $df = 1, 90$; $P = 0.77$, and $F = 0.49$; $df = 1, 90$; $P = 0.49$, for snout-vent length and body weight, respectively). An analysis of variance indicated that intervals between sheds were significantly shorter in winter months (Nov.-Feb.; $\bar{x} = 22.3 \pm 1.86$ (SE) days, $N = 37$) than in summer months (May-Aug.; $\bar{x} = 31.5 \pm 2.49$ (SE) days, $N = 25$) ($F = 8.70$; $df = 1, 60$; $P = 0.004$).

Except for the fact that the yolks of chicken eggs were used instead of reptile eggs to prepare the liquid diet, the feeding regime used in this study may not have been entirely "artificial." The published descriptions of feeding habits of this species (e.g., Palmer and Tregembo 1970) describe it as piercing eggs and consuming the yolk and contents in a manner similar to that employed by the snakes in drinking the contents of their soaking jars in our study. It is possible that a less dilute mixture of egg yolk and water or perhaps homogenized whole eggs including whites and yolks, might have proved even more satisfactory and might have reduced mortality even below that reported here.

The weight gains shown by the snakes in this study, 5 for periods of a year or longer (Fig. 2), clearly suggest that the liquid diet provided a generally adequate plane of nutrition and, under appropriate conditions, could provide a basis for the long-term captive husbandry of this species and perhaps other forms of small egg-eating snakes. Of key importance to our procedures however, was the provision that the snakes never be given access to drinking water except when soaking in the liquid diet. In earlier attempts to develop this technique, snakes which had access to drinking water at all times seemed agitated and seldom consumed much of the liquid diet when moved to the smaller soaking jars.

Several of the snakes in the present study whose body weights showed evidence of reaching asymptotes (snakes #2, 8, and 11; Fig. 2) had snout-vent lengths of 41.1, 33.9, and 40.2 cm, respectively. These exceeded the average of 30.2 cm reported by Nelson and Gibbons (1972) for a sample of 62 wild-caught scarlet snakes from the same area from which the snakes used in this study had been collected. The tendency of the body weights of such individuals to level-off during our study may thus have been due to their beginning to reach their genetic potential for adult body size.

Snider and Bowler (1992) present two records for captive longevity which exceed those periods of captive maintenance reported here for this species (2 years 10 months for *Cemophora coccinea coccinea*, and 4 years 10 months for *C. c. copei*). Information provided by the individuals maintaining the snakes which set these records indicated that in both cases the snakes involved were kept on feeding regimes similar to that described in the present study. In both instances, the snakes were maintained solely on a liquid diet of chicken eggs which one individual ingested voluntarily, and which in the other case had to be force-fed to the snake (J. Beane and D. C. McIntyre, pers. comm.).

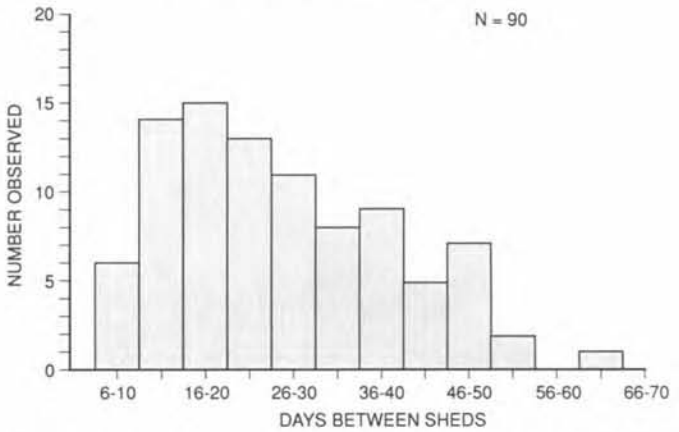


FIG. 3. Frequency distribution of elapsed times between successive shedding events of captive scarlet snakes maintained on an artificial liquid diet.

Our data suggest that the larger the snake, the more likely it would be to thrive on the artificial diet, suggesting in turn that some component of the diet may have been inadequate for the smaller individuals. It is also possible that being deprived of *ad libitum* drinking water, the higher surface-to-volume ratio of the smaller snakes may have resulted in excessive dehydration which would have required soak-feedings at a higher frequency than three times per week. Very small specimens of this species are probably not capable of piercing and drinking the contents of most reptile eggs and natural dietary habits of such smaller specimens may differ from those of the adults. Snakes #4, 5, and 6 (Fig. 2) were captured in August and September and were probably hatchlings of the year (snout-vent lengths all less than 15.0 cm; Woolcot 1959).

The tendency of 4 out of the 5 individuals, for which initial weight/length data were recorded at capture, to increase these ratios during captive maintenance (Fig. 1), was suggestive of these snakes' ability to thrive on the artificial liquid diet. The average weight gains shown by the scarlet snakes on this diet represented as much as 0.80% body weight gain/day (snake #7, over a 15-week period; Fig. 2) and averaged 0.27% body weight gain/day for the 10 snakes which showed significant regressions of body weight against time in captivity. This value is close to the 0.36% body weight gain/day calculated from data for captive-reared *Spalerosophis cliffordi* provided by Dmi'el (1967), and is much higher than gains of 0.002-0.093% body weight/day, calculated from data for wild *Lampropeltis triangulum* (Fitch and Fleet 1970). Both of these latter studies dealt with snakes of approximately the same body size as the *Cemophora* used in the present study.

The failure of shedding intervals to change with increasing body size of the scarlet snakes suggests that the process of ecdysis in this species may involve more than the replacement of the epidermis in order to accommodate an increasing body size. Otherwise, shedding intervals should have been lengthened as the snakes' growth slowed at the larger body sizes. However, data presented by Cliburn (1976) indicate that under some circumstances more rapidly growing snakes may have shorter shedding intervals. Munro (1952) indicated that there may be significant differences in the shedding intervals of different species of snakes even when maintained together under the same captive conditions. The shedding intervals reported here for the scarlet snakes tended to be shorter than most of those reported for other species. The tendency of our data to show a skewed distribution suggests that simple comparisons of average shedding intervals may not be meaningful.

In conclusion, the data presented here show that some individuals of *Cemophora coccinea* can be maintained in captivity for extended periods of time on an easily prepared artificial liquid diet. Since food intake could also be readily quantified by analyzing the nutrient and energy content of the liquid diet and weighing the snakes immediately before and after their feeding soaks, data on nutrition, energetics, and contaminant cycling could easily be collected using these procedures. Despite being considered one of the most difficult of small snakes to maintain in captivity, with further refinements of the procedures described here, *Cemophora coccinea* could possibly become a useful laboratory model for studies of many aspects of the general biology of the smaller snakes.

Acknowledgments.—The patient and careful assistance of Mrs. R. Anderson, P. E. Johns, and M. J. Vargo in caring for the snakes is gratefully acknowledged, as is the assistance of the late G. Knighton who, along with various members of the Savannah River Ecology Laboratory staff, helped to provide snakes for the study. The authors are grateful to J. Beane and D. C. McIntyre for sharing information on their husbandry techniques for this species. J. D. Congdon, W. E. Cooper, and L. J. Vitt provided critical readings of this manuscript, while helpful editorial assistance was provided by J. D. L. Mayer and drafting services by J. Coleman. This work was supported by a contract (DE-AC09-76SR00-819) between the Institute of Ecology of the University of Georgia and the U.S. Department of Energy. Portions of final data analyses and manuscript preparation were undertaken while the senior author was a visiting scientist at the Duke University Marine Laboratory.

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RECENT POPULATION CHANGES

Recent Population Changes provides an outlet for anecdotal or minimally documented information on local extinctions or regional population changes. These reports could be valuable historic indications that might enhance our understanding of very long term (>20 yrs) population trends and changes in distribution patterns.

Manuscripts should be submitted directly to the editor of this section: Ralph W. Axtell, Department of Biological Sciences, Southern Illinois University, Edwardsville, Illinois 62026, USA.

Possible Decline Of *Xenopus* Populations In Southern California

The African clawed frog (Pipidae: *Xenopus laevis*) has been a common southern California amphibian for more than twenty years. During this period, populations were recorded and studied from many drainages in Los Angeles, Orange, Riverside, and San

Diego counties (McCoid 1976, 1985; McCoid and Fritts 1980a, b, 1989, in press; St. Amant and Hoover 1969; St. Amant et al. 1973).

On 29 and 30 June 1992, we visited known sites of former *Xenopus* occurrence in San Diego and Riverside counties. These sites had harbored dense populations in the past, but some had not been surveyed since the late 1970's or the mid-1980's. Survey techniques consisted of visual observations and dip-netting. Drainages surveyed (San Diego Co.) were Sweetwater River, Tijuana River, Tecolote Canyon, and (Riverside Co.) Santa Margarita River (=Arroyo Seco Creek). Additionally, the stream below Lake Murray Reservoir (San Diego Co.) was surveyed in 1990.

Adequate aquatic habitat was present at most sites with the exception of one in the Sweetwater River drainage (Avocado and Valencia Streets) and Arroyo Seco Creek (Riverside Co.). The site in the Sweetwater drainage had been dry for a number of years and Arroyo Seco Creek (upstream from a known occurrence site) was dry. While the actual site in Riverside Co. was not surveyed, the creek above the site was flowing during *Xenopus* investigations in the late-1970's. This site was, however, trapped in 1989 and no frogs were collected (R. Tinsley, pers. comm.). No *Xenopus* were observed at any of these sites.

It is unlikely that *Xenopus* has been extirpated from many sites in southern California. Had successful reproduction occurred, however, dip-netting and visual observations should have yielded either larvae or recently metamorphosed frogs at the localities we surveyed (see McCoid and Fritts 1989 for a discussion of seasonal reproduction). More likely, frog populations have declined and there was little or no successful reproduction at the surveyed sites in 1992, despite above normal rainfall the previous winter. There are several 1992 anecdotal (but reliable) reports of adult *Xenopus* in both the Sweetwater drainage and Otay Mesa area (San Diego Co.).

Reasons for the apparent decline may be due to the extended drought in southern California from 1987 to 1991 which probably inhibited successful reproduction and recruitment. Additionally, at one site that maintained adequate habitat (Tijuana River), predaceous centrarchids (*Micropterus salmoides*) were observed. Predaceous fishes may control larval populations of *Xenopus* (McCoid and Fritts 1980a; Prinsloo et al. 1981).

Acknowledgements.—We thank R. Tinsley for sharing his observations on the Riverside Co. population. R. Hensley reviewed a version of the manuscript.

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LIFE HISTORY NOTES

Life History Notes is analogous to Geographic Distribution. Individual notes should, with few exceptions, concern only one species, and authors are requested to choose a keyword which best describes the nature of their note (e.g., Reproduction, Longevity, Morphology, etc.). Figures are permissible to illustrate any data, but should **replace** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles submitted to this section will be reviewed and edited prior to acceptance. Send two copies of manuscripts, double-spaced, directly to the section editor.

Standard format for this section is as follows: SCIENTIFIC NAME (in caps), COMMON NAME (lower case, in parentheses) as it appears in Collins (1990. *Standard Common and Current Scientific Names for North American Amphibians and Reptiles*, 3rd ed., Herp. Circ. 19:1-41), KEYWORD (in caps). DATA on the animal. Place of deposition or intended deposition of specimen(s), and catalog number(s). Then skip a line and close with SUBMITTED BY (Name(s) in caps, and address(es) in full). (NCN) should be used for common name where none is recognized. References may be briefly cited in text (refer to a recent issue for citation format).

ANURA

RANA CATESBEIANA (Bullfrog). **PREDATION**. Although Tester (1932. Univ. Toronto Stud. Ser. 36. Pub. Ontario Fish Res. Lab. 46:171-203) includes tadpoles in the normal diet of the smallmouth bass, *Micropterus dolomieu*, little is known of bass predation behavior on tadpoles.

On 25 May 1986 a concentrated aggregation of about 50 *Rana catesbeiana* tadpoles was noticed in ca. 30 mm of water at Ward Lake, Pontiac Z.E.C., Pontiac Co., Quebec, Canada. The site was located on the NW side of a sandy peninsula at the NE end of the lake. The air temperature was 33°C, and there was no cloud cover. To either side of this tadpole cluster were large rocks which formed natural barriers. Aquatic vegetation or other suitable cover was absent. One large tadpole darted away from the group towards deeper water. Upon reaching 300-350 mm of water, the tadpole was consumed by a *M. dolomieu*. Further investigation

revealed that two bass were in the immediate area. Both fish were about 300 mm total length. This behavior was observed for 15 minutes, and three more tadpoles were taken by the fish.

It is unknown whether or not the smallmouth bass played a role in forming the aggregation of tadpoles. No other aggregations were seen. Fourteen *R. catesbeiana* tadpoles were collected and deposited in the herpetology section of the Canadian Museum of Nature (NMC 28490).

Submitted by **RAYMOND A. SAUMURE**, 169 D'Auvergne Ave, Gatineau, Quebec, J8T 1J5, Canada.

RANA CLAMITANS (Green Frog). **ALBINISM**. On 6 June 1991, an albino *Rana clamitans* tadpole was collected (Canadian Museum of Nature NMC 33885) on the Kazabazua River, Pontiac County, Quebec. The tadpole was collected in an inlet of a meandering river. Aquatic vegetation consisted of a few scattered clumps of tape grass, *Vallisneria*. Substrate consisted of a sand and gravel mixture with heavy siltation. A normally pigmented specimen of similar developmental stage was also collected at the site. Green frogs are the most common frog along the river. During eight years of observations at this site, no other abnormally pigmented tadpoles have been observed. Only one other report of albinism in this species has been located (Dyrkacz 1981. SSAR Herp. Circ. 11, 31 pp.).

Submitted by **RAYM0ND A. SAUMURE**, 169 D'Auvergne Ave, Gatineau, Quebec, J8T 1J5, Canada.

TESTUDINES

APALONE FEROX (Florida Softshell). **REPRODUCTION**. Iverson (1985. Florida Sci. 48(1):41-44) reported the range for single clutch size in *Apalone ferox* as 9-24 eggs. In this note we report an unusually large single clutch size and unique nest site.

An *A. ferox* nest containing 32 eggs was discovered on 8 May 1991 in the apron of a recently abandoned *Gopherus polyphemus* burrow located at Boyd Hill Nature Park, St. Petersburg, Pinellas Co., Florida. The nearest body of water (0.186 ha) was located 103 m north. The intervening habitat is classified as scrubby flatwoods (Myers and Ewel 1990. Ecosystems of Florida. Univ. Central Florida Press, Orlando, 765 pp.). The center of the nest was located 71 cm from the burrow mouth. The egg chamber measured approximately 9 cm diam and 14 cm deep.

Sixteen of the eggs were collected, measured (to the nearest 0.5 mm using metric dial calipers), and incubated in sand collected from the nest site at outdoor ambient temperature. Egg diameter measurements on 8 May 1991 were 27.0–33.5 mm ($\bar{x}$ = 29.4 mm, N = 16)

Hatchlings began emerging on 26 July 1991. Twelve emerged at 79 days and one at 80 days post-discovery (81.25% hatch success rate). On 28 July 1991 hatchling carapace length (measured to the nearest 0.1 mm using metric dial calipers) was 36.2–44.3 mm ($\bar{x}$ = 41.2 mm, N = 13), carapace width at mid-point was 29.1–36.4 mm ($\bar{x}$ = 34.2 mm, N = 13), and mass (measured to the nearest 0.1 g using a triple beam balance) was 8.4–11.0 g ($\bar{x}$ = 9.7 g, N = 13).

The *G. polyphemus* burrow system, including its excavated sand mound, provides important habitat for a large number of vertebrates and invertebrates (Campbell and Christman 1982. *In* N. J. Scott, Jr. (ed.), Herpetological Communities. USFWS Wildl. Res. Rpt. 13, pp. 163-171; Jackson and Milstrey 1989. *In* J. Diemer et al. (eds.), Gopher Tortoise Relocation Symposium Proceedings. Florida Game and Freshwater Fish Commission Nongame Wildl. Prog. Tech. Rpt. No. 5, pp. 86-98). In addition, the excavated sand mound serves as an open site for seedling establishment (Laessle 1942. Univ. Florida Publ. Biol. Sci. Ser. 4(1):1-143).

Although *G. polyphemus* generally construct their nests in the excavated sand mound (Iverson 1980. Am. Midl. Nat. 103(2):353-359), this note documents another chelonian species utilizing this site for nesting and reiterates the importance of the burrow apron.

We thank P. A. Meylan for comments that greatly improved an early draft of this note and the staff and volunteers of Boyd Hill Nature Park for assistance during ongoing research.

Submitted by **GEORGE HEINRICH**, P.O. Box 61301, St. Petersburg, Florida 33784-1301, USA, and **DIANE E. RICHARDSON**, Boyd Hill Nature Park, 1101 Country Club Way South, St. Petersburg, Florida 33705, USA.

KINOSTERNON FLAVESCENS (Yellow Mud Turtle). **MULTIPLE NESTING**. Dividing a clutch of eggs into two or more nests is a strategy that has been documented for very few turtle species. The Malaysian river terrapin, *Batagur baska*, divides its clutch of eggs between two or more nests (Moll 1980. Malays. J. Sci. 6:23-62). Fitch and Plummer (1975. Isr. J. Zool. 24:28-42) attributed the discrepancy between small nest complements and large oviductal complements of eggs in smooth softshell turtles (*Apalone mutica*) to division of some clutches between two or more nests.

During a 1992 radiotelemetry study of a population of *K. flavescens* in Henry Co., Illinois, two females divided clutches of eggs between two nests. One female laid two eggs in a nest on 21 June and two eggs in another 3 m away on 22 June. A second female laid 3–4 eggs in one nest on 25 June and about 2 eggs in another nest 2 m away on 26 June. Both nests were destroyed by foxes soon after deposition. Johnson (1987. The Amphibians and Reptiles of Missouri. Conservation Commission of the State of Missouri, Jefferson City, 368 pp.) reported that clutch sizes of *K. flavescens* ranged from 2–6 eggs. This estimate may be low if clutch division is a common behavior of this species.

Predation is a common source of nest mortality for turtles. Multiple nesting is a strategy which may increase nest survivorship by spreading the risk of total clutch failure to predation.

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LEPIDOCHELYS KEMPII (Kemp's Ridley Sea Turtle) and ***CARETTA CARETTA*** (Loggerhead Sea Turtle). **DIET**. Juvenile Kemp's ridley (*Lepidochelys kempii*) and loggerhead (*Caretta caretta*) sea turtles seasonally utilize Long Island Sound and the estuarine embayments of eastern Long Island, New York as feeding grounds (Burke et al. 1991. Copeia 1991:1136-1138; Morreale et al. 1992. J. Herpetol. 26:301-308). Piscivory is not commonly reported for sea turtles. Additionally, we have located only one documented case of a seahorse consumed by a sea turtle. A loggerhead stranded in Nova Scotia had a single seahorse (*Hippocampus hudsonius* = *H. erectus*) among numerous food items contained within the gut (Bleakney 1967. Can. Field Nat. 81:269-272). Since 1985 we have examined the dietary components of many sea turtles from Long Island. Here we report three Long Island turtles, two Kemp's ridleys and one loggerhead, that consumed seahorses. Seahorses in all samples represented *H. erectus*. The intestinal tract of the

Kemp's ridley sampled in 1985 contained mostly seahorses (70% by volume, Table 1). The 1990 Kemp's ridley sample and the loggerhead sample contained a smaller proportion of seahorses (20% and 11% by volume, respectively). Notably, the 1990 Kemp's ridley and the loggerhead samples also contained small amounts of floatable plastics.

Hippocampus erectus is the most common seahorse in Long Island waters and is associated with local eel grass (*Zostera marina*) communities. The presence of eel grass and benthic invertebrates in the samples suggest that the three turtles were feeding in eel grass beds. Most seahorses from the 1985 sample had transverse bite marks across their abdomens. These marks, and the minor amount of eel grass in the sample, suggest that the 1985 Kemp's ridley did not incidentally ingest the seahorses.

TABLE 1. Intestinal contents of three sea turtles from Long Island, New York. SCL indicates straight-line carapace length in cm. The number of sea horses consumed is shown in parentheses.

Species	Capture Date	SCL	Diet Item
L. kempii	1 Aug 1985	23.5	*Hippocampus erectus* (20) Small hydrozoans Eel grass (*Zostera marina*)
L. kempii	4 Oct 1990	25.7	*Hippocampus erectus* (3) Small hydrozoans Crab parts (*Cancer irroratus*) Eel grass (*Zostera marina*) Small clear plastic strip
C. caretta	21 Aug 1989	53.3	*Hippocampus erectus* (18) Algae (*Fucus* sp.) Crab parts (*Cancer irroratus*) Small hydrozoans Small mussels (*Mytilus* sp.) Eel grass (*Zostera marina*) Plastics: clear sheet, nylon cord, drinking straw, and multifilament line

Unlike many other fish, seahorses are incapable of rapidly fleeing from predators and depend mainly on crypsis to escape predation (Blake 1980. Can. J. Zool. 58:2116-2119). Once detected, seahorses may be easy for turtles to capture. Young sea turtles may opportunistically exploit seahorses when encountered. Both Kemp's ridleys and loggerheads are known to consume a variety of prey. Observations of seahorses in the diet further emphasizes the degree to which loggerheads and Kemp's ridleys are polyphagous.

We thank Tracy Jones of the University of Georgia Museum of Natural History and Karsten Hartel of the Museum of Comparative Zoology at Harvard University for identifying the seahorses. We acknowledge the assistance of P. Logan, S. Sadove, H. Berna, and K. Roe. Funding was provided by the New York State Department of Environmental Conservation's Return a Gift to Wildlife Program. Manuscript preparation was aided by contract DE-AC09-76SR00819 between the U. S. Department of Energy and the University of Georgia's Savannah River Ecology Laboratory.

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RHINOCLEMMYS AREOLATA (Furrowed Wood Turtle). DIET. Specific information on the diet or foraging behavior of *Rhinoclemmys areolata* is not available. Congeners are herbivorous, consuming ferns, shrubs, various seedlings, and occasionally fruit (Ernst and Barbour. 1989. Turtles of the World. Smithsonian Institution Press, Washington, D. C., 313 pp.). I examined the feces of two *R. areolata* collected during the summer of 1992 in order to determine diet. The turtles were collected from a 1000 ha intensively grazed cattle pasture on Gold Button Ranch, Orange Walk District, Belize. The pasture was reverting to an early second-growth forest. Pasture vegetation included various grasses (Poaceae), *Cercropia* spp., and *Acacia* spp.

On 23 June 1992, an adult female *R. areolata* (carapace length = 17.7 cm, weight = 800 g.) was found with head submerged, foraging in a rain-filled depression. It appeared to be excavating flooded leaf litter. The following day the turtle was placed in cool (ca. 25°C) tap water to stimulate defecation. Fecal material contained a large amount of grass, small stones, chitinous remains of unidentified insects, and a large number of eggshell fragments. These fragments may have been from neotropical slider (*Trachemys scripta venusta*) eggs. Sliders were abundant in a nearby (ca. 100 m) man-made lake. More than 75 slider nests along the lake shore had been destroyed by raccoons (*Procyon lotor*). It is not known if the *R. areolata* consumed the slider eggs after excavating the nests or by feeding on eggs from previously opened nests.

On 20 July 1992, another female (carapace length = 13.8 cm, weight = 450 g) was collected from the same pasture. The procedure previously described was employed to stimulate defecation the following day. The fecal material contained numerous elytra from unidentified beetles (Coleoptera) and a large amount of unidentified fibrous vegetation and pieces of fruit, probably *Cercropia* spp. These observations suggest that the diet of *R. areolata* is not strictly herbivorous and that these turtles may consume a variety of animal prey .

Submitted by **STEVEN G. PLATT,** Department of Biological Sciences, 132 Long Hall, Clemson University, Clemson, South Carolina 29634-1903, USA.

TRACHEMYS GAIGEAE (Big Bend Slider). **MAXIMUM SIZE.** Conant and Collins (1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.) reported the maximum size of *Trachemys gaigeae* as 222 mm (straight-line carapace length; CL). Smith and Smith (1979. Synopsis of the Herpetofauna of Mexico, VI. John Johnson, North Bennington, Vermont, 1044 pp.) reported a maximum CL of "at least 222 mm in females, 166 mm in males." On 27 June 1991, a female with a CL of 257 mm was trapped by JNS from a swiftly-flowing, cold-water reach of the Rio Grande, 1.6 km N of Las Palomas, Sierra County, New Mexico. The collecting site is between Elephant Butte Dam and the upper end of Caballo Reservoir. On 30 June 1992, an intact shell with a CL of

259 mm was collected at the same locality. No extensive melanism was evident in either turtle. Both are preserved in the Museum of Southwestern Biology, University of New Mexico (MSB 51979 and 54750).

A series of 22 adult *T. gaigeae* trapped on 29 June 1990 by two of us (CWP, BCS) at the north end of Elephant Butte Reservoir, Sierra County, New Mexico, included a number of noteworthy specimens. The CL ranges for the series were: females (N = 10), 181-248 mm, $\bar{x}$ = 214.4; males (N = 12), 119-199 mm, $\bar{x}$ = 149.7. The lengths of the four largest females were 248, 244, 231, and 225 mm, and those of the three largest males were 199, 175, and 168 mm. All turtles in this series were marked and released for future studies.

Our data indicate that *T. gaigeae* regularly attains a greater size than has been reported, at least in the northern part of its range (south-central New Mexico). We thank R. D. Jennings, A. J. Landwer, J. S. Ramsey, N. J. Scott, Jr., and P. A. Stone for comments.

Submitted by **JAMES N. STUART**, National Ecology Research Center, U. S. Fish and Wildlife Service, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA, **CHARLES W. PAINTER**, Endangered Species Program, New Mexico Department of Game and Fish, P. O. Box 25112, Santa Fe, New Mexico 87504, USA, and **BRETT C. STEARNS**, Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118, USA.

LACERTILIA

MESASPIS MONTICOLA (NCN). **REPRODUCTION**. The anguid lizard *Mesaspis monticola* occurs at high elevations in southern Central America. Vial and Stewart (1985. Herpetologica 41:51-57) reported that a 69 mm *Barisia* (*Mesaspis*) *monticola* gave birth to 10 young ($\bar{x}$ = 25.9 mm SVL). Fitch (1970. Univ. Kansas Mus. Nat. Hist. Misc. Pub. 52, 247 pp.) found 3-10 ($\bar{x}$ = 5.35) maturing eggs and embryos in a series of 17 females. No other reports on reproduction by this species are available.

Gravid *M. monticola* were collected from Cerro de la Muerte, Cartago Province, Costa Rica between 2860 and 3250 m elevation on 7 and 8 October 1988 (Table 1). Animals were maintained in a temperature controlled room at 15.5 ± 0.5°C, with light and heat from a heat lamp (28°C) on a 13:11 on:off cycle until 9 December. During this time, these lizards were used in part of a study on anguid behavior. After 9 December they were held at 32 ± 1°C daytime temperature and 22 ± 1°C overnight. Water was available at all times and chambers were misted with water daily. All animals were held separately while in captivity.

Five litters were born in the laboratory from 12 January to 1 February 1989 (Table 2). Body mass was recorded on live specimens, and length was recorded on preserved specimens. Relative clutch mass (RCM), the ratio of total litter mass to female mass (postpartum), was calculated (Table 1).

Fitch (1973. Univ. Kansas Sci. Bull. 50:39-126) suggested a 7–10 week gestation period for this species, with births concentrated in October and November. Vial and Stewart (1985. Herpetologica 41:51-57), however, found that the gestation period is prolonged, lasting about one year, and suggested seasonal synchrony in parturition, occurring in May and June. Births reported here occurred approximately 14.5 and 17.5 weeks after collection; animals were not visibly gravid when collected. Vial (1975. Brit. J. Herpetol. 5:491-495) reported substrate and air (parentheses) temperatures of 9.2°C (8.2°C) minimum daytime and 39.0°C (37.2°C) maximum daytime, and nighttime minimum 3.4°C, at similar (2780–3210 m) elevations in the Cerro de la Muerte, and found the thermal active range of this species to be at body temperatures of 20.2–27.2°C. Laboratory minimum temperatures here were high compared to minimum field temperatures throughout the captivity period, and the increase in laboratory temperature after 9 December resulted in holding the animals within their thermal active range at all times. These factors may have accelerated parturition. It is interesting to note that three of the five litters were delivered on the same day, and the remaining two were delivered within 24 h of one another (Table 1).

TABLE 1. Adult size and reproductive data of *Mesaspis monticola* from Cerro de la Muerte.

	SVL (mm)	Mass (g)				RCM
		28 Oct 1988	12 Nov 1988	DOP* 1989	Litter (Total)	
Female M2	72.19	7.36	8.86	6.20 (12 Jan)	1.944	0.31
Female M10	74.61	8.07	9.17	6.96(12 Jan)	1.310	0.19
Female M12	76.75	7.08	8.27	8.45(12 Jan)	0.684	0.08
Female M6	79.47	8.69	9.05	8.63(31 Jan)	1.205	0.14
Female M7	80.76	10.07	11.89	8.29(1 Feb)	2.450	0.30
Female M1	72.74	6.57	7.50			
Female M4	82.31	8.01	8.50			
Female M11	78.02	5.49	6.85			
Male M3	83.38	7.63	8.65			
Male M5	81.76	8.18	9.01			
Male M8	81.61	10.03	11.92			
Male M9	76.06	8.73	10.24			

* Date of parturition.

TABLE 2. Litter and neonate sizes.

Litter	Litter Size	$\bar{x}$ SVL (SD) (mm)	$\bar{x}$ TL (SD)* (mm)	$\bar{x}$ mass (SD) (g)
L-M2	6	24.58 (0.38)	51.85 (0.49)	0.324 (0.005)
L-M10	5	23.85 (0.80)	50.83 (2.86)	0.262 (0.026)
L-M12	2	25.65 (0.14)	54.98 (0.59)	0.342 (0.003)
L-M6	4	25.33 (0.32)	52.71 (1.83)	0.301 (0.013)
L-M7	7	25.91 (0.66)	55.55 (2.16)	0.350 (0.024)

* A tail tip was lost during preservation from one neonate in each of L-M2 and L-M10. Total lengths of these individuals were not included.

Adult *M. monticola* are sexually dimorphic in color pattern, but adult females do not differ significantly from juveniles in nine color characters (Vial and Stewart 1989. Can J. Zool. 67:68-72). Coloration of the adults varied among individuals; coloration of the neonates described herein was similar to that of the known (female) parent.

Seven other adults (3 females and 4 males) were collected along with the five adult females discussed above (Table 1). Two females (M1 and M4) were carrying 6 and 10 enlarged eggs, respectively, in the ovaries at preservation (10 March 1989).

I thank an anonymous reviewer for comments, and E. D. Brodie, Jr. and J. A. Campbell for specimen collection. Collecting permits were issued by Ministerio de Agricultura y Ganaderia, Costa Rica. Specimens were deposited into The University of Texas at Arlington Collection of Vertebrates (UTACV R-26999–27034).

Submitted by **JILL A. WICKNICK**, Department of Biology, University of Southwestern Louisiana, P.O. Box 42451, Lafayette, Louisiana 70504-2451, USA.

SERPENTES

AGKISTRODON PISCIVORUS LEUCOSTOMA (Western Cottonmouth). **BEHAVIOR.** Cooperative behavior is unusual among ophidians. A series of behaviors involving cottonmouths was observed between 1300 and 1430 h on 28 April 1991 at the University of Mississippi Biological Field Station (ca. 6 air miles NE Oxford, Lafayette County, Mississippi). The station has numerous spring-fed ponds within a valley surrounded by forested hills. The day was windy with an overcast sky. Air temperature was 21°C at 1330 h.

While walking a grassy levee between rows of small (<1000 m^2), shallow (<0.5 m depth) ponds, I observed 4 adult cottonnouths near a pond discharge pipe. Recent heavy rains had produced a strong outflow of water from the pipe that formed a small pool at the western end of a nearly empty pond. The pool was about 1 m^2 in surface area and about 25 cm deep. A shallow rivulet emerged from the pool, meandered about 7 m across the mudflat, and collected at the deeper, eastern end of the pond.

The cottonmouths had their heads and necks elevated and were alertly facing the pool. None was distracted by my approach to within 3 m. During five minutes of observation, the snakes remained alert and motionless. I then left the area.

When I returned about 30 min later, three cottonmouths were still facing the small pool below the outflow pipe. The fourth was in the rivulet at the pool's edge and swallowing a small sunfish (*Lepomis* sp.). The current soon swept the snake downstream. One of the three remaining snakes then moved into the pool. Immediately, several small sunfish (<8 cm) leaped from the pool, landing near the two cottonmouths on shore. Both quickly attempted to capture the fish, but the fish returned to the pool. More small fish leaped from the pool (apparently escaping from the submerged cottonmouth). One landed on a snake! The two snakes repeatedly and unsuccessfully attempted to capture the flopping fish. Within the next minute, three more fish junped onto land. One snake finally captured a fish. The unsuccessful cottonmouth then moved into the pool. More fish immediately leaped from the pool onto land. I then left the site.

I returned briefly about 15 min later. Two cottonmouths were again on land and alertly facing the pool. The cottonmouth that had drifted downstream was rejoining them. The fourth was not evident.

While these behavioral patterns are not cooperation in the strictest sense, the snakes on land were taking advantage of the fish-disturbing activities of an individual in the pool. Body postures and actions suggest individual alertness, perhaps even anticipation, to the possibility of aquatic prey appearing on land. Chance profiteering from opportunistic behaviors such as these may have had an important selective role in the evolution of cooperation.

Submitted by **EDMUND D. KEISER, JR.**, Department of Biology, University of Mississippi, University, Mississippi 38677, USA.

ALSOPHIS PORTORICENSIS RICHARDI (Ground Snake). **FEEDING.** *Alsophis portoricensis richardi* is an opisthomegadont colubrid snake which can use a highly variable toxic secretion to subdue live prey. The feeding habits of this colubrid are poorly known among the islands of the eastern Puerto Rican Platform, but anolid and sphaerodactylid lizards are presumed to be primary prey in the Virgin Islands (MacLean 1982. Reptiles and Amphibians of the Virgin Islands. Macmillan Caribbean Education, Ltd., London; see also Schwartz and Henderson 1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. Univ. Florida Press, Gainesville, 720 pp.). Here I give two accounts of previously unreported and unusual prey items and feeding behavior for *A. p. richardi* observed at two small cays; Congo Cay located 2.5 km NW of Cruz Bay, St. John, 18°22'N, 64°46'W and Little Saba Cay 5 km S of St. Thomas, 18°19'N, 65°00'W.

On Congo Cay, an *A. p. richardi* was masticating dried fish below a seabird nest. The snake, about a meter in length, appeared to search deliberately among the slab-like rocks to collect in its jaws small, dried fish, *Herangula* sp., approximately 2-3 cm in total length. The dessicated and hard fish, originally food for brown pelican nestlings (*Pelecanus occidentalis*), had been lost over the side of the nest three meters above ground level. At Little Saba Cay, I observed a large *A. p. richardi* entering a nest containing two eggs of a ground-nesting bird, Zenaida dove (*Zenaida aurita*). The snake was positioning its head over the eggs while the adult dove was standing nearby flicking its wings in a combative posture when my presence disturbed the snake. In both cases, the prey was immobile, desiccated, or hard.

I thank the staff of the Division of Fish and Wildlife, St. Thomas, USVI, for field assistance; James Lazell, Jr., Greg Mayer, and Peter Tolson for their encouragement; and Stephen Corn for critical review of earlier drafts of the ms. Field work was made possible by the Pittman-Robertson Virgin Islands Wildlife Restoration Aid Program (FW-3), U.S. Fish and Wildlife Service, Atlanta, Georgia.

Submitted by **ROBERT L. NORTON**, Smithsonian Migratory Bird Program, National Zoological Park, Washington, DC 20008, USA. Present address: 817 Quince Orchard Blvd. #14, Gaithersburg, Maryland 20878, USA.

CLONOPHIS KIRTLANDI (Kirtland's Snake). **DIET.** Worms and slugs have commonly been reported as major food items for this secretive snake (Conant 1938. Amer. Midl. Nat. 20:1-200; Minton 1972. Amphibians and Reptiles of Indiana. Indiana Acad. Sci. 346 pp.; Pope 1944. Amphibians and Reptiles of the Chicago Area. Chicago Nat. Hist. Mus., 275 pp.). Parmalee (1955. Reptiles of Illinois. Illinois St. Mus., 88 pp.) stated they also eat small fish and amphibians, and Barbour (1971. Amphibians and Reptiles of Kentucky. Univ. Press of Kentucky, Lexington, 334 pp.) mentions

all of these, plus "insects." One rainy night on 13 October 1985 I ran over a *Clonophis* on the road below the Mississippi bluffs in extreme southwestern Adams Co., Illinois. It disgorged a water strider (*Gerris* sp.). I had never previously seen any animal prey on this common aquatic insect, though presumably it has other predators. This *Clonophis* and two others from Illinois (WIU 14138-14140) were later dissected, but their digestive tracts were devoid of recognizable items.

Submitted by **GORDON R. THUROW**, Department of Biological Sciences, Western Illinois University, Macomb, Illinois 61455, USA.

CROTALUS WILLARDI WILLARDI (Arizona Ridgenose Rattlesnake) and ***CROTALUS LEPIDUS KLAUBERI*** (Banded Rock Rattlesnake). **ARBOREAL BEHAVIOR**. Although crotalines are not commonly encountered in trees and bushes, they have been observed to climb into them occasionally (Klauber 1972. Rattlesnakes: Their Habits, Life Histories, and Influence on Mankind. 2nd ed., Univ. California Press, Berkeley, 1533 pp.). We observed climbing behavior on two occasions in the Huachuca Mountains in southeastern Arizona.

On 9 September 1992 at 0930 h, a subadult *C. w. willardi* was observed draped in a poison oak bush (*Toxicodendron diversilobum*) ca. 46 cm above ground. The air temperature was ca. 22°C. On the same date, at 0945 h, a juvenile *C. l. klauberi* was observed ca. 61 cm above ground wedged between the ridges in the bark of a large Ponderosa pine (*Pinus ponderosa*).

Hypotheses explaining why rattlesnakes climb include thermoregulation (basking), escape from high water, and foraging behavior. The *C. w. willardi* may have been basking as it was in filtered sunlight. However, the *C. l. klauberi* was in complete shade. Alternatively, rattlesnakes may climb to avoid predators. Large numbers of coatimundis (*Nasua nasua*) were seen in the area recently, and the ground near the snakes was disturbed.

Submitted by **JOHN V. ROSSI**, Blanding Animal Hospital, 5610 Blanding Blvd., Jacksonville, Florida 32244, USA, and **JERROLD J. FELDNER**, Southwestern Herpetologists Society, P.O. Box 7469, Van Nuys, California 91409, USA.

HETERODON PLATIRHINOS (Eastern Hognose Snake). **MELANISM HEREDITY**. Do eastern hognose snakes ever hatch black? Michener and Lazell (1989. J. Herpetol. 23:35-40) recognized two sorts of black hognose snakes: "slate" and "satin." They suggested slate was the extreme of variation in a continuum of gray pigmented individuals, but that satin was a discrete morph. Alternately, there may be an ontogenetic shift to black in some eastern hognose snakes (William Palmer and Alvin Braswell, North Carolina State Museum, Raleigh; pers. comm.), similar to that in some racers (*Coluber constrictor*) and some rat snakes (*Elaphe obsoleta*). Only the grayest hognose snake hatchlings, those without red pigments (pink, russett, or orange), would make the shift.

A satin black female 708 mm total length (TL), captured at Moncure, Chatham County, North Carolina, laid seven eggs 10 July 1992. These hatched 6 September 1992. The litter included three males 192–204 ($\bar{x}$ = 200) mm TL, with tails 19–20 ($\bar{x}$ = 19.6) percent of TL, and four females 192–207 ($\bar{x}$ = 202) mm TL, with tails 16–17 ($\bar{x}$ = 16.3) percent of TL. All had some red nape coloration (at least), appeared normally pigmented, and were boldly patterned with 20–24 ($\bar{x}$ = 22; no sexual difference) body saddles. Males had 9.5–12 ($\bar{x}$ = 10.3) tail bands. Females had 8.5–9 ($\bar{x}$ = 8.9) tail bands. Nape ground color varied from coral-orange through rose and terra cotta to pinkish-gray. Posterior ground colors were terra cotta, pinkish-gray, lavender-gray, various shades of gray-brown, and ash-gray. Elucidation of heredity will involve rearing hognose snakes of known black parentage, so as to determine onset and duration of phenotypic shift, and backcrossing them to at least one parent. The first hypothesis to attempt to reject is that eastern hognose snakes never hatch black.



FIG. 1. A satin black eastern hognose snake and her normally pigmented litter of seven. Photo by Vann Covington.

I am indebted to Vann Covington, Department of Entomology, North Carolina State University, Raleigh, for permission to examine and report on the snakes captive in his care, and for Figure 1. This Agency's work in North Carolina and the Southeast is supported by The Grace Jones Richardson Trust.

Submitted by **JAMES LAZELL**, The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835, USA.

GEOGRAPHIC DISTRIBUTION

New County Records Of Amphibians And Reptiles From West-Central Texas

From May of 1987 to July of 1992, while conducting field surveys and monitoring populations of the Concho water snake (*Nerodia harteri paucimaculata*), numerous new county records were documented. Voucher specimens for these were deposited in the Texas Cooperative Wildlife Collection (TCWC) at Texas A&M University, and are reported herein. Dixon (1987, Amphibians and Reptiles of Texas. Texas A&M University Press, College Station, Texas, 434 pp.) updated the distribution maps for all Texas species of amphibians and reptiles. Additional county records have subsequently been reported for this region of the state (McAllister et al. 1987, Southwest. Nat. 32(3):406–408; Gannon 1987, Texas J. Sci. 39(3):293; Schafer and Kasper 1989, ibid 41(3):337–338; Cordes et al. 1990, ibid 18(2):209–210; Bridegam and Smith 1987, Herpetol. Rev. 18(2):40; Calaway et al. 1988, ibid 19(1):19; Cordes et al. 1987, ibid 18(2):40; McAllister et al. 1987, ibid 18(1):20; McAllister et al.

1986, ibid 17(4):92; McCord and Dorcas 1989, ibid 20(4):94,96; Butterfield et al. 1991, ibid 22(1):28; Hibbits 1991, ibid 22(2):65; and Hibbits 1991, ibid 22(2):68.).

In this note we list 37 new county records for west-central Texas and fill distributional gaps for 28 species of reptiles and amphibians (Dixon 1987, op. cit.). These specimens were collected by the authors and various other field personnel who have worked on the Concho water snake project during the past five years. Some of these new records were incidental collections made by the senior author prior to May 1987. Verification of specimen identifications was by James R. Dixon. Standard common names are from Collins (1990 SSAR Herp. Circ. 19:1–41).

ANURA

Scaphiopus bombifrons (Plains Spadefoot). Callahan Co: 1.6 km E Clyde. 11 May 1981. TCWC 67506.

Acris crepitans crepitans (Northern Cricket Frog). Titus Co: Horse Creek, 0.8 km S IH 30. 14 October 1991. TCWC 69250, 69251.

Pseudacris streckeri streckeri (Strecker's Chorus Frog). Callahan Co: 1.6 km E Clyde. 4 February 1987. TCWC 69056; Coleman Co: North Prong of Hords Creek, 7.2 km NW Glen Cove. 1 June 1987. TCWC 69057.

Bufo debilis debilis (Eastern Green Toad). Concho Co: Kickapoo Creek, 8.1 km SW Paint Rock. 27 May 1987. TCWC 68095, 68096; Runnels Co: Ballinger Municipal Lake spillway. 30 June 1987. TCWC 67854.

Bufo speciosus (Texas Toad). Runnels Co: Elm Creek, 6.3 km N Ballinger. 29 June 1987. TCWC 67868.

Bufo valliceps valliceps (Gulf Coast Toad). Runnels Co: Colorado River, 14.8 km WSW Ballinger. 21 September 1988. TCWC 67346.

TESTUDINES

Apalone spinifera guadalupensis (Guadalupe Spiny Softshell). McCulloch Co: Cow Creek, 5.6 km E Lohn. 1 June 1987. TCWC 66103; Lampasas Co: Little Lucy Creek at low water crossing, 9.3 km NNE Lampasas. 13 July 1987. TCWC 66101; Mills Co: Colorado River, 3.2 km W Oakland Church, jct FM 586 & SH 45. 21 June 1988. TCWC 68469.

Chelydra serpentina serpentina (Common Snapping Turtle). Runnels Co: Lake Winters spillway, 8.9 km E Winters. 30 June 1987. TCWC 69095; Irion Co: Spring Creek at FM 915, 4.3 km SSW Mertzon. 14 May 1991. TCWC 69094; Coleman Co: 0.8 km S Whon. 27 August 1991. TCWC 69713.

Pseudemys texana (Texas River Cooter). Irion Co: Middle Concho River, 9.7 km W SH 163. 1 July 1987. TCWC 65386; Coleman Co: Elm Creek, 4.8 km NNE Freese Dam (formerly Stacy Dam Site). 26 July 1987. TCWC 65906.

Kinosternon flavescens flavescens (Yellow Mud Turtle). Lampasas Co: 13.4 km NW Adamsville. 14 July 1987. TCWC 66111.

Kinosternon (Sternotherus) odoratus (Common Musk Turtle). Concho Co: Concho River at Vinson Dam, 5.8 km W Paint Rock. 20 July 1987. TCWC 69701; Coleman Co: Home Creek, 8.9 km SW Santa Anna. 10 July 1992. TCWC 69913.

Trachemys scripta elegans (Red-eared Slider). Irion Co: Spring Creek at Mertzon City Park low water crossing. 16 May 1991. TCWC 68657.

Terrapene ornata ornata (Ornate Box Turtle). Schackleford Co: 24.9 km WNW Albany on Rt. 180. 23 May 1992. TCWC 69898.

SAURIA

Eumeces obsoletus (Great Plains Skink). USA: TEXAS: Taylor Co: 0.5 km W SH 351 on IH 20. 10 June 1982. TCWC 67743.

SERPENTES

Lampropeltis getula splendida (Desert Kingsnake). Glasscock Co: 4.5 km W Garden City on SH 158. 23 June 1979. TCWC 66038.

Lampropeltis calligaster calligaster (Prairie Kingsnake). Callahan Co: unnamed county road 0.8 km W FM 604, 1.6 km N of IH 20. 28 November 1982. TCWC 66045.

Regina grahamii (Graham's Crayfish Snake). Coleman Co: Bull Creek, 0.5 km E Gouldbusk on FR 1026. 19 May 1987. TCWC 66028; Tom Green Co: Concho River at FM 1692, 6.4 km S Miles. 19 July 1988. TCWC 67237.

Virginia striatula (Rough Earth Snake). Coleman Co: 1.0 km NNE Freese Dam (Stacy Dam). 24 May 1987. TCWC 66020.

Heterodon nasicus (Western Hognose Snake). Coleman Co: Freese Dam (Stacy Dam). 26 May 1987. TCWC 66046.

Opheodrys aestivus (Rough Green Snake). Coleman Co: 0.5 km S Leaday. 26 May 1987. TCWC 66049.

Hypsiglena torquata jani (Texas Night Snake). Irion Co: 5.8 km S Mertzon. 9 June 1987. TCWC 66018.

Nerodia rhombifer rhombifer (Diamondback Water Snake). Irion Co: Middle Concho River, 21.7 km NW Mertzon. 1 July 1987. TCWC 67630.

Nerodia erythrogaster transversa (Blotched Water Snake). Callahan Co: Pecan Bayou, 16.1 km ESE Oplin above confluence of Crooked Creek. 8 June 1992. TCWC 69899.

Masticophis taeniatus schotti (Schott's Whipsnake). Lampasas Co: Lynch Creek at FR 580, 10.8 km SW Lometa. 8 July 1987. TCWC 68944.

Sonora semiannulata (Ground Snake). Jones Co: Deadman Creek, 10.0 km SSE Leuders. 23 May 1992. TCWC 69900.

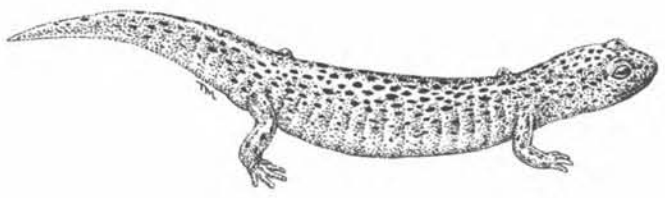
Storeria dekayi texana (Texas Brown Snake). Runnels Co: Colorado River at Egan Dam, 8.5 km NNW Rowena. 5 September 1991. TCWC 69253.

Gyalopion canum (Western Hooknose Snake). Concho Co: O. H. Ivie Reservoir, Hafner Island, 3.5 km N SW end of Freese Dam. 6 April 1992. TCWC 69688.

Sistrurus catenatus tergeminus (Western Massasauga). Jones Co: 11.6 km SSE Leuders. 23 May 1992. TCWC 69901.

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Submitted by **OKLA W. THORNTON, JR.** and **JERRY R. SMITH**, Colorado River Municipal Water District, HCR 82, Box 4B, Leaday, Texas 76888, USA.



Pseudotriton ruber schencki (Blackchin Red Salamander). USA, Georgia: Murray County, near Lake Conasauga. Illustration by Tim Manolis.

BOOK REVIEWS

The Reproductive Husbandry of Pythons and Boas, by Richard A. Ross and Gerald Marzec. 1990. Privately published by the Institute for Herpetological Research (P.O. Box 2227, Stanford, California 94305, USA). 270 pp, 249 color photographs, 11 black and white photographs, 11 text figs., 52 reproductive graphs. $75.00 U.S. (hardcover).

This book is a larger, more comprehensive, and much more colorful version of Ross' *Python Breeding Manual* (1978), that compiled much of the early data on the subject. In the dozen intervening years, interest in reptile husbandry has grown enormously, motivated by declining wild populations and the concomitant escalation of commercial prices for good broodstock. Reptile breeding has become very commercial, requiring sophisticated techniques and high technology equipment. Ross and Marzec are prominent figures in boid husbandry and their book summarizes many of the recent advances in the field.

The book is divided into two sections, the first consisting of six chapters covering various general aspects of the care and breeding of boids: 1) General Husbandry of Breeding Stock; 2) Reproductive Husbandry; 3) Disorders of Reproduction and Pregnancy; 4) Egg Husbandry and Incubation; 5) Husbandry of Neonate Boids; and 6) Genetics of Boid Reproduction. The final section opens with a short chapter titled "Captive Husbandry and Seasonality." It briefly discusses the absence or existence of breeding seasons in wild populations from temperate and tropical climates, and gives explanatory comments relating to reproductive graphs that illustrate the subsequent species accounts. These are discussed in the final two chapters, the first dealing with reproductive data for pythons and the second for that of boas.

In general the book is well produced and well proofed, with very few typographical errors. The binding is strong and glossy paper is used throughout (although there is a generous amount of blank paper, and placing six empty pages at the front of the book isn't an attention grabber!). Five pages of references, a three-page glossary, an appendix of medication dosages, and nine-page index complete the book. The Literature Cited lists many important works, but is by no means comprehensive even for boid captive breeding and ignores much of the great wealth of foreign literature that exists on the subject.

The layout of the species accounts is geographical rather than systematic, and this leads to some confusion. All sand boas, for instance, are discussed under Madagascar and African boas, even though most *Eryx* (8 of 12 species) are Arabian or Eurasian. They are closely-related to the small North American rosy and rubber boas (and usually placed in a separate subfamily, Erycinae), and yet their husbandry or reproduction is never compared or contrasted with these snakes. In addition, the inclusion of tropidophids and bolyeriids would be questioned by most systematists as they are now usually placed in separate families (Underwood 1976), or even separate superfamilies (McDowell 1979). These small, primitive snakes are so rare and restricted that they are unlikely to be of interest to any but the most specialized collector. They should have been left out.

The species accounts would also have benefited from a few introductory sentences, giving the ranges, habitats, and systematic references for each species. In the Preface the authors note that the "taxonomy of the Boinae is currently in a state of flux." This is very true, given the recent spate of conflicting revisions (e.g., McDowell 1975, 1979; Underwood 1976; Underwood and Stimson 1990), and the authors are probably correct in not adopting a higher classification that might soon have been outdated. However, they could at least direct the interested reader to the relevant literature. They should also have given a brief overview of the classification they adopted, as I doubt that they really consider pythons, boas, and tropidophids as being included in a single subfamily, Boinae. For many species, the lack of basic natural history data inhibits understanding, particularly for herpetoculturists trying to keep a species for the first time. How many people know the distribution of the blood python or on which islands the different races occur? Information on the average size that a species attains at least gives an indication on what size it may be expected to reach at sexual maturity.

The authors have done an admirable job in condensing reproductive data for the different species, and the first section on general husbandry contains a wealth of information for herpetoculturists. However, my biggest disappointment is not for what the book contains, but for what it lacks. That is a lack of excitement for the snakes themselves; for an understanding of their lives in the wild. There is no attempt to overview reproductive strategies within the Boidae, or to find what subtle differences in biology make some groups successful, and others less so.

The reproductive capabilities of snake lineages are not equal, and the biology of any species is constrained by its phylogeny. For example, within *Python*, egg size is relatively constant, and the number of eggs produced intra- and interspecifically is usually a function of body length (Branch and Erasmus 1984). The same relationship between clutch size and body length generally holds throughout the subfamily (although egg size may also get smaller in dwarf species, such as *Liasis childreni*). This is not the case with many boas, in which interspecific variation in the number and size of neonates may vary considerably, even within the same genus, e.g., *Acrantophis* and *Epicrates* (Branch and Erasmus 1984).

So what are the similarities and differences among the various boid lineages? What features of their reproduction are phylogenetically constrained, and what features are specific adaptations to similar habitats? The latter may highlight convergent evolution between different groups, and may identify features more amenable to manipulation in captivity. Ross and Marzec have a wealth of data on reproduction in pythons and boas that may answer such questions within different lineages of these primitive snakes. It is a pity they make no attempt to broach, let alone answer, such questions.

Despite these quibbles (which make me feel a bit like a spoilt boy wanting another cherry on top of his chocolate cake!), this is an excellent book and should do much to stimulate and promote the husbandry and breeding of boids.

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Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History, by Albert Schwartz and Robert W. Henderson. 1991. University of Florida Press, Gainesville, ISBN 0-8130-1049-7. xvi + 720 pp. $75.00 U.S. (hardcover).

Having worked in the West Indies for more than twenty years, I always relish the receipt of a new publication by Albert Schwartz. Al's work has always been characterized by an exactness and attention to detail that is satisfying and refreshing. The experiences of more than forty years of field work in the Antilles infuse his publications with a wealth of useful data. The culmination of Al's career has been a series of books on West Indian herpetology co-authored with Bob Henderson. Although several of the earlier contributions were uncharacteristically rife with careless errors, the most recent compendium causes no such disappointment. There is much to praise in the volume, beginning with Rose Henderson's spectacular watercolor of a male *Anolis marmoratus* on the dust jacket and frontispiece. This fine illustration is not identified to subspecies, but it is apparently *A. m. marmoratus*, a truly striking lizard. Visitors to Guadeloupe should be forewarned, however, that *A. m. speciosus* from the vicinity of Pointe-a-Pitre is drab by comparison, an indication of the considerable variation within a small area that is so common in the Antilles.

Although tempted to praise the many strong points of this volume, I am sure that other reviewers will adequately extol its virtues. With apologies to Al and Bob, I will try to focus on the flaws, which are admittedly minor and inevitable in a work of this scope, but they are present and occasionally inexplicable. However, book reviews, like baked goods, are best when fresh and the less obvious problems of a book only surface with repeated use. I have not had this luxury, but I am familiar with the fauna and the associated literature. I read through the book completely and flagged areas that did not "look right." I then checked the details in these accounts. I found too many errors for this review to be an effective errata sheet, so I have cited only representative problems, without trying to imply that a high degree of inaccuracy occurs throughout. One assumes, however, that a series of books on the same area would have a winnowing effect, gradually eliminating errors and problems in previous volumes. Distressingly, some of the errors found in this volume were correctly presented earlier.

Tradition dictates that a review should provide some idea of the book format, so my comments are arranged accordingly. The introduction (pp. 1-4) concisely summarizes what is contained in the text of the book and how the information was accumulated. The taxonomy follows the Schwartz and Henderson (1988) checklist, but "with some exceptions" that are neither listed nor explained. One of the most obvious is that the much-disputed generic re-arrangement of *Anolis* by Guyer and Savage (1986) has been abandoned. A brief chronological history of species descriptions documents that significant discoveries are still being made and the authors admirably emphasize that much remains to be done.

The acknowledgments (pp. 5-6) reveal that unpublished field observations from selected individuals were included, but little effort was expended to solicit information from many other potentially rich sources. Years ago it was easy to "touch base" with virtually all other researchers working in the Antilles before publishing, but now a cast of thousands has discovered this interesting area. I am sympathetic to this problem, but the number of major institutions with ongoing Antillean projects is much more manageable. Almost without exception, these sources were available to Schwartz and Henderson but the appropriate staff members were unaware of the imminent appearance of this volume, so important collections and ancillary information were not included. As an example, collections from as long ago as 1985 (SDSNH and USNM) demonstrate that both *Eleutherodactylus johnstonei* and *Gymnophthalmus* sp. are much more widely distributed on Guadeloupe (including Basse Terre) than the maps indicate.

Flowery passages on "the many wonders I have seen" seem *de rigueur* for regional monographs these days but Schwartz and Henderson's "Envoi" section (pp. 14-16) is commendably restrained. The section leads off with a quote by the misguided W. Bancroft Espeut, extolling the virtues of mongoose. It is perhaps appropriate that Espeut's name is misspelled in both the quote and Literature Cited. The role of introduced biota and unwise land-management practices in the extinction process is briefly discussed but it was disappointing that no mention was made of the historical aspects of extinction in the West Indies. There is considerable literature on the role of Amerindians in floral and faunal change of the past few thousand years. The introduction of feral animals and habitat destruction by Europeans may have been the coup de grace for some native species but they were brought to the brink of extinction well before European contact. Without this historical perspective the authors reinforce the misconception that West Indian extinctions are primarily a recent phenomenon that can be blamed on the excesses and indiscretions of modern man.

The species accounts (pp. 19-672) justifiably occupy the bulk of the book and they are well-organized and coherent. They are remarkably free of typographical and technical errors, but a few creep in: on page 181, *Ameiva ameiva fuliginosa* (not *fulginosa*) was described by Cope 1892 (not 1862); Petzold is misspelled Petzhold on p. 408. *Leptodactylus dominicensis* was synonymized with *albilabris* by Heyer (1978); although I do not agree with this taxonomic arrangement, it has never been formally refuted. The distribution maps are indispensably useful but occasionally their placement relative to the species account may be momentarily confusing. Although the species accounts contain a great deal of useful information, I was puzzled by the lack of pertinent information in some accounts. *Ophisaurus ventralis* and *Gonatodes* in the Caymans are included without reference or comment, despite the fact that they were previously unreported either from the island (in the case of *Gonatodes*) or from the entire Antilles (*Ophisaurus*). There is nothing inherently wrong with publishing new information in a checklist, but it should be adequately referenced. In the case of unpublished information, this can be in the form of a "personal communication" from the contributor(s) (as done in the Natural History section) or citation of manuscripts in preparation or in press. In fact, if I have a major complaint about this book, it is the paucity or appropriateness of the references. A true reference

book should not only be referred to *for* information but it should also refer one *to* the original sources of that information. This is particularly notable in the accounts for non-native species, where most of the references are to North American field guides. Admittedly, these are good sources of illustrations, but they offer little (if any) information pertinent to the Antilles. The *Catalogue of American Amphibians and Reptiles* accounts are largely ignored (none is listed in the Literature Cited) and these are valuable summaries of published illustrations and much other information. By citing the *Catalogue* account for the species (if available) the References in this volume could concentrate on the original and any subsequent reports from the Antilles. Even for native Antillean species, the references were variable in their appropriateness. In *Leptodactylus fallax*, for example, no mention or reference was given for the (apparently) unsuccessful introductions of the species on Jamaica and Puerto Rico, or for its historical extinction on St. Kitts, Guadeloupe, and St. Lucia.

The mapped distributions occasionally do not match the text and the extralimital distributions are often incorrect. *Kentropyx borckianus* occurs only on Barbados and in the Guianas, but not on Trinidad, which is inhabited by *K. striatus*. Although there are two isolated records of *Hemidactylus palaichthus* from Trinidad proper (and none from Tobago), the species is generally found on offshore islands (Chacachacare, Little Tobago), as is the case on the Maria Islands off St. Lucia. C. J. Cole and co-authors have demonstrated recently (after Schwartz and Henderson was in press) that virtually all of the *Gymnophthalmus* records for Dominica and Guadeloupe are *underwoodi*, rather than *pleei*, but the presence of both species on Guadeloupe in the Schwartz and Henderson maps should have been suspicious.

The Natural History section of the species accounts is wildly uneven in its accuracy and utility, although I think it is a potentially useful addition. Characterizing a species as a "xerophile," "mesophile," "forest associated," or other encapsulization is always fraught with risk, since species generally defy such facile simplifications. No exception here, and there are numerous cases of xeric species being found in patently mesic situations and vice versa. However, given the relatively limited sources consulted for such information and the constraints of summarizing it in such a small space, I was surprised that this section made as much sense as it did. However, I question that "going in front entrance of cafe" is a particularly salient observation on the natural history of *Gymnophthalmus underwoodi* (p. 412), even though I have found *G. speciosus* doing exactly the same thing in Panama.

In summary, this is a good book and one that few biologists or amateurs can do without. However, if you cannot do without this volume, you will have to invest in many of the previous Schwartz and Henderson volumes as well, since they are inextricably linked and each is considerably less useful without the information in one or more of the others. This may be mere coincidence or a clever marketing ploy, but the final word on the West Indies is not yet in. Many more species await description, and distributions of some species may change drastically with additional data and taxonomic resolution. In a few more years, this volume may well be two or even three volumes. Until then, buy Schwartz and Henderson, save your pennies, and hope that the next edition offers as much information at such a bargain price.

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A Water Snake's Year, by Doris Gove, illustrated by Beverly Duncan, 1991. Atheneum Publishers, New York, NY. 40 pp. $13.95 U.S. (softcover).

This is a rather unusual book to be reviewed in a herpetological journal, not due to the subject matter, but rather the intended audience. *A Water Snake's Year* is a children's story, aimed mainly at second to fifth graders (ages 7 - 11 years). It is a story of the life and times of a six-year old female water snake (*Nerodia sipedon*) living near the Middle Prong of the Little River in the Smoky Mountain National Park of east Tennessee.

Over the course of the tale, we follow the snake from her emergence after winter's hibernation through the daily toils of fishing, basking, and staying safe from predators. Our scaly heroine sheds her skin, encounters various other denizens of her home range, mates, and finally gives birth to a litter of babies before returning to her hibernaculum for the next winter. Excitement occurs mid-summer as a rainstorm washes the snake downstream and she must find her way home through unfamiliar territory. I found the guest appearance of a defensively "fluttering" hellbender a nice touch.

This story is a positive and highly accurate depiction of what life may be like for the average (lucky) water snake. Descriptions of snake behavior and natural history are rich and detailed, as one would expect from this author. Doris Gove has conducted research into the evolution of behavior in snakes and lizards, and lives and works in and near the Smoky Mountains.

The book is also visually impressive. The artwork is an important part of the storytelling, and is lush and attractive, with the text flowing aesthetically into the artwork rather than the other way around. Various plants, flowers, and other animals found in the Smokies make their appearances in Beverly Duncan's watercolors. There are often small critters peeking out from under leaves or the water surface that will be fun for children to notice. The accuracy of the drawings is also quite good, though the water snakes are sometimes a bit too long-bodied in proportion. This small error is probably far beyond the ability of the intended readers to criticize, and certainly does not detract from the story or the look of the artwork.

One thing I found amusing about this book was the index. I have never before seen a children's book with an index, and the subjects found there are somewhat intriguing. For instance, you can look up the pages where acorns, inner tubes, or water striders are mentioned. I suppose this would be a good tool for getting kids to use an index; I even had some fun with it.

The only possible drawback of the book as I read it is in the tone of the writing. I wonder if the story, as quiet and unassuming as it is, is exciting enough to capture the attention of the children reading it, particularly in this age of high adventure cartoons, action figures, and interactive computer games. It may have been

nice to have personalized the snake a bit more (at the risk of anthropomorphizing too much) to make the readers care more about her. Perhaps giving her a name, or making her scrapes with danger more thrilling would help.

Overall though, this is an attractive and informative book, describing a snake and its world in a positive light to young readers—a fairly rare undertaking and one I wholly support. I am only familiar with two other children's stories featuring "good" snakes, and both are quite fantastic tales with virtually no realism (*Crictor*: Ungerer 1958; and *Mr. Yowder and the Giant Bull Snake*: Rounds 1978). Of course, Kipling's *The Jungle Book* (1895) portrays Kaa as a wise snake and Mowgli's teacher (unlike the more recent, and probably better-known, Disney-version of the story), though I'm not convinced that Kipling was writing for children. I look forward to giving copies of this book to young nieces, nephews, and friends, some of whose parents may not approve of a more direct introduction to the subject matter of herpetology.

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Captive Invertebrates. A Guide to Their Biology and Husbandry, by Fredric L. Frye. 1992. Krieger Publishing Company, Malabar, Florida. 135 pp. $29.50 U.S. (hardcover).

Why should a book on invertebrate husbandry be of interest to herpetologists? Aside from the fact that many herpetologists are nominally the local experts on all "creepy crawlies," there is the very practical issue of insects and other invertebrates as feeder organisms for captive amphibians and reptiles. Most people solve the problems of maintaining live invertebrates through trial and error based on common sense. Nonetheless, there is a clear need for a practical guide concerning the biology and husbandry of these animals; the book by F. L. Frye is an attempt to meet this need. Frye's book begins with an introductory section that contains a convincing discussion on the aesthetics and relevance of invertebrates in our daily lives. The introduction is followed by a separate chapter on special accommodations for terrestrial, arboreal, and aquatic invertebrates. Subsequent chapters deal with the biology and husbandry of specific invertebrate taxa, including arachnids, chilopods and diplopods, insects, crustaceans, pulmonate snails and slugs, and turbellarians. These chapters cover diagnostic characters, housing needs, water requirements, nutrition, reproduction, and medical disorders. While much of this information is simple common sense (e.g., "dry branches or flat stones . . . must be adequately propped or anchored so that they cannot topple over and crush the inhabitants"), other material is quite useful and interesting. Frye does a nice job at keeping the reading lively by including interesting trivia. For example, how many people know that the silk of black widow spiders served as cross hairs in World War II bomb sights and sniper rifle scopesights? The combination of Frye's genuine interest in invertebrates and his training in veterinary medicine provides a unique perspective into how medical disorders can affect laboratory insect cultures. Anyone who has ever maintained invertebrate cultures that occasionally "crash" will especially appreciate Frye's discussions on the effects of bacterial, viral, and protozoan infections on culture vitality.

The last chapter is the one most clearly relevant to herpetology and discusses the culturing of invertebrate prey species as food sources for vertebrates. Taxa covered include earthworms, crickets, mealworms, silkworms, waxworms, fruit flies, and houseflies. Much of this information is already available in the literature of biological supply houses, but is conveniently brought together here. Other things that will make this book useful to both professional and amateur zoologists are an appendix that lists addresses of commercial sources for some living invertebrates, a glossary, an extensive list of suggested readings and comprehensive indices. Although the book is well illustrated, with 96 color plates, these are inconveniently separated from the text in separate sections. Further, the unusually wide text margins (4 inches on 8.5 inch width pages) detract from the design of the book and artificially inflate its size. Of passing interest to most herpetologists, this book may find a place on the shelves of those who maintain their own invertebrate cultures to support large numbers of captive amphibians and reptiles.

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PUBLICATIONS RECEIVED

An Introduction to Snakes of the Dismal Swamp Region of North Carolina and Viriginia, by Donald R. Brothers. 1992. 139 pp. Softcover. $10.00 + $2.50 shipping and handling. (Available from Edgewood PROBES, Inc., HC 33, Box 1176, Boise, Idaho 83706, USA).

According to the preface, this book's purpose "is to provide general information for those with an interest in or curiosity about snakes of the Dismal Swamp region and to dispel popular false beliefs about them." Twenty-seven species are illustrated by 32 high quality color illustrations (executed by the author). Numerous black and white drawings depict dorsal, ventral, and lateral aspects of each species. Distribution maps show the ranges of each species for the eastern United States but not for the Dismal Swamp region specifically. The information is accurate and presented in a mostly non-technical style.

Wisconsin Herpetology: A Bibliographical Update with Taxonomic, Subject, and Geographic Indices, by Dreux J. Watermolen. 1992. Wisconsin Department of Natural Resources. Wisconsin Endangered Resources Report series installment number 87. (Available at no cost from Bureau of Endangered Resources, Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, Wisconsin 53707, USA; telephone 608-266-7012).

This publication updates the 1987 *Wisconsin Endangered Resources Report No. 28*, and is intended to assist the research efforts of Wisconsin herpetologists and resource educators and to compliment the activities of the Wisconsin Herpetological Working Group. The bibliography includes 144 technical and popular references that deal with all aspects of Wisconsin's native amphibian and reptile species. Some items refer to physiological, taxonomic, or other studies in which Wisconsin specimens were used. The indices following the bibliography provide cross-reference by subject, taxonomic group (genus), and geographic locality (county), and direct the user to specific works by a numeric code.

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For further guidelines, authors should consult the *CBE Style Manual* (5th edition, 1983, Council of Biology Editors, Inc., 9650 Rockville Pike, Bethesda, Maryland 20814, USA).

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Herpetological Review

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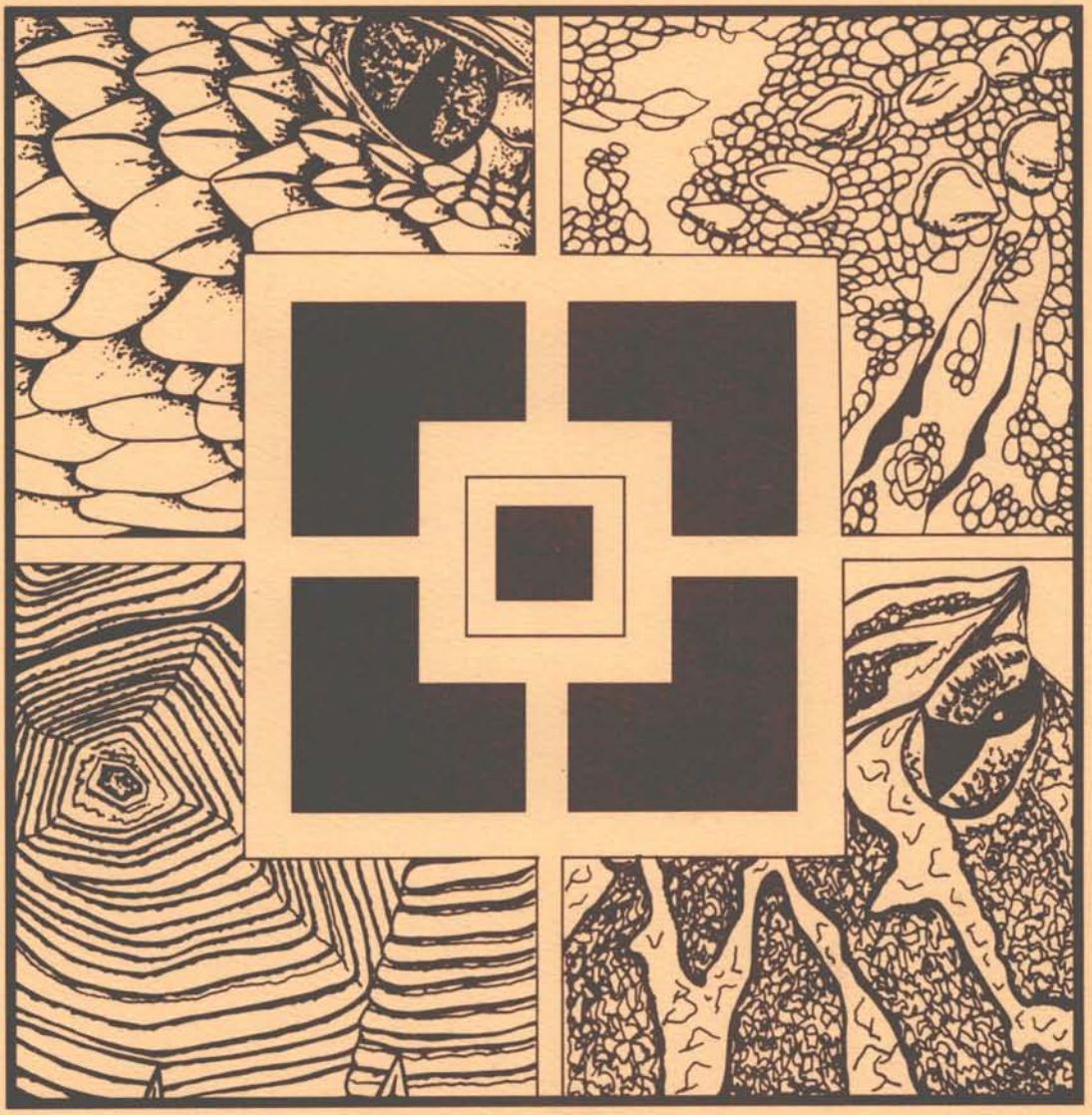
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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the ***Journal of Herpetology*** (4 issues annually), ***Herpetological Review*** (4 issues annually), and occasional issues of ***Facsimile Reprints in Herpetology***. Members may purchase other Society publications at reduced rates.

ANNUAL DUES 1993

Student member	$25.00*	Sustaining member	$60.00*
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SSAR 1993 Annual Meeting • 7 - 12 August 1993
Indiana University • Bloomington, Indiana

Announcement And First Call For Presentations

Featuring . . . Reptilian Behavioral Ecology: A Symposium In Honor Of Charles C. Carpenter • Auction and Gourmet Beverage Tasting • Faculty: Free Raffle Tickets If You Bring Duplicate/Extra Offprints For Students (and save your office, too) • Students: The Great Reprint Scavenge • Field Trips: Thursday August 12th (including Herping with Joe Collins) • Tours of Indiana University's Axolotl Facility. *Additional details in March 1993 issue of HR.*

Instructions for Completing the Abstract Form

ABSTRACTS ARE NEEDED FOR EACH PAPER AND EACH POSTER. READ THESE INSTRUCTIONS BEFORE COMPLETING THE ABSTRACT FORM BELOW.

1. Compose abstract to fit inside rectangle below. Type a draft on a separate sheet of paper to be sure it will fit. Your abstract will be slightly reduced but otherwise appear exactly as you submit it. Leave 1/4" margins from the edges of the box. Do not exceed the space in the rectangle (or 200 words, whichever takes less space). Do not use fewer than 12 characters per inch.
2. Use the following format:
   First line—name(s) of author(s)
   Second line—address of author(s)
   Third line—title in all capital letters
   Fourth line—indent and begin text of abstract
3. Use the asterisk to denote the person who will make the presentation. Example:
   Frogs, I. C., and R. U. Curious*
   Herpetological College, Happy Valley, PA
   EFFECT OF ACID RAIN ON ANURAN DNA
   Frogs and tadpoles were collected from vernal ponds in Centre County. Acidity of pond water was measured by . . .
4. Use an electric typewriter or laser printer. Do not use a dot matrix printer.
5. Return your abstract form, unfolded, with one copy. Placing the abstract between piecies of cardboard will reduce the possibility of damage in the mail. If necessary, the abstract can be submitted on bond paper in rectangle of the same dimensions as the form provided.
6. Be sure that the abstract is informative: Consider inclusion of problem, methods (if pertinent), results, summary, and conclusions. Do not simply write, "Results are discussed."
7. Papers (except in symposia) are limited to 12 minutes for presentations and 3 minutes for discussion. Posters are not to exceed 4 feet x 4 feet.
8. THE DEADLINE FOR RECEIPT OF ABSTRACTS IS 15 MAY. (Honest)

( ) Paper ( ) Poster Special Audiovisual Needs _____

Are each of the authors students? _____

Mail to: Craig Nelson, Dept. of Biology, Indiana University, Bloomington, Indiana 47405, USA.

The Society for the Study of Amphibians and Reptiles Announces
A Facsimile Reprint to Commemorate the Second World Congress of Herpetology (Adelaide 1993)

THE REPTILES AND AMPHIBIANS OF SOUTH AUSTRALIA

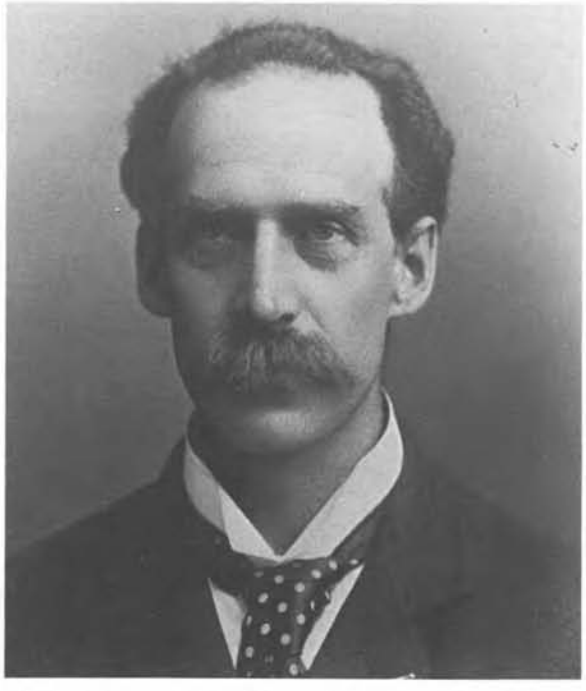
by Edgar R. Waite

with a new introduction by Michael J. Tyler and Mark Hutchinson

WAITE'S WELL-KNOWN BOOK WAS THE FIRST AND IS still the only complete review of the herpetofauna of any Australian state. Published in 1929, it covers 112 species of reptiles and 12 species of amphibians, each described in detail, including size, distribution, and habits. There are 95 individual photographs, numerous line drawings showing diagnostic features, and keys to the genera and species.

Edgar Waite (1866–1928) was an English naturalist who emigrated to Australia in 1893 to join the staff of the Australian Museum in Sydney. He moved to New Zealand in 1906 as director of the Canterbury Museum and in 1914 became director of the South Australian Museum in Adelaide. Although primarily an ichthyologist, he also published numerous papers on herpetology. Waite's popular book on snakes, issued in 1898, was probably the first pocket-sized field guide published on reptiles. His *magnum opus* was his book, "Reptiles and Amphibians of South Australia," which although out-of-print for decades is still highly useful and sought after.

The reprint includes a new introduction by Michael J. Tyler (University of Adelaide) and Mark Hutchinson (South Australian Museum), who provide a biography of Waite that gives the historical context for the book. They also include an extensive annotated list of Waite's species names, showing the current taxonomy and correcting some errors in Waite's identifications. Waite was also an accomplished artist and included in this reprint is a watercolor of several frogs, reproduced in full color.



Specifications: 290 pages, 6 x 9 inches (15 x 23 cm), 95 photos, portrait of Waite, bound in library-grade cloth. To be published in April 1993.

PRICES AND ORDERING

- Pre-publication price (before 15 March 1993) to SSAR members ..... US$28
- Price to other persons and to institutions $35

Packing and shipping per volume: within the USA, add $2; to other countries, add $4.

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A complete list of SSAR publications ❑ and applications for Society membership ❑ are available from Dr. Aldridge by marking the boxes and returning this form to him at the above address.

SSAR BUSINESS

SSAR Annual Meeting: El Paso 1992

The University of Texas at El Paso played host to a hoard of over 400 herpetologists between 2 and 6 August 1992, as SSAR held its 35th annual meeting. The meeting was co-hosted by UTEP, El Paso Community College, and Sociedad Herpetología Mexicana, with Jerry Johnson (EPCC) and Carl Lieb (UTEP) co-chairs of the local committee.

The unofficial start of the meeting was the annual meeting of the SSAR Board of Directors, held on 2 August 1992, between 1000 and 1815 hours (MDT), in the conference room of the downtown Travelodge Hotel. Attendance at the meeting was larger than recent tradition would suggest: all twelve officers and Board members were there, as were at least one editor from each of the Society's publications, several coordinators, and chairs or representatives of virtually all committees; an additional 10-12 interested members rounded out the attendance. A summary of business conducted was later presented at the Business Meeting (see below).

Presentations

The official call to order came from local Co-chair Carl Lieb at 0915 hours on Monday, 3 August 1992, at which point we were welcomed to UTEP by the Associate Vice-President for Research and Graduate Studies, Julie Sanford. The welcoming was followed by a brief memorial to Ruth Zantzinger, who passed away last autumn; Ruth was a frequent volunteer when SSAR needed assistance (see Herpetol. Rev. 23:3-4, 1992). President Moll then introduced our Keynote Speaker, Linda Maxson, of Pennsylvania State University, who presented "A Random Walk Among the Anura." Following the keynote address and the requisite announcements, Mike Tyler made a brief presentation on the upcoming Second World Congress of Herpetology, to be held 29 December 1993 to 6 January 1994 at the University of Adelaide, South Australia, Australia.

Dr. Maxson's address began by noting that her first field study was to work out the genetics of color polymorphism in *Hyla/Pseudacris regilla*. In this system, the final morphology is the result of an unknown process or processes acting on the genotype. Concern about the unknown part of that equation led her to molecular techniques. The bulk of the address discussed examples of how the techniques of microcomplement fixation, by robustly estimating differences in amino acid sequences, allow the uncovering of heretofore hidden relationships among taxa, or, since amino acid substitution occurs at a reasonably steady rate, the timing of separation events. The practical biological significance of such studies is (for just a couple of examples) to recognize that there are many more species than we are aware of in the Amazon Basin, or to clarify biogeographic problems.

There were nearly 90 papers contributed by 145 authors in a dozen sessions between 1330 hours, 3 August 1992 and 1200 hours, 6 August 1992. In addition, nearly 80 authors presented 40 posters during three sessions. Three symposia (Chelonians, Conservation, and Subspecies), involving 65 authors and 44 papers, and a Regional Societies Conference rounded out the official scholarly presentations. There was also an informal, students-only poster session (no prepared materials allowed, on-the-spot graphics only) to encourage interaction among students.

Sociality

Hosts Johnson and Lieb were careful to plan for our less scholarly needs as well, a point to which the busy schedule of additional events attests. These efforts by the local committee were well appreciated. We were welcomed to the hospitality of El Paso by an evening social at the Centennial Museum, on 3 August. This was followed later in the evening by a new incarnation of an old SSAR tradition. The revived event, now christened "President's Herpetological Travelogue," was an only slightly more organized version of the sit-around-viewing-slides-of-exotic-herps evening entertainment of not so many years past. James Dixon entertained us with a view of the herps of Venezuela, Aurelio Ramirez-Bautista offered glimpses of the herps of Jalisco, México, and SSAR President Ed Moll treated us to the turtles of India. Those of us with the interest but no opportunity to visit such exotic shores were introduced to their herpetofauna vicariously—and thoroughly enjoyed it.

The next evening, Tuesday, presented a "Fajita Fiesta" on the patio of the UTEP Union, an event much appreciated by the pilgrims assembled in a region of the country where Mexican food is done right. This was followed by the annual SSAR Auction. Master auctioneer Joe Collins skillfully coaxed greenbacks from the wallets of attendees to help support various SSAR projects. He was ably assisted by the following individuals, whose efforts helped ensure another successful auction: Suzanne Collins, Jerry and Kathy Johnson, Doug Taylor, Gabriel Valles, Chrystal Mars, Steve Christman, Jeanne Young, Kelley Smith, Laurie Dohm, Ellin Beltz, and the Incomparable Laura. With all of the food, the liquid refreshments, and the wild bidding, to say we had an entertaining evening would be the epitome of understatement.

Another long-term SSAR tradition, the live exhibit of local amphibians and reptiles, included an exhibit of old meeting t-shirts. Held at the Centennial Museum, the live exhibit was co-sponsored by the Chihuahuan Desert and the El Paso Herpetological Societies, and offered dozens of local species to the photographers among us. Also available throughout the meeting, were a juried show of herpetological art at the Museum, and a number of commercial exhibits, offering such items as books, arts and crafts, and research and care equipment, in the Union.

The annual multimedia event rounded out the week's events on Thursday, 6 August. "Amphibians of the Appalachians" and "Herpetology of the American West" by David Dennis and Eric Juterbock, and "Herpetologists Past and Present" by Kraig Adler and Dave Dennis, played to a large and enthusiastic audience at the Union Theater.

Business Meeting

The Annual Business Meeting was called to order at 1700 hours, Wednesday, 5 August 1992, in the Union Theater at UTEP, by President Ed Moll. After welcoming everyone to the meeting, he gave a very brief summary of the inter-society liaison meeting held this June in Urbana, at which a 1994 meeting in Athens, Georgia was discussed. As a result of requests from the incumbents, committees have been formed to locate individuals to serve as Treasurer and Publications Secretary (both Board positions), and *Journal of Herpetology* Editor.

In order that the Chair of the Resolutions Committee could be certain to catch the bus to the Juarez Racetrack, the resolutions (see below) were then read before any other business was conducted. All resolutions were passed unanimously by the assembled members.

Secretary Juterbock presented a very brief summary of business conducted at the Board Meeting, since the significant items were reported elsewhere (see below). Treasurer Taylor announced that SSAR was in good financial shape, and that the budget was balanced without having to raise dues.

A brief summary of editorial and committee business was presented. *Journal of Herpetology* is on time and under budget; there is no lag time, the flip side of which is that there can be problems filling each issue if authors are slow with revisions; the number of submissions is increasing, especially from authors outside the U.S. (now approximately 50%). *Herpetological Review* introduced a new format this year, and a 20-year index is now available. The *Catalogue of American Amphibians and Reptiles* notes only a significant problem in soliciting accounts. *Facsimile Reprints in Herpetology* will issue Fauvel's "Alligators in China" (1879) in autumn 1992; *Contributions to Herpetology* issued Leviton et al.'s "Handbook to Middle East Amphibians and Reptiles" in March 1992 and will issue "Herpetology: Contemporary Research on Amphibians and Reptiles," the First World Congress plenary lectures, in December 1992. *Herpetological Circulars* issued Snider and Bowler's "Longevity of Reptiles and Amphibians in North American Collections" in June 1992. Committee work of note included the Grants-in-Herpetology Committee discussing a definition of "student" (i.e., "graduate student" would appear to exclude research by undergraduates); the Annual Meetings Committee is pursuing a meeting in 1995 in Lincoln, Nebraska.

Craig Nelson (1993 Local Committee Chair) reported on plans for the 7-12 August 1993 meeting in Bloomington, Indiana. Indiana University will host the meeting. Be sure to follow *Herpetological Review* for news of the plans and descriptions of the site.

Kraig Adler, reporting for the Nominating Committee, announced the candidates for terms of office beginning in 1993. President-elect: Lynne Houck and Rodolfo Ruibal; Secretary: J. Eric Juterbock; Treasurer: Douglas H. Taylor; Director: Gregory Pregill and Dianne B. Seale; Director (non-U.S.): David M. Green and Robert Johnson. With no nominations from the floor, Bob Hansen moved (Dale Belcher seconded) to close the nominations; the motion carried without dissent.

The only item of old business discussed was the revision of the SSAR Bylaws. The Board had previously approved amending the Bylaws to make them gender-neutral. Copies of the proposed changes were distributed to attendees, who also approved the changes. The proposed amendments will be voted on by the membership in the 1992 election. Finally, at about 1750 hours, President Moll presented the official SSAR Presidential Gavel to President-elect Fritts, who adjourned the meeting.

Resolutions

Societies Salute Mexican Government Progress On Sea Turtle Conservation (Joint)

WHEREAS the world's populations of sea turtles have seriously declined as a consequence of direct human take for food and curios and incidental mortality associated with other fisheries; and,

WHEREAS México has historically supported the highest species richness and abundance of sea turtles in the western hemisphere, with all but one of the worldwide species nesting on its shores; and,

WHEREAS the Government of México took action in 1990 to end all directed fisheries for sea turtles in México, and has taken action to end exportation of sea turtle products; and,

WHEREAS the Government of México has announced that beginning in September 1992 Mexican shrimp fishing fleets will be required to use turtle excluder devices (TEDs) to reduce the rate of incidental capture of sea turtles; and,

WHEREAS the Government of México has taken concerted and consistent action to protect nesting Kemp's Ridley turtles on the nesting beach at Rancho Nuevo; and,

WHEREAS the Government of México has taken other steps to encourage and support international efforts to conserve sea turtles;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles (SSAR) and the Sociedad Herpetología Mexicana, professional scientific societies devoted to the study of amphibians and reptiles, salute and applaud these conservation actions of the Government of México and President Salinas de Gortari; and, be it further

RESOLVED that these Societies encourage the Government of México to vigorously enforce these conservation-oriented regulations.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles and the Sociedad Herpetología Mexicana, 5 August 1992 at their joint Annual Meeting.

Honoring Outgoing SSAR Officers and Editors

WHEREAS the following individuals have given freely of their time, skills, insight, and knowledge to the Society for the Study of Amphibians and Reptiles in this past year, thereby advancing its goals and furthering its growth and development as an international society; and,

WHEREAS these persons have, in the finest tradition of the Society, passed on to their institutions as much of the associated costs of this service to SSAR as was possible (even in a stressful budget year!); and,

WHEREAS the Society hopes that by lauding them here it may encourage them to serve again at some future time; and,

WHEREAS said Society is greatly indebted to these persons for their continual efforts in its behalf; and,

WHEREAS the Society urges these persons not to ride off into the sunset, but rather to, with or without official titles, continue to be available as resources to help those who follow better guide SSAR;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles offers its most sincere thanks to the following persons who have served in these capacities:

A. DALE BELCHER— Director
WILLIAM S. BROWN— Immediate Past-President
JAMES L. CHRISTIANSEN— Director and Chair, Long-Range Planning Committee
JOSEPH T. COLLINS— Annual Meeting Sites Coordinator
CARL ERNST— CAAR Section Editor
F. WAYNE KING— CAAR Section Editor
LINDA R. MAXSON— President and Chair, 1991 Local Committee
MARGARET STEWART— Chair, Nominating Committee
JAIME VILLA— Journal of Herpetology Editorial Board

Adopted by the Society for the Study of Amphibians and Reptiles 5 August 1992 at its Annual Business Meeting.

Thanking The Local Committee (Joint)

WHEREAS hundreds of herpetologists from several countries have assembled in El Paso for this joint meeting of the Society for the Study of Amphibians and Reptiles and the Sociedad Herpetología Mexicana; and,

WHEREAS Local Committee Chairs Carl Lieb and Jerry Johnson, ably assisted by Joyce Lieb, Kathy Johnson, Bob Webb, Margaret Jackson, Travis LaDuc, members of the Chihuahuan Desert Herpetological Society and of the El Paso Herpetological Society, the El Paso Centennial Museum, and many others, performed a great service for the SSAR and the Sociedad Herpetología Mexicana by agreeing to undertake the arduous task of hosting this meeting; and,

WHEREAS the University of Texas, El Paso has provided a congenial setting for this meeting; and,

WHEREAS this meeting has provided the second major opportunity for these two societies to extensively mingle and for our members to learn from one another;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles and the Sociedad Herpetología Mexicana offer their most sincere thanks to these persons who worked so hard to make this meeting a success.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles and the Sociedad Herpetología Mexicana, 5 August 1992 at their joint Annual Meeting.

Kennedy Student Award

The 1992 Kennedy Student Award, for student-authored papers published in volume 25 of the *Journal of Herpetology* is "Growth rates and ages at maturity of sympatric scincid lizards (*Ctenotus*) in Central Australia" by Craig James. The paper is credited to the School of Biological Sciences, University of Sydney; Craig's major professor was Dr. Richard Shine; his present address is: CSIRO Division of Wildlife and Ecology, P.O. Box 84, Lyneham, A.C.T., 2602, Australia.

The Award Committee noted both the high quality and the exceptionally high number of papers submitted this year. SSAR congratulates Craig James for his fine paper.

Seibert Awards

The first annual Seibert Awards were presented at the 35th Annual Meeting of the SSAR in El Paso, 2-6 August 1992. These awards are named in honor of Henri C. Seibert, an early and tireless supporter of SSAR (having served as an officer for over 20 years). The awards recognize outstanding student presentations at the annual meeting.

The winners: First Place—Bryan Windmiller (Tufts University), "Oriented dispersal in juvenile green frogs, *Rana clamitans*." Second Place—Mary Rybitski (Virginia Institute of Marine Science), "Organochlorines in Atlantic sea turtles." Honorable Mention—E. L. Blankenship (Auburn University), "Feeding trial of the smoky jungle frog larva (*Leptodactylus pentadactylus*)." SSAR congratulates these students for their fine presentations.

Announcement: ASIH, HL, And SSAR Position Statement On Environmental Problems

In late 1991 the National Research Council's Committee on Environmental Research asked numerous professional societies to comment on specific questions regarding environmental research and funding problems in the United States. Representatives of the three herpetological societies (ASIH, HL, SSAR) drafted a single position statement that was submitted to the NRC committee on 10 January 1992. This statement contains many of the comments provided in response to a Committee for the National Institutes for the Environment questionnaire that was mailed to all HL members (and therefore many ASIH and SSAR members) in September 1991. The position statement itself will be published in *Copeia* 1992(4).

New Life History Notes Section Editor

Randy Jennings has assumed the section editorship for Life History Notes effective 1 January 1993. He takes over for Steve Corn, who has accepted the position of Editor-in-Chief of *Northwestern Naturalist*. Steve's efforts on behalf of *HR* are sincerely appreciated. All Life History Note manuscripts should be sent to:

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Section Editor, Life History Notes
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SSAR Financial Statement For 1991

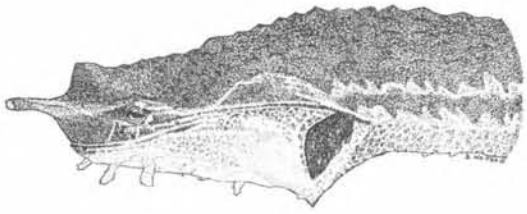
Cash Basis Balance Sheet - 31 December 1991

ASSETS	
Current Assets	
Cash in Bank - Checking:	86,761
Cash in Bank - Savings:	1,398
Merrill Lynch WCMA:	36,825
Certificates of Deposit - FSB:	57,728
Certificate of Deposit - Bank One:	31,328
Certificate of Deposit - FNB:	50,000
Total Cash:	264,040
Inventory held for sale:	602,000
Total Current Assets:	866,040
Other Assets	
Property and Equipment:	6,800
TOTAL ASSETS:	**$872,840**
LIABILITIES and FUND BALANCE	
Total Liabilities:	-0-
Fund Balance:	872,840
TOTAL LIABILITIES and FUND BALANCE:	**$872,840**

Statement of Revenues, Support and Expenses and Changes in Fund Balance - 31 December 1991

REVENUES and SUPPORT	
Memberships and Subscriptions:	87,904
Sale of Publications:	47,975
Sale of Reprints:	10,099
Page Charges:	6,798
Donations:	1,645
Grants:	3,426
Review Advertising:	2,187
Revisions and Royalties:	498
Credit Card Fees:	742
Postage Fees:	1,892
General Income:	31,261
Other Income:	353
Interest Income:	10,643
Dividend Income:	282
Total Revenues and Support:	205,705

EXPENSES	
Bank Charges:	2,074
Ballot Expenses:	1,000
Contingency Expenses:	2,697
Facsimile Reprints:	263
Grants in Herpetology:	1,500
Herpetological Circular:	904
Herpetological Review:	17,153
Journal of Herpetology:	54,788
Publication Projects:	63,439
Reprint JH Articles:	6,219
Turtles of Venezuela:	857
Publications Secretary Expenses:	13,100
Secretary's Expenses:	1,284
Treasurer's Expense:	3,574
Other Expenses:	291
Total Expenses:	169,143
Excess of Revenues and Support over Expenses:	36,562
Fund Balance December 31, 1990:	836,278
Fund Balance December 31, 1991:	**$872,840**



IN MEMORIAM

Charles Mitchill Bogert
June 4, 1908 — April 10, 1992

Science lost a world-class herpetologist with the recent death of Charles "Chuck" Mitchill Bogert. Because a complete bibliography of his publications will be published in *Herpetologica*, and a review of his life and accomplishments will appear in other obituaries, I shall confine my remarks to a brief chronological sketch of his career, and then concentrate on Chuck Bogert as the man I knew and called a close friend for more than half a century.

Bogert was born at Mesa, Colorado, but his family later moved to Los Angeles, California, where he received much of his education, including his preparation for a degree of Bachelor of Arts from the University of California at Los Angeles in 1934 and a Master of Arts in 1936. Meanwhile he served as a teaching assistant and worked in national parks during summer recesses. His early mentors were Laurence M. Klauber and Raymond B. Cowles, the latter of whom became one of his life-long friends. From 1936 through 1940 he was Assistant Curator in the Department of Herpetology at the American Museum of Natural History. After the death of G. K. Noble late in 1940 he was in charge of the department, becoming Curator in 1943 and subsequently Chairman. He retired at the end of 1968, when he moved to Santa Fe, New Mexico. His thermal investigations on temperature requirements of reptiles and amphibians started in 1938, and his faunal work in México, which was to continue for decades, began in 1939 with the assistance of a Grant-in-Aid from the Carnegie Corporation. His first major paper, other than the published updating of his thesis on the snake genus *Salvadora*, appeared in 1940 (Results of the Vernay Angola Expedition . . . . Part I, Snakes). Bogert took an active part in the internal affairs of the American Museum, serving on committees and in a number of other positions. In 1955 he was awarded a Guggenheim Fellowship for the study of reptilian thermoregulation and amphibian vocalization. Because herpetology, as well as other disciplines, was dominated by systematics at the time, Bogert was pioneering with his behavioral studies.

He was the first President of the Herpetologists' League, but soon resigned when it became clear Major Chapman Grant considered that organization as his private domain. Bogert was elected to several offices in the American Society of Ichthyologists and Herpetologists, and was its President in 1952-1954. In 1966 he received an honorary LL.D. from his alma mater, UCLA. Bogert traveled and collected widely through North and Middle America, the Bahama Islands, and Ceylon. He married Martha Meredith Ruby, one of his former students, on February 19, 1937. Their two children were Dereth Margaret (deceased) and Patricia Heaton (Patricia B. Holbrook).

Charles M. Bogert was a prolific writer throughout his professional life, and he was adept at penning things for the layman as well as for his more erudite reading audiences. He produced a steady flow of publications based on his own research and fieldwork, his broad knowledge of herpetology and its literature, and his willingness to respond to the lay public. He answered many queries and comments that were addressed to Natural History Magazine, and which printed his replies. His former colleagues in the Department of Herpetology, Charles W. Myers and Richard G. Zweifel (*Herpetologica*, in press) list 65 scientific contributions, 151 titles under "Abstracts, Reviews, and Popular Publications," and four commercially available records, the sounds for which Bogert recorded in the field, often with the help of his wife.



FIG. 1. Portrait of Charles Mitchill Bogert during the 1950's. Courtesy of the American Museum of Natural History.

Although the list of Bogert's strictly scientific publications may seem surprisingly short, cognizance must be taken of the fact that

many of his contributions were exceptionally long and definitive works, several of them co-authored with others. They embraced a wide spectrum of subjects, such as African snakes, cobras especially, *Lanthanotus*, the Helodermatidae, the herpetofauna of Sonora, thermoregulation of reptiles, and the influence of sound on the behavior of amphibians and reptiles. His scientific output accounted for more than 1700 printed pages, an impressive total.

Bogert was meticulous. He strove for thoroughness and perfection. For example, he took the time and effort to seek out original references and was not content, as were some of his contemporaries, to copy from others who presumably had verified facts and dates, but who sometimes made mistakes. He put in long hours of overtime, often carrying a briefcase full of work to his home for added attention at night. He was critical of sloppy writers, and he did not hesitate to say so.

Just when I first met Chuck Bogert I have now forgotten. Possibly it was at a herpetological meeting, but more likely I paid him a visit at the American Museum. We both had arrived in the East in the mid-1930's. Our correspondence, which occupies more than six inches in my archival files, began in late 1937, but there is no mention of an earlier meeting.

My herpetological interest at the time, and for many years afterward, was largely with water snakes, then all placed in the genus *Natrix*. The rather extensive collection of those serpents at the Museum offered much material useful for my studies. One day when I was in New York, I was busily counting scales on specimens of the red-bellied water snake, which Chuck had helped me dig out of the stored collection. Some time later he arrived with another rather large snake with a reddish venter and remarked, "Here's one we missed." I took it from him, examined it briefly, and said, "That's no red-bellied water snake. It's not even a member of the genus *Natrix*." Chuck responded, in mocked surprise, "It isn't! What is it then?" I didn't know. The scoundrel had hunted through the collection for a snake from some distant part of the world that superficially resembled the ones I was studying. He was testing me out. I didn't mind, and I had a good private laugh about it later. But when he tried the same thing on certain other persons, they resented it and were quite annoyed. Evidently I passed the test because a short time later I was notified I had been made a Research Associate of the Department of Herpetology, a privilege that I still enjoy.

It early became apparent that Chuck, at times, could be rude, even abusive, toward others. That surprised me at first, and I thought perhaps something had gone wrong to disturb his equanimity, or even that he had not slept well the previous night. Unhappily, it was chronic with Chuck, in that similar behavior cropped up now and then. The thought crossed my mind that perhaps there had been some happenstance in his life that made him feel the need to be irritable at times. To defend himself? Perhaps subconsciously? I learned recently that members of his family believe that such an unfortunate complex may have originated in his early youth. He became abrasive with me one day early in our association, and I responded in kind. He respected me for it and, although there were occasional later outbursts, we got along well thereafter. Regrettably, when others were subjected to similar treatment they did not always forgive him, and he made a number of enemies as a result.

I have heard so many conflicting stories about Bogert over the years that one might think he was a latter-day Dr. Jekyll and Mr. Hyde. On the negative side some people depicted him as a stern, forbidding ogre who lorded it over his subordinates. He could be scathingly critical. He seemed reluctant to compliment anyone on a good piece of work. He was quick to anger and slow to forgive.

On the other hand he was polite and helpful to visitors. He insisted on keeping up the Departmental bibliography of herpetology, and he supervised the maintenance of a well-curated preserved collection when both funds and staff were low. He was a good correspondent with many people, and he received honors from a number of prestigious organizations. He worked hard for long hours. He could be very kind and thoughtful at times. Ellin Beltz, columnist for the *Bulletin* of the Chicago Herpetological Society, vividly recalls her first encounter with him when she was very young. She and a bosom friend were both too small to see into the Museum exhibits. They remedied that difficulty by holding each other up briefly to have a look. They could not read the labels without jumping up and down, as she put it, like Mexican jumping beans. They were so noisy that Chuck left his office to investigate. He sized up the situation at once, procured a wooden box for them to stand on and then told them, whenever they were at the Museum, to knock on the door and ask for it. Bogert, who was always a tall, handsome, and imposing figure, later took the two little girls, who were especially fond of reptiles, for a behind-the-scenes-tour of his Department.

Chuck normally did everything in his power to help me. He looked up references for me among the huge literary resources of the Museum, he critically reviewed some of my manuscripts, and when I visited the Museum he made sure that I had access to everything I needed. We were prompt correspondents with each other and, when he received an inquiry from me, I was almost invariably assured of a card or letter in reply that he would mail the same day. When I asked to borrow specimens, they were packed and shipped almost as quickly. I owe much to Chuck who befriended me, guided me, and helped me to avoid mistakes in the days when I was trying to make a serious herpetologist of myself. In a sense he became *my* mentor.

It was Chuck Bogert who helped focus my attention on Mexican reptiles and amphibians. On August 26, 1946, he was in the field, with two companions, along the Río Nazas in Durango, when they collected a rather large water snake by shooting it. By camp light, that very same night, he composed a hand-written letter telling me about it that he mailed from Torreón the next day. I deeply appreciated his thoughtfulness which, although I didn't know it at the time, was to open a whole new vista for me. The Río Nazas is an isolated river that rises in the highlands of western Durango, flows chiefly eastward, and once emptied into the desert in western Coahuila. (The water is now almost entirely devoted to human use, chiefly in the Laguna District centering around Torreón, Gómez Palacio, and Ciudad Lerdo.) How did a water snake get into such a stream, one that went nowhere, so to speak? That question was to intrigue me for years. Chuck sent me the specimen as soon as he arrived home from México, and I managed a few years later to collect more of the same kind. In 1953, after a careful study of all pertinent material, I described *Natrix erythrogaster bogerti*, which is endemic to that single river system. My trip to the region and other parts of México in 1949 was stimulated by Bogert, and he later encouraged me to apply for financial support from the National Science Foundation. I was able to qualify for three consecutive grants.

On the subject of new taxa, Chuck named 27 during his long professional career, two of them new genera. Some 20 taxa were named for him, including my water snake and two new genera, *Bogertia* and *Bogertophis*. The first had an interesting origin. Bertha Lutz, an authority on Brazilian frogs, apparently sent a pair of geckos, which she had found near the Atlantic Coast, to Bogert for identification. He, in turn, sought help from Arthur Loveridge at the Museum of Comparative Zoology, who described them in

1941 as a new species and created the combination *Bogertia lutzae*, thus honoring two persons. Doubtless Loveridge was reciprocating inasmuch as Bogert had named a new African snake, *Meizodon loveridgei*, for him the previous year. Bogert, based on our friendship and also doubtless because I called the new water snake *bogerti*, named a salamander, *Pseudoeurycea conanti*, for me.

The other new genus dedicated to Chuck was *Bogertophis*, which was erected by Dowling and Price to accommodate the species of snakes, *rosaliae* and *subocularis*, which had long been assigned to the genus *Elaphe*.

Chuck always had a subtle sense of humor. The last taxon named for him was *Heloderma horridum charlesbogerti* Campbell and Vannini, for a new subspecies of that venomous lizard from a xeric area in eastern Guatemala. He thought it was a great joke—"the horrible Charles Bogert."

Based on his broad experience south of the border, Chuck taught me many things about México. Although I had visited the American Southwest a few times, I knew little about arid country and its plant and animal life. I suspected that the best time to be in the field was during the onset of the summer rains when "critters" of various kinds would emerge from estivation following the long dry season. He vigorously confirmed that supposition. By relating many of his experiences he gave me an insight on how to treat the *peones* in rural México, how to avoid being cheated in the markets, and how to bargain when necessary. My limited Spanish, which improved greatly when I had to use it for several summers in succession, was ample to cope with most problems. In short, Bogert was more than willing to share his information with me.

Inasmuch as Chuck continued to visit México regularly, it was inevitable that we should plan to meet and be in the field together. Our first such encounter was at Chapala, Jalisco, where my late wife, Isabelle, and I met Bogert and three students. We did some collecting, and Chuck introduced me to the large garter snake, *Thamnophis eques*, which occupies one of the water snake niches on the Mexican plateau and trans-volcanic belt. It was abundant but difficult to catch. Chuck also took us on shopping tours of Guadalajara and nearby Tlaquepaque, scarcely field work but interesting and useful nonetheless.

It was from Oaxaca de Juárez as a base that we spent more time with him and his wife, Martha, or "Mickey," as she is universally known to her friends. Chuck and John A. Moore had visited the area during the previous year, but in 1961 and for a full decade afterward, the Bogerts spent their summers in Oaxaca, meantime developing a close rapport with Roy H. and Anita Jones, who operated the Oaxaca Courts, a first-class place for tourists to stay. It was much better than the average motel. Anita was an excellent manager, and she kept such a tight rein on her employees that their dining room was one of the few places in México where it was safe to eat and drink anything placed on the tables. From Oaxaca the Bogerts ranged out in all directions. He found a number of new species which he described, including a new genus of dwarf boa. They made sure that we saw the ancient ruins at Mitla and Monte Alban, but our most momentous excursion was an abortive attempt to find a freshwater lake along the Pacific coast near Puerto Angel. Did the west coast water snake, which was abundant in a lagoon near Acapulco, range that far southward and eastward? I wanted to know if possible.

Mickey elected to remain in Oaxaca, but Isabelle and I drove our Volkswagen Kamper and Chuck was accompanied in his field vehicle by two visitors, a Mr. and Mrs. Potter. The paved road terminated at Miahuatlán, and then we had a hundred miles of rough going to negotiate, over many knife-like ridges and down the steep, sinuous road of the escarpment. In some places, during afternoon thundershowers, we could see the dirt road washing away on its downward side, and we wondered if there would be enough room left for us to get through on our return trip.

We never found our objective, but we collected wherever and whenever we could. Chuck, who enjoyed social contacts and who also was a good raconteur and so well-informed about so many aspects of México, spent a large part of his time talking with the Potters. Both he and I collected frogs, but I caught the only snake, the only turtle, and the only two salamanders of the trip. When I twitted him about it, he accepted it good-naturedly, and there was no vituperative outburst as I had heard him direct at others who had managed to beat him in the field. Our Kamper, which was well stocked with food, became the "chuck wagon," and Isabelle found herself catering for five instead of two.

On our return trip Chuck demonstrated an aspect of his personality that was pixie-like, to say the least. Wild calla lilies were in bloom here and there at places where we stopped to rest and to try to find something to collect. Where a primitive lane met the almost equally primitive road along which we traveled, a young girl, perhaps seven or eight years of age, held a bouquet of lilies that she obviously hoped we would buy. Bogert stepped from his vehicle and told her in Spanish that he would take them if she would give him a kiss. She was shy, and an amusing tableau developed that lasted for several minutes and only terminated when she gave him a peck on the cheek as he leaned over. She grabbed the few pesos from his hand and ran as fast as she could to the safety of her nearby humble home, from which her mother had watched us. When we arrived back at the Oaxaca Courts with the lilies, Roy Jones blurted out, "Who's dead?"

The Bogerts loved Oaxaca so much that they hoped to retire there. They even bought some land, or thought they had, on which they planned to build a house, but Mexican law, plus a heavy dash of chicanery, thwarted them. Anita Jones had been born in México, of Dutch parents, and she was thus a Mexican citizen, and she could own property. The Bogerts, as gringos, had no such privileges. At almost the last minute their daughter, Patricia, found a nice house near her own in Santa Fe, New Mexico, which they bought sight unseen. They moved into it during 1968. Traces of Oaxaca quickly appeared in the form of *tapetes* and other objects skillfully prepared by a clever and intelligent weaver, Isaac Vásquez, of Teotitlán, a small village about midway between the city of Oaxaca and Mitla. Some of Isaac's creations still adorn my own home in Albuquerque.

The Bogerts settled in, and Chuck assembled his woodworking shop in one of the bedrooms. He was a skilled craftsman with his hobby of making boxes of inlaid wood of various kinds and colors. He also continued his interest in herpetology. He caught and marked many short-horned lizards, *Phrynosoma douglassii*, in the open land around their house. He contracted to prepare a report on the herpetofauna of the Los Alamos Natural Environmental Research Park, and he wrote an exhaustive manuscript on the subject which, probably because of its great length, was never published. Meantime, dissatisfied with the conclusions reached in his Master's thesis on *Salvadora*, especially in view of the accumulation of new material from critical localities, he hoped to produce a monographic study on the genus. He even patched up his misunderstanding with Charles H. Lowe, of the University of Arizona, and was able to examine the pertinent specimens at that institution. Also, when the Society for the Study of Amphibians and Reptiles expressed a desire to reprint the Bogert and Martín del Campo opus on the Helodermatidae, he agreed to prepare an introduction updating that major contribution to herpetology. Alas, neither was ever finished.

Once he was away from the stimulation of his colleagues at the American Museum, Chuck turned more and more to other things, notably traveling and spending much time conversing with local friends, as well as many others who visited Santa Fe and were guests in their home. With Mickey he made several trips to Africa, as well as one to New Guinea and Australia, not to pursue research, but to see and enjoy distant parts of the world. It was interesting to note the change in decor at their home. For the first many years of retirement, Isaac's weavings and Mexican arts and crafts and utensils were very much in evidence. Once the Bogerts began traveling extensively, African artifacts gradually replaced their memories of México.

Chuck produced a few short papers during his retirement, but the old drive and productivity were gone. He continued to correspond with friends and colleagues, we visited back and forth occasionally, but we had to use the telephone for communication after I began spending large blocks of time in Tucson, Arizona, as I pressed forward with the Howard K. Gloyd and Conant tome that was eventually published as "Snakes of the *Agkistrodon* Complex, a Monographic Review."

Disaster overtook Chuck on April 17, 1988, when he suffered a stroke that greatly impaired one of his legs. He was sent to Albuquerque for therapy, where Kathryn Gloyd and I visited him, and later in Santa Fe when he was getting around on a walker. It was all downhill from the day of his stroke. Others followed at intervals. His fingers became so numb that he could use the typewriter only in the afternoon after they had limbered up, and then only with liberal applications of liquid paper to white out his mistakes. How extremely frustrated he must have been after such a long and distinguished career. Finally, on April 10, 1992, he had the courage to end it all and to eliminate the exhausting, almost 24-hour duty to which his faithful and beloved wife had been subjected for almost four years. He was thoughtful to the end and delivered the fatal bullet into himself in such a way as to cause no bloodshed.

Mickey Bogert recently scattered half his ashes on a hillside overlooking Oaxaca. The other half was committed to the soil of the Chiricahua Mountains of Arizona, one of his favorite places in the entire Southwest.



FIG. 2. C. M. Bogert recording at Schaeffer's Pond on the Palisades above Tenafly, New Jersey, ca. 1961. Photograph by Richard G. Zweifel.

Charles M. Bogert made an outstanding name for himself, and his many important scientific contributions are an enduring memorial to him as a dedicated herpetologist. Like so many of his other friends and admirers, I deeply mourn his passing. His career and accomplishments were unique in many ways.

Acknowledgments.—I am deeply grateful to Martha R. Bogert for her help in preparing these recollections of Chuck. Others who assisted in various ways are: Kraig Adler, Ellin Beltz, Charles W. Myers, Manny Rubio, Norman J. Scott, Jr., and Richard G. Zweifel.

ROGER CONANT
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NEWSNOTES

1993 CHS Herpetological Grants Program

The Chicago Herpetological Society announces the CHS Herpetological Grants program to award financial support for herpetological research, education, and conservation. Eight awards of up to $500 each will be available. Interested parties may apply for a grant in any one of the following categories:

1) Illinois Herpetology
2) Graduate Student Research in Herpetology
3) Undergraduate Research in Herpetology
4) Field Studies in Herpetology
5) Conservation
6) Captive Management, Husbandry, and Propagation

An attempt will be made to award grants in each category, but depending on the applications received, not all categories may receive awards. Some categories may receive more than one award. The Grants Committee reserves the right to reassign the category under which a given proposal is submitted. If applications are lacking, fewer than eight awards may be distributed.

Applicants must be CHS members. In accepting a grant, the recipient agrees to abide by all state and federal laws, to submit a written summary at the end of their work for publication in the CHS *Bulletin*, and to acknowledge the CHS in any publications that result from their subsidized research. Recipients are encouraged to submit their work in article form or as a CHS monthly meeting program.

Applications should include the following:

1) Statement of proposal objectives.
2) Description of materials and methods.
3) Complete budget, not to exceed $500.
4) Brief resumé of the applicant, if an individual. If the applicant is an organization, background information on the organization should be included.
5) A completion date for the project.

Applications must be typed, double spaced, and submitted in duplicate. Applications should be kept brief; proposals longer than four (4) pages are discouraged. All applications must be received by 1 March 1993, and awards will be announced by 1 May 1993.

It is the goal of the Grants Committee to award grants to a

variety of applicants; enthusiastic amateurs will receive equal consideration with professional herpetologists and graduate students. Topics including Illinois herpetology, captive husbandry and propagation, and those which may translate into quality CHS *Bulletin* articles or monthly meeting programs are favored, though not requisite.

Submit applications to:

CHS Herpetological Grants
Chicago Herpetological Society
Field Museum of Natural History
Division of Amphibians and Reptiles
Roosevelt Road at Lakeshore Drive
Chicago, Illinois 60605, USA.

Or contact Thomas G. Anton, 1993 Grants Committee Chair, at (708) 869-8219, or (312) 922-9410 ext. 271.

Summer Course In Amphibian Cytogenetics At Highlands Biological Station

The Highlands Biological Station, located in the Blue Ridge Mountains of southwestern North Carolina, is offering a course in Amphibian Cytogenetics, to be taught by Stanley K. Sessions of Hartwick College, during the period 7-18 June 1993.

Topics to be covered include chromosome banding, preparation of karyotypes and idiograms, analysis of meiosis, microspectrophotometry, genome size, and lampbrush chromosome preparation.

The course is designed for advanced undergraduates, graduate students, and professionals. Three semester hours credit is available through either Western Carolina University or the University of North Carolina at Chapel Hill. The course may also be taken on a non-credit basis. For further information and application forms contact:

Highlands Biological Station
P.O. Box 580
Highlands, North Carolina 28741, USA
Tel. (704) 526-2602.

SWRS Volunteer Opportunities

Approximately 20 volunteer positions are open in 1993 at the American Museum of Natural History's Southwestern Research Station in Portal, Arizona. The volunteer program is run annually and offers students in biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging are provided to volunteers in exchange for twenty-four hours per week of routine chores, with the remaining time available for research activities.

The program is open to both undergraduate and graduate students; the latter may pursue their own research projects. Faculty knowing of promising students should alert them to this opportunity for professional experience toward, development of, and evaluation of their career goals.

Volunteers are needed between 15 March and 1 November 1993. Appointments are for part of this period, with a minimum appointment of six weeks. Applicants for spring positions (March–May) should submit applications by 15 February 1993, summer volunteers (June–August) by 1 April 1993, and fall volunteers (September–November) may apply any time.

For applications, write to:

Dr. Wade C. Sherbrooke, Director
Southwestern Research Station
American Museum of Natural History
Portal, Arizona 85632, USA
Tel. (602) 558-2396.

AAZK Grants Available

The American Association of Zoo Keepers announces the availability of two $750 research grants in the field of zoo biology. The deadline for submissions is 1 March 1993. Interested applicants should direct their inquiries to:

Sue Barnard
AAZK Research/Grants Committee
Zoo Atlanta
Department of Herpetology
800 Cherokee Avenue, SE
Atlanta, Georgia 30315, USA.

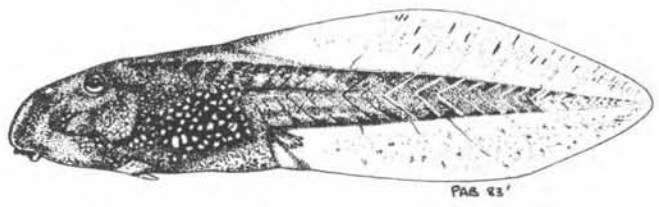
Smithsonian Research Fellowships

The Smithsonian Institution announces its research fellowships for 1993-94 in the Biological Sciences. Smithsonian Fellowships are awarded to support independent research in residence at the Smithsonian in association with the research staff and using the Institution's resources. Under this program, senior postdoctoral fellowships of three to twelve months, pre- and postdoctoral fellowships of six to twelve months, and graduate student fellowships of ten weeks are awarded. Proposals for research in the following areas may be made: animal behavior and pathology; ecology; environmental studies; evolutionary biology; marine biology; natural history; paleobiology; systematics; and tropical biology.

Applications are due 15 January 1993. Stipends supporting these awards are $26,000 per year plus allowances for senior postdoctoral fellows (individuals who have the Ph.D. for more than seven years); $21,000 per year plus allowances for postdoctoral fellows; $13,000 per year plus allowances for predoctoral fellows; and $3,000 for graduate students for the ten-week tenure period. Pre-, post-, and senior postdoctoral stipends are prorated on a monthly basis for periods less than twelve months.

Awards are based on merit. Smithsonian fellowships are open to all qualified individuals without reference to race, color, religion, sex, national origin, age, or condition of handicap of any applicant. For more information and application forms, please write to (indicating area of proposed research and dates of degrees received or expected):

Smithsonian Institution
Office of Fellowships and Grants
955 L'Enfant Plaza, Suite 7000
Washington, D.C. 20560, USA.



MEETINGS

ASIH/HL/AES/ALFC 1993 Annual Meeting

The annual meetings of the American Society of Ichthyologists and Herpetologists (ASIH), Herpetologists' League (HL), American Elasmobranch Society (AES), and the Annual Larval Fish Conference (ALFC) will be held jointly on the campus of The University of Texas at Austin 27 May – 2 June 1993. The meetings are co-sponsored by The University of Texas at Austin and Texas A & M University. Scientific sessions will be held in Welch Hall and housing will be available in nearby Jester Center on the UT campus and at nearby hotels.

The meetings will include contributed papers and posters, exhibits, social activities, business meetings, and field trips. A special student paper symposium will be jointly sponsored by all participating societies. In addition, the following symposia are scheduled (organizers and sponsoring societies in parentheses): Biology of Feeding in Fishes, Amphibians, and Reptiles (Kiisa Nishikawa - HL/ASIH); Lizard Ecology: The Third Generation (Laurie Vitt and Eric Pianka - ASIH); *Sceloporus*: A Model System (George Middendorf - HL); Sexual Selection: What Has Been Learned From Ectotherms (Mike Ryan - ASIH/HL).

A meeting announcement will be mailed in December to members of the ASIH, HL, AES, and Early Life History Section of AFS. Others may request an announcement by contacting:

Diana Dobson
Thompson Conference Center
P.O. Box 7879
University of Texas
Austin, Texas 78713-7879
Tel. (512) 471-3123
FAX (512) 471-0647.

Sceloporus Symposium: Announcement And Call For Participation

As part of the ASIH/HL Meetings to be held 27 May – 2 June 1993 at the University of Texas at Austin, a symposium will be organized to address the following topics as they relate to the biology of *Sceloporus*: Systematics and Biogeography; Ecology and Demography; Reproduction and Physiology; and Behavioral Interactions.

Presentations are invited from all herpetologists studying *Sceloporus*. Interested persons should submit a tentative title and indicate a session affiliation. For additional information or to submit a title, please contact:

George Middendorf
Department of Zoology
Howard University
Box 887 Administration Building
Washington, D.C. 20059, USA
Tel. (202) 806-6933
FAX (202) 806-4564.



Symposium On The History Of Herpetology: Call For Papers

A symposium on the history of herpetology will be part of the Second World Congress of Herpetology at the University of Adelaide, South Australia from 29 December 1993 to 6 January 1994. The program is planned to include ten 15-minute talks contributing to the history of herpetology in the broadest sense. Contributors are welcome to submit papers dealing with the following topics:

— the development of herpetology as a recognized scientific field according to the modern standards (biographies of major herpetologists; major explorations and discoveries related to amphibians and reptiles over the world; foundations of major collections, departments, and laboratories devoted to herpetology; methods and techniques, etc.). Papers related to major themes (1. Evolution and Genetics; 2. Systematics and Distribution; 3. Physiology; 4. Ecology; 5. Ethology; 6. Conservation and Captive Care) are especially recommended;

— the origin, methods, aims, and results of what was once considered as herpetology in other periods of time and civilizations or cultures all over the world;

— data expressing knowledge and ideas about reptiles and amphibians at a common or traditional (pre-scientific) level (including positive and negative prejudices and their effects on the status of creeping creatures, on the development of their scientific study, on the relationship between humans and amphibians and reptiles). Such papers will emphasize anthropozoological analysis along with historical criticism.

Deadline: potential speakers should send complete details (title and summary of papers; affiliation and full address) as soon as possible.

Publication: papers (up to 10,000 words in length) recommended for publication by the committee of referees will be published in the collection of *Colloques d'histoire des connaissances zoologiques*.

For futher information or to submit papers, please contact:

Prof. Lilliane Bodson
rue Bois-l'Evêque 33
B-4000 Liège 1, Belgium
Tel. (041) 66 55 79
FAX (041) 66 57 00.

International Conference On Tortoise And Turtle Conservation

The American Museum of Natural History's Turtle Recovery Program and the New York Turtle & Tortoise Society will cosponsor Conservation, Restoration, and Management of Tortoises and Turtles—an International Conference. The conference will be hosted by the State University of New York, SUNY Purchase and held 11-17 July 1993.

The conference will provide a forum for a wide array of people concerned with conservation to critically assess current efforts and develop strategies for the future. Using turtles as a model, the conference will develop techniques that can be applied to the conservation of a wide array of flora and fauna. Conference participants will include representatives from the academic, business, government, and private sectors.

The Turtle Recovery Program is a joint initiative of the American Museum of Natural History and the IUCN-World Conservation Union Species Survival Commission. The program designs and implements turtle conservation programs around the world. The New York Turtle & Tortoise Society, one of the world's largest turtle groups, is dedicated to the conservation and preservation of turtles and tortoises and their habitats. The society is also committed to the promotion of the proper husbandry and captive propagation of turtles and tortoises.

For further information on the conference contact:

Craig Vitamenti
c/o The New York Turtle & Tortoise Society
163 Amsterdam Avenue, Suite 365
New York, New York 10023, USA
Tel. (212) 459-4803.

IHS 17th Annual Symposium: Announcement And Call For Papers

The International Herpetological Symposium, Inc. will hold the 17th Annual Symposium in Miami Beach, Florida, 17-20 June 1993. The IHS presents papers on herpetoculture, natural history, veterinary medicine, and other topics related to herpetology. Individuals interested in presenting a paper at this meeting should write to:

Richard Ross, MD
Institute for Herpetological Research
P.O. Box 2227
Stanford, California 94309, USA.

Tiger Salamander Symposium

The second symposium on the eastern tiger salamander (*Ambystoma t. tigrinum*) will be held on Friday, March 5, 1993 in East Hampton, Long Island, New York. The focus of the symposium will be conservation and management of the eastern tiger salamander. Featured events will include field trips on the evenings of March 4-5. If you are interested in participating or would like more information, please contact:

Andy Sabin
South Fork Natural History Society
P.O. Box NATURE
Amagansett, New York 11930, USA
Tel. (516) 267-7944.

Symposium On The Status And Conservation Of Turtles Of The Northeast

The Massachusetts Audubon Society will host a symposium on the status and conservation of the turtles of the northeast on Saturday and Sunday, 20-21 March 1993 at Worcester State College in Worcester, Massachusetts. Reports and papers will include state status reports, management projects, and biology of all northeastern species. For complete information, send a self-addressed, stamped envelope to: Massachusetts Audubon Society, South Great Road, Lincoln, Massachusetts 01773 attn: Turtle Symposium.

REGIONAL SOCIETIES

Czechoslovak Herpetological Society

The Czechoslovak Herpetological Society was founded in 1992. Czechoslovak herpetologists have been until now organized only in the Herpetological Section of the Czechoslovak Zoological Society. The main purposes for the foundation of the independent Society are as follows:

1) There are no professional herpetological institutions in Czechoslovakia. Hence, the Czechoslovak Herpetological Society (CSHS) is intended to be a platform for promotion and coordination of herpetological research (including preservation of herpetofauna) in Czechoslovakia.

2) The Czechoslovak Herpetological Society will support abovementioned herpetological research both scientifically and financially. It will enable contacts among its members (for instance, by means of informational pamphlets, scientific publications, organization of annual conferences), and it will take part in education of undergraduate students interested in herpetology. The Society will encourage its members to join the international herpetological community.

3) Membership is open both to natural persons and corporate bodies, from Czechoslovakia and from abroad, under the condition that they are interested in herpetology and follow the Statutes of the Society.

Further information may be obtained from:

Dr. Jirí Moravec
Department of Zoology
Národní muzeum
Václavské nám. 68
115 79 Praha 1
Czechoslovakia.

Finnish Herpetological Society

The keeping and breeding of reptiles and amphibians for study or hobby is a relatively recent development in Finland. The establishment of the Finnish Herpetological Society is the first official attempt to bring together the people involved in these activities in Finland.

Currently, FHS members are primarily interested in the following: 1) developing contacts both within Finland and abroad in order to expand their herpetological knowledge; 2) increasing the very limited number of species available to hobbyists in Finland; 3) ensuring appropriate treatment and welfare of captive animals; and 4) encouraging accurate and carefully planned attempts to breed captive herps.

FHS members would very much like to hear from similar organizations and their members around the world. All correspondence and assistance is welcomed. Correspondence should be directed to:

Mr. Mika Jansson
Ansaritie 2 A 9
SF-00300 Helsinki
Finland.

POINT OF VIEW

The Family Iguanidae: Disagreement With Frost And Etheridge (1989)

Frost and Etheridge (1989) presented "A phylogenetic analysis and taxonomy of iguanian lizards" resulting in recognition of nine families. Conant and Collins (1991) embraced this arrangement. However, I have studied iguanians for over three decades, in the field around the world, and at many museums, especially the Museum of Comparative Zoology (MCZ), and I cannot accept it.

The first issue for me confronting a drastic taxonomic fragmentation of this sort is "why"—in the sense of "what good does it do?" The taxa in higher categories (hereafter called simply higher taxa) such as families are words, not organisms. They are arbitrarily delimited by humans and serve only two purposes: facilitation of communication and facilitation of identification. To these ends higher taxa need to be unequivocally defined (as words) and readily recognizable wherever possible. The signal restraint is that a higher taxon must also be monophyletic as opposed to polyphyletic.

The evolutionary or synthetic systematist is willing to accept difficulties in correct recognition and identification if, by so doing, polyphyletic grouping is avoided. In the case of iguanian lizards, no issue of polyphyly arises. No one doubts that the Iguania is a monophyletic assemblage.

The cladistic notion of "paraphyly" is not a replacement for, or contradiction of, monophyly for the evolutionary or synthetic systematist. I fully accept that most any monophyletic higher taxon is or potentially can become paraphyletic (and remain monophyletic, of course). This occurs when some member lineage, a species, evolves beyond the defined limits of its ancestral higher taxon. For me, that is simply and obviously the way novel higher taxa originate (Simpson 1961:140-146). I do not believe cladistic and synthetic taxonomies can be reconciled in many cases, and reams have been printed on this subject (e.g., Mayr and Ashlock 1991; Wiley 1981). A succinct overview with which I can agree is provided by Nelson (1984).

In any case, while Frost and Etheridge provide equivocal evidence for paraphyly in the previous arrangement of three iguanian families, they present no compelling proof. Indeed, they present no new factual evidence at all and provide no definitive phylogeny.

Frost and Etheridge do place under one cover many of the scattered facts about iguanians many of us have known and considered for decades. These facts led us to adopt informal names for the groups Frost and Etheridge have elevated to formal families. I could not accept these groups even as valid subfamilies (e.g., Lazell 1989). No evidence has been presented to make me reconsider: I knew all that before and thought little of it then. The characters used by Frost and Etheridge are only a subset of those available and many, as shown in Table 1, do not bear up well under close scrutiny (see below).

Frost and Etheridge explicitly eschew "overall similarity," which is general resemblance or gestalt. I value gestalt highly and regard it, in the absence of evidence for polyphyletic convergence, as excellent evidence of relationship. Gestalt similarity results from the correspondence of myriad mensurable or meristic characters. Any of these can be quantified, evaluated as ancestral or derived, and used just exactly as Frost and Etheridge use qualitative characters such as gular fold complete or incomplete.

A generation ago a group of systematists built a briefly popular fad of classification around the codification and computation of gestalt. The notion was to count or measure literally everything possible about organisms and have a computer sort the organisms out. This group was called pheneticists or numerical taxonomists. Fundamental to their view was rejection of all subjective character weighting. The length of a lizard's tail was credited with exactly the same value as its number of limbs. This approach garnered many enthusiastic and vocal supporters, including many highly placed academicians generally judged to be quite intelligent (but see Orr 1992). Many of us were amazed that anyone would believe giving two characters equal weight was any less subjective than claiming one to be a dozen, or a million, times more valuable than the other. Frost and Etheridge also shun character weighting, thus subjectively rendering all characters equal.

Enlarged middorsal scales are certainly not the equal of zygodactyl foot. A classification which rejects gestalt as evidence for relationship within a monophyletic assemblage is unappealing to me. For example, chameleons are so bizarrely different in gestalt from all other iguanians and—indeed—all other earthly life forms that I would grant them a family of their own without hesitation. Fortunately, major qualitative characters back this up and I find no need to codify gestalt into specific characters in this case.

Conversely, tropidurines (or "Tropiduridae") and crotaphytines (or "Crotaphytidae") share many aspects of gestalt: they are rather similar looking lizards. Frost and Etheridge separate them as distinct families on the basis of three characters: femoral pores, gular fold, and S-condition of the nasal chamber in crotaphytines. The presence or absence of femoral pores varies within species of iguanians (e.g., *Polychrus marmoratus*); I cannot accept it as a family level character. Tropidurines lack a complete gular fold and have a primitive nasal chamber (see Table 1). I weight characters differentially and judge the differences between tropidurines and crotaphytines to be trivial in light of their overall gestalt resemblance and numerous other uniting features shown in Table 1.

The distinction of tropidurines from equally similar looking sceloporines (or "Phrynosomatidae") is even weaker, relying solely on the "sink trap" versus primitive nasal chamber. For me, that is simply not good enough for even subfamilial separation.

Frost and Etheridge settled on 30 characters for defining their proposed families. I regard some of their characters as utterly trivial. For example, hemipenes (present only in males, of course, and therefore of little use for identification) separate out no taxon. Similarly sternal rib attachments and sternal fontanelles are useless. Caudal vertebral features are not definitive for any group. Rugosity of skull roof signifies nothing more than a separation of oplurines from sceloporines and tropidurines (see Table 1).

All this contrasts dramatically to characters of gross morphology and histology of the tongue (Schwenk 1988), for example, which contradict the Frost and Etheridge scheme.

I reject the partition of continua in definition of higher taxa. That is, I insist on a gap in quantitative characters. For example, within the Iguania, colic folds or septa vary from zero to more than a dozen. The Iguanidae *sensu stricto* of Frost and Etheridge (iguanines previously) are separated from most other groups solely because they have from one to over a dozen folds or septa. Much of this distinction is in the phraseology. When one writes the character as present or absent it is specious. It sounds major and important. When one considers the actual structures in a spectrum of species (Iverson 1980) it becomes the artificial division of a continuum.

Most iguanians lack colic folds or septa. Iverson (1980) deter-

TABLE 1. The thirty characters used by Frost and Etheridge (1989) to define families of iguanian lizards. Abbreviated character names are given along the left. Fuller descriptions are supplied by Frost and Etheridge for all of these, and for some of them in this text. Initials across the top are for the families represented: CH, Chameleonidae (including agamids, etc.); CO, Corytophanidae (basiliscines); CR, Crotaphytidae (crotaphytines); H, Hoplocercidae (morunasaurs); Iguanidae (iguanines); Opluridae (oplurines); PH, Phrynosomatidae (sceloporines); PO, Polychridae (anolines); T, Tropiduridae (tropidurines).

Symbols in the table are as follows: +, present; –, absent; Q, quadrangular; D, domed; Y, Y-shaped; T, trapezoidal; V, variable; F, in frontal; I, in suture; M, medial; SH, short; L, long; IS, isolated and separated; C, confluent; A, acrodontan; P, primitive; S, S-shaped; ST, sink-trap; U, unicapitate and unisulcate.

		CH	CO	CR	H	I	O	PH	PO	T
1.	Maxillae meet	+	–	–	–	–	–	–	–	–
2.	Large lacrimal foramen	±	–	–	+	–	–	–	–	–
3.	Skull roof rugose	±	±	±	±	±	+	–	±	–
4.	Jugal-squamosal juxtaposed	+	±	–	–	–	–	–	–	–
5.	Parietal roof	Q,D	Y	T	T	V	T	T	V	V
6.	Parietal foramen	F	F	I	I	I,F	I	I	V	I
7.	Supratemporal lateral	±	+	+	+	M	M	+	+	V
8.	Endolymphatic sacs	±	–	–	–	–	–	–	+	–
9.	Dentary exposure	+	–	–	–	–	–	–	–	–
10.	Labial blade	–	–	±	+	+	±	±	V	±
11.	Surangular foramen low	+	–	–	+	–	–	–	–	–
12.	Meckel's groove open	+	±	+	+	–	±	+	–	±
13.	Splenial	–	±	+	+	±	–	+	±	±
14.	Acrodont	+	–	–	–	–	–	–	–	–
15.	Palatine teeth	–	–	+	–	–	±	–	±	–
16.	Pterygoid teeth	–	+	+	+	+	+	–	±	±
17.	Interclavical process	–	–	–	–	–	–	+	±	±
18.	Caudal autotomy	±	±	±	±	±	+	±	±	+
19.	Post-coracoid fenestra	±	–	±	±	+	–	–	±	±
20.	Sternal fontanelles	±	±	±	±	±	±	+	±	±
21.	Sternal ribs	V	4	4	4	4	3-4	3-4	V	3-4
22.	Post-xiphisternal ribs	V	SH	SH	L	V	IS	SH	LC	V
23.	Interparietal large	–	–	–	–	–	–	±	–	V
24.	Middorsal row	V	+	–	±	±	±	–	±	±
25.	Gular fold complete	±	+	+	+	+	+	±	±	–
26.	Femoral pores	±	–	+	+	+	–	+	±	–
27.	Spinulate scale organs	±	–	–	–	–	+	–	±	–
28.	Nasal chamber	A,P	P	S	P	S	P	ST	P	P
29.	Hemipenes	V	U	U	U	U	U	U	V	V
30.	Colic septa	±	–	–	–	+	–	–	–	–

mined that the many folds seen in *Amblyrhynchus* are homologous to the septa seen in other species. Iverson (1980) found only one septum present in all *Dipsosaurus*. The situation in *Sauromalus* is unresolved. Iverson (1980) found septa in all seven specimens he examined, but cites two sources for absence of septa in other individuals. Iverson (1980) found the number of septa to be variable individually (*Iguana delicatissima*), geographically (*I. iguana*), and ontogenetically (species not named by Iverson 1980: 88) within species.

Traditionally, a strong case has been made for separation of the Iguania into three families: Chameleonidae *sensu stricto* for chameleons, Agamidae, and Iguanidae. I have long questioned the

use or value of separating agamids from iguanids. There are two seemingly important distinctions: acrodont teeth and maxillae in contact posterior to premaxilla. Both are far more complex and equivocal than the simplistic characterization of Frost and Etheridge implies.

Frost and Etheridge considered only the dentition on the posterior portions of the maxilla and dentary. Thus they made a simple qualitative distinction between acrodont and pleurodont. This is misleading. New World forms and Malagasy oplurines have entirely pleurodont dentition, presenting a similar dental gestalt and, apparently, etiology. The situation in the Old World agamids is one of amazing diversity. I have given little consideration to intrageneric or individual variation, so in the listing that follows I will cite individual specimens so that others may verify or refute my claims.

A classic acrodont like *Phrynocephalus mystaceus* (MCZ 33996) has fully socketed teeth on dentaries, maxillae, and premaxilla. The gestalt is reminiscent of a bulldog, with incisiform, caniform, and carnassial teeth well differentiated. (In this case I confidently reject dental gestalt as evidence of relationship on grounds of convergent evolution.) *Draco volans* (MCZ 37829) is slightly less extreme, but all teeth are acrodont and socketed. In many agamids the standard pattern is pleurodont incisiform teeth on the premaxilla, followed by caniform teeth on the maxillae, and then acrodont teeth posteriorly on the maxillae and dentaries. For example, *Ceratophora stoddarti* (MCZ 39836), *Leiolepis belliana* (MCZ 43087), *Agama planiceps* (MCZ 30624), and *Goniocephalus bruinjii* (MCZ 54209) .

In many individuals pleurodont teeth extend posteriorly onto the maxillae: *Japalura dymondi* (MCZ 15852 and 16738, but MCZ 16739 has all acrodont teeth) and *Hydrosaurus pustulosus* (MCZ 43727). Some have pleurodont teeth on the anterior dentaries: *Calotes versicolor* (MCZ 44230-3) and *Amphibolurus barbatus* (MCZ 37200).

A subacrodont condition is common in agamines. Here the tooth is socketed but widely open on the lingual aspect, closely approaching the pleurodont condition: *Acanthosaura armata* (MCZ 39156: maxillae; premaxillary teeth are pleurodont), *Ceratophora stoddarti* (MCZ 39836, on anterior dentary), and *Calotes versicolor* (MCZ 44230-3, on the maxillae).

Other agamine dental conditions are bizarre. In *Moloch horridus* (MCZ 86751) all teeth are acrodont, but those on the maxillae are canted lingually—a unique condition in my experience among all vertebrates. In *Uromastix acanthinurus* (MCZ 27376) the premaxillary teeth are fused, *Sphenodon*-like, into a beak—in this case bluntly tricuspid. The remaining teeth are acrodont. In *Amphibolurus barbatus* (MCZ 37200) the premaxillary teeth are subacrodont, the anterior dentary teeth pleurodont, and the teeth on the posterior maxillae and dentaries fused into a cap-like ridge.

I have noted only some of the array of variation one may discern in these lizards. Simply put, dental characters provide a continuum from all pleurodont, through some pleurodont and some acrodont, to all acrodont, with some subacrodont, and with branches off to various sorts of heterodonty, fusions, and cantings. There are not two sorts of teeth and teeth do not provide any way to divide iguanians into acceptable families.

The meeting of the maxillae posterior to the premaxilla is arguably definitive only if one accepts a simplistic presence versus absence condition and ignores compromising variation. In New World forms, again, the situation is relatively simple: the premaxillary-vomer articulation is broad and the maxillae do not closely approach. In Old World forms the situation is again complex. In *Calotes versicolor* (MCZ 44230-3), for example, the maxillae meet but the junction varies from wider than the ventral aspect of the premaxilla (i.e., very broad) to barely touching. In *Physignathus cocincinus* (MCZ 43732) the maxillae extend mesially as narrow bars or straps and their union is about 25% of premaxillary width. In Madagascan *Oplurus quadrimaculatus* (MCZ 67946) the situation is very similar; the maxillary bar-like processes extend mesially behind the premaxilla but are separated by a cartilaginous area and fall just short of contact. I cannot agree to base a family on such a variable character.

In sum, I believe Frost and Etheridge went in exactly the wrong direction. For me, Iguania divides neatly and unequivocally into two families that are easily recognized by gestalt, supported by numerous trenchant characters, and are unequivocally monophyletic:

Iguanidae.—Lizards with fully developed, functional eyes and four limbs; feet of ordinary saurian configuration; a broad frontal shelf underlying nasals; dracomorph brain-stem morphology; *m. intercostalis* absent; clavicles, interclavicle, and ceratobranchials present.

Chameleonidae.—Lizards with fully developed, functional, turreted eyes and four limbs; feet zygodactyl; a broad frontal shelf underlying nasals; dracomorph brain-stem morphology; *m. intercostalis* absent; clavicles, interclavicle, and ceratobranchials absent.

Relationships within my Iguanidae *sensu lato*, as defined above, are unresolved. Well-defined, easily recognized, and certainly monophyletic subfamilies resist delimitation. The informal appelations such as "agamine," "anoline," "iguanine," and "sceloporine" that have served me well for three decades continue to suit me. I find no new information, clarification, or improvement deriving from the Frost and Etheridge attempt at formal fragmentation.

All this leads back to my original question "why?" If splitting the Iguania into nine small, difficult to recognize "families" does not benefit (in fact hinders) me—a field biologist with a great and direct need for highly communicable information about easily identified groups—then what good does it do? Who benefits? Here are 65 printed pages resulting in an unwieldy plethora of taxonomic fragments with no information gain whatsoever. This is typical of the splitting literature in systematics that I see. To determine who benefits from its publication we will have to consider the motives of the authors, the structure of institutionalized "science" in our society, and economic and political constraints and ambitions, carrots and sticks. Fascinating as all that would be, it is beyond the scope of this review.

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TECHNIQUES

The Use Of Mouse Glue Traps To Capture Lizards

"Sticky traps" have long been employed by herpetologists as a means of assessing the diversity and relative abundance of potentially available arthropod prey (e.g., Ballinger 1977; Dunham 1978; Simon 1975). Improved models of such glue traps have been widely employed in household use for the capture of both insects and small rodents and, more recently, have been used with some success in the capture of reptiles, including *Gekko chinensis* on South China Sea islands (Lazell 1988), *Hemidactylus turcicus* in Baltimore, Maryland (Norden and Norden 1991), and *Boiga irregularis* in Guam (Fritts 1988). However, the use of glue trapping in faunal surveying and censusing has not been mentioned by recent comprehensive reviews of herpetofaunal sampling methods (Campbell and Christman 1982; Karns 1986; Simmons 1987). We here report on the successful use of such traps for the capture of tropical arboreal lizards.

We employed 10 cm x 20 cm Victor® mouse glue traps (Woodstream, Inc., P.O. Box 327, Lititz, Pennsylvania 17543, USA) in the course of a survey of the herpetofauna of the Isle of Pines, a small (150 km^2) island approximately 50 km south of the southern tip of the French island territory of New Caledonia, in the southwest Pacific. Traps were attached by mylar packing tape to the trunks of ten coastal forest trees at a height of approximately 1.5 m above ground. As many traps as necessary (usually 2-4) were used to encircle the trunks. Traps were set in the afternoon of 29 February 1992 and checked at approximately 2000 h and 800 h for three consecutive days. These traps yielded 38 specimens of the New Caledonian endemic gecko *Bavayia sauvagii*, with 19, 17, and 2 geckos obtained on successive nights. Significantly, no specimens of this species were collected by hand in the vicinity, despite intensive searching. Elsewhere in its range the species typically spends daylight hours under stones or bark and emerges at night to hunt on the trunks of trees (Bauer and DeVaney 1987). The forest floor in the site studied (Gite Kodjeue, Baie de Waa Mé) has a pavement of highly dissected coral, which provides especially effective protection for small secretive lizards and prevents the application of standard hand and pit trap collecting methods.

Entrapment occurs immediately after contact with the glue surface, near the edge of the trap first entered by the lizard. Thus, documentation of both the presence of particular hard-to-sample taxa, and also of the direction of lizard movement (from the ground up rather than the canopy down in the case of *Bavayia sauvagii*) is possible. Further, if checked regularly over the course of the night, glue traps may reveal peak periods of activity of trunk-active reptiles. Simultaneous sampling of potentially available arthropod prey is also possible. Although held fast by the glue, all lizards were easily removed without ill effect by rubbing corn oil on their bodies and slowly peeling them off of the traps. As this could be done *in situ*, the traps could be left in place and used over an extended period of time. Changes in the color and apparent tackiness over four days, however, suggest that traps should not be set for more than one week.

Glue traps were also successful in capturing two other arboreal species. One specimen of *Lioscincus nigrofasciolatum* was collected on the forest traps described above. A second specimen was obtained on a beach front *Casuarina* sp. In this case the skink had been observed basking during the day and a trap was placed at the entrance of the hollow in the trunk. When checked the next morning both the skink and a *Lepidodactylus lugubris* had been captured. Traps were also opportunistically employed in terrestrial situations. While, in general, these yielded few lizards, they resulted in the capture of the only specimen of *Nactus pelagicus* obtained in the survey. This specimen was collected under the edge of a pile of coconut fronds at the forest edge, suggesting that this species may also use the coral pavement as a daytime retreat. Ground-placed traps also yielded a single individual each of the locally abundant skinks *Caledoniscincus austrocaledonicus* and *Marmorosphax euryotis*, both of which were otherwise easily captured by hand or by rubber banding.

Under some conditions glue traps may also prove effective when used in place of conventional pit traps in conjunction with drift fencing. Such trap lines take only minutes to set up and may be especially useful where rocky substrate hinders excavation. Nonetheless, the danger of thermal stress in most open habitats and the likelihood of fouling of the traps by leaf litter, soil, or debris may limit the effectiveness of terrestrial glue trapping in general. In the shaded and thermally stable conditions of tropical forests, however, glue traps may be the collecting method of choice for trunk- and branch-active reptiles (although similar methods were not successful in a Bornean rainforest plot, H. K. Voris, pers. comm.). Glue traps are inexpensive (when purchased in bulk they can be obtained for approximately $0.75 per unit for the size trap used in this study) and are far more time effective than night spotting for collecting at least some gekkonid lizards. We strongly advocate the addition of glue traps to the arsenal of collecting equipment used by herpetologists engaged in the surveying or censusing of reptiles.

Acknowledgments.—We thank Tom Fritts for providing ordering information and suggesting the use of corn oil to remove lizards from the traps and Joe Pilcicki for his continued service as a procurer of collecting supplies. Skip Lazell and Daryl Karns provided useful comments on the manuscript and Harold Voris provided information regarding the use of "rat glue" in Sabah.

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A Device For Separating Fecal Samples Of A Mollusc-Feeding Turtle, *Malaclemys terrapin*

Studies of chelonian food habits have employed five primary techniques for dietary analysis: (l) laboratory feeding trials, (2) field observation, (3) dissection of the digestive tract, (4) stomach flushing, and (5) fecal analysis. Each method possesses unique advantages and the method selected depends upon the nature of the study or the need for repeated sampling (Graham 1979; Korschgen 1971; Legler 1977; Parmenter and Avery 1990). We used the nondestructive technique of fecal analysis to examine the dietary preference of an estuarine turtle, the diamondback terrapin *(Malaclemys terrapin)*. As the animals belonged to a demographic study of wild terrapins, there were concerns about preventing losses to the population. Fecal analysis was chosen as the preferred analytic technique because it is less invasive than stomach-pumping and does not involve sacrificing individuals from the population. We were able to address a disadvantage of this method indicated by Folkerts (1968) who noted that prey items that leave no trace in the feces are overlooked, meaningful volumetric analysis is precluded, and fecal remains often are difficult to identify. Concerned with these drawbacks, we developed an efficient method to separate fecal material, found that fecal remains from *Malaclemys* could be easily identified and prey size distribution quantified.

The diamondback terrapin is the only North American emydid of widespread occurrence in saltmarshes (Carr 1952; Ernst and Barbour 1989). Although terrapins principally feed on marsh-dwelling snails and crabs (Carr 1952), their functional role as macro-consumers has been largely overlooked for temperate salt marsh ecosystems (Pomeroy and Wiegert 1981). All studies of terrapin diet (reviewed by Palmer and Cordes 1988) concluded that the most important dietary item was snails. However, no studies to date have examined the size distribution of food items ingested by wild terrapins. To investigate the food habits of terrapins, we used a winnowing device to separate fecal samples into components based on similar mass.

Our study was part of an investigation to define the ecology of terrapins near a South Carolina barrier island (Lovich and Gibbons 1990; Lovich et al. 1991). From the intertidal saltmarsh west of Kiawah Island, we collected 294 terrapins using trammel nets and seines from 22 June to 27 July 1991. Fecal samples were collected for 21–48 h post-capture during temporary confinement in fiberglass holding bins (80 x 45 x 45 cm). Fecal materials were washed into U.S. Standard Testing sieves (#18 = 1 mm) and air dried for 24-48 h.

The samples consisted of snail shell fragments *(Littorina irrorata)*, intact snail opercula *(L. irrorata)*, and fragments of crab exoskeleton *(Uca* spp., *Calinectes sapidus, Sesarma* spp.). *Littorina* was both numerically and volumetrically (minimum estimate of 90%) the most significant prey item. A linear regression of opercula length (x) to snail length (y) was generated from measurements spanning all size classes of *Littorina* in the area ($y = 2.9 x - 1.1$, $r^2 = 0.90$, $n = 270$, $p = 0.001$). The positive relationship allowed us to reconstruct the size range of snails ingested from intact opercula in the fecal sample. However, the analysis was impeded by the difficulty of sorting out the small snail opercula (2-8 mm diam).

We constructed a winnowing apparatus to facilitate the separation of opercula from the heavier portions of the sample (crab legs, shell fragments, sediment) (Fig. l). Dried fecal material was carefully loosened from the bottom of the sieve (S) and a large inverted funnel (F) was fitted closely over the upper rim of the sieve to cap it, forming the lower chamber. The funnel's spout was directed upwards with a nylon mesh (M) surrounding the spout. The spout was inserted through a 3 cm slit incised in the bottom of a mesh jelly strainer and secured with a rubber band [RB]). An inverted 500 ml beaker (B) was held a short distance above the funnel spout. The nylon mesh was secured around the lip of the beaker with another rubber band. A stream of air provided by a small hair dryer (HD) was directed upwards through the sieve. A support for this device can be made from 1/4" plywood, threaded rod, and nuts to lend stability for one individual to winnow a sample unassisted.

The principle of winnowing is to separate items by their relative mass. To operate the winnowing device, the air jet is aimed at the bottom of the sieve to suspend or propel fecal particles of different mass. Lighter particles suspended by the air jet are directed through the funnel into the upper chamber while heavier particles remain in the lower chamber. Particles in the upper chamber are deflected downwards after hitting the beaker and accumulate in the nylon mesh surrounding the funnel spout. By changing the distance of the beaker above the funnel, the capture efficiency of the upper chamber is varied. When the sample has been winnowed sufficiently to separate particles of similar mass, the sieve is removed and the upper chamber is inverted. The particles

contained by the mesh are carefully shaken into the beaker. Distinct sequential separations by mass are achieved by progressively moving the air source closer to the sieve. The time necessary to separate a sample declines from about 1 h for manual sorting to < 5 min when winnowing.

This apparatus is useful in dietary studies of animals that leave recognizable fecal remains as evidence of dietary preference. The analysis is ideally suited to dietary specialists that concentrate upon molluscs or gastropods, e.g., *Graptemys, Kinosternon, Macroclemys, Malaclemys, Malayemys,* and adult *Sternotherus* are all noted to feed extensively upon snails (Ernst and Barbour 1989; Folkerts 1968). Ingestion of plant tissue or soft foods by chelonians might be underestimated by the technique since this material is not easily identified.

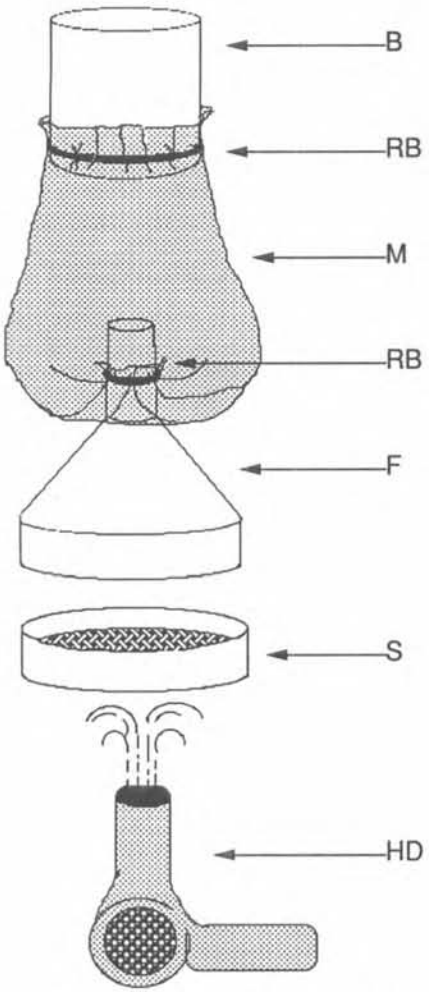


FIG. 1. A winnowing apparatus for separation of dietary components from fecal samples of mollusc-feeding turtles. Components include: beaker (B), fine mesh (M), rubber bands (RB), a funnel (F), a #18 mesh sieve (S), and a hair-dryer (HD).

The method may also provide an approach to investigate size-related resource partitioning, particularly in sexually dimorphic species such as *Graptemys barbouri, Graptemys pulchra,* and *Malaclemys terrapin* (Ernst and Barbour 1989; Gibbons and Lovich 1990; Vogt 1981). In those species, resource partitioning may serve as a driving force in the evolution of sexual dimorphism (Camilleri and Shine 1990; Shine 1989) to reduce intraspecific competition. If a relationship exists between body size and food size selectivity (Schoener 1974), it may be overlooked if dietary components are analyzed solely on a volumetric or numerical basis rather than a size specific basis. With the aid of a winnowing apparatus data will better indicate the extent of niche overlap, either between sexes and size classes or interspecifically, if multiple species are being compared. The technique is particularly useful to estimate the magnitude and selectivity of predation by snail-feeding specialists.

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LIFE HISTORY NOTES

Instructions for contributors to Life History Notes appear in volume 23, number 2.

CAUDATA

NOTOTRITON BARBOURI (NCN). **REPRODUCTION**. On the night of 7 August 1991 on the east slope of Pico Pijol, Departamento de Yoro, Honduras, at 1920 m, we found a single clutch of five adherent, non-stranded salamander eggs (KU 219991) within the moist walls of an abandoned hummingbird nest. The bird nest was suspended from a limb of a broadleaf tree about 2 m above the ground. No adult salamander was attending the eggs. On the morning of 9 August 1991, at 1930 m at the same locality, a partial examination of another abandoned hummingbird nest found under similar conditions revealed another clutch of salamander eggs and an adult *Nototriton barbouri* (KU 219990). The salamander was in a coiled position, although not coiled around any eggs, and was near and in partial contact by its tail with a single clutch of salamander eggs. The bird nest was then carefully reconstructed and secured inside a cloth collecting bag and suspended from the same limb on which it was found. On the following morning, the salamander was found to be in the same position and place within the bird nest as the previous day, but was now coiled around six eggs (KU 219996) obviously deposited since the previous morning (Fig. 1). An examination of the remainder of the bird nest revealed four clutches of salamander eggs (KU 219992-95) in addition to the newly deposited clutch. The eggs in each of these five clutches were adherent and non-stranded, clutch size ranged from 6-19 ($\bar{x}$ = 10.8). Two of the communal clutches (KU 219992, 219995) contained late embryos with reduced gills and were well-pigmented and had well-developed feet and toes. We identified these embryos as *N. barbouri* based on the pigmentation and the long, slender, weakly-webbed toes. The two other advanced communal clutches had pigmented embryos with well-developed limb buds with poorly developed feet. The solitary clutch was similar in development to the most advanced embryos and obviously conspecific. Average egg capsule diameter of the six clutches ranged from 4.7 to 5.2 mm.

Attendance of egg clutches, usually by the female, is widespread within the Plethodontidae and is thought to be essential to clutch survival (Hom et al. 1990. Herpetologica 46:304-319). Vial (1968. Revista Biologia Tropical 15:13-115) found that egg clutches of *Bolitoglossa subpalmata* ceased development and died if abandoned by the attending adult. Nussbaum (1985. Misc. Publ. Mus. Zool. Univ. Michigan 169:1-50) listed 13 species of neotropical bolitoglossines in which egg attendance is known. Adult egg attendance has also been reported in five other neotropical bolitoglossines (*B. diminuta*: Robinson 1976. Proc. Biol. Soc. Washington 89:289-294; *B. platydactyla*: Smith et al. 1968. Herpetologica 24:67-72; *B. yucatana*: Barbour and Cole 1906. Bull. Mus. Comp. Zool., Harvard 50:146-159; *Lineatriton lineola*: Sessions 1977. Herpetologica 33:452-454; *Pseudoeurycea expectata*: Stuart 1954. Proc. Biol. Soc. Washington 67:159-178). Duellman (1961. Univ. Kansas Publ. Mus. Nat. Hist. 15:1-148) did not mention attendance with four egg clutches of *P. belli*. It is perhaps noteworthy that one of these clutches "...was partially dessicated" and another "... was being eaten by beetles ..." (Duellman 1961:17). The only other record of non-attendance in a neotropical bolitoglossine of which we are aware is that of *B. compacta* (Hanken 1979. Copeia 1979:741-744) from eggs deposited in captivity. This may have resulted from behavior brought on by captivity.

The fact that five healthy, advanced clutches of *N. barbouri* were found without an attending adult strongly suggests that egg brooding does not occur in this species. Vial (*op. cit.*) noted that in captivity brooding adults of *B. subpalmata* seldom left the eggs, doing so only for short periods of time apparently to forage for food. Adults of *N. barbouri* were commonly seen at night on Pico Pijol while apparently foraging on limbs and branches of small trees and shrubs. None were found active at daylight hours at which time four of the five advanced clutches were found, thus it is extremely unlikely that the adults were temporarily away from all five clutches. Oviposition by *N. barbouri* resembles that of the western North American bolitoglossine *Batrachoseps attenuatus*, which often deposits eggs in communal nests (Maslin 1939. Copeia 1939:209-212) that are often not attended by adults (Maiorana 1976. Evolution 30:599-613). The eggs of both these species also develop during the rainy season, opposite of the pattern for most neotropical bolitoglossines (Houck 1977. *In:* Taylor and Guttman [eds.]. The Reproductive Biology of Amphibians. Plenum Press, New York: pp. 43-72), suggesting that egg brooding in these species may serve in part to keep the eggs moist during long periods of little or no rainfall. On the other hand, egg brooding to keep the eggs moist would not be necessary for rainy season developing *N. barbouri* if the female chooses a satisfactory site for egg laying. Maiorana (1976, *op. cit.*) made a similar suggestion for the non-brooding *B. attenuatus*.



FIG. 1. Adult *Nototriton barbouri* with multiple clutches of eggs.

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TESTUDINES

CARETTA CARETTA (Loggerhead). **PELAGIC MOVEMENT AND GROWTH**. This note reports the first confirmed movement of a non-headstarted *Caretta caretta* from the Atlantic into the Mediterranean Sea. The turtle was one of over 1200 sea turtles tagged in the waters around the Azores in a joint project of the University of Florida, USA, and the University of the Azores, Portugal. The turtle was tagged with a monel metal tag (style #681, National Band and Tag, Newport, Kentucky) on 14 July 1986, 80 km east of the island of Flores, Azores. Straight carapace length from center of nuchal scute to distal tip of the posterior marginal (SCL) was 17.0 cm. The turtle was recaptured on a drifting longline set for swordfish on 26 August 1991, 43 km from Licata, Agrigento, Sicily. Curved carapace length from center of nuchal scute to distal tip of the posterior marginal (CCL) was 42 cm. The turtle was observed by personnel of Porgetto Tartarughe, Italy, and released alive.

CCL (42 cm) was converted to SCL (36 cm) using the equation in Frazer and Ehrhart (1983. Marine Turtle Newsl. 24:4-5) and unpublished data (Bolten and Martins) for smaller class sizes. Thus, the turtle grew at a rate of 3.7 cm/yr during the 61-mo interval. This is the first reported growth increment for a non-headstarted pelagic-stage sea turtle and is much slower than reported for similar-sized loggerheads in benthic habitat in the southern Bahamas (Bjorndal and Bolter 1988. J. Herpetol. 22:480-482). The von Bertalanffy and logistic models presented for Florida loggerheads by Frazer and Ehrhart (1985. Copeia 1985:73-79) predict growth rates of 8.1 cm/yr and 2.6 cm/yr, respectively, for the same size interval. Our value is closer to that predicted by the logistic equation. Although the von Bertalanffy model has a better fit for growth of sea turtles on benthic foraging grounds, this model may not fit data for growth rates in the very different pelagic habitat (Bjorndal and Bolten 1988. Copeia 1988:555-564). Greater knowledge of growth in the pelagic habitat is critical for demographic studies.

The extent of movements of sea turtles into the Mediterranean is important for the development of management plans for the region. Large numbers of juvenile loggerheads are caught each year incidental to the long-line fisheries. Whether this take is supported entirely by juveniles from the declining Mediterranean nesting populations or is supplemented by the larger turtle populations in the Atlantic, has important implications for the survival outlook of the Mediterranean *Caretta* populations.

Other sea turtles that apparently move from the Atlantic to the Mediterranean include *Lepidochelys kempi* (Brongersma and Carr 1983. Proc. Koninklijke Nederlandse Akademie van Wetenschappen, C 86:445-454) and *Dermochelys coriacea* (Groombridge 1990. Marine turtles in the Mediterranean: distribution, population status, conservation. Council of Europe, Nat. and Environ. Ser. 48). Also, a headstarted *C. caretta* (raised in captivity for about a year before release off Padre Island, Texas, USA) has been recaptured in the Mediterranean (Manzella et al. 1988. Marine Turtle Newsl. 42:7). However, headstarted turtles often end up in unnatural sites (Taube 1992. Science 256:614-616), so their movements must be interpreted with caution.

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CLEMMYS INSCULPTA (Wood Turtle). **SIZE**. On 21 May 1984, an adult male *Clemmys insculpta* (RAS-251) was captured in Pontiac Co., Quebec. Measurements were CL=238 mm; PL=207mm; PW=109 mm. This specimen is presently being maintained by the author.

On 15 June 1985, another adult male was captured in the same area. Its measurements were CL=234.5 mm; CW=161.8 mm; PL=210.2 mm; PW=109.1 mm. This specimen was deposited at the Canadian Museum of Nature (NMC 26568). All measurements were taken by Dr. F. R. Cook, Curator of Herpetology, CMN. The first specimen exceeds and the second is equal to the maximum carapace length reported in Conant and Collins (1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 3rd ed. Houghton Mifflin Co., Boston, Massachusetts, 450 pp.) as 234 mm for this species.

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STERNOTHERUS ODORATUS (Stinkpot). **REPRODUCTION**. *Sternotherus odoratus* is reported to mate under water in the shallows of lakes at night or in the early morning hours (Ernst and Barbour 1989. Turtles of the World, Smithsonian Institution Press, Washington, D.C. 313 pp.). Mating adults have been observed to congregate, with up to thirty specimens being collected within a radius of 15 ft (Risley 1933. Pap. Michigan Acad. Sci., Arts Letters 17:685-711). Ernst and Barbour (*op. cit.*) stated that mating occurs throughout the year, with peaks in the spring and fall, and Carr (1952. Handbook of Turtles, Cornell Univ. Press, Ithaca, New York, 542 pp.) stated that copulation occurs from April until as late as October. Ernst (1989. J. Herpetol. 20(3):341-352), however, observed mating only from 15 April to 22 May. Here, we describe a pair of *S. odoratus* mating on land, late in the year, and in mid-afternoon.

On 15 October 1989 at 1500 h, at Crab Orchard Lake, Williamson Co., Illinois, we observed a pair of *S. odoratus* mating on the former lake bed in a partially isolated cove 0.2 km north of the west side boat launch (the water level of the lake had been lowered 1.3 m for renovations of the dam). The male had mounted the female when the turtles were first noticed. The female (CL=105.1 mm) was just out of the water with her posterior end near the water's edge, and the male's (CL=100.7 mm) hind legs were in the water. Ernst (*op. cit.*) described 12 pairs of mating *S. odoratus* and the male was always larger than the female. We collected, sexed, and released five other *S. odoratus* (three males, two females) in the shallows less than five meters away from the mating pair.

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SAURIA

ANOLIS GINGIVINUS (NCN). **NOCTURNAL ACTIVITY**. Schwartz and Henderson (1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. University of Florida Press, Gainesville, xvi + 720 pp.) reported nocturnal activity on or around structures for three Antillean anoles: *A. bimaculatus* (Antigua), *A. cristatellus* (Puerto Rico and the Dominican Republic) and *A. sagrei* (Bahamas). Similar observations have been made by RWH of *A. marmoratus* (Guadeloupe) and *A. sabanus* (Saba). The anoles were associated with hotels in all instances. During the week of 16–23 May 1992, five *Anolis gingivinus* were repeatedly observed by RP foraging for insects around lights on walls or on lamp posts as late as 2300 h in the Pelican Resort Complex at Simpson Baai, St. Maarten. In one instance, two individuals were active around the same light. All the lizards were subadult males. On the night of 20 May, a *Hemidactylus mabouia* was taken from a lamp post in the complex. The following night a sixth subadult male *A. gingivinus* was observed on the perch previously used by the gecko. These individuals were unusually sensitive to human disturbance at night, retreating into vegetation upon approach by an observer within <3 m. During the day, these lizards (although possibly not the same individuals) could easily be approached to within <25 cm.

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BARISIA IMBRICATA IMBRICATA (NCN). **PREDATION**. *Barisia imbricata imbricata* is an anguid lizard distributed in the Mexican Transvolcanic Belt (mountains of Distrito Federal, Hidalgo, Jalisco, México, Michoacan, Morelos, Oaxaca, Puebla, and Veracruz), and occurs at high elevations (2100-4000 m) in coniferous or pine-oak forest (Guillette and Smith 1982. Trans. Kansas Acad. Sci. 85:13-33). Few accounts of the biology of this species exist. Duellman (1961. Univ. Kansas Publ. Mus. Nat. Hist. 15:1-148) reported predation on *B. i. imbricata* by *Crotalus pusillus*, Guillette and Smith (*op. cit.*) reported distributional records, and Guillette and Casas-Andreu (1987. Herpetologica 43(1):29-38) studied its reproductive cycle. Here we report additional habitat descriptions and reptilian predators of this lizard.

On 7 June 1991, while observing *Sceloporus mucronatus* near km 24.5 on the Ajusco-Tianguistenco highway (Mexico Hwy 892, Distrito Federal), we captured a *Thamnophis scalaris* (wet body mass = 97 g). During handling, the snake regurgitated a partially digested adult *B. i. imbricata* (ca. 85 mm SVL). During early August, individual *S. mucronatus* were collected for stomach analyses. One male (JLE00040, SVL = 91 mm, wet body mass = 33 g) contained a young *B. i. imbricata* (ca. 45 mm SVL). *Barisia i. imbricata* is a common anguid lizard at this site. Most observations (n = 21) of this lizard were in grasses (*Festuca amolisima*) where *T. scalaris* was also observed (n = 2). *Barisia i. imbricata* was also observed on basaltic rocks and lava (n = 3) where *S. mucronatus* occurs. Another potential predator observed syntopically with *B. i. imbricata* is *Crotalus triseriatus*. This rattlesnake was also common in grasses (n = 17). These observations increase the number of predatory species of *B. i. imbricata* to include another lizard and at least one snake.

The preserved specimen (JLE00040) will be deposited in the vertebrate collection of Instituto Nacional de Investigaciones Forestales y Agropecuarias de México (Accession INIFAP#). A permit (412.2.1.2.0.06869 Direccion General de Conservacion Ecological de los Recursos Naturales) to collect specimens for research was kindly granted by Dr. Graciela de la Garza Garcia. John Rowe and Geoff Smith provided useful comments on an early draft of this manuscript. This research was supported by Instituto Nacional de Investigaciones Forestales y Agropecuarios de México (INIFAP), and Consejo Nacional de Ciencia y Tecnologia de México.

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GAMBELIA SILA. (Blunt-nosed Leopard Lizard). **REPRODUCTION**. The number of young that a female produces in her lifetime is an important life-history trait that affects her fitness. The number of eggs produced by oviparous lizards can be affected by the age, size, and physiological condition of the individual. Multiple clutches of eggs in a year is one way a female can increase her output beyond the physical limitations of her size.

From late April to the middle of July, 1992, we found several female *Gambelia sila* that produced two to four clutches of eggs at our permanent study plots on the Elkhorn Plain, San Luis Obispo County, California. Egg number and relative size can be accurately determined by palpation. We captured each female by pole and noose as often as found on a plot, and weighed each individual to the nearest 1 g using a 100 g Pesola scale. Leopard lizards deposit the entire clutch at one time (Montanucci 1967. Herpetologica 23:119-125), so we inferred that multiple clutches of eggs had been produced by changes in egg number and/or mass over a period of eleven weeks.

Changes indicative of production of at least a second clutch were seen in six females: number 18 (102 mm SVL) - 4 eggs, 38 g on 27 April to 3 small eggs, 36 g on 15 June; number 27 (107 mm SVL) - 3 eggs, 36 g on 1 May to 4 eggs, 30 g on 20 June; number 12 (117 mm SVL) - 5 eggs, 62 g on 6 May to 3 medium-sized eggs, 44 g on 22 June; number 18-2 (105 mm SVL) - 5 eggs, 42 g on 7 May to 4 eggs, 37 g on 19 May; number 16 (99 mm SVL) - 3 eggs, 31 g on 8 May to 0 eggs, 24 g on 22 May to 3 medium-sized eggs, 35 g on 19 June; number 31 (114 mm SVL) - 5 eggs, 55 g on 8 May to 3 eggs, 49 g on 23 June.

Changes indicative of production of at least a third clutch were seen in 3 females: number 13 (112 mm SVL) - 4 eggs, 46 g on 4 May to 5 small eggs, 44 g on 18 May to 4 medium-sized eggs, 44 g on 4 June; number 4 (104 mm SVL) - 2 eggs, 35 g on 8 May to 3 small eggs, 32 g on 18 May to 4 small eggs, 31 g on 23 June; number 6 (117 mm SVL) - 5 eggs, 56 g on 19 May to 3 medium-sized eggs, 45 g on 28 May to 4 medium-sized eggs, 41 g on 26 June.

Four clutches of eggs were seen in one female (112 mm SVL): 5 eggs, 50 g on 1 May to 4 eggs, 46 g on 15 May to 4 medium-sized eggs, 46 g on 16 June to 3 eggs, 45 g on 14 July. No data exist for the length of time eggs remain in the oviduct before oviposition.

Multiple clutches in *G. sila* have been suspected but not positively determined (Montanucci 1965. Herpetologica 21:270-283; Tollestrup 1982. Am. Midl. Nat. 108:1-20; Germano, Williams, and Tordoff, ms. in review). These are the first data that confirm the production of multiple clutches in *G. sila*. We also found a female (118 mm SVL, 58 g) carrying six eggs on 27 April. This is only the

second report of six eggs carried by *G. sila* (Montanucci 1970. Copeia 1970:104-123).

Submitted by **DAVID J. GERMANO** and **DANIEL F. WILLIAMS**, Department of Biological Sciences, California State University, Stanislaus, Turlock, California 95380, USA.

MICROLOPHUS BILINEATUS (Galápagos Lava Lizard). **MORPHOLOGY**. A bifid-tailed adult male *Microlophus bilineatus* (Fig. 1) was observed on 28 May 1990 on San Cristobal, Galápagos, inhabiting a rock pile near the harbor. The animal was not captured for closer inspection. However, it was noted that the bifurcation occurred ca. 20-30 mm from the vent with the left branch of the tail originating ca. 5 mm anterior to the point of regeneration of the right branch. Reports of bifid- and even trifid-tailed lizards are relatively common in the literature (Scott 1982, Herpetol. Rev. 13(2):46). However, apparently this is the first report for *M. bilineatus*.



FIG. 1. Bifid-tailed *Microlophus bilineatus*.

Submitted by **GREGORY J. COLWELL**, Department of Biological Sciences, Ohio University, Athens, Ohio 45701, USA.

SERPENTES

CROTALUS ADAMANTEUS (Eastern Diamondback Rattlesnake). **BEHAVIOR**. Many aspects of the life history of *Crotalus adamanteus* are not well known, and few observations have been documented. It has been suspected that this species may utilize the same refuge during consecutive seasons, but review of the literature did not reveal any reference to verify this behavior. This report describes the use of a refuge by *C. adamanteus* during three consecutive seasons.

On 17 March 1989, a juvenile male *C. adamanteus*, 60 cm TL, was observed in Jasper Co., South Carolina. The individual was found coiled in the entrance of a tunnel at the base of a decayed tree stump. The animal was sexed, measured, photographed for identification, and released. Sketches detailing head pattern were also recorded for identification. The location of this refuge was noted and the site was marked with a colored ribbon affixed to vegetation.

On 7 February 1990, this individual was again observed at the entrance to this refuge. Comparisons of photographs and head sketches verified identity. During the preceding eleven months, TL had increased by 16 cm, to 86 cm. At this time, a 1.5 x 0.5 cm red plastic tag, designed for marking fish, was attached to the basal rattle segment using monofilament line. This tag contained an individual identification number and an address for return of the tag in the event the snake was captured or killed.

On 10 May 1991, the specimen was observed for the third time at the site. The identification tag was still in place. Length had increased 23 cm during the preceding sixteen months to 109 cm TL. Unfortunately, no attempt was made to locate this animal during 1992.

Submitted by **CHUCK SMITH**, 11940 W. Calle Pima, Tucson, Arizona 85743, USA.

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ELAPHE VULPINA (Fox Snake). **PREDATION**. On 20 April 1992, I observed a juvenile red-tailed hawk, *Buteo jamaicensis*, feeding on a snake while perched on a fence post along State Hwy. 41 in eastern Brown Co., Wisconsin (T22N, R19E, S16). The bird was startled by an oncoming truck and flew off, dropping the snake a short distance from the fence post. I examined the snake and identified it as *Elaphe vulpina* (ca. 1 m TL). It had several lacerations (1-3 cm long) on its sides, and the liver had been almost completely excised. The hawk reclaimed the snake after I left the site.

The only raptors previously reported to prey on *E. vulpina* are the bald eagle, *Haliaeatus leucocephalus* (Pierce and Ross 1989. Passenger Pigeon 51:155-156) and the northern goshawk, *Accipiter gentilis* (Zirrer 1947. Passenger Pigeon 9:79-94). However, *E. vulpina* is probably a common prey item of raptors. Ross (1989. Amphibians and reptiles in the diets of North American raptors. Wisconsin Endangered Resour. Rept. 59:1-33. Wisconsin Dept. Natur. Resour., Madison) documented the occurrence of amphibians and reptiles in raptor diets, including several other colubrids in the diet of *B. jamaicensis*.

That the hawk fed first on the liver is similar to observations of common crows, *Corvus brachyrhynchos*, which catch *Thamnophis sirtalis* and feed only on their livers (Aleksiuk 1975. Natl. Geog. 152:715-723).

Submitted by **DREUX J. WATERMOLEN**, Water Resources Management, Wisconsin Department of Natural Resources, P.O. Box 10448, Green Bay, Wisconsin 54307-0448, USA.

HYPSIGLENA TORQUATA (Night Snake). **PREDATION**. Predation on lizards by scorpions is well-documented (McCormick and Polis 1982. Biol. Rev. 57:29-58). *Leptotyphlops humilis* commonly falls prey to several species of scorpions, including *Hadrurus arizonensis* and the sand scorpion *Paruroctonus mesaensis*, but predation by scorpions on other snakes is not well-documented (Polis 1979. J. Zool., London 188:393-346; McCormick and Polis, *op. cit.*). This observation represents the first record of predation on *Hypsiglena torquata* by a scorpion and the first record of the scorpion *Diplocentrus bigbendensis* preying upon a snake.



FIG. 1. The scorpion *Diplocentrus bigbendensis* feeding on *Hypsiglena torquata*. (Photo by Terry Hibbitts).

On the morning of 8 June 1989, at ca. 0230 h, an adult *D. bigbendensis* was found feeding on a dead *H. torquata* 27.4 km west of Lajitas on Ranch Road 170, Presidio Co., Texas, at ca. 830 m elevation on the southern slopes of Santana Mesa, a large hill covered with igneous boulders interspersed with bare, rocky soil. The air temperature was 30°C. The scorpion and snake were found by Tony Hibbitts in an area of bare soil between boulders. The snake was ca. 300 mm TL, while the scorpion was ca. 45 mm, not including the metasoma. The scorpion was found motionless with the snake grasped in its chelicerae, feeding from a small laceration ca. 40 mm behind the snake's head (Fig. 1). No other lacerations were evident on the body of the snake. Both *H. torquata* and *D. bigbendensis* are common in this area.

I thank Kelly Hogan and Thomas E. Lee, whose suggestions were helpful in editing a previous version of this manuscript.

Submitted by **TROY HIBBITTS**, Department of Biological Sciences, University of Texas at Arlington, Arlington, Texas 76019, USA.

LAMPROPELTIS TRIANGULUM SMITHI (NCN). **SIZE**. The maximum reported TL for female *Lampropeltis triangulum smithi* is 973 mm (Williams 1988. Systematics and Natural History of the American Milk Snake, *Lampropeltis triangulum*. Second ed. Milwaukee Publ. Mus. x +176 pp.).

On 29 March 1991, an adult female *L. t. smithi* (MZFC 05025: 863 mm SVL, 1006 mm TL) was collected by Mario Mancilla in a site with secondary vegetation near Nonoalco, Hidalgo, México, at an elevation of 1680 m. This snake is 33 mm longer than Williams' (*op. cit.*) longest female specimen, although he reported males reaching a TL of 1138 mm. TL of four male *L. t. smithi* in MZFC (030, 0484, 05024, and 05026) are 275 mm, 378 mm, 420 mm, and 969 mm, respectively.

We thank Arturo González, H. Smith, Mario Mancilla M., Oscar Flores V., and Adolfo Navarro S. for their assistance on this manuscript and their assistance with the field work. O. Flores provided helpful information. Funding was provided by the Dirección General de Apoyo al Personal Académico (DGAPA) project IN201789.

Submitted by **F. MENDOZA QUIJANO** and **C. A. RODRIGUEZ YAÑEZ**, Museo de Zoología, Facultad de Ciencias, UNAM, Apdo. Post. 70-399, D. F. 04510, México.

RHADINEA BILINEATA (NCN). **DIET.** Snakes of the arboreal and frog-eating genus *Leptodeira* are well-known for feeding on arboreal frog eggs (Duellman and Trueb 1986. Biology of Amphibians, McGraw-Hill, New York, 670 pp.). Instances of frog oophagy in terrestrial snakes, such as that recorded for *Liophis atraventer* (Dixon and Thomas 1985. Herpetologica 41:257-262), seem less common. The feeding habits of South American species of the large genus *Rhadinea* are poorly known, although lizards and frogs are recorded as food of the widespread *R. brevirostris* and *R. occipitalis* (Cunha and Nascimento 1978. Publ. Avuls. Mus. Para. Emilio Goeldi 10:1-218). Here, we report on frog oophagy by *R. bilineata*, a species endemic to southeastern Brazil whose habits are little known (Di-Bernardo and Lema 1990. Acta Biol. Leopoldensia 12:359-391). Fieldwork was done at the Parque Estadual in Campos do Jordão, São Paulo, southeastern Brazil (ca. 22°45'S, 45°34'W, 1550 m) in montane, *Araucaria* and *Podocarpus* rainforest during the wet season from January to March 1992.

Four specimens of *R. bilineata* (housed in ZUEC, Leviton et al. 1985. Copeia 1985:802-832) were caught while moving on the ground in forest trails in early morning (n=1) and late afternoon (n=3). We observed two additional snakes crawling amidst roots and creeping vegetation on stream banks in middle afternoon. Thus *R. bilineata* is diurnal and exhibits cryptozoic habits when presumably foraging. One specimen caught at 1630 h had 24 recently ingested frog eggs in its gut. The eggs were identified as those of *Eleutherodactylus*, a forest floor frog genus with terrestrial

eggs and direct development (Duellman and Trueb, *op. cit.*). All the eggs were at a similar developmental stage (close to hatching, see Figs. 6-8 in Lynn and Lutz 1946. Bol. Mus. Nac. Rio de Janeiro, Zool. 71:1-46), so probably were from a single clutch. The small size (ca. 50 cm TL), elongated head, and slender body of *R. bilineata* appear well-suited for foraging on small frogs and their terrestrial eggs sheltered in crevices and holes on forest floor and stream banks. As several tropical frogs present terrestrial eggs (Duellman and Trueb, *op. cit.*) it is tempting to speculate that frog oophagy will be found among other small, frog-eating snakes with cryptozoic foraging habits.

We thank M. J. Robim (Instituto Florestal) for logistical support, O. Augusto for help in fieldwork, M. Di-Bernardo (snakes) and J. P. Pombal-Jr. (frog eggs) for confirmation of our identifications, and the CNPq for financial support.

Submitted by **IVAN SAZIMA, SAMIRA A. CHINI**, and **CELSO R. C. SOUZA**, Departamento de Zoologia, Universidade Estadual de Campinas, 13081-970 Campinas, São Paulo, Brasil.

TRIMORPHODON BISCUTATUS (Lyre Snake). **PREY**. Oliver (1937. Occas. Pap. Mus. Zool. Univ. Michigan 360:1-30), Alvarez del Toro (1982. Los Reptiles de Chiapas, 3rd ed., Tuxtla Gutiérrez, Chiapas, Gobierno de Estado, México, Publicación del Instituto de Historia Natural, 247 pp.) and Stebbins (1985. A Field Guide to Western Reptiles and Amphibians, Houghton Mifflin Co., Boston, Massachusetts, 336 pp.) reported that prey of *Trimorphodon biscutatus* included small lizards, birds, and bats. Recent observations of this snake from Chamela, Jalisco, revealed the diet to include the small nocturnal lizards *Phyllodactylus lanei rupinus* and *Hemidactylus frenatus* (A. Ramírez-Bautista, unpubl. data), and *Ctenosaura pectinata* (Ramírez-Bautista and Uribe 1992. Herpetol. Rev. 23:82). In this report, we add bats to the prey of *T. biscutatus* in Jalisco.

Our observations were made in a culvert located at about km 59.1 under Highway 200 in a tropical deciduous forest and near the Biological Field Station, Chamela, Jalisco, México from 1979 to 1990. Each year from July to September a maternity colony of the bat *Natalus stramineus saturatus* occurs in the culvert. The culvert is oriented east to west and is about 20 m long and 1.2 m diam. Mean temperature in the culvert was 28°C (25-31°C) during July and August.

Over twelve years, we observed 11 *T. biscutatus* in the culvert, and two of the snakes were observed eating young bats. Each snake ate one bat. Snout-vent lengths of the two snakes were 1300 and 1200 mm, and total lengths of neonate bats were 59.0 and 63.5 mm respectively. In both cases the snakes climbed the wall of the culvert on a straight line and moved toward the groups of bat pups with the head retracted. Each young bat was caught swiftly by each snake. Snakes captured the bats at the middle of their body. Then, the snakes climbed down the wall and moved toward the rocks (refuge) where the bats were eaten. In both cases, the bats were eaten feet first, and wings last. Ingestion was slow, and the entire process took about 20 min.

We are most grateful to Stephen Corn, M. L. Romero, Zeferino Uribe, Miriam Benabib, and Edna Naranjo-García for their comments on the manuscript.

Submitted by **CORNELIO SÁNCHEZ-HERNÁNDEZ** and **AURELIO RAMÍREZ-BAUTISTA**, Departamento de Zoologia, Instituto de Biología, UNAM. Ap. 70-153, D. F. 14510, México.

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CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). USA: MISSOURI: Pike Co: S edge Ranacker Wildlife Area, 9.5 km N Curryville, Sec. 26 (SE 1/4, SE 1/4), T54N, R4W. 16 November 1991. Brian S. Edmond & Jason D. Blackwell. Verified by D. E. Metter. University of Missouri-Columbia (UMC 1984C). New county record and extends known range 55 km north of closest known locality in Lincoln County.

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

AMBYSTOMA TEXANUM (Smallmouth Salamander). USA: MISSOURI: Putnam Co: near pond next to Dean Cemetery, Rebel's Cove Wildlife Area, 11 km N Livonia, Sec. 32 (SE 1/4, NW 1/4, SW 1/4), T67N, R16W. 29 February 1992. Brian S. Edmond. Verified by D. E. Metter. University of Missouri-Columbia (UMC 1987C). New county record.

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

AMBYSTOMA TIGRINUM TIGRINUM (Eastern Tiger Salamander). USA: MISSOURI: Putnam Co: pond on Jean Polson farm, 3 km S Omaha & 8 km NW Livonia, Sec. 23 (SE 1/4, NW 1/4), T66N, R17W. 29 February 1992. Brian S. Edmond. Verified by D. E. Metter. University of Missouri-Columbia (UMC 1986C). New county record.

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

CRYPTOBRANCHUS BISHOPI (Ozark Hellbender). USA: ARKANSAS: Randolph Co: Eleven Point River at a point 1.9 km N Dalton, Sec. 25, T21N, R2W. 8 July 1992. Gary Thatch & Woody King. Verified by V. R. McDaniel. Arkansas State University Museum of Zoology (ASUMZ 18544). New county record; ends speculation by Nickerson and Mays (1973, Milwaukee Public Mus. Publ. Biol. Geol. No. 1:1–106) that Ozark Hellbenders may occur in the lower stretches of the Eleven Point River in Arkansas. Three additional specimens were subsequently tagged and released by authors on 11 July 1992 at Mill Dam (Randolph Co: Sec. 11, T21N, R2W) on the Eleven Point River, 2.4 km inside the Arkansas/Missouri border. The voucher specimen was found in a fisherman's hoopnet at a depth of 4 m, whereas the others were taken while scuba diving in a swift current (2 m in depth). The voucher specimen was collected under Arkansas Game & Fish Commission Scientific Collection Permit No. 34 issued to the senior author.

Submitted by **STANLEY E. TRAUTH, J. D. WILHIDE**, and **PATRICK DANIEL**, Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467–0599, USA.

EURYCEA QUADRIDIGITATA (Dwarf Salamander). USA: NORTH CAROLINA: Randolph Co: 11 km SW Farmer. 27 December 1991. J. C. Beane & S. L. Alford. Verified by A. L. Braswell. NCSM 31683. New county record; extends range ca. 24 km NNE, 43 km NW, and 86 km WSW of nearest records in Stanly, Moore,

and Chatham counties, respectively (NCSM files).

Submitted by **JEFFREY C. BEANE,** North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, North Carolina 27611–7647, USA.

NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS (Central Newt). USA: MISSOURI: Pike Co: pond on Carl Blackwell farm, 8 km NNW Curryville, Sec. 5 (NW1/4, NE1/4, NE1/4), T53N, R4W. 1 February 1992. Brian S. Edmond. Verified by D. E. Metter. University of Missouri-Columbia (UMC 1985C). New county record.

Submitted by **BRIAN S. EDMOND**, 400 East Hinton Road, Apt. C, Columbia, Missouri 65201, USA.

ANURA

BUFO COGNATUS (Great Plains Toad). USA: ARIZONA: Apache Co: Lyman Reservoir. 2 July 1988. J. Boundy. San Jose St. Univ. (SJSU A3353); Rt. 666, 11–14 km N St. Johns. 2 July 1988. J. Boundy. SJSU A3354. Verified by D. L. Martin. Extend range south of Little Colorado River in east-central Arizona (Krupa. 1990, *Bufo cognatus*. SSAR Cat. Amer. Amphib. Rept. 457.1).

Submitted by **JEFF BOUNDY**, Museum of Natural Science, Louisiana State University, Baton Rouge, Louisiana 70803, USA.

BUFO MICROSCAPHUS CALIFORNICUS (Arroyo Toad). USA: CALIFORNIA: Riverside Co: Whitewater Canyon: 3–5 km N Interstate 10 on Whitewater Canyon Road, Secs. 27 & 35, T2S, R3E. 10–11 April 1992. Three specimens. Michael A. Patten, Deborah Davidson, & Stephen J. Myers. Verified by Mark Jennings. KU Color Slides 10123–10125. The species has been petitioned for listing under the Endangered Species Act and is protected by the California Department of Fish and Game. This is a new location for the species in California and one of only six past or present localities on the desert slopes. No verified record existed for Riverside County as of late 1960's (Glaser 1970, Nat. Hist. Ser. No. 1, Riverside Mus. Press, Riverside Calif., 40 pp.), but it was "suspected to occur" and is now known from a few localities in the county. Extends range of species about 78 km NE of any known population remaining in the county and 10–15 km NE of the proposed historic range of the species (Sweet 1992, Report USDA Forest Service, Goleta, California, 198 pp.). Past reports from near this location have proved to be erroneous (G. M. Fellers, *in litt.*).

Submitted by **MICHAEL A. PATTEN** and **STEPHEN J. MYERS,** Tierra Madre Consultants, 1159 Iowa Avenue, Suite E, Riverside, California 92507, USA.

BUFO WOODHOUSII (Woodhouse's Toad). USA: TEXAS: Armstrong Co: Palo Duro Canyon, jct. Rt. 207 & Prairie Dog Branch of Red River. 4 July 1992. D. Chiszar. Verified by David Duvall. UCM 56594. First county record (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.)

Submitted by **DAVID CHISZAR**, Department of Psychology, and **HOBART M. SMITH**, Department of EPO Biology, both Museum of Natural History, University of Colorado, Boulder, Colorado 80309–0345 and –0334, USA.

HYLA PUNCTATA (Treefrog). ARGENTINA: PROVINCE OF SANTA FÉ, Dept. La Capital: marginal ponds of Arroyo Colastiné (32°04'S, 60°56'W). December 1991. Adriana S. Manzano. Verified by Esteban D. Lavilla. (FML 04828). First record of the species for the province of Santa Fé. The species was previously recorded from Matto Grosso (Brazil), Santa Cruz de la Sierra (Bolivia), and the southernmost record in Argentina was Resistencia (Chaco Province) (27°27'S, 58°59'W). Extends known range south by 4°37' from the previous records along the Parana drainage system.

Submitted by **ADRIANA S. MANZANO**, Instituto de Herpetología, Fundación Miguel Lillo, Miguel Lillo 251, 4000, San Miguel de Tucumán, Tucumán, Argentina.

TESTUDINES

APALONE SPINIFERA PALLIDA (Pallid Spiny Softshell). USA: TEXAS: Hood Co: 20 km SE Granbury off FM 2174 at Taylor Branch. 14 June 1992. C. T. McAllister. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 18523). New county record filling a distributional gap between Somervell and Parker counties (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Department of Veterans Affairs Medical Center, 4500 South Lancaster Road, Dallas, Texas 75216, USA.

CHRYSEMYS PICTA BELLII (Western Painted Turtle). USA: WYOMING: Johnson Co: Shell Creek, N Buffalo. 27 June 1932. J. Henderson & H. G. Rodeck. Washakie Co: Shell Creek, near Tensleep. 27 June 1932. H. G. Rodeck. Verified by Richard L. Holland. UMC 723, 1053 respectively. Confirm range in both counties as projected without records (Baxter and Stone 1985, Amphibians and Reptiles of Wyoming. Second edition. Wyoming Game and Fish Department, 137 pp.), and extends the documented range about 30–40 km in each county.

Submitted by **DAVID CHISZAR,** Department of Psychology and Museum of Natural History, and **HOBART M. SMITH,** Department of EPO Biology and Museum of Natural History, University of Colorado, Boulder, Colorado 80309, USA.

CLEMMYS MUHLENBERGII (Bog Turtle). USA: NORTH CAROLINA: Gaston Co: 8 km N Gastonia. 2 May 1992. J. F. Green, Sr. Verified by A. L. Braswell. Photographic slides deposited in North Carolina State Museum of Natural Sciences (NCSM AN 92–5–24: DWH 91.49 & DWH 92.06). New county record; verifies county occurrence of A. S. Williams specimen found May 1991. Extends range 38.7 km SW nearest Piedmont province record in Iredell County (NCSM records) and 90.2 km SE nearest Blue Ridge Mountain Province record in Yancey County (Herman 1986, Herpetol. Rev. 17:50). Endangered species permit provided by North Carolina Wildlife Resources Commission.

Submitted by **DENNIS W. HERMAN**, Department of Herpetology, Zoo Atlanta, 800 Cherokee Avenue SE, Atlanta, Georgia 30315, USA, **JAMES F. GREEN, SR.**, Schiele Museum of Natural History, 1500 East Garrison Boulevard, P. O. Box 953, Gastonia, North Carolina 28053, USA, and **BERN W. TRYON**, Department of Herpetology, Knoxville Zoological Garden, P. O. Box 6040, Knoxville, Tennessee 37914, USA.

KINOSTERNON SCORPIOIDES SCORPIOIDES (Scorpion Mud Turtle). VENEZUELA: FALCON: Península de Paraguaná, Municipio Santa Ana, 1 km from Santa Ana (town). 12 November 1987. José Moscó & Tito Barros. Verified by Tito Barros. Museo de Biología de la Universidad del Zulia, Maracaibo (MBLUZ 110). First record for the Península region and northernmost record for the species in South America (Pritchard and Trebbau 1984, The Turtles of Venezuela. SSAR Contrib. Herpetol. 2: 1–414). Speci-

men was found in a temporary pond. Another specimen was observed north of the town of Tacuato, also in the Península, in an artificial permanent pond within a goat enclosure, but was not collected.

Submitted by **ABRAHAM MIJARES-URRUTIA** and **ALEXIS ARENDS R.**, Centro de Investigaciones en Ecología y Zonas Aridas (CIEZA), Universidad Francisco de Miranda, Apartado 7506, Coro 4101–A, Venezuela.

AMPHISBAENIA

ANOPS KINGII (NCN) ARGENTINA: RIO NEGRO: Valcheta. February 1965. Identified by R. Montero. Verified by R. F. Laurent. MACN (Ex CENAI) 136. First documented provincial record. Extends known range ca. 400 km SE Bahía Blanca (Gans and Rhodes 1964, American Mus. Novit. 2186:1–25); CHUBUT: neighborhood of Puerto Madryn. 1967–1970. P. Korchenewsky. Verified by R. F. Laurent. MACN 33890 & 33891. First provincial record. Extends known range ca. 500 km to the south. The high body annuli counts (251, 256) and caudal annuli (21, 22) confirm the idea of their regular increment from northeast to the southwest (Gans and Rhodes 1964, American Mus. Novit. 2186:1–25).

Submitted by **RICARDO MONTERO**, Cátedra Vertebrados, Facultad de Ciencias Naturales, Universidad Nacional de Tucumán, y Instituto de Herpetología, Fundación Miguel Lillo, Miguel Lillo 251, 4000 Tucumán, Argentina.

LACERTILIA

CNEMIDOPHORUS GULARIS GULARIS (Texas Spotted Whiptail). USA: TEXAS: Floyd Co: 3.2 km S Briscoe County line, Road 1065. 11 July 1992. R. L. Holland & H. M. Smith. Verified by David Duvall. UCM 56595–6. First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **RICHARD L. HOLLAND**, Science Department, Boulder High School, Boulder, Colorado 80303, USA, and **HOBART M. SMITH,** Department of EPO Biology and Museum of Natural History, University of Colorado, Boulder, Colorado 80309–0334, USA.

EUMECES LATICEPS (Broadhead Skink). USA: PENNSYLVANIA: Lancaster Co: 2.5 km WNW Safe Harbor along Susquehanna River. May 1991. John Kunsman. CM 124295. Verified by John D. Groves. New county record and third record from Pennsylvania (McCoy 1982, Carnegie Mus. Nat. Hist. Spec Publ. 6:1–91); extends range of species 7 km upriver (northwest) from York Furnace, York County (Taylor 1935, Univ. Kansas Sci. Bull. 23:1–643).

Submitted by **C. J. MCCOY,** Carnegie Museum of Natural History, Pittsburgh, Pennsylvania 15213, USA.

EUMECES SEPTENTRIONALIS SEPTENTRIONALIS (Northern Prairie Skink). USA: WISCONSIN: Sawyer Co: Phipps Road at jct. with Gouch Road, ca 100 m W Namekagon River (Sec. 12, T41N, R9W). 16 July 1992. Andrew Cochran, Joseph Cochran, & Philip Cochran. Verified by Gary Casper. MPM P360. A second specimen found along Phipps Road ca 200 m west of the first is currently held alive in the St. Norbert College teaching collection. First county record (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Museum, 205 pp.). Occurrence of this species in Sawyer County was predictable on the basis of its association with region H sand deposits (Casper 1992, Abstract, 72nd Annual Meeting, American Society of Ichthyologists and Herpetologists, pp. 80–81.) A "peninsula" of region H sand extends northeast along the Namekagon River from Washburn County into Sawyer County, roughly paralleled by U.S. Rt. 63 (Hole 1976, Soils of Wisconsin, Univ. Wisconsin Press). The Sawyer County skinks were collected not far within the tip of this peninsula. Previously, I have collected specimens near its base, at the confluence of Whalen Creek and the Namekagon River, in Washburn County, ca. 30 km southwest of the Sawyer County capture site. Surveys along U.S. Rt. 63 in Sawyer and Bayfield counties beyond the limit of region H sand failed to produce prairie skinks.

Submitted by **PHILIP A. COCHRAN**, Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115, USA.

HEMIDACTYLUS BROOKII (Limpia-casa). PANAMÁ: PROVINCIA DE PANAMÁ: Distrito de Panamá: Tocumen, 9°05'N 79°22'W, ca. 25 m elevation. 15 November 1980. G. Beleño. Verified by Ronald I. Crombie. Círculo Herpetológico de Panamá (CH 227). New county record. *H. brookii* is found in the old and new worlds, and in the latter was previously known from the West Indies and Colombia (Kluge 1969, Misc. Publ. Mus. Zool. Univ. Michigan 138:1–78). This specimen was collected on the walls of a house in a town close to the Tocumen International Airport. The history of the distribution and abundance of *H. brookii* at this locality is unknown.

Submitted by **ROBERTO IBAÑEZ D., CESAR A. JARAMILLO**, Smithsonian Tropical Research Institute, Apdo. 2072, Balboa, Rep. de Panamá, **FRANK A. SOLIS**, Departmento de Zoología, Universidad de Panamá, Rep. de Panamá, and **FIDEL E. JARAMILLO,** Círculo Herpetológico de Panamá, Apdo. 10762, Estafeta Universitaria, Panamá, Rep. de Panamá.

HEMIDACTYLUS LESCHENAULTI (Bark Gecko). SULTANATE OF OMAN: 4.5 km SW Ra's Suwadi (23°42'N, 57°43'E). 12 October 1989. A. S. Gardner. Verified by E. N. Arnold. BMNH 1988. 220–221. First Arabian record. Appears to be a restricted population in mature *Acacia tortilis* woodland, not closely associated with human activities. However, this site is now rapidly being developed for agriculture, usually involving the felling of the trees, and the future for this species in Arabia is uncertain.

Submitted by **ANDREW S. GARDNER**, Department of Biology, College of Science, Sultan Qaboos University, P. O. Box 32486, Muscat, Sultanate of Oman.

HEMIPHYLLODACTYLUS TYPUS (Indo Pacific Tree Gecko). PITCAIRN ISLAND, PITCAIRN GROUP. Natural History Museum of Basel, Swiss, NMB 8494. Labelled as *Lepidodactylus lugubris*. Exchanged through American Museum of Natural History in 1923. Verified by Aaron M. Bauer. New island record and new island group record (Ineich and Blanc 1989, Atoll Research Bulletin, 1988, 318:1–75).

Submitted by **IVAN INEICH,** Muséum national d'Histoire naturelle, Laboratoire de Zoologie (Reptiles et Amphibians), 25 rue Cuvier, 75005 Paris, FRANCE and Centre de l'Environnement, Antenne Muséum/E.P.H.E., B. P. 1013 Papetoai, Moorea, French Polynesia.

SCELOPORUS UNDULATUS GARMANI (Northern Prairie Lizard). USA: NEBRASKA: Perkins Co: 3.2 km N Chase County line, Road 61. 23–25 June 1992. R. E. Ballinger. Verified by David Duvall. UCM 56590. First county record (Lynch 1985, Trans. Nebraska Acad. Sci. 13:44).

Submitted by **ROYCE E. BALLINGER**, School of Life Sciences,

University of Nebraska, Lincoln, Nebraska 68588–0118, USA, and **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309–0334, USA.

SERPENTES

CROTALUS VIRIDIS VIRIDIS (Prairie Rattlesnake). USA: ARIZONA: Apache Co: Rt. 666, 4.5 km N Rt. 60. 13 June 1988. J. Boundy. San Jose St. Univ. (SJSU R6432); Rt. 666, 3.2 km S Nelson Reservoir. 5 August 1988. J. Boundy. SJSU R6436–6437; head of Hobson Canyon, 9.6 km WSW Eagar. 16 October 1988. J. Boundy. SJSU R6446. All verified by Sam S. Sweet. First records for east-central Arizona (Lowe et. al. 1985, The Venomous Reptiles of Arizona. Arizona Game & Fish Dept., Phoenix, 115 pp.).

Submitted by **JEFF BOUNDY**, Museum of Natural Science, Louisiana State University, Baton Rouge, Louisiana 70803, USA.

CROTALUS WILLARDI WILLARDI (Arizona Ridgenose Rattlesnake). USA: ARIZONA: Cochise Co: Whetstone Mountains. 19 September 1991. Luke J. Thirkhill & Brian L. Starrett. Verified by Charles H. Lowe. University of Arizona (UAZ 49176–PSV). Previously known in Arizona from Huachuca, Patagonia, and Santa Rita mountains only. Extends range 10 km N of nearest known locality, Florida Canyon, Santa Rita Mountains. (Fowlie 1965, The Snakes of Arizona. McGraw Hill, New York, 164 pp.).

Submitted by **LUKE J. THIRKHILL** and **BRIAN L. STARRETT**, P. O. Box 9403, Scottsdale, Arizona 85252, USA.

HELICOPS PASTAZAE (NCN) VENEZUELA: ESTADO PORTUGUESA: upper reaches of Río Caparo. 13 February 1983. B. Busto & C. Ramo. Museo de Ciencias Naturales, Guanare (MCNG 737); ESTADO TACHIRA: Río Burgua, 9.2 km S El Piñal. 26 May 1982. D. Taphorn & C. Lilyestrom. MCNG 736. Verified by Joseph T. Collins. These two juvenile males represent new state records and are the second and third known specimens from Venezuela. They agree with previously reported *H. pastazae* in all meristic and mensural features save that MCNG 737 has 89 subcaudals—four fewer than the previous minimum for males (Rossman 1976, Occas. Pap. Mus. Zool. Louisiana State Univ. 50:1–15).

Submitted by **ALLAN L. MARKEZICH,** Department of Natural Sciences, Black Hawk College, Moline, Illinois 61265, USA, and **DOUGLAS A. ROSSMAN**, Museum of Natural Science, Louisiana State University, Baton Rouge, Louisiana 70803, USA.

LAMPROPELTIS TRIANGULUM CELAENOPS (New Mexico Milk Snake). USA: TEXAS: Dallam Co: Rt. 87, 13.75 km NW Dalhart (western city limit). 3 July 1992. H. M. Smith. Verified by David Duvall. UCM 56597. First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A&M University Press, College Station, Texas, 434 pp.), and first report for the northwestern panhandle of Texas.

Submitted by **DAVID CHISZAR**, Department of Psychology, and **HOBART M. SMITH**, Department of EPO Biology, both Museum of Natural History, University of Colorado, Boulder, Colorado 80309–0345 and –0334.

LICHANURA TRIVIRGATA GRACIA (Desert Rosy Boa). USA: CALIFORNIA: Imperial Co: 33°6'28"N, 114°51'33"W. 17 October 1991. Jerrold J. Feldner. Verified by Robert Bezy. LACM 139667 (PC 1210). Range extension ca. 48 km SE of record for Imperial County, California; helps to fill a hiatus between well-known populations in Riverside County, California, and those in southwestern Arizona (Stebbins 1985, A Field Guide to Western Reptiles and Amphibians. Second ed. Houghton Mifflin Co., Boston, Massachusetts, 336 pp.).

Submitted by **JERROLD J. FELDNER,** Southwestern Herpetologists Society, P. O. Box 7469, Van Nuys, California 91409, USA.

MASTICOPHIS LATERALIS (Striped Racer). USA: CALIFORNIA: Trinity Co: Sec. 30, T5N, R6E, ca. 0.75 km S of end of US Forest Service Road 5N03 on S Fork of Trinity River Trail. 23 May 1992. Photographs verified by Hartwell H. Welsh, Jr. CAS Photographs 44.12 & 44.13. Extends the range ca. 20 km W of previous records in northern California (Bury 1970, J. Herpetol. 4:165–178; Jennings 1983, Cat. American Amphib. Rept. 343.1–343.2). Female, approximately 1000 cm TL. Found 2 m above ground in a canyon live oak (*Quercus chrysolepis*) in mixed evergreen, Douglas-fir (*Pseudotsuga menziesii*) dominated forest on a slope with aspect 130 degrees.

Submitted by **AMY J. LIND**, Pacific Southwest Research Station, Redwood Sciences Laboratory, USDA Forest Service, 1700 Bayview Drive, Arcata, California 95521, USA.

SENTICOLIS TRIASPIS INTERMEDIA (Green Rat Snake). USA: NEW MEXICO: Hidalgo Co: Peloncillo Mountains, Guadalupe Canyon, along a dirt road 0.64 km NE Arizona/New Mexico state line, ca. 56.3 air km S Rodeo, NW 1/4 Sec. 14, T34S, R22W, 1341 m elev. 28 April 1992. Clay M. Garrett. Verified by William G. Degenhardt. Museum of Southwestern Biology, University of New Mexico (MSB 54161). This record represents the first voucher specimen from New Mexico. Occurrence of this species in New Mexico was previously documented by photographs taken by C. M. Bogert and T. A. Snell of specimens from Post Office Canyon in the Peloncillo Mountains, ca. 10 km S Rodeo. These photographs are on file with the Endangered Species Program, New Mexico Department of Game and Fish.

Submitted by **CLAY M. GARRETT,** Department of Herpetology, Dallas Zoo, 621 E. Clarendon, Dallas, Texas 75203, USA, and **CHARLES W. PAINTER**, New Mexico Department of Game and Fish, Endangered Species Program, P. O. Box 25112, Santa Fe, New Mexico 87504, USA.

TANTILLA NIGRICEPS (Plains Blackhead Snake). USA: TEXAS: Dallam Co: Rt. 87, 13.75 km NW Dalhart (western city limit). 3 July 1992. H. M. Smith. Verified by David Duvall. UCM 56593. First county record (Dixon 1987, Amphibians and Reptiles of Texas. Texas A&M University Press, College Station, Texas, 434 pp.) and first report for the extreme northwestern panhandle.

Submitted by **DAVID CHISZAR**, Department of Psychology, and **HOBART M. SMITH,** Department of EPO Biology, both Museum of Natural History, University of Colorado, Boulder, Colorado 80309–0345 and –0334, USA.

THAMNOPHIS HAMMONDII (Two-striped Garter Snake). USA: CALIFORNIA: Fresno Co: Arroyo Leona Creek, ca. 0.5 km upstream from the confluence with Arroyo Venado, SW 1/4 NE 1/4 Sec. 10, T18S, R13E. 27 April 1992. Ed Ely. CAS 185349; Fresno Co: Cantua Creek, ca. 2.1 km upstream from confluence with Arroyo Leona Creek, SE 1/4 NE 1/4 Sec. 4, T18S, R13E. 14 June 1992. Ed Ely. CAS 185350. Both verified by Jens Vindum, California Academy of Sciences, and collected under California Scientific Collector's Permit 0630. These records substantiate recent field records by George E. Hansen for nearby Los Gatos Creek (also Fresno County), and extend the known distribution into drainages on the eastern slope of the Diablo Range (Fitch 1940, Univ. California Publ. Zool. 44:1–150).

Submitted by **ED ELY**, Field Associate, Department of Herpetology, California Academy of Sciences, Golden Gate Park, California 94118, USA.

New County Records For Amphibians And Reptiles From Northern Indiana

Minton, List, and Lodato (1983, Proc. Indiana Acad. Sci. 92:489–498) provide a distributional update to Minton's monograph on the herpetofauna of Indiana (1972, Indiana Acad. Sci. Monog. 3). These publications, along with Pentecost and Vogt (1976, Environmental status of the Lake Michigan Region. Vol. 16. Amphibians and Reptiles of the Lake Michigan Drainage Basin. Unpub. Report Argonne National Lab.) greatly enhance our knowledge of the distribution of amphibians and reptiles in Indiana. Despite Indiana's substantial representation in the literature, distributional gaps remain for some well known taxa.

The following specimens represent new county records for five amphibians and eleven reptiles in northern Indiana. All specimens and slides are deposited in the Field Museum of Natural History (FMNH) in Chicago. Identifications were confirmed by Sherman A. Minton and Alan Resetar.

CAUDATA

Plethodon cinereus (Redback Salamander). Starke Co: Oregon Township: Koontz Lake Wetlands. 11 May 1989. A. Resetar. FMNH Slide Collection.

Plethodon cinereus (Redback Salamander). St. Joseph Co: Rum Village, SW sector of South Bend. 29 March 1960. R. E. Gordon and E. Randal. FMNH 247956. Extends the Indiana range into the north central tier of counties.

ANURA

Bufo americanus (American Toad). Starke Co: Hamlet. 17 August 1935. H. Dybas. FMNH 22663. Records exist for *B. americanus* in all surrounding counties.

Rana clamitans melanota (Green Frog). St. Joseph Co: Potato Creek State Park. 11 May 1989. A. Resetar. FMNH Slide Collection.

Rana clamitans melanota (Green Frog). Lake County: Wolf Lake. October 1908. S. F. Hildebrand. FMNH 2842.

TESTUDINES

Chelydra s. serpentina (Common Snapping Turtle). LaPorte Co: New Durham Township: SW 1/4, NE 1/4, Sec. 17, T36N, R4W, Westville Quadrangle. 1 May 1989. A. Resetar. FMNH 242276.

Chelydra s. serpentina (Common Snapping Turtle). Elkhart Co: Little Elkhart River. July 1963. R. E. Gordon. FMNH 246768.

Chrysemys picta marginata (Midland Painted Turtle). LaGrange Co: Little Stone Lake (Mud Lake). 15 June 1943. R. Zangerl. FMNH 206111.

Chrysemys picta marginata (Midland Painted Turtle). Elkhart Co: Washington Township: Pipewort Pond Nature Preserve. 4 June 1989. A. Resetar. FMNH Slide Collection.

Sternotherus odoratus (Common Musk Turtle). St. Joseph Co: University of Notre Dame campus, St. Mary's Lake. R. Mizelle. FMNH 21770–72.

Terrapene c. carolina (Eastern Box Turtle). Elkhart Co: Washington Township: Pipewort Pond Nature Preserve. 4 June 1989. A. Resetar. FMNH 242272 (skeletal remains).

LACERTILIA

Cnemidophorus s. sexlineatus (Six-lined Racerunner). LaPorte Co: Michigan City, NE 1/4, NE 1/4 , NE 1/4, Sec 6, T37N, R4W, Michigan City West Quadrangle. 19 August 1991. A. Resetar, M. Blanford, B. Burke and D. Resetar. FMNH 247400. This is the easternmost record for this species in the Indiana Dunes region.

SERPENTES

Nerodia erythrogaster neglecta (Copperbelly Water Snake). St. Joseph Co: South Bend, South Bend Avenue & Corby Boulevard. 17 June 1965. G. Sechyrist. FMNH 245282. Extends Indiana range westward by three counties from Steuben County into the extreme NE corner of the state.

Storeria dekayi wrightorum (Midland Brown Snake). St. Joseph Co: South Bend. 21 May 1962. R. E. Gordon. FMNH 240472.

Thamnophis sauritus septentrionalis (Northern Ribbon Snake). Starke Co: Oregon Township: Koontz Lake Wetlands. 7 May 1989. A. Resetar. FMNH Slide Collection.

Thamnophis sauritus septentrionalis (Northern Ribbon Snake). LaPorte Co: Cool Springs Township: Pinhook Bog. 7 July 1985. A. Resetar. FMNH Slide Collection.

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BOOK REVIEWS

Australian Snakes: A Natural History, by Richard Shine. 1991. Cornell University Press, 124 Roberts Place, Ithaca, N.Y. 14850 (first published by Reed Books Pty. Ltd., 3/470 Sydney Road, Balgowlah, N.S.W. 2093, Australia). 223 pp. Hardcover. $34.95 U.S. ISBN: 0-8014-2737-1.

Has snake ecology come of age? At the 1986 ASIH meeting in Victoria, Canada, in the aftermath of a two-day symposium on snake ecology and behavior, many North American workers on snakes were brought together for the first time and formed a loose organization dubbed the "Snake Ecology Group." Subsequent gatherings brought together many workers on snakes, most notably in 1989 at the First World Congress of Herpetology, and, in the same year, a conference on the biology of pit vipers. In 1990 and 1991, the Snake Ecology Group held informal workshops to discuss on-going research directions, and the group has produced occasional newsletters and a membership directory. These activities, and a number of recent major synthetic publications on snakes (e.g., Pough's *The Diversity of Feeding Mechanisms of Snakes*, Seigel, Collins, and Novak's *Snakes: Ecology and Evolutionary Biology*, Gloyd and Conant's epic monograph *Snakes of the Agkistrodon Complex*, Campbell and Lamar's *Venomous Reptiles of Latin America*, Campbell and Brodie's *Biology of the Pitvipers*), lead me to suggest that research on snakes is flourishing and that snake biology is maturing rapidly. Indeed, the book under review makes a major contribution to that maturation process and may be the best all-around snake book in recent years.

Shine has summarized in one volume much of what is known of the biology of the 172 currently recognized species of Australian

snakes. The book is attractively produced on 8" x 11" (20 x 28 cm) glossy paper in three-column format. It is organized into eight main chapters, and has an appendix (natural history information on Australian snakes), a glossary, bibliography, and index. The main chapters are: Anatomy of a Snake, The Evolution of Snakes, Where Snakes Live, The Behaviour of Snakes, The Sex Lives of Snakes, Snake Life Histories, What Snakes Eat, and Snakes and Humans.

Shine wrote the book, he says, to provide up-to-date information on Australian snakes that is readily understandable to readers throughout the world and to produce the kind of book he wanted to have when he was a teenager: "My goal is to encourage a fresh outlook on these widely feared and misunderstood animals." He succeeds in this approach, presenting a large amount of previously unavailable information (except in the technical literature) in a factual, soundly based, scientific manner. Primary literature is not cited in the text, and the style is free-flowing and relaxed.

A primary feature of the book is its lavish color photographs, of which there are no fewer than 265, portraying 61 species (1 acrochordid, 11 boids, 6 colubrids, 32 elapids, 3 hydrophiids, 2 laticaudids, and 6 typhlopids) of which thirteen of the better-known or more spectacular species (e.g., the diamond/carpet python, *Morelia spilota*; death adder, *Acanthophis antarcticus*; tigersnake, *Notechis scutatus*; and taipan, *Oxyuranus scutellatus*) are each shown in four or more separate photographs. Shine points out that the photographs were contributed by more than fifty colleagues, saying "My main criterion for selection of photographs has been pictures that tell a story rather than portrait shots." And tell a story they do. To classify this diversity of color plates, I grouped them into several categories: close-ups of Australian snakes (77), Australian snakes doing something (53), other scene or event related to Australian snakes (39), Australian snakes in their natural habitats (24), researchers doing something in the field (20), non-Australian snakes (15), Australian lizards and frogs (14), habitat scenes in Australia (12), and anatomical features or products related to snakes (11). On pure economics, at $34.95 (a bargain price for any hardcover book these days) one gets all these spectacular photographs for 13 cents each.

This book is, however, by no means merely a photographic atlas to a regional fauna. Shine's style throughout is to advance interesting ecological patterns and to show them by means of a number of diagrams, maps, and data plots. Many of the patterns probably apply generally to other regions and other ophidian faunas. Several of the maps of continental distributions are fairly sophisticated in being drawn using isopleth lines (e.g., species densities of elapids, pythons, blindsnakes, and colubrids; percentages of elapids and of livebearing elapids). He includes graphs, usually drawn as bicoordinate scatter diagrams or histograms. Data plots include temperature selection in relation to feeding; annual gonadal cycles; average number of young and hatchling body length against female size; growth curves in the water python; seasonal cycles of fat and liver mass; and size-specific dietary diversity.

This is an activist's book: It exudes a strong sense of a modern evolutionary ecologist's synthetic outlook in discovering patterns, and it shows that this information was gained from many years of difficult field research in remote areas throughout Australia. The flavor and excitement of the author's life studying snakes comes through. Incidents such as his narrow escapes from a deadly eastern brownsnake and a saltwater crocodile are chilling. And, his description of boredom in painstakingly gathering information from snakes carrying miniature radiotransmitters ("Most of the snakes I locate are doing exactly the same thing . . . nothing!") is, for those who have done it, brutally sincere. Shine uses this prominent behavior of snakes (doing nothing) to explain the advantages of being a thinbodied ectotherm: ". . . snakes need relatively little food, so can survive difficult conditions by just waiting them out." In contrast to a more familiar furry endotherm, Shine emphasizes many of the features of snake morphology and behavior that seem unusual to humans. He says: "Any attempt to call one of these systems 'advanced' and the other one 'inferior' is bound to be wrong. We need to stop assuming that we are somehow superior to the rest of the living world, and accept that other animals like snakes are not 'lower' than us, but simply different. We should admire them for their abilities, not judge them as 'primitive' or 'inefficient' just because they are different."

There is a mixture of fascinating natural history which leads the reader expectantly onward, and solid biological writing which does not shy away from technical terms. This does beg the question of exactly to whom the book is addressed. Initially, I questioned whether it could be assimilated by an average and interested reader, one who may not necessarily have any training in biology. Although a college or university biology undergraduate probably would be more appreciative of the finer points (and could better cope with the many family names as noted below), I think, overall, the book will appeal to a wide audience. In several places, Shine goes out of his way to take note of the contributions of "amateur" herpetologists and encourages them to take detailed notes on reproduction and growth of their captive snakes, as for some species these data are the only ones we have.

The book is well written and largely error-free, but is not without several small typographical or grammatical mistakes. An excellent cut-away diagram of snake anatomy has tracheal rings identified incorrectly as cartilaginous "ribs." Another otherwise excellent cut-away diagram of the anatomy of the head and venom apparatus labels the quadratomaxillary ligament at the posterior angle of the mouth as a "masseter" muscle. An inconsistency appears in the spelling of the family Anomalepididae (p. 31, phylogenetic diagram of families of snakes) and Anomalepidae (p. 32, text). On page 105, two "the's" are juxtaposed in one line. On page 142, there is a missing line or block of text, as the sentence beginning with "Large frogs . . ." is lengthy and nonsensical and apparently should be two sentences. Whereas most (184) of the legends to the color plates occur outside of the photograph, some (65) are placed within the plate itself. Among these "inside" legends, eight are annoyingly difficult to read because they generally color-match that portion of the photograph which they overlie.

The most often-used technical terms are the common forms of the family names (elapid, boid, colubrid) which may, for the uninitiated reader, pose some difficulty. In the glossary each of the families so identified is defined (e.g., "a venomous snake belonging to the family Elapidae"), but the glossary itself, in containing 56 entries, is dominated by 17 (30%) of these family epithet definitions. Perhaps, because they are so numerous, they should be separated out into a table, and their usage throughout the text explained early on. Several other more substantive, but still minor, criticisms have to do with inconsistencies in the number of genera of elapids, and in the construction and usefulness of the index. Shine provides two useful compendia of the Australian snake fauna: on page 41, a table lists all families, genera, and number of species per genus, and points out that the names of many of the elapids have changed recently, referring the reader to Mark Hutchinson's 1990 paper for an explanation and complete list. Hutchinson's paper, however, does not appear in the bibliography, or anywhere else in the book. The table lists 20 genera of elapids, whereas a few pages later a stylistic diagram of the higher

and species-level taxa shows the number of elapid genera is 25; still later, the appendix of life history information lists 20 genera. Without further background checking, there is no way of determining the correct number of elapid genera, or of referring to a taxonomic authority for this information.

The index is only moderately useful. Its main problem is redundancy in listing the same pages under both the common and scientific names of many species. Examples of dual listings include the taipan (*Oxyuranus scutellatus*), 22 references; the water python (*Liasis fuscus*), 26 references; the king brown (*Pseudechis australis*), 15 references; the diamond python (*Morelia spilota*), 26 references; and the tigersnake (*Notechis scutatus*), 41 references. A number of additional species have the same redundancy problem (but fewer references), whereas for others the page references do not match. Also, the index provides no indication of the type of material referred to, whether topical, tabular, or illustrative. Thus, the utility of the index is minimal.

As mentioned above, there are so many high quality photographs throughout the book, providing a taxonomic index to them would have been most useful, especially as each is fully labeled by both common and scientific name. On one page in the book, to give a specific example, five pictures of the western brownsnake, *Pseudonaja nuchalis*, show the dramatic geographic variation in coloration and pattern in this remarkable snake. Shine points out that whereas this snake traditionally has been treated as a single species, in reality it probably comprises several species, yet the access to the page of photographs showing the snake is not apparent in the index.

A culmination to Shine's approach may be found in the appendix which provides a comprehensive table summarizing the natural history information of the best known snakes in Australia. The appendix provides five full pages of extremely valuable information: average body size (snout-to-vent length) of hatchlings, adult males, and adult females; reproductive mode; average number of offspring; and food habits (percentage of dietary composition of seven major prey groups). The appendix is well organized, listing dozens of species by family, common, and scientific name in alphabetical sequence of generic names. Following the appendix and the glossary, a useful seven-page bibliography lists relevant books and scientific papers, the latter grouped by higher taxon. No fewer than 68 citations are to papers authored or co-authored by Shine, demonstrating his productive scientific output on Australian snakes.

Those who enjoy good natural history writing with a firm foundation of good science will like this book. Rick Shine is to be congratulated for making available in an attractive, affordable package, a scientifically sound herpetological book on a fascinating group of animals. Here, he synthesizes more than twenty years of his own research efforts. Despite my noting a few errors, these certainly are minor and do not detract from the value of the book. It is a bargain for the price. More importantly, it deserves wide recognition as a natural history book with a solid underpinning of modern evolutionary thinking. Shine's book provides a fascinating read for the general biologist or vertebrate zoologist, the snake culturist and captive breeder, and especially for the herpetologist interested in, or even doing research on, snakes.

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Atlas de Repartition des Batraciens et Reptiles de Corse, by Michel Delaguerre and Marc Cheylan (and collaborators). 1992. Parc Naturel Regional de Corse, B.P. 417, F-20184 Ajaccio, France. 128 pp. Softcover 120 FF (approx. $25.00 U.S.).

Lisez-vous francais? Although one will need to brush up one's French to make full use of this book, all herpetologists are likely to appreciate the attractive layout and numerous color photographs of the volume. Despite the title of the work, this is far more than a collection of distribution maps; it is an introduction to the herpetofauna of one of the most biologically interesting and scenically spectacular areas of Europe. Corsica, France's largest Mediterranean island, covers an area of 8722 km^2 and reaches elevations of up to 2700 m. The herpetofauna (including marine species) comprises seven species of amphibians and 13 reptiles. Of these, two amphibian species, *Euproctus montanus* and *Discoglossus montalentii*, and two reptile subspecies, *Archaeolacerta b. bedriagae* and *Natrix natrix corsa* (the latter questionably valid), are Corsican endemics. A further nine species are regional endemics, also occurring on neighboring Sardinia.

This book is based primarily on recent records of specimens from the island, over 2700 in all, most since 1979. The bulk of the volume is formed by individual species accounts, each 2-4 pages in length. These present an overview of the distribution, natural history, and past research on the animals, with special reference to information relating to Corsican populations. Conservation status, human threats, and local names are provided in at least some instances. The distribution of each species within Corsica is shown on large point-locality maps of the island, each of which also presents an elevational profile of the species, indicating the absolute and relative percentages of observations of each taxon within each 100 m elevational band. The resolution of the maps is far greater than that available in the more general atlas of France as a whole (Castanet and Guyetant 1989) and provides the basis for meaningful distributional analyses.

In addition to the taxonomic accounts, a short historical overview of the Tyrrhenian herpetofauna, a geologic, climatic, and vegetational introduction to Corsica, and a detailed biogeographic section are provided. The last of these presents a wealth of information. The distribution of amphibians and reptiles on 111 smaller islands, islets, and rocks surrounding Corsica is presented in tabular form, and intra-Corsican analyses of species richness and environmental correlates of distribution are presented. The distributional patterns of all terrestrial vertebrates are also discussed in a broader Mediterranean context and maps, tables, histograms, and graphs are effectively used to highlight particular points. Common island phenomena, such as gigantism/dwarfism and melanism are also reviewed, and two "island specialists," *Phyllodactylus europaeus* and *Podarcis tiliguerta*, studied in detail by Delaguerre and Lanza, respectively, provide the focus for a discussion of insular geographic variation. Unfortunately, however, there are few explicit connections made between phylogenetic and biogeographic patterns.

The layout of the volume as a whole is attractive, and there are over 70 illustrations, exclusive of maps and graphs. Photo quality throughout ranges from fair to excellent and although the color reproduction is very good, a number of animal shots suffer from poor composition or excessive shadowing. The photos are augmented by a number of line and half-tone drawings, illustrating such subjects as larval amphibians and sequential views of behavioral events.

Typographic errors, such as the frequent misspelling of the

names of German authors, are reasonably unobtrusive and an errata sheet provided with the book corrects most of the more significant problems, such as incorrect maps for the species of *Discoglossus*. The narrative form of the species accounts makes the quick referencing of basic biological information somewhat difficult and the absence of an index of any kind is a real drawback. The rather specialized Corsican focus of the volume may put off some North American herpetologists with only a casual interest in the European herpetofauna and the many available European field guides are likely to meet the requirements of these readers more adequately. However, for those with special interests in the amphibians and reptiles of the Mediterranean, or in island biogeography in general, this inexpensive book will be a valuable and attractive addition to the library.

LITERATURE CITED

CASTANET, J., and R. GUYETANT. 1989. Atlas de Repartition des Amphibiens et Reptiles de France. Société Herpétologique de France, Paris, 191 pp.

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Florida's Fabulous Reptiles and Amphibians, by Pete Carmichael and Winston Williams. 1991. World Publications, P.O. Box 24339, Tampa, Florida 33623, USA. 120 pp. Softcover. $15.95 U.S.

From alligators to sea turtles, you will find 120 pages packed with fabulous photographs and factual natural history notes on Florida's herpetofauna. The cover of this coffee-table style book indicates that it deals with snakes, lizards, alligators, frogs, and turtles. In addition to those taxa it includes an amphisbaenid, a nice comparison of alligators and crocodiles, and a section on salamanders. The book, however, does not describe every species known to occur in Florida. Some of the panhandle species are missing. Every animal considered, however, is beautifully illustrated, including many introduced species. For example, the authors include excellent photos of curly-tailed lizards (*Leiocephalus carinatus*), and knight anoles (*Anolis equestris*) from Miami, and a brief discussion of the northward progress of the brown anole (*Anolis sagrei*) through the state.

Most pages have one or two highlighted paragraphs which the authors use to place an individual taxon into a broader ecological, behavioral, or evolutionary perspective. A section on rattlesnakes includes paragraphs on rattlers and bulldozers, fabulous fangs, the remarkable strike, rattlesnake roundups, and deadly encounters. Conservation is emphasized throughout. In particular, the potential negative effects of introduced species are dealt with in several places in a manner that promotes the value of maintaining the native faunal integrity. The authors acknowledge a lengthy list of consultants (especially Peter Meylan) for their contributions. These consultants did a fine job of assuring the accuracy of the text. Folks who read this book will come away with a good feeling about amphibians and reptiles and a sound introduction to the several hundred species that call Florida home. The stated range of each taxon is limited to its distribution within Florida. Future editions would benefit from inclusion of the entire geographic range of each species.

Considering the quality, scope, educational value, and price, this book should be in the library of every North American herpetologist. It is especially appropriate to use as a gift to a young budding herpetologist, who just might grow up to study some of Florida's Fabulous Reptiles and Amphibians.

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An Indexed Bibliography of the Herpetofauna of Florida, by Kevin M. Enge, and C. Kenneth Dodd. 1992. Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program Technical Report No. 11. 231 pp. Softcover. $2.70 donation suggested. (Available from Nongame Wildlife Section, Florida Game and Fresh Water Fish Commission, 620 S. Meridian Street, Tallahassee, Florida 32399, USA).

A bibliography of 2820 entries on the Florida herpetofauna including references through January 1992. The bibliography is thoroughly indexed by scientific name, common name, and topic. The 25 topics used in the index are clearly defined and consistently applied.

Catálogo Taxonómico, Biogeográfico y Bibliográfico de las Ranas de Venezuela, by Enrique La Marca. 1992. Cuadernos Geográficos No. 9. 197 pp. Softcover $9.00 U.S. (postage included). (Available from Facultad de Ciencias Forestales, Universidad de Los Andes, Via los Chorros de Milla, Mérida, Venezuela).

A review, in Spanish, of the 202 species of Venezuelan frogs. Systematic accounts include primary references to types and the original name citations as well as statements of type localities, general distribution, synonyms, and taxonomic comments. The distributional section consists of 76 shaded range maps showing distributions within Venezuela. Also included are a bibliography of 500+ references to Venezuelan frogs, a list of institutional acronyms mentioned in the text, a taxonomic list of all species, and an index of scientific names.

Erratum

In the Life History Note concerning *Liolaemus lutzae* (Rocha 1992. Herpetol. Rev. 23(2):60), an incorrect sample size was given for the number of lizards examined. The correct sample size of the lizards analyzed was 158 adults.

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Authors should submit an original and two copies of manuscripts. Manuscripts should be typewritten, double-spaced, on 21.5 x 28 cm (8.5 x 11 inch) white paper. Refer to this issue of ***HR*** for style and format information, including correct format for literature citations. More detailed information for submissions to Geographic Distribution, Life History Notes, and Recent Population Changes appear in a recent issue of ***HR*** under their respective headings.

Originals of illustrative material (e.g., tables, photographs, or diagrams) should be submitted with the text, with appropriate precautions taken to ensure delivery without damage. Illustrations should be discussed in the text and numbered sequentially with Arabic numbers. References to illustrations should be placed in parentheses at the end of sentences. Original photographs should be submitted as black and white glossy prints (8 x 10 inch preferred).

For further guidelines, authors should consult the *CBE Style Manual* (5th edition, 1983, Council of Biology Editors, Inc., 9650 Rockville Pike, Bethesda, Maryland 20814, USA).

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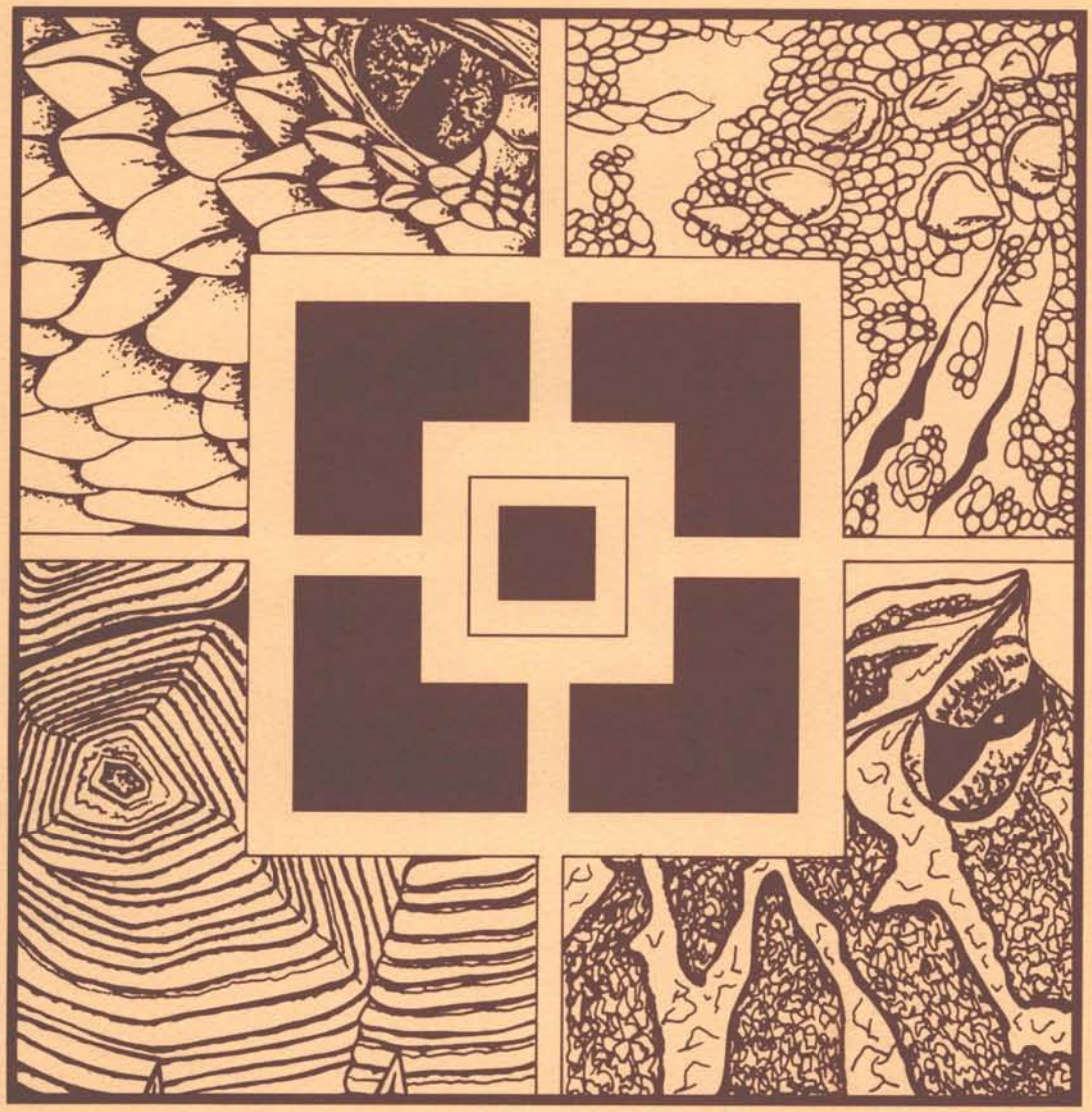
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SSAR BUSINESS

SSAR Grants-In-Herpetology

Proposals are now being accepted for the 1993 SSAR Grants-in Herpetology Program. This program is intended to provide financial support for deserving individuals or organizations involved in herpetological research, education, or conservation. Grant proposals will be considered in the following categories:

1. REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS. Proposals may address educational projects, speakers' fees, regional research, defrayment of one-time-only costs, or other purposes that would strengthen regional societies. Proposals may be submitted by regional herpetological societies or by individual members and must be accompanied by a letter of support from the current president of the regional society.

2. HERPETOLOGICAL RESEARCH OR EDUCATION IN ZOOS. Proposals may address any herpetological endeavor conducted in zoos, such as improvement of displays, interpretive graphics, husbandry or behavioral research. A letter of support from the herpetological curator or the director of the sponsoring zoo must accompany the proposal.

3. CONSERVATION OF AMPHIBIANS AND/OR REPTILES. Proposals should address research on species endangered or threatened at the state, national, or international level, or address research on potentially threatened habitats or species. Proposals must be from individuals only and must be accompanied by a letter of support from another member of the SSAR.

4. FIELD WORK. Proposals may address support for travel to ecological study sites or for survey collections. Proposals normally submitted in the CONSERVATION or GRADUATE STUDENT RESEARCH categories should be submitted here if travel or field station support is sought. Proposals must be from individuals only and be accompanied by a letter of support from another member of the SSAR or a student's major advisor or committee chairperson.

5. GRADUATE STUDENT RESEARCH IN HERPETOLOGY. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only. Applications must be accompanied by a letter of support from the student's major advisor or committee chairperson.

In keeping with the Society's goal of encouraging participation by the broadest possible community, preference may be given to individuals who might not have access to other funding sources. All applicants must be members of the SSAR with the exception of those applying in the REGIONAL HERPETOLOGICAL SOCIETY category. Applicants are limited to submission of one proposal in one category per year. If proposals in any of the categories are not forthcoming, or judged not to be of sufficient quality, the funds in those categories may be transferred to other categories. Each proposal must include the following: (A) BACKGROUND AND OBJECTIVES of the proposed project. (B) METHODS of carrying out the project. (C) COMPLETE PROJECT BUDGET (regardless of whether the SSAR grant will entirely cover expenses). (D) BRIEF RESUME of the applicant or project coordinator. (E) LETTER OF SUPPORT. The proposal must be typed, double spaced, and must not exceed five pages excluding resume and budget.

Applicants must designate to which of the five categories their proposal is submitted (although the committee reserves the right to reassign categories). All proposals must be submitted (postmarked) no later than 31 DECEMBER 1992 to be considered. Failure to meet the guidelines may result in elimination of a proposal from consideration. The awards will be announced by 1 April 1993. Successful applicants will be expected to submit a written report of the results of this support within a reasonable amount of time after the project year is completed. They are also encouraged to submit the results of research projects for publication in the *Journal of Herpetology* or *Herpetological Review* or to present their findings at the annual meeting of the SSAR. Submit proposals or questions regarding application procedures to:

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The Department of Herpetology is pleased to provide limited financial aid to graduate students who wish to visit our collections to support their research in systematics.

Proposals should include a short—no more than one page—description of the research project, as well as a letter of support from the student's faculty advisor.

Proposals will be due on 15 October 1992, with notification by 1 December 1992. Grantees will be expected to complete their Academy visit by 15 September 1993.

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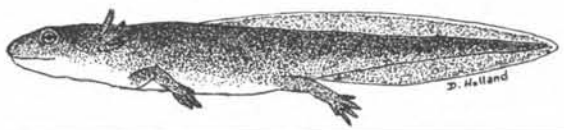
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Chicago Academy of Sciences Collection Records Computerized

The Chicago Academy of Sciences is pleased to announce the computerization of its herpetological specimen records, comprising nearly 20,000 specimens. Most of the collections date from the 1920s through the 1940s, although some specimens were collected as early as the 1850s. The geographic areas best documented are Arizona, Illinois, Indiana, Missouri, Georgia, Tennessee, and Wisconsin. Ninety-eight percent of the Academy's herpetological holdings are from the continental U.S.

Information requests are welcomed from all serious researchers. For more information contact:

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REGIONAL SOCIETY NEWS

New Regional Societies

Please add the following regional societies to your directories:

Rhode Island Herpetological Association
P.O. Box 29474
Providence, Rhode Island, USA

South/Central Texas Herpetological Society
c/o Niels Saustrup
1405 Rabb Road
Austin, Texas 78704, USA

Southern New England Herpetological Association
470 Durham Road
Madison, Connecticut 06443, USA

Wahsatch Alliance of Herpetoculturists
c/o T.A.H.
P.O. Box 1907
Casper, Wyoming 82602, USA

The San Antonio Herpetological Society is no longer extant.

Regional society officers are encouraged to submit address changes to the SSAR Regional Society Section Editor (see inside front cover of HR) and new societies are invited to announce their existence in this column. Established groups are also invited to submit short descriptive articles about their societies for publication in this column.

LEGISLATION & CONSERVATION ALERT

This column serves to update the herpetological community on the regulatory status and protection measures implemented for rare, threatened, and endangered herps. We are in need of more information, especially at the state/province and regional levels. Please send pertinent information to the Section Editor.

The following final and/or proposed listings, regulations, and general information have been announced by governmental regulatory agencies. Pertinent Federal Register (FR) citations are given for U.S. notices.

USA, Massachusetts: The Massachusetts Natural Heritage and Endangered Species Program added two snakes to their list of Endangered, Threatened, and Special Concern species on 31 January 1992: *Elaphe obsoleta* (State Endangered) and *Carphophis amoenus* (State Threatened). A copy of the complete Endangered Species Act Regulations, 321 CMR 10.00, may be obtained from the State House Bookstore, State House, Rm. 116, Boston, Massachusetts 02133, USA. The cost is $2.25 plus $1.50 for postage and handling.

USA, Virginia: The Virginia Department of Game and Inland Fisheries (VDGIF) is proposing a 1993 Legislative Bill to amend S29.1-417 of the Code of Virginia by adding a subsection to require a permit for the taking of amphibians, reptiles, and aquatic invertebrates for commercial use. Comments and suggestions from the herpetological community to help make this an effective conservation strategy would be appreciated by the VDGIF, 4010 Broad Street, Box 1104, Richmond, Virginia 23230, USA.

USA: Federal Register, Vol. 57, No. 93, 31 May 1992. The listing status of the following species has changed. From Category I to II: *Alligator sinensis, Crocodylus niloticus* (Ethiopia, Kenya, Madagascar, South Africa, Uganda, and Tanzania populations), *Crocodylus porosus* (Indonesian population). From Category II to I: *Crocodylus cataphractus* (Congo population), *Crocodylus niloticus* (Cameroon, Congo, and Sudan populations), *Osteolaemus tetraspis* (Congo population), *Clemmys muhlenbergii* (United States). Added to Category II: *Clemmys insculpta* (United States), *Corucia zebrata, Phrynosoma coronatum*, and *Vipera wagneri*.

USA: The Nature Conservancy: A memorandum was issued by the Eastern Regional Heritage Task Force urging all TNC and Natural Heritage Program Staff to report any observed illegal taking of bog turtles (*Clemmys muhlenbergii*) to USFWS law enforcement officials. The bog turtle was added in March to Appendix I of CITES, thus prohibiting international trade in the species.

KURT BUHLMANN
SSAR Conservation Committee



ARTICLES

Vertical-Tree Ambush Posture In *Crotalus horridus*

An adult male timber rattlesnake (*Crotalus horridus*, total length 122 cm, body mass 954 g) captured on 27 April 1991 was radiotracked and observed in northeastern New York. Habitats and climate of the study locality are described by Brown (1992). The snake was one of six animals tracked between 19 May and 11 October 1991. Transmitters were inserted intraperitoneally (cf. Reinert 1992; Reinert and Cundall 1982).

The rattlesnake was observed on nine dates as it moved distances of about 75 to 300 m between successive locations prior to its return migration to its hibernaculum. On four occasions this snake was observed in a previously undescribed ambush posture



FIG. 1. Vertical-tree ambush posture in adult male *Crotalus horridus* in northeastern New York, 25 August 1991. (Photo by G. Lemmo)

at the base of a tree (Fig. 1). When first seen in the posture on 26 May, the snake was stretched at the base of a large (65 cm DBH) red oak tree (*Quercus rubra*) with its head facing upward and its neck looped against the tree trunk. The height of its head was ca. 25-30 cm above ground level. On 22 August, the snake was against a small (32 cm DBH) eastern hemlock tree (*Tsuga canadensis*). The body of the snake extended around the side of the trunk, and its head was directed vertically about 30-35 cm above ground level. On 25 August, the snake was similarly observed at the base of a small (25 cm DBH) shagbark hickory tree (*Carya ovata*).

On 29 August the snake was again observed at the base of a small (25 cm DBH) red oak tree. To test the ability of the snake to strike prey while in this posture, a freshly-killed adult eastern chipmunk (*Tamias striatus*) was grasped in tongs and slowly lowered against the tree trunk toward the snake from a height of 1 m. The snake tongue-flicked when the chipmunk was about 10 cm above it, and, as the chipmunk was moved closer, the snake struck it quickly from this head-up position without moving any other part of his body. The bitten chipmunk was moved (in jerky fashion to simulate stress) down the bark of the tree next to the snake and dragged across the leaf litter to a point about 1.5 m away. After about 20 min the snake had advanced slowly out from his original position. The snake's head was raised about 20 cm above the ground, motionless, facing the chipmunk. After ca. 45 min the snake had moved no farther than about 25 cm from the base of the tree. The chipmunk was then moved closer to the snake's head and observed as the snake investigated and began to swallow it head first. Thirty minutes later the snake had completed the meal and was crawling slowly away from the ambush tree.

These observations augment those of Reinert et al. (1984) on the foraging behavior of *C. horridus* in Pennsylvania where timber rattlesnakes use fallen logs as ambushing sites. This vertical-tree ambush posture, however, has not been described previously for *C. horridus* or for other viperids (Greene and Santana 1983) as a method for ambushing arboreal prey. Whether the posture is a characteristic of some proportion of the snakes in the local population, or is a learned behavior by a few individuals, is a question whose answer will expand our understanding of the role of diverse foraging strategies in snakes.

Acknowledgments.— A grant to Skidmore College by the W. M. Keck Foundation supported this faculty-student collaborative research. We appreciate Howard K. Reinert's assistance in initial surgical implantation of transmitters and, along with Michael V. Plummer, in giving much useful advice. We thank Hank Ayers, Willie Bencze, Maureen Jones, Barbara Kermeen, Gerard Lemmo, Pamela Reppert, and the late Ruth M. Zantzinger for assistance. Charles W. Boylen provided lab space at the Fresh Water Institute, a field station of Rensselaer Polytechnic Institute. Brown's studies of *C. horridus* are conducted under a New York State scientific collecting permit.

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An Important New Book

HERPETOLOGY

CONTEMPORARY RESEARCH ON THE BIOLOGY OF AMPHIBIANS AND REPTILES



HERPETOLOGY is at once an old and yet also a newly revitalized field of research. It was founded in the 18th and 19th centuries on taxonomic, anatomical, and distributional studies, but during the last century, trends in biology and science fragmented the study of amphibians and reptiles into narrower and more disconnected disciplines. The recent renaissance of holistic approaches has helped to transcend these disciplinary boundaries, enabling herpetologists to become active participants and even leaders in this rebirth of the integrated study of animals, as the authors in this new volume demonstrate.

The "New Herpetology" was formalized in 1989 at the First World Congress of Herpetology, held in the United Kingdom, which brought together more than 1000 specialists on amphibians and reptiles from some 60 countries. Ecologists, anatomists, conservationists, geneticists, physiologists, paleontologists, and others who span the spectrum of biology met to share ideas and information. There was a general acknowledgment of the value of broadly integrated approaches to the study of a group of organisms, and the recognition that modern herpetology represents a vigorous and cohesive discipline of enduring significance.

The main feature of the Congress was a series of plenary lectures chosen to emphasize the range of current herpetological studies and to highlight those topics in which research on amphibians and reptiles have made major contributions to biology. This book contains the revised and updated versions of those lectures by authors who are among the world's leaders in their respective fields. Together, these essays demonstrate the breadth of modern herpetology and its continuing vitality as a discipline.

The volume also contains a detailed, illustrated summary of the meeting, with a list of all participants in symposia, workshops, roundtables, poster sessions, and other events. Included is a complete list of delegates and their addresses. This volume represents the summary of record for the First World Congress of Herpetology and a synopsis of current research in our discipline. It is an excellent introduction to modern herpetology for students and others interested in the biology of amphibians and reptiles.

Specifications: 225 pages, format 8 ½ by 11 inches (22 by 28 cm), 20 photographs, numerous tables and graphs, clothbound in library-grade buckram. To be published December 1992.

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CARL GANS (USA): "The Status of Herpetology"

ILYA S. DAREVSKY (Russia): "Evolution and Ecology of Parthenogenesis in Reptiles"

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TIM HALLIDAY (UK): "Sexual Selection in Amphibians and Reptiles: Theoretical Issues and New Directions"

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S. DONALD BRADSHAW (Australia): "Ecophysiology of Desert Reptiles"

ERIC R. PIANKA (USA): "The State of the Art in Community Ecology"

DAVID B. WAKE (USA): "An Integrated Approach to Evolutionary Studies of Salamanders"

SUMMARY OF THE FIRST WORLD CONGRESS OF HERPETOLOGY

LIST OF CONGRESS DELEGATES WITH ADDRESSES

Prices and Ordering

The pre-publication price (before 15 November 1992) to SSAR members and to Delegates of the First Congress is $20. The price to all other persons and to institutions is $28. (Packing and shipping per volume: USA add $2, other countries add $4).

Numbers of copies ___ at $___ per copy, plus $___ total packing and shipping: total amount enclosed: $___.

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Omphalopagus Twins In *Chelonia mydas*

Monozygotic twinning is generally considered to be a form of aberrant development, although some evolutionary benefits have been postulated for armadillos, as monozygotic twins occur regularly in *Dasypus* (Benirschke 1981). For the most part, however, monozygous twinning is associated with structural and physiologic abnormalities which produce hazard to one or both embryos. In humans, such development can be associated with twin-twin transfusions, cord and body entanglements and, probably most significant, fusions or so-called Siamese twins. The latter phenomenon is termed "Pagus" (Greek for fixed) and the prefix for the given pagus fetus designates the body parts involved. For example, omphalopagus refers to fusion at the umbilicus with varying degrees of fusion with derivatives of the umbilicus including vitellin vasculature and intestines. The stimulus for such events occurring in nature is generally unknown.

Monozygotic twinning is known to occur in turtles. The frequency of this event may be region and species specific. For example, in a study of twin leatherback sea turtles, *Dermochelys coriacea*, a frequency of 0.0383 - 0.2000 pairs per female per year, or 2.6% of nests (N=468 nests) was recorded. Full term twin embryos were never observed (Eckert 1990). Another report cited twins in 4.1% of examined nests (Whitmore and Dutton 1985). In a large series from Tortuguero, Costa Rica, Fowler (1979) examined hatchling success and nest predation in *Chelonia mydas*. Of 11,813 eggs studied, 1977 were unhatched and in this subset, three sets of twins were identified. Additionally, one two-headed embryo near hatching size was noted (Fowler 1979). A single case report of a fused twin green sea turtle documented apparent omphalopagus twinning. This very brief report was without photographs or descriptive pathological or anatomical assessment (Hewavisenthi 1989). An instance of thoraco-omphalopagus twin turtles has been documented in *Pseudemys scripta*. The twins lived to about four months of age and had only one set of shared viscera (Szabuniewicz and McGrady 1967).

We report here an instance of omphalopagus twins in the green turtle, *Chelonia mydas*, and describe in detail the histopathologic and anatomic relations of this fusion. The twins were found in an excavated nest located south of the Sebastian Inlet in Indian River Co., Florida (28° 50" W, 80° 30" N). The nest was laid on 23 August 1990, emerged on 13 October 1990, and was inventoried on 14 October 1990. In this study, 35 of 54 nests were examined during the 1990 hatching season. Out of 4425 eggs, only one set of twins (this case) was identified. There were four unsuccessful emergents from this clutch of 125 eggs. Of these, three were mid-term and one egg contained fused twins. Additionally, there were 17 blighted eggs showing no sign of embryonic development. The twins were preserved in 10% buffered formalin for further study. The fused mid-term turtles were of unequal size and attached by a thin membrane near the umbilicus. They were oriented in opposite directions (Fig. 1). Both were well formed, except that the smaller turtle had its left forelimb extended, rather than pointing backwards, as would be normal. The twins were so closely attached that they were unable to move freely within the egg.

The larger of the two embryos weighed 15.5 g with an exteriorized yolk (3.2 g, 1.5 cm diam) extending through a round opening in the plastron into the abdominal cavity and connected with the intestines. Approximately one fifth of the yolk was internal. Dissection of the embryo revealed only a somewhat compressed left thoracic cavity and relatively small intestines (compared with the smaller twin). The smaller of the two embryos weighed 6.2 g and, with the exception of the extended foreleg, it appeared normal. Its connection to the larger twin was through a membranous vascular stalk that issued from a 0.3 x 0.3 cm round opening in the plastron and which connected to the intestines. No yolk was present and its intestines were longer and better developed than those of its twin.

Histologic examination confirmed muellerian ducts and primitive ovaries in both embryos. In the larger twin, the intervening epithelium-lined structure contained (l) vitelline vessels, (2) yolk, and (3) no intestine. In the smaller twin, the structure contained (l) vitelline vessels, (2) no yolk, and (3) a protruding portion of intestines.

The described findings are consistent with monozygotic female omphalopagus twin green turtles. The runted twin may have become retarded due to spatial constraints or vascular phenomena, such as transfusion syndrome. In such a condition, nutrient supplies may be shunted by vascular channels from a runted to a plethoric twin. This is a phenomenon observed in mammals but the physiologic response to such putative events in turtles is unknown. It is of interest that the fused turtles described by Hewavisenthi (1989) were discordant in their sizes (one measured 4. 2 cm and the other, 2.5 cm). Based on the extent of the connection and the presence of yolk, monozygotic division of the embryo probably occurred after gastrulation during formation of the yolk stalk.



FIG. 1. Omphalopagus twins in *Chelonia mydas*.

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Observations On The Defensive And Aggressive Behavior Of The Leatherback Turtle (*Dermochelys coriacea*) At Sea

We report an unusual encounter with an adult leatherback turtle (*Dermochelys coriacea*) off the coastal waters of the Republic of Palau in the western Pacific Ocean on 17 May 1991. We were plying the waters about 1 km south of Ncheangel (Kayangel) Atoll in the channel between the Atoll and Kossol Reef, approximately 8° 1' 30" N; 134° 44' E. The weather was sunny, the northerly wind light, and the ocean calm. Our boat was an open 7 m fiberglass runabout equipped with two 75-hp outboard engines.

At midday we noticed a large animal surfacing several times as we fished about 300 m away. After 5-10 min we motored toward the unidentified creature and found it to be a leatherback turtle interacting with a large (2 m) gray reef shark (*Carcharinus* sp.). The two animals were behaving aggressively, swimming rapidly about one another, with the turtle frequently breaking the surface alongside our boat. We stopped the boat and watched. The turtle swam erratically, repeatedly surfacing and exposing head, carapace, and flippers, often creating a frothy wake of bubbles as it resubmerged. At one point the turtle swam rapidly toward the shark, forcing it to take evasive action by darting away. Although we at first thought that the turtle had possibly been bitten and wounded by the shark, in fact the turtle appeared uninjured with all flippers intact and no blood in the water. After about 5 min the shark swam away and we did not see it again. The turtle, however, maintained an interest in our boat and continued to swim underneath and beside us, acting much as it did in the presence of the shark.

The turtle then began short rushes toward us, solidly ramming the underside of our boat. The turtle typically made shallow dives (5-15 m) in between each surfacing and hitting of the boat. It appeared to be ramming us with the leading edge of its carapace, or the upper part of the carapace itself, as opposed to its head. Although this butting was solid and could have thrown an inattentive person off one's feet, we did not notice any blood in the water or damage to the turtle's carapace. The turtle continued to surface frequently, lifting its head, a fore-flipper, and part of its body out of the water. On at least one occasion it surfaced upside down and swam several meters with its plastron up (Fig. 1). After 5-10 min of this behavior, and after hitting our boat half a dozen times, the turtle appeared to lose interest and began to swim away.

At this point, two members of our crew (C. Cook and N. Idechong) donned masks and snorkels and entered the water, jumping in on opposite sides of the boat. When Cook was 3-4 m from the boat the turtle came immediately and aggressively toward him. The turtle approached with mouth agape, but veered away within the last few meters when Cook made a threatening gesture by spreading his arms. Cook climbed quickly back into the boat, whereupon the turtle shifted attention to Idechong, who had lost sight of Cook and was searching for him at the stern of the boat. As the turtle approached, Idechong swam between the propellers of the two outboard engines. The turtle came from below, mouth open, evidently intent on biting the swimmer. Idechong delivered several kicks to the turtle's head, and the turtle backed off. The turtle did not or was not able to bite the swimmer's foot, and at the first opportunity Idechong climbed back into the boat.

The turtle hit the boat several more times, and then appeared to lose interest, moving farther and farther from us. When the turtle was no longer in sight, we started our engines and motored away. The entire encounter lasted 15-20 min.

The turtle was an adult whose carapace length we estimated to be ca. 1.5 m or more. Leatherbacks with a carapace of this length would be expected to weigh about 450 kg (Anonymous 1975, Van Denburgh 1924). The tail was short and the turtle was probably a female. We took several photographs of the animal as it surfaced around our boat (photos on file at the U.S. Fish and Wildlife Service Honolulu Office). The leatherback is occasionally reported in Micronesia (Pritchard 1977) and is thought to be an uncommon or rare species in Palau and Micronesia. Noah Idechong, who grew up in Palau and spent much time on the water, had seen only one leatherback prior to this encounter.



FIG. 1. Adult leatherback turtle surfacing upside down.

Based on our discussion with others familiar with sea turtles, the behavior of this leatherback was unusual (G. Balazs, T. Fritts, J. Woody, J. Richardson, pers. comm.). However, there are several published accounts of leatherbacks that have acted aggressively in response to humans or sharks (Cropp 1979, Schroeder 1965, Van Denburgh 1922). In one of two encounters described by Schroeder (1965), a large leatherback was observed somersaulting over backwards, making repeated vertical dives, and ultimately attacking Schroeder's boat—behaviors similar to those we observed. Cropp

(1979) detailed an encounter of a leatherback and shark off the coast of Australia. According to Cropp, a great white shark circled under a leatherback which was swimming on its back, wildly thrashing all four flippers, flipping, rolling, and diving on an erratic course. When Cropp maneuvered his boat between the turtle and shark, the turtle continued its tumbling and thrashing on the surface, evidently regarding the boat as another predator. We speculate that the aggressive display of the leatherback toward our boat was the result of its encounter with the shark. The turtle, which was clearly sparring with the shark, evidently considered us to be a threat as well.

Reports of turtles being bitten by sharks are relatively common, and the fact that turtles behave aggressively toward them is expected. However, the behaviors that turtles use to fend off sharks are not well documented. Rudloe (1979) reported that during an attack "turtles can sometimes chase off a shark by fleeing to the surface and beating their flippers, making a thunderous slapping noise that may be too much for the shark's delicate nervous system." Rudloe (1979) also wrote that "Archie Carr has told me about turtles blocking shark attacks by actually folding their flippers together under their plastron, bending their head down, and presenting their carapace as a shield."

Based on our encounter and those of others, adult leatherbacks use several different defensive behaviors when threatened, including ramming, biting, erratic swimming, thrashing on the surface, and swimming upside down on the surface. The survival benefits of ramming, biting, and erratic swimming are self-evident, but the value of swimming upside down and splashing on the surface is perhaps less clear. Swimming upside down on the surface may protect the vulnerable underside of a turtle from attacks lower in the water column. Splashing may deter an attack by a shark, but we can neither corroborate nor refute Rudloe's (1979) statement that the slapping noise made by a turtle is "too much for a shark's nervous system." Although leatherbacks may occasionally be preyed upon by sharks, a large healthy adult can obviously defend itself. Situations where leatherbacks are actually killed by sharks are probably exceptional and may occur mostly when a turtle is already wounded or sick.

Acknowledgments.—We thank George Balazs for his many helpful comments on a preliminary draft of the manuscript and for providing us with pertinent literature on leatherbacks. We gleaned much useful information in discussions with George Balazs, Thomas Fritts, Jack Woody, James Richardson, and Scott Eckert. We thank them for their input.

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Herpetological Literature In The International Zoo Yearbook, Volumes 19-29 (1979-1990)

In 1979, Tryon (Herpetol. Rev. 10(3):87-90) listed 164 articles pertaining to herpetology published in the International Zoo Yearbook by the Zoological Society of London. The scope of the articles ranged from exhibits to disease and treatment, and contained much information not available elsewhere. As Tryon pointed out, the IZY tends to be a rather expensive publication and generally is not received by most libraries.

From the 1979 volume (#19) through the 1990 volume (#29), 117 articles related to reptiles and amphibians appeared in the IZY. For those individuals without access to the IZY, this listing, as with Tryon's review, serves as an introduction to the herpetological information published therein.

Articles are listed alphabetically by author and grouped in nine general categories in the following order: General Titles (13), Exhibits and Construction (8), Disease and Treatment (6), Amphibians (9), Turtles (22), Crocodilians (11), Lizards (21), Snakes (25), Tuataras (2).

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A Reproducing Population Of *Trachemys scripta elegans* In Southern Pinellas County, Florida

Trachemys scripta elegans, the red-eared slider, occurs naturally northwest of Florida, from Indiana to Alabama west to New Mexico and extreme northeastern Mexico (Conant and Collins 1991). However, its widespread use in the pet trade promoted introduction of the subspecies at numerous localities in the eastern United States (Carr 1952; Dundee and Rossman 1989; Ernst and Barbour 1972; Harding and Holman 1990), including at least two in Florida: metropolitan Dade Co. (Wilson and Porras 1983) and in Lake Conway, near Orlando (Bancroft et al. 1983). Because of possible effects of introduced populations of *T. s. elegans* on native systems, it is important to identify such populations. The purpose of this report is to document the establishment of a breeding population of *T. s. elegans* in southern Pinellas Co., Florida.

Fox Hall Pond, Eckerd College, Pinellas Co., Florida was sampled for *T. s. elegans* using funnel traps (baited with sardines) periodically from 25 February 1991 to 8 May 1991. Carapace, plastron, and precloacal tail lengths, as well as weight were taken for all captured turtles. Sex was determined by plastron to cloaca length of the tail, or presence of the long claws of males (Gibbons 1988; Gibbons and Greene 1990). After marking, by notching of the marginal scutes of the carapace (Gibbons 1988), the turtles were released.

Two techniques were used to determine the reproductive status of the population. One female was dissected to determine if she was reproductively active and the population structure was examined for evidence of recruitment.

A population estimate was made using the Schnabel multiple census procedure (Everhart et al. 1953). These data were used with the total area of the pond (determined by aerial photo to be 1.17 ha) and mean weight of the turtles to estimate the density and biomass of the population.

A total of 16 *T. s. elegans* were captured 23 times during the ten week study period. Male, female, and juvenile turtles were represented by 11, 4, and 1 individuals respectively. Plastron length varied from 79.4 mm to 215.7 mm. The largest proportion of the sample, nine of sixteen individuals, ranged from 145 mm to 174 mm (Fig. 1).

Six males were above the minimum size for reproduction, as were the four females (Gibbons and Greene 1990). The ovaries of the smallest female were found to have a set of 28 well-developed follicles (average size 16.43 mm) and corpora albicantia, indicating reproductive activity.

The population estimate for *T. s. elegans* in Fox Hall Pond was 25.7 with a 95% confidence interval of 15 and 99, for which the bias was acceptable (Everhart et al. 1953). Using these data the population density and biomass were estimated as 20.9 turtles/ha and 13.5 kg/ha, respectively.

Presence of corpora albicantia and developing follicles provide direct evidence of reproductive activity in this population. Examination of population structure shows that the population seems to have an adequate number of reproductive sized individuals to maintain it. The presence of large juveniles and the finding of a hatchling skeleton on 14 September 1991, suggests that recruitment may be occurring. The absence of yearlings and hatchlings is probably a result of trap design (mesh size 26.4 mm) rather than absence of these age cohorts.

Populations of *T. s. elegans* were noted in southern Florida as early as 1966 (King and Krakauer 1966); however, established populations were not reported until much later (Wilson and Porras 1983). Population structure, presence of enlarged follicles, and corpora lutea were used to determine that a population of *T. s. elegans is* established in Lake Conway and adjacent areas near Orlando, Florida (Bancroft et al. 1983).

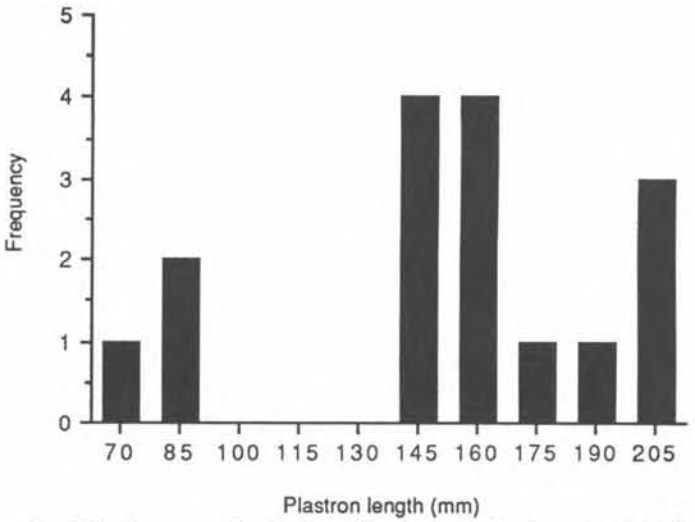


FIG. 1. Size frequency distribution of *Trachemys scripta elegans* in Fox Hall Pond, Pinellas Co., Florida.

Although competition with native fauna is a potential problem in Pinellas Co., genetic interference with native populations of *T. scripta* is not. *Trachemys scripta scripta* is native to Florida north of Gainesville and therefore allopatric with sites occupied by *T. s. elegans*. As Florida continues to develop, there exists a possibility that *T. s. elegans* will expand its range and intergrade with populations of *T. s. scripta*, as is occurring in Virginia (Mitchell and Pague 1990; Mitchell pers. comm.).

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Activity Patterns Of *Algyroides fitzingeri* In Semi-natural Conditions

Algyroides fitzingeri is a lacertid lizard endemic to Corsica and Sardinia, where it occurs at elevations from 0 to 1600 m (Keymar 1988; Schneider 1981). Apart from habitat characteristics and diet (In Den Bosch 1986; Keymar 1988), the autecology of *Algyroides fitzingeri* is poorly known, possibly because of the elusive behavior of the adults. In this paper we report results of a short-term investigation of annual rhythm and daily activity patterns of *Algyroides fitzingeri* in semi-natural conditions.

Materials and Methods.—Five adult male and four adult female lizards, collected during May 1990 in Sardinia (Giara di Gesturi, 270 km SW of Nuoro), were transferred to Rome, and maintained under semi-natural conditions. Our outdoor enclosure measured 180 x 100 x 80 cm, with food (mealworms, grubs, small spiders, and worker ants), water, and subterranean shelters provided. Each specimen was numbered on the dorsal surface with harmless paint. Diel activity was studied by recording the number of male and female lizards moving on the surface (see Cooper et al. 1985). Individuals occupying subterranean shelters were not considered active; those partially under blocks with at least their heads exposed were considered active. Data were recorded at different intervals from June 1990 to May 1991, and sample size was 862. Statistical analyses were performed with an SAS computer package, all tests being two tailed. Our choice of statistical tests followed recommendations in Snedecor and Cochran (1980) and Zar (1984).

Information presented here should be interpreted as preliminary. In fact, we refer entirely to specimens maintained in an outdoor enclosure away from their normal environment, and it is difficult to evaluate the significance of the findings presented here.

Results and Discussion.—Male *Algyroides fitzingeri* were active from about 15 February to 10 December, while females were active from 10 March to 25 November. Annual duration of activity lasted longer in males ($\bar{x} = 301 \pm 5.43$ days) than in females ($\bar{x} = 261.75 \pm 6.99$ days) ($t = 9.51$, $df = 7$, $p = 0.00003$), following the general pattern of temperate zone reptiles (Duguy 1958; Saint Girons 1952, 1982). Both males and females fed from the end of March to 15-20 November. When not feeding, lizards spent most of their active time basking. Mating occurred from 10 to 30 April, while male-male agonistic behaviors—though detected with highest frequency during the mating period—were observed in different seasons (spring, summer, and autumn). The meaning of intrasexual interactions is not clear, as males were frequently seen quite close to, or in contact with, each other during thermoregulation without showing territorial or aggressive behavior.

Surface activity was diurnal (Fig. 1). Activity increased from first daylight until mid-day and decreased from mid-day until evening ($P<0.01$, Spearman correlation rank, with time of activity running against percent of lizards active). During early spring and late autumn, when night temperatures were low (ambient temperature < 10°C), daily emergence (normally after 0930 h) usually followed ground surface warming. In late spring and summer, when night temperatures remain high (ambient temperature > 15°C), lizard activity was initiated earlier in the morning (about 0730 h). The duration of daily activity was practically the same from June to the end of October (about 8-9 h), while it was restricted from March-May and from November-December (about 3-5 h). Some individuals were occasionally found above ground during sunny winter days; in these cases, however, less than 30%

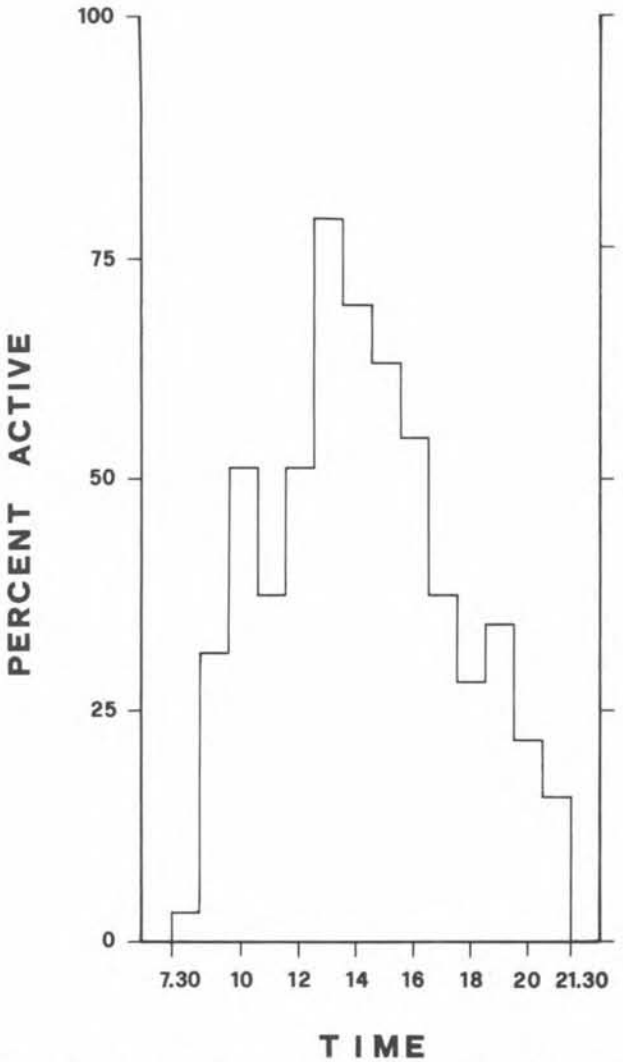


FIG. 1. Surface activity in *Algyroides fitzingeri* (European Standard Time).

of the population was active. Lizards basked more often ($P<0.01$, Mann-Whitney U-test) between 0830 h and 1130 h than during other activity hours; they frequently moved and caught prey during the warmest hours of the day. When *Algyroides* were basking, they often disappeared for brief periods either because they utilized multiple basking sites, or because they moved into the shade to bring down their body temperature. This type of basking behavior has been observed in other species of lacertid lizards (Avery 1979). Male *Algyroides* move more often than females during the mating period, but the percentage of active males (i.e., those exposed at the surface) was not significantly higher than that of females. Lizards were not found active during rain or on windy days. A few specimens were sometimes found basking during cool (air temperatures = 12-14°C) but sunny days, especially in early spring or late autumn.

In conclusion, a unimodal diel activity pattern, with a major peak between 1230 h and 1400 h, was observed in these lizards. This general pattern has been observed in lizards inhabiting cool climates, while bimodal patterns have been detected in lizards occurring in hot climates (Busack and Visnaw 1989; Cooper et al. 1985; Huey et al. 1977; Pianka 1973; Tinkle 1967). Thermoregulatory behaviors were concentrated in early activity hours, and lizards were active from 3 h to 8-10 h per day depending on the environmental temperatures. However, this did not necessarily imply that each individual was active for the whole period.

Keymar (1988) reported that free-living *Algyroides* emerge earlier in the morning than sympatric *Podarcis sicula* and *P. tiliguerta*. Moreover, sympatric *Podarcis* usually bask at temperatures higher than those preferred by *Algyroides*. Differing thermal requirements might be due to the uniform dark-brown dorsal color of *Algyroides* (Keymar 1988), which permits better absorption of radiation. Diel activity can be significantly modified in indoor terrariums having experimental daylight intervals. We were able to prolong the activity period of captive *Algyroides* up to 20 h by maintaining them in constant daylight. This drastic change of daylight conditions strongly modified both diel and annual activity in these lizards. Specimens maintained under these conditions did not show any sexual activity in spring and did not copulate. Specimens that did not hibernate during the winter period showed no sexual activity either.

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POINT OF VIEW

Credit Where Credit Is Due: A Plea To Authors And Editors

It is becoming increasingly common in herpetological publications to omit individual acknowledgment, by name, of institutions that provided specimens or other resources for the study. I believe two factors are responsible for this trend: the laudable desire of editors to maximize page space for results, and general adoption of the "standard" museum acronyms referenced in Leviton et al. (1985). Whatever the reasons, omission of institutional acknowledgments has a potential for negative impact on systematic herpetology collections and their bases of support.

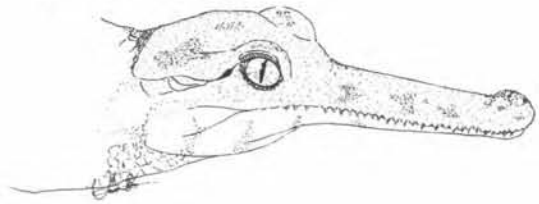
One of the strongest justifications for continued or increased financial support of a collection is quantity of use. Collection use can be measured indirectly in numbers of loans, exchanges, research visitors, or students. But a direct and quantitative measure is the number of publications that acknowledge use of the collection or associated resources. Museum administrators and granting agencies have an insatiable hunger for such numbers, which can be used to justify financial decisions. Those decisions, at the individual collection level, can translate to "life or death."

I am not pleading for acknowledgment of systematic collections' contributions to herpetology on the basis of either courtesy or tradition. If saving page space is of primary importance, then acknowledgment of individual curators or collection managers can be eliminated. After all, answering the mail, copying data, and packing loans are part of the job and merit no special recognition. But identification of contributing institutions is indispensable as long as those who hold the purse strings demand repeated demonstration of each collection's relevance.

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HERPETOLOGICAL HUSBANDRY

Captive Maintenance Of The Primitive New Zealand Frog, *Leiopelma hochstetteri*

The New Zealand endemic frog, *Leiopelma hochstetteri*, is of interest mainly because of its many primitive morphological features. The species' range consists of at least eight disjunct regions on the North Island and adjacent Great Barrier Island of New Zealand (Bell 1982; Green and Tessier 1990; Pickard and Towns 1988). The frogs inhabit cool streams and rivulets in undisturbed native forest (Robb 1980; Stephenson and Stephenson 1957) and because of their dwindling habitat (Bell 1985), the species is under protection by the New Zealand Department of Conservation. In 1987 and 1989, one of us (DMG) collected live frogs and we attempted to simulate their natural habitat in the laboratory seeking breeding in captivity.

We have kept some of our frogs for three years in specially modified "riffle" tanks, which we constructed (Sharbel and Green 1989). The tanks are similar to a stream vivarium described by Mattison (1987), but are probably more efficient and easier to maintain (Fig. 1). Within each large aquarium, an artificial cascading stream bed was fabricated out of fiberglass. On this foundation, we placed rocks of various sizes and sand. These provide the same type of substrate found in natural streams. An external aquarium pump provides the stream flow and water filtration. The filter intake is at the lower end of the tank and the outlet is positioned at the upper end of the tank so that the water can flow down the stream bed. The rocks provide a variety of hiding places and microhabitats. Within the tank there are relatively dry areas on the tops of rocks or in protected areas next to the simulated stream, an open water pool at the lower end of the tank, and flowing water of variable intensities on the different levels. The pumps are cleaned once a month and the charcoal filters are changed every two months.

We have constructed four tanks, which are kept in a walk-in environmental chamber in our lab (Fig. 2). This provides the necessary temperature and photoperiod control. In the wild, the streams in which the frogs live were never recorded above 20°C, even in midsummer. The frogs are tolerant of cool temperatures but not high ones. Accordingly, the temperature within the chamber is regulated to 17°C. It may be possible to achieve the same net result with tanks kept at room temperature by using refrigerated water pumps. The chamber is illuminated by a single "natural daylight" fluorescent tube on a 12-h photoperiod. We have not monitored the physical and chemical properties in the aquaria.

We are housing frogs from three separate populations. In their natural habitats, *L. hochstetteri* hide under rocks or in crevices beside streams during the day (Bell 1982; Tessier et al. 1991) and the frogs of our colony exhibit similar behavior. No evidence of aggression or territoriality has been noted and as many as five individuals have been found hiding under one rock. Individuals show some fidelity to their individual hiding places, as in nature, and an individual usually will be found under the same rock day after day. The frogs also are sometimes found submerged in the lower ends of the tanks. Oddly, for semi-aquatic animals, they are not particularly good swimmers and employ a sort of "dog-paddle" motion in the water instead of the more commonly-known anuran "frog-kick."

The frogs become active during the evening when they evi-

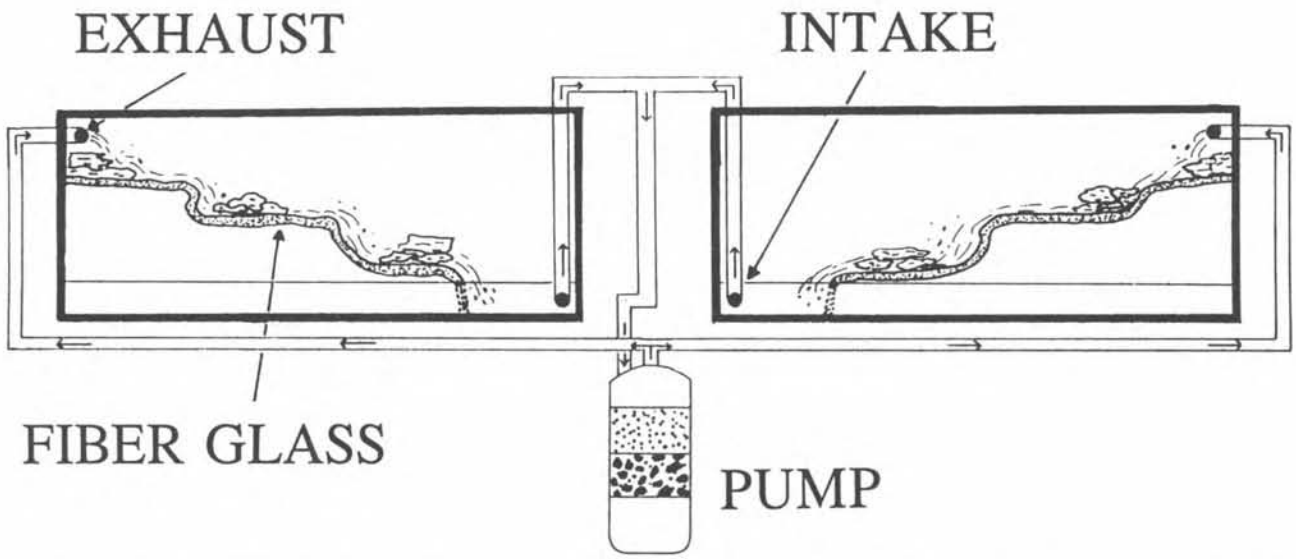


FIG. 1. Schematic diagram showing the configuration for two riffle tanks connected to a singe pump. Arrows show direction of water flow. (From Sharbel and Green 1989).

dently forage for food. They are fed second and fourth instar crickets (Fluker's Cricket Farm, Inc.) once weekly. The crickets are fed high protein rat chow for a day before being fed to the frogs so that their guts might contain many extra nutrients. No other dietary supplements have been given to the frogs. Introduced crickets can remain alive for up to one week in the tanks.

From an original stock of 28 frogs, we have euthanized 11 frogs for research purposes and four frogs have died, apparently from disease. Two of those may have died from kidney dysfunction or a form of subcutaneous lymphatic edema. These individuals were bloated with fluid and appeared unable to control their physiological water balance. Necropsies of these animals revealed enlarged, abnormally whitened kidneys. One individual exhibited abnormal neuromuscular control and was euthanized.

The frogs have shown significant growth over the two years of captivity. Our attempts at individually marking frogs have been unsuccessful so all we can present are average lengths of the frogs in each tank. The frogs from Great Barrier Island averaged 35.7 mm (SVL, N = 8) in January, 1989, while in January, 1991 they averaged 38.7 mm SVL (N = 5). The Tokatea Ridge frogs averaged 33.5 mm SVL (N = 10) in 1989 and 34.8 mm SVL (N = 4) in 1991. Frogs from Toatoa were 31.6 mm SVL (N = 10) in 1989 and 35.6 mm SVL (N = 4) in 1991. This information underestimates the growth of our frogs since most of the frogs used for research were the larger adults. Perhaps more significantly, when we caught the frogs from Toatoa, none was adult. Since that time several have reached sexual maturity and developed secondary sexual characteristics.



FIG. 2. Artificial stream bed in riffle tank (with frog *in situ*) showing fiberglass channels directing water flow. Rocks and broken clay flower pots provide hiding places.

We have not attempted to simulate seasonal variation in day/night cycle but the frogs still appear to follow an annual reproductive cycle. In January of both 1990 and 1991, some of the largest of our females became gravid. So far, however, the frogs will not amplex and females will not lay eggs on their own. To remedy this, we have attempted to stimulate breeding artificially with hormones. With partial success, we have given a selected gravid female an intraperitoneal (I.P.) injection of 50 units human chorionic gonadotropin (HCG; Sigma) over two days, followed on day three with 5 µg (I.P.) of luteinizing hormone releasing hormone (LHRH; Sigma) analogue (Barnabe and Barnabe-Quet 1985). At the same time, a male from the same tank was given 50 units HCG I.P. A dose of 10 µg of LHRH given to another gravid female resulted in apparent overstimulation leading to death. We have noticed no adverse effects resulting from the HCG injections in either sex. With the hormone treatments, we have been able to induce amplexus and even egg laying, but so far no eggs have developed. We cannot say at this time whether the lack of hatching success has been because the eggs were not fertilized or because environmental conditions were incorrect. Despite known information about the natural history of the frogs (Bell 1985; Turbott 1949), including general information about breeding habits, precise environmental parameters necessary for successful egg incubation of *L. hochstetteri* are not known. The reproductive biology of *L. hochstetteri* is quite different from the fully terrestrial species, *L. archeyi* and *L. hamiltoni*, which have been successfully bred in captivity (Bell 1982, 1985).

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LIFE HISTORY NOTES

Instructions for contributors to Life History Notes appear in volume 23, number 2.

CAUDATA

PLEURODELES WALTL (Iberian Newt). **ALBINISM**. An adult male *Pleurodeles waltl* was captured 10 April 1988 in a natural pond (Bassa de Montredons, Rasquera, Tarragona Province, Spain, UTM 31TBF9936) at 280 m elevation. The normal color pattern of this species is brown or olive green. The belly is white or pink with grey spots (García-París 1985. Los anfibios de España. Min. Agri. Pes. y Alim. Madrid, 287 pp.). The general color of this specimen was yellowish with grey patches. Limbs and tail were reddish because of the blood vessels seen through the transparent skin. The upper head, the dorsal trunk, and both sides of the tail were dark grey owing to a local accumulation of pigment (Fig. 1). The eyes were black for the same reason. The belly was homogeneous yellowish without spots.

This is an apparent example of a partial albino with xanthophores (Drykacz 1981. SSAR Herp. Circ. 11, 31 pp.). We assume the animal is amelanic because the eyes have red pupils. The pigmented patches of skin may be due to local concentrations of xanthophores (Bagnara et al. 1978. Amer. Zool. 18:301-318).

The animal is being maintained alive in captivity and pigmentation has not changed since time of capture. This is the first report of albinism in this genus.



FIG. 1. Partial albino *Pleurodeles waltl*, dorsal view.

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ANURA

ELEUTHERODACTYLUS COQUI (Puerto Rican Coqui). **PREY**. Most frogs are insectivorous and too small to prey on vertebrates, but there are reports of large frogs feeding on smaller vertebrate prey (Greene 1988. Antipredator mechanisms in reptiles. *In* C. Gans and R. B. Huey (eds.), Biology of the Reptilia, Volume 16, Ecology B. A. R. Liss, New York, pp. 1-152; Branch. 1976. J. Herpetol. 10(3):266-268). Here we report on an *Eleutherodactylus coqui* feeding on a lizard, *Anolis evermanni*. *E. coqui* is a small leptodactylid frog with a maximum SVL of 52 mm; it has been characterized as an extreme sit-and-wait nocturnal predator (Woolbright and Stewart 1987. Copeia 1987(1):69-75) that preys mostly on arthropods (Woolbright 1991. Biotropica 23(4a):462-467) .

The frog, an adult female *E. coqui* (SVL = 43 mm), was found inactive during the day on 14 April 1991 at the Bisley area of the Luquillo Experimental Forest (LEF) of Puerto Rico, under the loose bark of a dead branch of a motillo (*Sloanea berteriana*) at ca. 30 m above the ground. The frog had a large mass in the stomach region that could be seen through the ventral body wall. We forced the frog to regurgitate its stomach contents and found a partially digested juvenile *A. evermanni* (SVL ca. 43 mm) and a scarabid beetle, *Diaprepes abbreviata*. The fact that the frog was able to feed on an anole that was equal to its own SVL is remarkable, not only for the size of the anole but also for the strong defenses that anoles can present when they are attacked by a predator.

Specimens were deposited in the Museum of Biology, University of Puerto Rico, Rio Piedras (UPRRP 5746 *E. coqui*; UPRRP 5747

A. evermanni). We thank J. A. Rodriguez-Robles for identifying the beetle and reviewing the manuscript and Roman Dial for collecting the frog.

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CROCODYLIA

ALLIGATOR MISSISSIPPIENSIS. (American Alligator). **NEST MATERIAL**. Female alligators incubate their eggs in cone shaped nests. Nests usually consist of herbaceous vegetation and soil that are scraped together at the nest site. On 11 September 1990, two of the authors (LJH and DND) observed three unusual alligator nests at the Alico Company property, R.29E, T.45S, Hendry Co., Florida. The nests were built on the edge of a levee that contained an abandoned railroad bed of granite stones. Each conical nest was composed mainly of granite cobble (ca. 5 cm diam) with some plant material (*Andropogon* spp.)(Fig. 1). All three nests were similar in size (ca. 100 cm diam x 40 cm high) and located within a span of 300 m. The levee vegetation was primarily willow (*Salix* spp.), wax myrtle (*Myrica cerifera*), and scattered grasses (*Andropogon* spp.). The levee was bounded on both sides by emergent marsh predominantly vegetated with pickerelweed (*Pontederia cordata*).

The eggs had been previously collected from these nests as part of the Florida Game and Fresh Water Fish Commission's alligator management program. The eggs had been taken to an alligator farm for incubation, and produced viable hatchlings (J. Worden, pers. comm.). Data on clutch size and hatch rate are unavailable.

We have observed other alligator nests where inorganic objects (e.g., rocks, trash) have been incorporated, but never to this extent.

We thank P. E. Moler and T. E. O'Meara for reviewing the manuscript.



FIG. 1. The nest of an *Alligator mississippiensis* consisting primarily of granite stones.

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TESTUDINES

CHRYSEMYS PICTA PICTA (Eastern Painted Turtle). **PREDATION.** Previous accounts of predation by invertebrates on reptiles and amphibians focused primarily on lizards and frogs (Bauer 1990. Herpetol. Rev. 21:83-87; Hinshaw and Sullivan 1990. J. Herpetol. 24:196-197; McCormick and Polis 1982. Biol. Rev.57:29-58), but crabs regularly prey on sea turtle hatchlings (Stancyk 1982, *In* K. Bjorndal (ed.) Biology and Conservation of Sea Turtles, pp. 139-152). Here I report predation by invertebrates on juvenile freshwater turtles. Two hatchling and one small juvenile *Chrysemys picta* (CL 20-30 mm) were observed being attacked by large (40-50 mm) giant water bugs (Hemiptera: Belostomatidae) on three different occasions during early summer 1990. These attacks occurred along the vegetated margins of a shallow pond (3 ha) at the Patuxent Wildlife Research Center, Prince Georges Co., Maryland. In all three cases, the water bugs firmly grasped the turtles' carapace from the top with their legs and inserted their proboscis at the base of the turtles' necks beneath the anterior rim of the carapace. Only one of the turtles appeared alive when discovered, and it was not actively resisting or attempting to escape. About 30 min later, the water bug was on the now dead turtle and still had its proboscis inserted. Although hatchling turtles are vulnerable to many predators, most studies have focused on vertebrates. My observations suggest that large aquatic invertebrates also may be an important factor in juvenile turtle mortality.

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SERPENTES

COLUBER CONSTRICTOR (Black Racer). **PREDATION.** Annual mortality of adult *Coluber constrictor* is known to vary from 21-46% among three populations (Brown and Parker 1984. *In* R. A. Seigel, L. A. Hunt, J. L. Knight, L. Malaret, and N. L. Zuschlag (eds.), Vertebrate Ecology and Systematics, a Tribute to Henry S. Fitch. Univ. Kansas Mus. Nat. Hist. Special Publ. No. 10, pp. 13-40; Fitch 1963. Univ. Kansas Publ. Mus. Nat. Hist. 15:351-468; Rosen 1991. Copeia 1991:897-909), but the specific sources of adult mortality are poorly known. During the period 20 July - 18 October 1989, we radiotracked ten adult *C. constrictor* on the Savannah River Site near Aiken, South Carolina. Two snakes (20%) suffered predation in this period. One snake (male, 83 cm SVL, 140 g) was released on 28 July and monitored daily as it moved around and through a Carolina bay. On 3 August, it was eaten by a 112 cm, 420 g female *Lampropeltis getulus*. A second *C. constrictor* (female, 90 cm, 164 g), was released on 28 July. Over the next nine days it moved >1.2 km from the original point of capture. On 6 August, the snake was tracked to a mixed pine/hardwood forest where it was found in a pre-shedding opaque condition coiled in an abandoned bird nest 6 m up in a pine tree. When the nest was checked the following morning, the snake's head and anterior part of its body were missing.

Mortality in our approximate 90-day study was similar to that in Fitch and Shirer's (1971. Copeia 1971:118-128) radiotelemetric

study of *C. constrictor* in which two of 12 (17%) snakes suffered predation over a period of <102 days. If the 90-day mortality in our study is adjusted up to an annual rate (Krebs 1989. Ecological Methodology. Harper & Row, New York, 654 pp.), the value obtained (60%) is greater than annual mortality observed in three natural populations. The calculation of annual mortality from mortality observed in a restricted part of the year assumes that mortality is constant over the entire year, an assumption which may not be true in *C. constrictor* (Brown and Parker 1984. op. cit.). However, the calculation strongly suggests that the 20% mortality observed over 90 days was, in fact, high.

Although these data are limited, they suggest that significant mortality of adult *C. constrictor* may result from predation, despite these snakes being relatively large, fast-moving, alert, and occasionally aggressive (Fitch 1963. op. cit.).

Small snakes with implanted transmitters may suffer high rates of predation in the short term perhaps as a result of the increased mass burden of the transmitter (Plummer 1990. J. Herpetol. 24:327-328). In this study, the ratio of transmitter mass/body mass was less than 5%.

We thank J. Haskins for assisting in radiotracking. This work was supported by contract DE-AC09-76SROO-819 between the U.S. Department of Energy and the University of Georgia's Savannah River Ecology Laboratory.

Submitted by **MICHAEL V. PLUMMER** and **JUSTIN D. CONGDON**, Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29801, USA. Present address (MVP): Department of Biology, Harding University, Searcy, Arkansas 72143, USA.

LAMPROPELTIS PYROMELANA (Sonoran Mountain Kingsnake). **PREDATION.** As part of a continuing study of Mexican spotted owl (*Strix occidentalis lucida*) diet in Arizona and New Mexico, I identified the skeletal and epidermal remains of vertebrate and invertebrate prey items, primarily from regurgitated pellets. Mexican spotted owls feed on a variety of mammals, birds, reptiles, and arthropods, although mammals make up the bulk of their diet (>90% biomass; Duncan and Sidner 1990. Great Basin Nat. 50:197-200; Ganey 1988. M.S. thesis, Northern Arizona Univ., Flagstaff; E. D. Forsman, pers. comm., 1990; R. B. Duncan, this study and unpubl. data). Snakes are considered a rare prey item of spotted owls (Ross 1989. Wisconsin Endangered Species Res. Rep. 59). Ross (op. cit.) compiled published accounts of spotted owl diet containing reptiles and amphibians, in which only one snake, the western terrestrial garter snake (*Thamnophis elegans*), was documented.

In this study of spotted owl prey, reptiles accounted for <0.5% of the total number of prey items (N = 2557) and <0.2% total biomass. Among the catalogued reptiles, only one snake and 12 lizards were identified (Duncan, unpubl. data). The Sonoran mountain kingsnake was identified from a pellet sample that was regurgitated in July 1989 in the Huachuca Mountains, Cochise Co., Arizona beneath a roost in a steep canyon (elev. 1737-2134 m) in montane riparian woodland bordered by montane conifer forest and Madrean Evergreen Woodland (Brown 1982. Desert Plants 4:1-342). The specimen has been deposited at the USFS, Southwest Regional Office, Albuquerque, New Mexico, as part of a comparative collection of Mexican spotted owl prey items.

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MASTICODRYAS PLEII. (NCN). **ANTIPREDATOR BEHAVIOR.** During field work in the northwestern region of the Peninsula de Paraguaná, north-midwestern Venezuela, we observed a *Mastigodryas pleii* crawling slowly on the ground within a small patch of vegetation. When disturbed, the snake attempted to escape by crawling rapidly to a group of *Opuntia wentiana* (Cactaceae), where it stopped under one the plants. It then began slowly to climb the spines of the cactus until it reached the uppermost pad (ca. 1.3 m above ground). The snake then remained immobile but alert for 1-2 min before it was trapped.

In another instance, near Cabo San Román (northernmost extreme of the Peninsula de Paraguaná), another *M. pleii* displayed similar behavior. The second snake was discovered trapping a lizard (*Ameiva bifrontata*) under an *O. wentiana*. The snake tried to escape from the collector by climbing into the spiniest part of the cactus and it also then stayed quiet but alert.

We infer that this behavior could reflect a defensive tactic in response to medium- to large-sized terrestrial or avian predators. The *O. wentiana* pads detach very easily. The spines penetrate the skin readily, are very difficult to remove, and cause intense pain.

Submitted by **ABRAHAM MIJARES-URRUTIA** and **ALEXIS ARENDS R. CIEZA-UNEFM**, Apartado 7506, Coro 4101-A, Venezuela.

OPHRYACUS UNDULATUS (Horned Pit Viper). **DIGESTIVE DISTURBANCE.** *Ophryacus undulatus* is a semiarboreal species distributed in the Sierra Madre del Sur of Guerrero and Oaxaca, west-central Veracruz, the Mixteca region in Oaxaca (Campbell and Lamar 1989. The Venomous Reptiles of Latin America. Comstock Publ. Assoc., Cornell Univ. Press, Ithaca, New York, 425 pp.), and Hidalgo (O. Flores, pers. comm.).

An adult male *O. undulatus*, SVL = 536 mm (MZFC-04825), was collected on 14 July 1990 at El Portrero, Tenango de Doria, Hidalgo. This snake had an intestinal obstipation, which dissection revealed to be a skull of the Mexican vole (*Microtus mexicanus*). Part of the skull, especially the broken zygomatic arches, projected into the wall of the large intestine, obstructing free passage of feces. Scales and bones of one *Sceloporus grammicus* (mesquite lizard) that was ingested in captivity were also found.

A detailed external macroscopic examination of the affected area revealed strong swelling of the intestinal wall and although the wounds caused by the pieces of the zygomatic arches were healed over, they still contained the whole bone mass.

Information regarding this kind of perturbation is known only from captive animals (e.g., *Boa constrictor*) and more often in terrestrial chelonians (Frye 1981. Biomedical and Surgical Aspects of Captive Reptile Husbandry. Veterinary Medicine Publ. Co.). Our observation suggests that misdigested prey items in natural conditions may have potentially lethal consequences.

We thank Arturo González, Adolfo Navarro, Oscar Flores, H. M. Smith, and Jack Sites, Jr. for their comments on this manuscript, Mario Mancilla for help in the field, and Livia León and Gabriel Pérez for identifying the mouse. Financial support was provided by the Direccion General de Apoyo al Personal Academico (DGAPA) project IN201789.

Submitted by **E. HERNANDEZ GARCIA, F. MENDOZA QUIJANO, I. GOYENECHEA-MAYER**, Museo de Zoología, Fac. de Ciencias, UNAM Apdo. Postal 70-399, México, D.F. 04510, México, and **E. GODINEZ CANO**, Laboratorio de Herpetología (Vivario) ENEP-Iztacala, Apdo. Postal 314, Tlalnepantla, México, México.

REGINA ALLENI (Striped Crayfish Snake). **PREDATION**. Godley (1982. Florida Field Nat. 10:31-36) reported on seven species of predators of *Regina alleni*, two of which were avian. Here, I report on a third avian predator. On 19 April 1991, while checking drift fences in a cypress dome during a herpetofaunal survey of the Lake Thonotosassa watershed (Florida, Hillsborough Co.) I flushed an adult *Buteo lineatus* (red-shouldered hawk) from among the sparse forb layer of the dome floor. The hawk flew about 5 m from the flush site, perched on a lateral cypress limb, and observed my movements near the flush site. At the flush site I found a female *R. alleni* (UF 91640, SVL = 385 mm, tail length = 99 mm, live mass = 40 g). The snake was incapacitated due to trauma of the head but was not dead. A nest with juvenile hawks was in the vicinity and I assume that the snake was to be fed to them. Ross (1989. Wisconsin Endangered Species Res. Rep. 59) listed five species of snakes as prey items of *B. lineatus*, three of which were natricine. This is the first report of *R. alleni* as a prey item of any raptor.

Submitted by **JAMES C. GODWIN**, Florida Game & Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

TRIMORPHODON BISCUTATUS (Lyre Snake) **PREDATION FATALITY**. On 12 November 1991 at 1130 h, we observed an adult male *Trimorphodon biscutatus* capture a large adult male *Ctenosaura pectinata* on the ground. The general habitat was tropical dry forest at the Biological Field Station "Chamela", Jalisco (19° 30' N; 105° 03' W). The snake measured 1500 mm (SVL), 250 mm tail length (TL), 4.5 cm head width, and weighed 1183 g (after removal of prey). The lizard measured 300 mm SVL, 460 mm TL, and weighed 405 g. The snake observed the lizard for 15 min before capturing it. The snake constricted the lizard at the shoulders and neck and then ingested it head first. Capture and ingestion occurred from 1145 to 1330 h. The snake stayed in the same place after ingesting the lizard, moving its body. After 20 min it stretched, turned belly up, and died. Dissection revealed that the esophagus and stomach were ruptured by the spines of the lizard.

We thank Stephen Corn and Miriam Benabib for their comments on this note.

Submitted by **AURELIO RAMÍREZ-BAUTISTA** and **ZEFERINO URIBE**, Laboratorio de Herpetología, Departamento de Zoología, Instituto de Biología, UNAM. AP. 70-153, México 20, D.F. 04510 México.

TYPHLOPS SCHINZI (Beaked Blind Snake). **MAXIMUM SIZE**. On 26 March 1990 at 2045 h, a *Typhlops schinzi* was collected alive on a paved road 48.1 km east of Springbok, South Africa. The snake measured 283 mm total length. This exceeds the previous record of 255 mm reported by Roux-Esteve (1975. Recherches sur la morphologie, la biogeographie et la phylogenie des Typhlopidae d'Afrique. Bull. I.F.A.N. A36, 428-508.).

On 31 March 1990, a second specimen of *T. schinzi* was collected at 1950 h alive on a paved road 28 km east of Luderitz, Namibia (formally South West Africa). This specimen was slightly larger than the aforementioned snake and measured 293 mm total length. Both snakes have been preserved and deposited in the vertebrate collection of the Carnegie Museum of Natural History (CM 119300 & 119342).

Submitted by **PAUL S. FREED**, Section of Herpetology, Houston Zoological Gardens, 1513 N. MacGregor Drive, Houston, Texas 77030, USA.



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GEOGRAPHIC DISTRIBUTION

Instructions for contributors to Geographic Distribution appear in volume 23, number 1.

CAUDATA

AMPHIUMA MEANS (Two-toed Amphiuma). USA: FLORIDA: Sumter Co: Shady Brook, Sec. 10, T20S, R22E. Immature specimen collected in cypress swamp. 16 December 1990. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80204. New county record (Ashton and Ashton. 1988. Handbook of Reptiles and Amphibians of Florida. Part 3. The Amphibians., Windward Publ. Inc., Miami. 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

AMBYSTOMA JEFFERSONIANUM (Jefferson Salamander). USA: KENTUCKY: Campbell Co: Melbourne, Withamsville Quadrangle, 39°02'05"N, 84°22'15"W. 28 February 1992. Paul J. Krusling. Verified by John W. Ferner. Cincinnati Museum of Natural History (CMNH 3500). New county record.

Submitted by **PAUL J. KRUSLING**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amey Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

AMBYSTOMA MACULATUM (Spotted Salamander). USA: KENTUCKY: Kenton Co: 1.2 mi SSW Visalia; Alexandria Quadrangle, 38°54'00"N, 84°27'35"W. 25 February 1992. Paul J. Krusling & Greg Townsend. Verified by John W. Ferner. Cincinnati Museum of Natural History (CMNH 3498). New county record. This record partly fills the gap in northern Kentucky as shown in Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston, 450 pp.).

Submitted by **PAUL J. KRUSLING**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amey Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

AMBYSTOMA OPACUM (Marbled Salamander). USA: ILLINOIS: Perry Co: center Sec. 14, T6S, R3W, Pyramid State Park. 12 March 1991. M. Bavetz, R. Flick & H. Moeller. Verified by Ronald A. Brandon. Southern Illinois University Department of Zoology Collection (SIUC H4061). County record (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **MARK J. BAVETZ**, **ROBERT W. FLICK**, and **HARRY MOELLER**, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA.

AMBYSTOMA TALPOIDEUM (Mole Salamander). USA: ARKANSAS: Woodruff Co: 3.2 km N Gregory, Sec. 32, T7N, R3W. 28 April 1992. Bruce A. Dye. Verified by Stanley E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 18411). County record; fifth known locality in Arkansas, and extends known range ca. 55 km W in north-central Arkansas (Meshaka and McLarty 1988, Herpetol. Rev. 19:17; Meshaka and Butterfield 1989, Herpetol. Rev. 20:11).

Submitted by **MICHAEL V. PLUMMER** and **BRUCE A. DYE**, Department of Biology, Harding University, Searcy, Arkansas 72143, USA.

AMBYSTOMA TIGRINUM MAVORTIUM (Barred Tiger Salamander). USA: NEBRASKA: Red Willow Co: within McCook city limits, edge of Republican River floodplain, old Rt. 83, ca. 0.5 km E of turn south (AOR). 29 February 1992. C. D. Trail. Verified by J. D. Fawcett. University of Nebraska at Omaha (UNO 29). County record (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57.)

Submitted by **CYNTHIA D. TRAIL**, Department of Biology, College of Arts and Sciences, University of Nebraska, Omaha, Nebraska 68182–0040, USA.

EURYCEA LUCIFUGA (Cave Salamander) USA: OHIO: Butler Co: Fairfield Twp., Sec. 20, 0.2 km E jct. of East Miami River and Georgetown Roads, 50 m S of East Miami River Road. 28 May 1989. Paul Krusling. Verified by John W. Ferner. Cincinnati Museum of Natural History (CMNH 2900). First county record from east of the Great Miami River. (Pfingsten and Downs (eds.) 1989, Salamanders of Ohio. Ohio Biol. Surv. Bull. New Ser. Vol. 7 (2):xx+315 pp. + 29 pls.).

Submitted by **PAUL J. KRUSLING** and **JEFFREY G. DAVIS**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amey Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

GYRINOPHILUS PORPHYRITICUS (Spring Salamander). USA: TENNESSEE: Cannon Co: seepage area associated with springhead of East Fork of the Stone River in Dug Hollow (35°51'0"N, 85°57'30"W). 7 March 1991. B. T. Miller. Verified by D. E. Metter. Middle Tennessee State University (MTSU 49C). New county record; extends the known distribution into the eastern Highland Rim outliers located within the Outer Central Basin of Tennessee (Redmond 1985, A Biogeographic Study of Amphibians in Tennessee, Doctoral Diss., Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS (Central Newt). USA: ILLINOIS: Perry Co: NW 1/4 Sec. 14, T6S, R3W, Pyramid State Park. 12 March 1991. M. Bavetz, R. Flick & H. Moeller. Verified by Ronald A. Brandon. Southern Illinois University Department of Zoology Collection (SIUC H4060). County record (Smith 1961, The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1–298).

Submitted by **MARK J. BAVETZ**, **ROBERT W. FLICK**, and **HARRY MOELLER**, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, USA.

NOTOPHTHALMUS VIRIDESCENS VIRIDESCENS (Red-spotted Newt). USA: KENTUCKY: Campbell Co: Melbourne; Withamsville Quadrangle, 39°01'40"N, 84°22'25"W. 16 April 1992. Paul J. Krusling, Jeffery G. Davis & Dean McCoy. Verified by John W. Ferner. Cincinnati Museum of Natural History (CMNH 3539–3546). New county record.

Submitted by **PAUL J. KRUSLING**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amey Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

PLETHODON DUNNI (Dunn's Salamander). USA: WASHINGTON: Grays Harbor Co: E bank of North River, 1.6 km N Grays Harbor-Pacific Co. line, Sec. 7, T16N, R10W. 14 April 1991. A. G. Wilson, Jr. Verified by John A. Hall. Charles R. Conner Museum, Washington State University, Pullman (CM 92–1). New county record; extends the range northward. (Nussbaum, Brodie, and Storm 1983, Amphibians and Reptiles of the Pacific Northwest. Univ. Idaho Press, Moscow. 332 pp.).

Submitted by **ALBERT G. WILSON, JR.**, Department of Zoology, Washington State University, Pullman, Washington 99164–4236, USA, **KELLY R. MCALLISTER**, Washington Department of Wildlife, Nongame Program, 600 North Capitol Way, Olympia, Washington 98504, USA, and **JOHN H. LARSEN, JR.**, Department of Zoology, Washington State University, Pullman, Washington 99164–4236, USA.

PLETHODON GLUTINOSUS (Northern Slimy Salamander). USA: KENTUCKY: Campbell Co: 1.1 mi. NW Hawthorne; Alexandria Quadrangle, 38°59'15"N, 84°26'05"W. 16 April 1992. John W. Ferner. Verified by Paul J. Krusling. Cincinnati Museum of Natural History (CMNH 3529). New county record.

Submitted by **JOHN W. FERNER**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amey Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

PLETHODON VANDYKEI (Van Dyke's Salamander). USA: WASHINGTON: Thurston Co: W bank of Skookumchuck River, 0.6 km N Thurston-Lewis Co. line, Sec. 20, T15N, R2E. 6 June 1991. A. G. Wilson, Jr. Verified by Richard L. Wallace. Charles R. Conner Museum, Washington State University, Pullman (CM 91–581). New county record; extends westward the Cascade Mountains range of the salamander (Nussbaum, Brodie and Storm 1983, Amphibians and Reptiles of the Pacific Northwest. Univ. Idaho Press, Moscow, 332 pp.).

Submitted by **ALBERT G. WILSON, JR.**, Department of Zoology, Washington State University, Pullman, Washington 99164–4236, USA, **KELLY R. MCALLISTER**, Washington Department of Wildlife, Nongame Program, 600 North Capitol Way, Olympia, Washington 98504, USA, and **JOHN H. LARSEN, JR.**, Department of Zoology, Washington State University, Pullman, Washington 99164–4236, USA.

RHYACOTRITON OLYMPICUS (Olympic Salamander). USA: WASHINGTON: Thurston Co: W bank of Skookumchuck River, 0.6 km N Thurston-Lewis Co. line, Sec. 20, T15N, R2E. 6 June 1991. A. G. Wilson, Jr. Verified by David B. Wake. MVZ 218219. New county record; extends northward the Cascade Mountains range of the salamander (Nussbaum, Brodie, and Storm 1983, Amphibians and Reptiles of the Pacific Northwest. Univ. Idaho Press, Moscow. 332 pp).

Submitted by **ALBERT G. WILSON, JR.**, and **JOHN H. LARSEN, JR.**, Department of Zoology, Washington State University, Pullman, Washington 99164–4236, USA.

SIREN INTERMEDIA (Lesser Siren). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 10, R22E, T20S. 22 March 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80577. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida, Part 3. The Amphibians., Windward Publ., Inc., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

SIREN LACERTINA (Greater Siren). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 10, R22E, T20S. 15 March 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80578. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida, Part 3. The Amphibians, Windward Publ., Inc., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

ANURA

ARCOVOMER PASSARELLII (NCN): BRASIL: SÃO PAULO: Ubatuba: Parque Estadual da Serra do Mar, Núcleo de Picinguabe (ca. 23°23'S, 44°50'W). 1–3 November 1991. E. C. P. Pombal & J. P. Pombal, Jr. Verified by Ivan Sazima. Museu de História Natural, Universidade Estadual de Campinas (ZUEC 9174–9175). First documented record for the state of São Paulo, extending the distribution southward. Published distribution of the species is Espírito Santo and Rio de Janerio states, southeastern Brazil (Frost 1985, Amphibian Species of the World. A Taxonomic and Geographical Reference. Allen Press, Inc., and The Association of Systematics Collections, Lawrence, Kansas, 732 pp.). However, documented records are known thus far from Itaguaí (ca. 22°53'S, 43°47'W) in the state of Rio de Janeiro. Specimens from the state of Espírito Santo probably represent a distinct, smaller species (J. Jim, pers. comm. and pers. obs.).

Submitted by **JOSE P. POMBAL, JR.**, Departamento de Zoologia, Instituto de Biologia, Universidade Estadual de Campinas, Caixa Postal 6109, 13081 Campinas, São Paulo, Brazil and **ROGÉRIO P. BASTOS**, Departamento de Zoologia, Instituto de Biociências, Universidade Estadual Paulista, Caixa Postal 178, 13500 Rio Claro, São Paulo, Brazil.

BUFO DEBILIS (Green Toad). USA: KANSAS: Greeley Co: Sec. 8–11, T16S, R39W. 6 July 1991. KU 218823–827; Hamilton Co: SE 1/4 Sec. 12, T26S, R42W. 6 July 1991. KU 218838–844; Wichita Co: Sec. 19, T16S, R38S, 7 July 1991. KU 218845. All collected by Travis W. Taggart & Jay Taggart. All verified by Joseph T. Collins. Helps to fill in the little known and spotty distribution of this species in western Kansas (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

BUFO MARINUS (Giant Toad). USA: FLORIDA: Pasco Co: Dade City, 700 S. 26th Street. 3 July 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 81843. New county record (D. L. Auth, Florida Mus. Nat. Hist., pers. comm.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

BUFO QUERCICUS (Oak Toad). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 34, T19S, R22E. 26 April 1991. D. Crowe

and D. Stevenson. UF 80797. Verified by D. L. Auth. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 3. The Amphibians. Windward Publ., Inc., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

GASTROPHRYNE CAROLINENSIS (Eastern Narrowmouth Toad). USA: ALABAMA: Walker Co: 1.6 km N and 1.6 km W of Pocahontas, Lost Creek at Mill Creek confluence. 3 May 1985. J. N. Stuart. Verified by William G. Degenhardt. Museum of Southwestern Biology (MSB 45206–07); ca. 1.6 km NNE of Townley, Lost Creek at Holly Grove, rain pool. 6 September 1985. J. N. Stuart. Verified by Paulette L. Ford. MSB 46323 (lot of 12 tadpoles). First records for county (Mount 1975, Reptiles and Amphibians of Alabama. Auburn Univ. Agric. Exper. Station, Auburn, Alabama, 347 pp.). Collected under Alabama Dept. Conservation Permit No. 173.

Submitted by **JAMES N. STUART**, Museum of Southwestern Biology, Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA.

HYLA CHRYSOSCELIS (Cope's Gray Treefrog). USA: FLORIDA: Citrus Co: hydric hammock, ca. 2.1 km N Crystal River, Sec. 17, T18S, R17E. 26 April 1991. D. Crowe & D. Stevenson. UF 80799. First record for county and extends range S from nearest record in Levy Co; Sumter Co: hydric hammock near jct SR 44/CR 470, Sec 11, T19S, R21E. 9 April 1991. D. Crowe & D. Stevenson. UF 80548–49. Both verified by D. L. Auth. First record for county and extends range S from nearest record in Marion Co. (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 3. The Amphibians. Windward Publ., Inc., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

HYLA GRATIOSA (Barking Treefrog). USA: MISSISSIPPI: Lafayette Co: University of Mississippi Biological Field Station, ca. 9.6 km NE Oxford (Secs. 34 and 35, T7S, R2W; Sec. 3, T8S, R2W). 18 June 1977. W. D. Matthews. UMS 182; 10 June 1977. E. D. Keiser. UMS 219–221; 6 June 1978. D. R. Brooks. UMS 338, 352; 8 June 1978. H. L. Schuster. UMS 402; 13 August 1979. M. J. Balthazar. UMS 1490; 10 July 1979, M. J. Balthazar. UMS 1492–1495; June, July, August 1979. M. J. Balthazar. UMS 1702–1737; 1 June 1979. M. J. Balthazar. UMS 1859; 8 May 1979. M. J. Balthazar. UMS 1860; 18 June 1981. H. L. Schuster. UMS 1974; 18 June 1981. J. Goddard. UMS 1991; 9 June 1981. J. Shaw. UMS 2008; 9 June 1981. S. A. House. UMS 2019; 27 June 1984. D. Mitchell. UMS 2490; 20 June 1984. E. Dixon. UMS 2501; 12 June 1984. L. Schutz. UMS 2515; 23 June 1984. C. Davenport. UMS 2532; 20 June 1984. M. Walton. UMS 2535; 17 June 1985. E. D. Keiser. UMS 2667. Lafayette Co: ca. 1 km S Oxford, Old Taylor Road. 13 August 1979. M. J. Balthazar. UMS 1491; Marshall Co: Wall Doxey State Park. 25 May 1986. E. D Keiser. UMS 2674–2675. All 63 specimens are in the University of Mississippi collections and most were verified by Michael J. Balthazar. Lohoefener and Altig (1983, Mississippi Herpetology. Mississippi State Univ., Mississippi, 66 pp.) included *Hyla gratiosa* as a "Group Two" species in Mississippi. Group Two species were most common in southern Mississippi and had ranges generally south of an east-west line extending approximately from Meridian to Vicksburg. Map 294 of Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston, 450 pp.) was based to a large extent on Lohoefener and Altig (1983) and indicated no records for the northern half of Mississippi. *Hyla gratiosa* is abundant at a number of localities in Lafayette and Marshall counties in northern Mississippi. My students and I have studied the population at the University of Mississippi Biological Field Station since 1977. In 1980, Michael J. Balthazar completed his thesis on the frogs at this site [A Comparative Study of Selected Larval States of *Hyla gratiosa* LeConte and *Hyla cinerea* (Schneider). Master's Thesis, Univ. Mississippi, Oxford, 99 pp.].

Submitted by **EDMUND D. KEISER, JR.**, Department of Biology, University of Mississippi, University, Mississippi 38677, USA.

PSEUDACRIS CRUCIFER BARTRAMIANA (Southern Spring Peeper). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 34, R22E, T19S. 10 January 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80230–32. First record for county and extends range S of nearest record in Marion Co. (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 3. The Amphibians. Windward Publ., Inc., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

PSEUDACRIS CRUCIFER CRUCIFER (Northern Spring Peeper). USA: OHIO: Butler Co: Oxford Twp., Sec 2, Hueston Woods State Park, marsh south of the Acton Lake dam. 20 March 1984. Jeffrey G. Davis & Jeffrey S. Miller. Miami University (MU A-508); Morgan township: Sec. 7, vernal pond at north end Governor Bebb Park. 21 March 1984. Jeffrey G. Davis & Jeffrey S. Miller. MU A-507. Both verified by Paul M. Daniel; Reily township: Sec. 16, vernal pond 200 m S Indian Creek Park parking lot. 28 April 1984. Jeffrey G. Davis & George Burkhart. Cincinnati Museum of Natural History (CMNH 2971). Verified by John W. Ferner. County record.

Submitted by **PAUL J. KRUSLING** and **JEFFREY G. DAVIS**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amey Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

PSEUDACRIS NIGRITA VERRUCOSA (Florida Chorus Frog). USA: FLORIDA: Pinellas Co: SE 1/4 Sec. 24, T27S, R16E, 9.4 km (airline) N Oldsmar. 4 April 1991. James C. Godwin. Verified by David Auth. UF 81725. Single late chorusing male collected from a flooded rut near a disturbed marsh. New county record; extends range westward from Hillsborough Co. (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 3. The Amphibians. Windward Publ., Inc., Miami, 191 pp.).

Submitted by **JAMES C. GODWIN**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

PSEUDACRIS OCULARIS (Little Grass Frog). USA: FLORIDA: Citrus Co: St. Martin's Aquatic Preserve, Sec. 32, T18S, R17E. 28 January 1991. D. Crowe & D. Stevenson. UF 80561; Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 34, T19S, R22E. 19 March 1991. D. Crowe & D. Stevenson. UF 80563. Both verified by D. L. Auth. New county records (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 3. The Amphibians. Windward

Publ., Inc., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

PSEUDACRIS OCULARIS (Little Grass Frog) USA: FLORIDA: Pinellas Co: SE 1/4 Sec. 24, T27S, R16E, 9.4 km (airline) N Oldsmar. 4 April 1991. James C. Godwin. Verified by David Auth. UF 81723. One male collected from a flooded disturbed marsh. Numerous individuals were present at this locality and in the vicinity. New county record; extends range westward from Hillsborough Co. (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 3. The Amphibians. Windward Publ., Inc., Miami, 191 pp.).

Submitted by **JAMES C. GODWIN**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

RANA AREOLATA CIRCULOSA (Northern Crawfish Frog). USA: ARKANSAS: Jackson Co: 9 km NW Possum Grape, Sec. 5, T10N, R4W. 13 March 1989. Jonathan D. White & Thomas W. Duncan. Arkansas State University Museum of Zoology (ASUMZ 14298); Faulkner Co: 0.4 km W Enola on Ark. Rt. 310, Sec. 32, T7N, R11W. 18 February 1992. Jonathan D. White, Cheryl K. White & Hamilton N. Holliman. ASUMZ 18412. Both verified by Stanley E. Trauth. County record extending known range ca. 40 km NE and county record within known range, respectively (Plummer 1977, Herpetol. Rev. 8:38; Turnipseed 1990, Herpetol. Rev. 21:21–22).

Submitted by **MICHAEL V. PLUMMER** and **JONATHAN D. WHITE**, Department of Biology, Harding University, Searcy, Arkansas 72143, USA.

RANA CATESBEIANA (Bullfrog). USA: FLORIDA: Sumter Co: CR 470, 4.1 km NW Lake Panasoffkee, Sec. 25, R21E, T19S. 10 January 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80242. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 3. The Amphibians. Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

RANA GRYLIO (Pig Frog). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 34, T19S, R22E. 9 April 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80554. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 3. The Amphibians. Windward Publ., Inc., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

SCAPHIOPUS HOLBROOKII (Eastern Spadefoot). USA: FLORIDA: Sumter Co: CR 470, 4.1 km NW Lake Panasoffkee, Sec. 25, T19S, R21E. 10 January 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80227. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 3. The Amphibians. Windward Publ., Inc., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

CROCODYLIA

ALLIGATOR MISSISSIPPIENSIS (American Alligator). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 12, T20S, R22E. 14 March 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80808. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians., Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

TESTUDINES

APALONE MUTICA (Smooth Softshell). USA: OHIO: Hamilton Co: Columbia Twp., Little Miami River, Kroger Hill Park, 0.5 km downstream from mouth of E Fork Little Miami River. 23 June 1991. Paul J. Krusling & Wayne R. Wauligman. Cincinnati Museum of Natural History (CMNH 3393); Miami Twp., Great Miami River, 50 m N of the Shawnee Lookout Park Boat Ramp. 12 June 1988. Paul J. Krusling & M. Suzanne Simon. CMNH 2901. Both verified by John W. Ferner. New county records and first records for each river system.

Submitted by **PAUL J. KRUSLING** and **JEFFREY G. DAVIS**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amey Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

APALONE SPINIFERA HARTWEGI (Western Spiny Softshell). USA: NEBRASKA: Cherry Co: Mill Pond on Minnechaduza Creek, 0.8 km NW center of Valentine, SW 1/4 Sec. 30, T34N, R27W, 757 m elev. 18 August 1991. N. J. Scott, Jr. & J. N. Stuart. Verified by Paul Stephen Corn. U. S. Biological Survey Collection, Fort Collins, Colorado (BS/FS 6556). First record for the county and the Niobrara River basin (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **JAMES N. STUART** and **NORMAN J. SCOTT, JR.**, National Ecology Research Center, U. S. Fish and Wildlife Service, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA.

CARETTA CARETTA (Loggerhead). USA: ALASKA: Shuyak Island, Carry Inlet (58.33°N, 152.32°W). 31 December 1991. Headless female carcass on beach at high tide line. Carapace SL length 725 mm, carapace SL width 613 mm, weight 37.8 kg. Verified by Gil Bane & Ken Hansen. National Marine Fisheries Service Collection (Kodiak College GWB 970301, Kodiak, Alaska). Gulf of Alaska specimen is the first Alaskan *Caretta* and the northernmost eastern Pacific Ocean record to date (Hodge 1982, Herpetol. Rev. 13:24).

Submitted by **ROBERT PARKER HODGE**, 181 Raft Island, Gig Harbor, Washington 98335, USA.

CHELYDRA SERPENTINA OSCEOLA (Florida Snapping Turtle). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 10, T20S, R22E. 16 March 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80804. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards,

Turtles and Crocodilians., Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

DEIROCHELYS RETICULARIA MIARIA (Western Chicken Turtle) USA: TEXAS: Montgomery Co: 8.5 km SE of Todd Mission on FM 1774. 20 April 1991. Troy D. Hibbitts. Verified by James R. Dixon. Texas Cooperative Wildlife Collection (TCWC 68350). New county record. (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **TROY D. HIBBITTS**, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77840, USA.

GRAPTEMYS PSEUDOGEOGRAPHICA (False Map Turtle). USA: KANSAS: Mitchell Co: Oak Creek at Glen Elder Reservoir, 1.2 km E Osborne County line, Sec. 17, T6S, R10W. 18 May 1991. Travis W. Taggart. Verified by Joseph T. Collins. KU 218898. Extends the range 213 km WNW from the previously most northwestern Kansas record in Morris Co. and represents the most western record in the Kansas River system (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356; Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston, 450 pp.).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

KINOSTERNON FLAVESCENS (Yellow Mud Turtle). USA: KANSAS: Labette Co: 2.1 km NW Chetopa on U.S. Rt. 166. 4 June 1989. Travis W. Taggart. Verified by Joseph T. Collins. KU 211400. Substantiates the presence of an isolated colony in southeastern Kansas and adjacent states (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356; Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston, 450 pp.).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

KINOSTERNON SUBRUBRUM STEINDACHNERI (Florida Mud Turtle). USA: FLORIDA: Sumter Co: CR 470, 3.7 km NW Lake Panasoffkee, Sec. 25, T19S, R21E. 23 April 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80807. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians., Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

MACROCLEMYS TEMMINCKII (Alligator Snapping Turtle). USA: INDIANA: Morgan Co: adult female taken on floodplain of Westfork, White River, 2 km NNW Martinsville. ca. 3 March 1991. David Ferran. Verified by C. J. McCoy. CM Acc. No. 35067. County record and first for Indiana in many years, where it had been considered extirpated (Minton 1972, Amphibians and Reptiles of Indiana. Indiana Acad. Sci. Monogr. 3:1-346; Swanson 1939, Amer. Midl. Nat. 22:684-695)

Submitted by Michael J. Lodato, 925 Park Plaza Drive, Evansville, Indiana 47715, USA, **LOUIS T. GRANNAN, JR.**, 921 West Iowa Street, Evansville, Indiana 47710, USA, and **ROBERT ANDERSON**, Indiana Department of Natural Resources, Division of Fish and Wildlife, 402 West Washington Street, Indianapolis, Indiana 46204, USA.

PSEUDEMYS CONCINNA METTERI (Missouri River Cooter) USA: TEXAS: Leon Co: 0.8 km W of Buffalo on US Rt. 79. 12 May 1991. Troy D. Hibbitts. Verified by James R. Dixon. Texas Cooperative Wildlife Collection (TCWC 67317). New county record along the western edge of this subspecies distribution in Texas. (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **TROY D. HIBBITTS**, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77840, USA.

PSEUDEMYS NELSONI (Florida Redbelly Turtle). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 10, T20S, R22E. 4 April 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 83468 (photograph). New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians., Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

STERNOTHERUS MINOR MINOR (Loggerhead Musk Turtle). USA: FLORIDA: Sumter Co: Little Jones Creek, Sec. 17, T19S, R22E. 1 August 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 81851–52. First record for Sumter Co. and extends range ca. 21 km W of nearest record in Lake Co. (Iverson and Etcheberger 1989, Florida Scientist 52(2):104–118).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

STERNOTHERUS ODORATUS (Common Musk Turtle). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 10, T20S, R22E. 1 January 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80187. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians., Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

TRACHEMYS SCRIPTA ELEGANS (Red-eared Slider) USA: INDIANA: Dearborn Co: Lawrenceburg Twp: Sec. 1, 0.5 km W Ohio border and 1.1 km N Kentucky border. 1 May 1988. Paul J. Krusling & Wayne R. Wauligman. Verified by John W. Ferner. Cincinnati Museum of Natural History (CMNH 2902). New county record (Minton 1972, Amphibians and Reptiles of Indiana. Indiana Acad. Sci. Monogr. 3:1-346).

Submitted by **PAUL J. KRUSLING** and **JEFFREY G. DAVIS**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amey Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

AMPHISBAENIA

AMPHISBAENA ALBA (Worm Lizard). BRAZIL: RIO DE JANEIRO: Maricá Co: Restinga da Barra de Maricá (22° 57' S, 43° 50' W). On the sand beach habitat of the Restinga 50 m from the sea. 13 August 1986. Female 315 + 27.7 mm. C. F. D. Rocha & R. F. Fialho. Verified by Ulisses Caramaschi. Museu Nacional do Rio de Janeiro, Universidade Federal do Rio de Janeiro (MNRJ 4298). First documented record for Rio de Janeiro State, extends the range to Rio de Janeiro. This amphisbaenian has large distribution over South America from Venezuela, Guyanas, Colombia, Peru and Bolivia east of Andes, throughout Brazil to northern Paraguay (Peters and Donoso-Barros 1970, Bull. U. S. Nat. Mus. 297:29). In Brazil this species has been reported from many habitats (morphoclimatic domains, sensu Ab´Saber 1967, Dept. Geogr. Fac. Cienc. Latr. Univ. S. Paulo 3:45–48) including forested lowlands of Amazonia, savannas of central Brazil (locally called cerrado), Atlantic forest, Pantanal of Mato Grosso and Northeastern caatingas [Vanzolini 1955, Arq. Mus. Nac. Rio de Janeiro 42:683–706; 1968. Pap. Avuls. Zool. São Paulo 21(23):231–241]. However, this is the first record of this species in the coastal sand dune habitats (called restinga). Vanzolini (1968, op. cit.) showed a significant cline in the number of body annuli of *A. alba* latitudinally related to environmental temperature. He was not able to show the pattern of body annuli of this species in the State of Rio de Janeiro due to the lack of specimens from the area. The number of body annuli in our specimen (215 + 16) is similar to that recorded to adjacent areas of southeastern Brazil (Vanzolini 1955, op. cit.; 1968, op. cit.) and is consistent with that predicted by Vanzolini (1968, op. cit.) at the latitude of Rio de Janeiro.

Submitted by **CARLOS FREDERICO DUARTE ROCHA**, Setor de Ecologia, Departamento de Biologia Animal e Vegetal, Instituto de Biologia, Universidade do Estado do Rio de Janeiro, Rua São Francisco Xavier 524, Maracanã 20550, Rio de Janeiro, Brazil.

LACERTILIA

ANOLIS CAROLINENSIS (Green Anole). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 10, T20S, R22E. 1 January 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80219. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians, Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

ANOLIS SAGREI (Brown Anole). USA: FLORIDA: Citrus Co: St. Martin's Aquatic Preserve, Sec. 32, T18S, R17E. 17 June 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 81850. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians, Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

CNEMIDOPHORUS SEXLINEATUS (Six-lined Racerunner). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 20, T20S, R22E. 26 March 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80540. New county record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians, Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

EUMECES EGREGIUS ONOCREPIS (Peninsula Mole Skink). USA: FLORIDA: Hillsborough Co: SE 1/4 Sec. 25, T28S, R20E, 12.6 air km W Plant City. 22 February 1991. James C. Godwin. Verified by David Auth. UF 81699. Collected from an ecotonal zone between upland forest and mesic flatwoods. County record and fills gap between Pinellas and Polk counties (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians, Windward Publ., Miami, 191 pp.).

Submitted by **JAMES C. GODWIN**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

EUMECES LATICEPS (Broadhead Skink). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 34, T19S, R22E. 26 March 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80529–30. County record and fills gap between Lake and Citrus counties (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians, Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

EUMECES OBSOLETUS (Great Plains Skink). USA: KANSAS: Rawlins Co: Section 21, T1S, R33W. 19 August 1990. Travis W. Taggart. Verified by Joseph T. Collins. KU 217220. Helps fill hiatus between adjacent records in northeastern Colorado and southwestern Nebraska (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356; Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Denver, 131 pp.; Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

EUMECES OBTUSIROSTRIS (Southern Prairie Skink). USA: MISSOURI: Barton Co: Prairie State Park. 10 April 1992. Kevin R. Toal & Randall S. Reiserer. Verified by Joseph T. Collins. KU 219997. First record for the state; extends the range of this species ca. 90 km NW of nearest known locality in Oklahoma (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston, 450 pp.).

Submitted by **KEVIN R. TOAL** and **RANDALL S. REISERER**, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA.

EUMECES SEPTENTRIONALIS (Prairie Skink). USA: NEBRASKA: Saunders Co: Sec. 23, T15N, R9E. 7 May 1989. J. Mathew Weekly. Verified by John D. Lynch. University of Nebraska State Museum (UNSM 9829). New county record (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **J. MATHEW WEEKLY**, Department of

Otolaryngology and Head and Neck Surgery, University of Nebraska Medical Center, Omaha, Nebraska 68198, USA, and **JODY L. HAYNES**, Department of Biological Sciences, University of New Orleans, New Orleans, Louisiana 70148, USA.

HEMIDACTYLUS GARNOTI (Indo-Pacific Gecko). USA: FLORIDA: Citrus Co: 5.2 km E Inverness, Sec. 10, T19S, R20E. Adult specimen collected at campground. 9 May 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80802. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians, Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

MABUYA DORSIVITTATA (NCN). ARGENTINA: BUENOS AIRES: Municipio Urbano de la Costa: Costa Azul (36°40'S 56°40'30"W). 15 November 1989. P. J. Bellagamba & L. E. Vega. Verified by Jorge Williams. Herpetological Collection of the Vertebrate Laboratory, Departmento de Biologia, Universidad Nacional de Mar del Plata (UNMdP-0166). First record for the county (Cei 1986, Mus. Reg. Sci. Nat. Torino Monogr. 4:1–527). Adult captured in coastal sand dunes with grass cover. A doubtful record without collection data exists for the city of Mar del Plata (Liebermann 1939, Physis 16:61–82). Until this can be corroborated, the present record extends the range of this lizard 150 km SE from nearest known locality in Partido de Magdalena, and is the first for the Atlantic Coast (Williams 1991, Situacion ambiental de la provincia de Buenos Aires. A-Recursos y rasgos naturales en la evaluacion ambiental. Anfibios y reptiles. CIC. Ano I No. 4. 21 pp.).

Submitted by **LAURA E. VEGA** and **PATRICIO BELLAGAMBA**, Lab. Vertebrados, Departamento de Biologia, Universidad Nacional de Mar del Plata, Funes 3350, 7600 Mar del Plata, Argentina.

NEOSEPS REYNOLDSI (Sand Skink). USA: FLORIDA: Orange Co: 3.1 km E jct CR 545/SR 192, Sec. 33, T24S, R27E. 24 February 1990. D. Stevenson. Verified by D. L. Auth. UF 80185. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians, Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

OPHISAURUS COMPRESSUS (Island Glass Lizard). USA: FLORIDA: Glades Co: 1 km E jct CR# 731/SR# 74. 1 March 1991. K. Enge & B. Kellnerr. Verified by D. L. Auth. UF 80543–44. Collection site bordered by xeric flatwoods/palmetto prairie habitat. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians, Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

OPHISAURUS VENTRALIS (Eastern Glass Lizard). USA: FLORIDA: Sumter Co: 1.8 km N Carlson on CR 470, Sec. 14, T19S, R21E. 4 June 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 81847. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians, Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

SCINCELLA LATERALIS (Ground Skink). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 34, T19S, R22E. 29 March 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 80537. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 2. Lizards, Turtles and Crocodilians, Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

SERPENTES

CLONOPHIS KIRTLANDII (Kirtland's Snake) USA: OHIO: Butler Co: Fairfield Twp., Sec. 22, Gilmore Ponds, at jct. Symmes Road and Berk Boulevard. 25 October 1991. James Becker & Jeffrey G. Davis. Verified by John W. Ferner. Cincinnati Museum of Natural History (CMNH 3459). First county record and verifies 50-year old report (Fichter 1947, Herpetologica 4:71–73).

Submitted by **PAUL J. KRUSLING** and **JEFFREY G. DAVIS**, Department of Herpetology, Cincinnati Museum of Natural History, Frederick and Amey Geier Research and Collections Center, 1720 Gilbert Avenue, Cincinnati, Ohio 45202, USA.

COLUBER CONSTRICTOR (Racer). USA: NEBRASKA: Garfield Co: 12.8 km N and 3.2 km E of Burwell. 11 September 1958. C. J. Jones. Verified by William G. Degenhardt. Museum of Southwestern Biology (MSB 4743). New county record; partially fills hiatus in central part of state (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **JAMES N. STUART**, Museum of Southwestern Biology, Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA.

COLUBER CONSTRICTOR FLAVIVENTRIS (Eastern Yellowbelly Racer) USA: COLORADO: Elbert Co: 1.2 km E & 6.5 km N of Agate (NW 1/4, Sec. 20, T6S, R58W). 31 August 1991. David Chiszar & David Drew. Verified by Jeffrey B. Mitton. University of Colorado Museum of Natural History (UCM 56509). New county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Department of Natural Resources, Denver, 131 pp.).

Submitted by **DAVID CHISZAR**, Department of Psychology and Museum of Natural History, University of Colorado, Boulder, Colorado 80309 USA, **J. DAVID DREW**, Campion Academy, SW 42nd and Academy Drive, Loveland, Colorado 80537 USA, and **HOBART M. SMITH**, Department of EPO Biology and Museum of Natural History, University of Colorado, Boulder, Colorado 80309, USA.

COLUBER CONSTRICTOR MORMON (Western Yellowbelly Racer). USA: COLORADO: Moffat Co: 35.4 km SW Craig (SW 1/4 Sec. 21, T4N, R93W). 25 July 1991. Jan J. Roth. Verified by Hobart M. Smith. University of Colorado Museum of Natural History (UCM 56512). First county record, although there is an earlier record of this species 113 km NW at the border of Moffat Co., Colorado, and Uintah Co., Utah (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Depart-

ment of Natural Resources, Denver, 131 pp.).

Submitted by **JAN J. ROTH,** Sundance Museum, Craig, Colorado 81625, USA, and **DAVID CHISZAR**, Department of Psychology and Museum of Natural History, University of Colorado, Boulder, Colorado 80309, USA.

CROTALUS HORRIDUS (Timber Rattlesnake). USA: VIRGINIA: Prince William Co: Prince William Forest Park, 5.5 km WNW Triangle. 15 September 1991. Marie Frias. USNM 314213 (DOR neonate); 19 October 1991. Tom Davis. USNM 314211 (DOR adult). Both verified by Roy W. McDiarmid. New county records and only records near the Fall line in the Virginia Piedmont; extend the range 40 km SE of nearest extant record in Bull Run Mountains (Fauquier Co.), and ca. 170 km NNW of nearest Coastal Plain records in southeastern (York Co.) Virginia (Tobey 1985, Virginia's Amphibians and Reptiles, a Distributional Survey. Publ. Virginia Herpetol. Soc., Purcellville, Virginia. 114 pp.).

Submitted by **WILLIAM H. MARTIN,** Route 3, Box 804, Harper's Ferry, West Virginia 25425, USA, **JOSEPH C. MITCHELL**, Department of Biology, University of Richmond, Richmond, Virginia 23173, USA, and **RILEY HOGGARD**, Prince William Forest Park, P. O. Box 209, Triangle, Virginia 22172, USA.

CROTALUS VIRIDIS (Western Rattlesnake). USA: KANSAS: Jewell Co: Sec. 19, T2S, R8W. 27 July 1991. Travis W. Taggart. Verified by Joseph T. Collins. KU 218889–890. Substantiates a questionable record from Republic Co. to the east (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

DIADOPHIS PUNCTATUS ARNYI (Prairie Ringneck Snake) USA: TEXAS: Edwards Co: 9.1 km NE of Rocksprings on US Rt. 377. 10 August 1991 Troy D. Hibbitts. Verified by James R. Dixon. Texas Cooperative Wildlife Collection (TCWC 69200). New county record; fills distributional hiatus between the range of this subspecies and the western form *D. p. regalis* in southwest Texas, with *D. p. regalis* occurring to the west in the adjacent Val Verde Co. and *D. p. arnyi* occurring to the east in the adjacent Real Co. (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.). Adult male measuring 253 mm SVL/64 mm tail, exhibits color, pattern, and scutellation typical of D. *p. arnyi*, as per Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston, 450 pp.).

Submitted by **TROY D. HIBBITTS**, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77840, USA.

ELAPHE OBSOLETA (Rat Snake). USA: NEBRASKA: Jefferson Co: Sec. 15, T1N, R3E. 3 May 1989. Jody L. Haynes. Verified by John D. Lynch. University of Nebraska State Museum (UNSM 9833). New county record; fills a gap in known distribution in Nebraska (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **J. MATHEW WEEKLY,** Department of Otolaryngology and Head and Neck Surgery, University of Nebraska Medical Center, Omaha, Nebraska 68198, USA, and **JODY L. HAYNES**, Department of Biological Sciences, University of New Orleans, New Orleans, Louisiana 70148, USA.

FARANCIA ABACURA (Mud Snake). USA: ARKANSAS: Pope Co: SW 1/4 NE 1/4 Sec 31, T8N, R20W. 2 April 1991. Glyn Turnipseed. Verified by Matt Gallagher. KU 220059. County record and northwestward range extension in the state (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston, 450 pp.)

Submitted by **GLYN TURNIPSEED**, Department of Biology, Arkansas Tech University, Russellville, Arkansas 72801, USA.

HETERODON PLATIRHINOS (Eastern Hognose Snake). USA: KANSAS: Graham Co: ca. 23.2 km S and 16.3 km E Hill City. 3 September 1989. KU 212558; Norton Co: Sec. 26, T4S, R21W. 19 September 1990. KU 217229; Gove Co: Sec. 12, T15S, R42W. 17 June 1990. KU 216129. All collected by Travis W. Taggart. Verified by Joseph T. Collins. These are the most northwestern records for this species in the state (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

HETERODON SIMUS (Southern Hognose Snake). USA: FLORIDA: Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), R22E, T20S, Sec 10. 15 May 1991; sandhill adjacent to SR 44, 4.6 km E jct SR 44/CR 470, Sec. 6, T19S, R22E. 25 October 1991. D. Crowe & D. Stevenson. UF 80772 & 83443. Both verified by D. L. Auth. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 1. The Snakes. Second ed. Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

LAMPROPELTIS GETULA (Common Kingsnake). USA: KANSAS: Hamilton Co: below Hamilton County State Lake, Sec. 28, T23S, R41W. 7 July1991. Travis W. Taggart. Verified by Joseph T. Collins. KU 218867. Helps to substantiate the population of this serpent along the Arkansas River in both Kansas and Colorado (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356; Hammerson 1986, Amphibians and Reptiles in Colorado. Second Printing. Colorado Division of Wildlife, Denver, 131 pp.).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

NERODIA SIPEDON (Northern Water Snake). USA: KANSAS: Cheyenne Co: Sec. 10, T1S, R42W. 21 July 1990. Travis W. Taggart. Verified by Joseph T. Collins. KU 217230. Confirms its existence in extreme northwestern Kansas and helps to fill hiatus between adjacent records in northeastern Colorado and southwestern Nebraska (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356; Hammerson 1986, Amphibians and Reptiles in Colorado. Second Printing. Colorado Division of Wildlife, Denver, 131 pp.; Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

OPHEODRYS AESTIVUS (Rough Green Snake). USA: FLORIDA: Sumter Co: CR 470, 3.7 km NW Lake Panasoffkee, Sec. 25, T19S, R21E. 1 August 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 81831. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 1. The Snakes.

Second ed. Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811 USA.

OPHEODRYS AESTIVUS (Rough Green Snake) USA: TEXAS: Lavaca Co: 9.9 km N of jct FM 682 on US Rt. 77. 25 April 1991. Troy D. Hibbitts. Verified by James R. Dixon. Texas Cooperative Wildlife Collection (TCWC 68333). New county record (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas. 434 pp.).

Submitted by **TROY D. HIBBITTS**, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77840, USA.

PITUOPHIS MELANOLEUCUS MUGITUS (Florida Pine Snake). USA: FLORIDA: Sumter Co: Sec. 6, T19S, R22E, sandhill adjacent to SR 44, 4.6 km E jct SR 44/CR 470. 18 September 1991. D. Crowe & D. Stevenson. Verified by D. L. Auth. UF 83633 (photograph, adult male). County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 1. The Snakes. Second ed. Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

RHADINAEA FLAVILATA (Pine Woods Snake). USA: FLORIDA: Bay Co: 4.5 air km SSW Ebro (Sec. 18, T1S, R16W). 19 September 1991. John G. Palis. Verified by David L. Auth. UF 84079. New county record; second collection from the Florida panhandle W of Apalachicola River (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 1. The Snakes. Second ed. Windward Publ., Miami, Florida, 191 pp.).

Submitted by **JOHN G. PALIS**, Florida Natural Areas Inventory, 1018 Thomasville Road, Suite 200-C, Tallahassee, Florida 32303, USA.

RHADINAEA FLAVILATA (Pine Woods Snake). USA: FLORIDA: Pinellas Co: SE 1/4 Sec. 13, T27S, R16E, 10.7 air km N of Oldsmar. 8 May 1991. James C. Godwin. Verified by David Auth. UF 81633. Collected within a hydric hardwood hammock. County record; extends range westward from Hillsborough Co. (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 1. The Snakes. Second ed. Windward Publ., Miami, 191 pp.).

Submitted by **JAMES C. GODWIN**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

STORERIA DEKAYI (Brown Snake). USA: KANSAS: Sheridan Co: Sheridan County State Lake. 6 June 1992. Kevin R. Toal & Lori McElroy. Verified by Joseph T. Collins. KU 219998. New county record; extends range ca. 60 km W (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston, 450 pp.) and verifies the record from Graham Co. reported by Collins (1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356).

Submitted by **KEVIN R. TOAL**, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA.

STORERIA DEKAYI (Brown Snake). USA: NEBRASKA: Saunders Co: Sec. 23, T15N, R9E. August 1989. J. Mathew Weekly. Verified by John D. Lynch. University of Nebraska State Museum (UNSM 9836). New county record; extends range ca. 25 km N in Nebraska (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **J. MATHEW WEEKLY**, Department of Otolaryngology and Head and Neck Surgery, University of Nebraska Medical Center, Omaha, Nebraska 68198, USA, and **JODY L. HAYNES**, Department of Biological Sciences, University of New Orleans, New Orleans, Louisiana 70148, USA.

STORERIA DEKAYI VICTA (Florida Brown Snake). USA: FLORIDA: Sumter Co: CR 470, 3.7 km NW Lake Panasoffkee, Sec. 25, T19S, R21E. 9 April 1991. Collector unknown. Verified by D. L. Auth. UF 80512. County record (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 1. The Snakes. Second ed. Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

STORERIA OCCIPITOMACULATA (Redbelly Snake). USA: FLORIDA: Pasco Co: S Hudson, SR 52, 8 km E jct US Rt. 19. 1983. Collector unknown. Verified by P. E. Moler. USNM 245390. County record; extends range south of nearest record in Citrus Co.; Sumter Co: Southwest Florida Water Management District (SWFMD) Property (Berry Tract), Sec. 34, T19S, R22E. 9 April 1991. D. Crowe and D. Stevenson. UF 80511. Verified by D. L. Auth. County record; extends range south from nearest record in Marion Co. (Ashton and Ashton 1988, Handbook of Reptiles and Amphibians of Florida. Part 1. The Snakes. Second ed. Windward Publ., Miami, 191 pp.).

Submitted by **DIRK STEVENSON** and **DAVID CROWE**, Florida Game and Fresh Water Fish Commission, 3900 Drane Field Road, Lakeland, Florida 33811, USA.

THAMNOPHIS SIRTALIS (Common Garter Snake). USA: KANSAS: Rawlins Co: South Fork Driftwood Creek, 14.5 km N and 1.6 km E Atwood, Sec. 28, T1S, R33W. 19 August 1990. KU 217234; Norton Co: Sec. 20, T3S, R23W. 18 May 1991. KU 218886. Both collected by Travis W. Taggart. Both verified by Joseph T. Collins. Extends range into northwestern Kansas and helps to fill hiatus between adjacent records in northeastern Colorado and southwestern Nebraska (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356; Hammerson 1986, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Denver, 131 pp.; Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

TYPHLOPS MICROSTOMUS (NCN). BELIZE: COROZAL DISTRICT: Sarteneja. 27 June 1991. J. C. Meerman. Verified by M. S. Hoogmoed. National Naturhistorisch Museum, Leiden (RMNH 25946). Previously known from the Peten region of Guatemala (Campbell and Vannini 1989, Proc. W. Found. Vert. Zool. 4:1–21), this is the first record of this species for Belize. Found at depth of 1.6 m in a well being excavated, although it may have fallen into the pit.

Submitted by **J. C. MEERMAN**, P. O. Box 134, Orange Walk, Belize.

VIRGINIA STRIATULA (Rough Earth Snake) USA: TEXAS: Madison Co: 14.2 km N of Iola on FM 39. 11 May 1991. Troy D Hibbitts. Verified by James R. Dixon. Texas Cooperative Wildlife Collection (TCWC 68334). New county record (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press,

College Station, Texas, 434 pp.).

Submitted by **TROY D. HIBBITTS**, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77840, USA.

VIRGINIA VALERIAE ELEGANS (Western Earth Snake). USA: MISSOURI: Adair Co: Rt. 157 at the entrance to Thousand Hills State Park, Sec. 1, T62N, R16W (DOR). 2 May 1992. Robert Powell. Verified by J. S. Parmerlee, Jr. Bobby Witcher Memorial Collection (BWMC 04801), Avila College. New county record within a hiatus in the range indicated by Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston, 450 pp.). Johnson (1987, The Amphibians and Reptiles of Missouri. Missouri Dept. Cons., Jefferson City, 368 pp.) speculated that this species was present in northeastern Missouri (presumably based on records in southern Iowa, western Illinois, and central Missouri), but included no records backed by voucher specimens.

Submitted by **ROBERT POWELL**, Department of Natural Sciences, Avila College, Kansas City, Missouri 64145, USA.

BOOK REVIEWS

Checklist of the Amphibians and Reptiles of Connecticut with Notes on Uncommon Species, by Michael W. Klemens. 1991. Connecticut Department of Environmental Protection Bulletin No. 14. Natural Resource Center, Publications Sales, Rm. 555, 165 Capitol Avenue, Hartford, Connecticut 06106, USA. (24 pp. with 50 color photographs). $6.00 for 1 copy, $4.20 for 3-10 copies and $3.65 for 11 copies or more.

Very little has been published on the herpetofauna of the New England region, due mostly to the less diverse nature of the fauna compared to the rest of the contiguous United States. This is not to say that the area's fauna is of no interest or that it has not been studied. Most recent publications have dealt with the region as a whole and have not concentrated on any one state. This checklist is a welcome addition to the literature.

The author's purpose is to provide a brief introduction to the herpetofauna of Connecticut based on what he considers documented reports and his own fifteen years of field work. The checklist achieves this goal effectively.

In his introduction, Klemens explains his approach and summarizes the composition of Connecticut herpetofauna ("45 species, . . . twelve salamanders, ten frogs, eight turtles, one lizard and fourteen snakes. . ." p. 6) and comments generally on amphibian and reptile density throughout the state. A discussion of methods follows in which the author defines which taxa he considers "uncommon" and noteworthy for the amateur naturalist as well as for the professional. The balance of the bulletin is broken down into three sections: 1) a discussion of the species the author considers "uncommon" with general comments on their habitat, distribution, and possible reasons for their apparent rarity, 2) color photographs of all the amphibians and reptiles in Connecticut, and 3) a final checklist of Connecticut's herpetofauna that includes a summary coding of their distribution throughout the state. Included in this final list are species that have been erroneously reported as indigenous to Connecticut. These are also briefly explained in the text. Finally, a literature cited section allows the reader to locate additional, more detailed information.

The checklist itself is practical and its content, given its generality, is accurate and useful. The photographs are good to excellent, with enough detail to make the identification of adult animals relatively easy. A photograph for every Connecticut species is included. Obviously, it will still be difficult to identify amphibian larvae and juveniles as well as some of the ambystomatid salamanders, but no claim of completeness is made by the author. This bulletin is a useful addition to any library, amateur or professional, and for those interested in the herpetofauna of the New England region and Connecticut in particular, it is an especially welcome contribution.

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Bibliographie Herpetologischer Bibliographien II. Amphibia, Reptilia, by Helga Braßeler. 1991. Courier Forschungsinstitut Senckenberg 140. 129 pp. Paper. DM 30, approx. US $19.20.

Compiling a bibliography is generally a thankless task; the end result is frequently used but rarely acknowledged. As a tertiary reference, the *Bibliographie der Herpetologischer Bibliographien* will almost never be cited directly, yet its potential as a research tool is significant. This volume is the second in a series of herpetological bibliographies from the Informationszentrum für Biologie at the Forschungsinstitut Senckenberg and joins several similar publications devoted to birds, bats, whales and bryophytes. The first of the herpetological bibliographies (Braßeler 1989) focused on the fields of ecology, systematics and zoogeography, and a third installment, promised for late 1992, will emphasize paleoherpetology and evolutionary biology. The present volume records 906 titles, dealing largely, but not exclusively, with physiology, genetics, biochemistry, and venoms. The criterion for inclusion in the work is that each publication cited itself has a bibliography or literature cited section of more than 100 entries. As such, the bibliography serves as a source book for comprehensive literature reviews in a variety of herpetological subdisciplines. In addition to books and journal articles, a large number of North American and European theses and dissertations are included, providing access to these difficult to trace works. The bibliography is indexed by author and by subject. The latter index is in English, with German equivalents provided only for place names that differ significantly between the two languages.

All bibliographies are incomplete to some extent, but I note that the majority of recent titles that I have used myself and that meet the criterion for inclusion have been referenced by Braßeler. The subject indexing of the bibliography, however, leaves something to be desired, and the criteria for key word choice appear to be inconsistently applied. For example, comparable systematic works dealing with suprageneric levels of hierarchy are indexed variously by the names of the genera involved, the higher order group name only, or under the group name and under "phylogeny." While many entries can undoubtedly be retrieved from the index, it would appear that maximal utility of the bibliography is achievable only by scanning all 900 entries for one's topic of interest. Nonetheless, for those whose research necessitates extensive bibliographic work, this publication will serve as a valuable aid for

locating papers in a variety of fields. It will also be useful for advanced students or others entering into new areas or wishing to explore the literature in unfamiliar branches of herpetology.

LITERATURE CITED

BRAßELER, H. 1989. Bibliographie Herpetologischer Bibliographien I. Amphibia, Reptilia. Cour. Forschungsinst. Senckenberg 116:1-214.

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A Social History of the American Alligator. The Earth Trembles with His Thunder. by Vaughn Glasgow. St. Martin's Press, New York. vi + 260 pp., ill., cloth, $29.95.

This is a curious and fascinating book. It deals with alligators and men, but hardly from the viewpoint of most of our readership. Also the extensive bibliography does not overlap the various technical accounts recently made available. Instead we have here accounts of interactions, but mainly as reported in the popular press. Chapters deal with such topics as legends, symbolism, the history of discovery, the use of the animals and their parts, their utilization as food and some recipes, the animals in literature, films and songs and the history of hunting, protection and managed utilization. Crocodiles (and caimans) are often mentioned, but mainly as being different from alligators.

The author is director for special projects at the Louisiana State Museum and apparently there has available a remarkable collection of newspaper clippings, popular books and articles, and illustrations many of which are here excerpted or reproduced. As the book apparently derived from an exhibition, it reflects astonishing research projects involving many individuals whose efforts are detailed in a four page account.

The style of presentation is that recommended by newspaper editors, rather than in classes of scientific writing. The topic is introduced and then circumscribed, with factual and imaginary comments cited thereafter in fine abandon. In the last third or so, the author returns to the topics noted in the introductory section. For each subtopic there is the citation "in quotes" of multiple individuals (often from quotations in previous accounts, rather than personal confirmation) and some snippets of text. Apparently true and obviously misleading comments appear in parallel. The method of presentation leads to much redundancy with similar comments appearing repeatedly in successive chapters. One wonders whether the chapters were initially intended for independent publication. Clearly, the book is intended to be read through and put down, rather than used as a reference to the topic. However, the index and literature cited are good and permit one to find materials pertinent to specific issues.

One of the obvious aims of the book is to explain and defend the Louisiana pattern of controlled alligator hunting and ranching. There is an extensive discussion of the changing climate of opinion, the shift of legislation and the conflict between those aiming for conservation and absolute protection. The folk lore of the hunting community is characterized in an interesting fashion. Curiously, the Audubon Society is placed into a demonic role and the animal rights lobby is hardly mentioned. The book is full of odd snippets of fascinating information; thus, I was amazed to discover that New Orleans district attorney Jim Garrison once had given the order not to pursue a strong case against a skin poacher.

An important component is that the author acknowledges the significant contributions of scientists working on these animals, from Coulson to Joannen. Those studies that later facilitated ranching, that elicited data on sex determination and accelerated growth rate, are obviously emphasized. Ecology of the animals is hardly touched upon and the book lacks a real account of alligator biology. Hence, it had best be read in parallel with one of the several more zoologically inclined accounts that have recently appeared. The emphasis is not surprising as the animals provide the basis of a substantial industry and one that involves an area that has incurred economic depression.

In reviewing my impressions, not so much of the book, but of the events it characterizes, I am left in a quandary. Enthusiasm for controlled alligator hunting is reflected in the conservation of wetlands and the other wildlife there native. However, the hunting methods described are rather cruel. Shift to ranching could alleviate this; however, it would reduce the strength of the argument for wetlands. Protection must remain for ecological associations, rather than for particular species.

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Neotropical Wildlife Use and Conservation, edited by John G. Robinson and Kent H. Redford, 1991. University of Chicago Press, 5801 Ellis Avenue, Chicago, Illinois 60637, USA. xvii + 520 pp. $28.00 U.S. + shipping (paperback).

Tropical habitats are especially rich in biodiversity, hard to study, poorly known, and threatened by human impact. *Neotropical Wildlife Use and Conservation* focuses on an attribute of the tropics that also is true of the entire earth: people are in them. This volume resulted from a seminar series convened by the editors at the University of Florida in 1987, inspired by A. L. Gardner's earlier presentation. Gardner's lucid Preface sets an overall tone for the book—well informed, empirical, and pragmatic—to which I shall return shortly. About 45% of the 47 authors are from Latin America. Editing and production are of the high quality we expect from this publisher. There are numerous graphs, and dozens of photographs portraying subjects as diverse and interesting as 16th century methods for collecting parrots, wild iguanas congregating at an artificial feeding station, and a lodge for ecotourists in Peru.

Six chapters directly address "reptiles" (exclusive of birds): Management of olive ridley sea turtles (*Lepidochelys olivacea*) nesting at Playas Nancite and Ostional, Costa Rica, by S. E. Cornelius, M. A. Ulloa, J. C. Castro, M. Mata del Valle, and D. C. Robinson; Economic analysis of sea turtle eggs in a coastal community on the Pacific Coast of Honduras, by C. J. Laguex; Effects of hunting on the reproduction of the Paraguayan caiman (*Caiman yacare*) in the Pantanal of Mato Grosso, Brazil, by P. G. Crawshaw, Jr.; The rational use of green iguanas, by D. I. Werner; An analysis of the spectacled caiman (*Caiman crocodilus*) harvest program in Venezuela, by J. B. Thorbjarnarson; and *Tupinambis* lizards in Argentina: implementing management of a traditionally exploited resource, by L. A. Fitzgerald, J. M. Chani, and O. E. Donadio. Amphibians are not treated. In addition to their primary concerns with conservation status and management, the chapters on reptiles are gold

mines of important new information on basic biology: female *Tupinambis* lizards remain with the nest throughout incubation (Fitzgerald et al.); female *Caiman crocodilus* in the Venezuelan llanos lead their young over distances of several kilometers to water (Thorbjarnarson).

Among 22 other chapters, those on hunting in South America by J. Marcio Ayres et al., R. A. Mittermeier, and W. T. Vickers document utilization of reptiles by indigenous people. Other "must read" chapters for anyone interested in conservation are those by K. H. Redford, J. G. Robinson, and J. H. Shaw on sustainable harvests of wildlife. M. J. Groom et al.'s analysis of prospects and problems associated with nature tourism, based on the author's experience in Manu National Park, is excellent.

This is a rewarding, thought-provoking book for anyone who has worked in the neotropics. It may shock those who still believe there are pristine places on earth and that conservation somehow can avoid incorporating humans as integral parts of the landscape. There are numerous photographs of hunters with dead monkeys and tapirs, and several authors make clear that "savages" can only remain "noble" if human population density is low. There are contradictory opinions about the domesticability of pacas, pitting a naturalistic perspective on what is "wild" against the surprising results of an ingenious experiment. There are assertions that large industries based on the hides of lizards (Fitzgerald et al.) and caimans (Thorbjarnarson) are profitable, sustainable, and desirable.

For biologists this book also has vignettes that induce frustration: In Mexico, how can it be so easy to hunt millions of doves or buy endangered cat skins, yet impossible to collect a few dozen common lizards for science? Another important issue is criticized explicitly in C. H. Freese and C. J. Saavedra's concluding chapter; they estimate that well over half of the information generated by "wildlife management research" goes unpublished, at best buried as "gray literature" in reports to agencies.

This is not a preachy book, but its overall messages are as important as the research findings and specific recommendations. Citizens of the richest nation on earth, we in the U. S. often presume to export ideals and practical strategies to other "less fortunate" cultures. Living in the San Francisco Bay Area, a hotbed of environmentalism, I find the hubris ironic at times: our regional park management lacks the political will to control feral cats that eat the lizards upon which threatened Alameda whipsnakes depend for food; animal rights groups thwart efforts to eliminate introduced red foxes, thereby hastening the extinction of clapper rails; William Devall, coauthor of *Deep Ecology*, tells a public gathering that chanting Native American songs at dawn is more important than recycling; and far too many believe that if we can just buy the land down there, we'll own the jaguars.

In *Neotropical Wildlife Use and Conservation*, several Latin American countries emerge as real heroes of conservation; there are lessons for everyone in their frustrations and successes. Although most land supporting wild populations will be used in some form by humans in the 21st century, as yet we haven't formulated widely accepted goals for conservation in that context and we know little about how disturbed ecosystems work. The pragmatic attitudes and approaches described in this book will help lead the way.

HARRY W. GREENE
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Gila Monster – Facts and Folklore of America's Aztec Lizard, by David E. Brown and Neil B. Carmony. 1991. High Lonesome Books, P.O. Box 878, Silver City, New Mexico 88062, USA. ISBN 0-944383-12-2. 127 pp. $8.95 (softcover).

Indians and other long-time residents of the American Southwest were aware of the gila monster well before its formal description by Cope in 1869. Cope discovered that a specimen at the Smithsonian Institution collected by the United States-Mexico Boundary Survey had been misidentified as *Heloderma horridum* (Wiegmann 1829). That species, the Aztec or beaded lizard of México, ranges from southern Sonora to Guatemala, whereas the gila monster, *H. suspectum*, is a resident of the Sonoran Desert, primarily of Arizona and northwest México.

The origin of its common name is unknown, but presumably refers to the Gila River where the animal was frequently encountered in the early days of Mexican and Anglo settlement. Conceivably, the name is a phonetic derivation of its Greek epithet *Heloderma*, which translates as "studded or beaded skin." These and numerous other facts and fables about America's most peculiar squamate are contained in this delightful little book by Brown and Carmony illustrated with 32 black & white photos, line art, and distribution maps. It is a modest production but the style and content are well-crafted.

Part I is a natural history sketch of the gila monster that brings together salient points from the scientific literature (listed in a separate bibliography) on the lizard's description, distribution, fossil record, subspecies, home range, habits, and venom. The treatment of these topics is brief but accurate. Part II is an entertaining journey into the curious myth and folklore that has followed the gila monster. Many tales are reproduced in the book as direct quotes from old newspaper accounts, magazine articles, and other archives from the Southwest. Not surprising, the gila monster's gaudy appearance and venomous properties were the basis for much of the mythology.

Indeed, that the gila monster is "poisonous" was disputed for many years, and several authorities of the day maintained that except for its powerful bite the animal was harmless. That mistaken view followed from the fact that venom was difficult to extract, and envenomation itself is accomplished not by enclosed, hollow fangs as in rattlesnakes, but through open grooves on the teeth. Not until after 1900, more than three decades since Cope's description of the species, was there conclusive evidence of the gila monster's capability. The venom is certainly potent, yet there are few if any credibly documented human fatalities from a gila monster bite. Still, the lore of the Southwest is replete with accounts that are supposedly true, as well as more fantastic claims such as: "the spot where the gila monster left that one drop of saliva can still be seen in the desert today, ten years later. All vegetation for a radius of 10 yards withered and died immediately and none new has ever grown here."

Once regarded with disgust and loathing, the gila monster today is a protected member of Sonoran Desert wildlife. This book is informative and lively reading. Anyone interested in these fascinating animals, or for that matter in Southwestern folklore, should pick up a copy.

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Survey Of Academic Herpetology Programs

Faculty and staff at high schools, colleges, universities, zoos, and museums, as well as members of regional herpetological societies, are often asked by high school students to recommend an institution where they can begin training for a career in herpetology. There are a number of well known institutions that have major programs in this field and are the first to come to mind. However, many colleges and universities do not have a formal program in herpetology and offer only one course in the subject, with or without opportunities for undergraduate research. A student interested in herpetology can receive an excellent education at such institutions but may not submit an application for admission because the existence of a herpetology course at that location is not widely known.

This survey will attempt to correct this deficiency by compiling a list of colleges and universities that offer students some degree of training in the field of herpetology. The results will be made available (in a format to be determined) as soon as the data are compiled. If you are employed at an institution that offers a course/program in herpetology, please answer the following questions and return your responses to me. If you are not directly associated with a college or university but are aware of one or more institutions that has offerings in the area of herpetology, send me their names (a postcard will do) so they may be included in the survey; I will follow up on all such indirect references if no response is received directly from the named institution. I anticipate receiving many duplicate answers for this particular question (no. 9, below), but this may result in a few additional schools that might otherwise be omitted.

1. Name and address of college or university.

2. Name and telephone number of contact person at the above institution.

3. How many courses in herpetology are offered at the undergraduate level?

   a. How frequently are these courses offered?

   b. How many students are usually enrolled in the courses?

4. How many courses in herpetology are offered at the graduate level?

   a. How frequently are these courses offered?

   b. How many students are usually enrolled in the courses?

5. Do opportunities exist for undergraduate research in herpetology?

   a. If yes, is this research done under the guidance of and in conjunction with a faculty member?

   b. If yes, is this a formal part of the curriculum for which credit may be granted?

6. Can a student pursue a master's degree with a concentration in herpetology?

7. Can a student pursue a doctoral degree with a concentration in herpetology?

8. Please list the names of permanent faculty or staff who are doing herpetological research at this institution and give a brief statement of their research interests.

9. Please list the names of other smaller institutions that offer a course in herpetology.

Return completed survey to:
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Authors should submit an original and two copies of manuscripts. Manuscripts should be typewritten, double-spaced, on 21.5 x 28 cm (8.5 x 11 inch) white paper. Refer to this issue of *HR* for style and format information, including correct format for literature citations. More detailed information for submissions to Geographic Distribution, Life History Notes, and Recent Population Changes appear in a recent issue of *HR* under their respective headings.

Originals of illustrative material (e.g., tables, photographs, or diagrams) should be submitted with the text, with appropriate precautions taken to ensure delivery without damage. Illustrations should be discussed in the text and numbered sequentially with Arabic numbers. References to illustrations should be placed in parentheses at the end of sentences. Original photographs should be submitted as black and white glossy prints (8 x 10 inch preferred).

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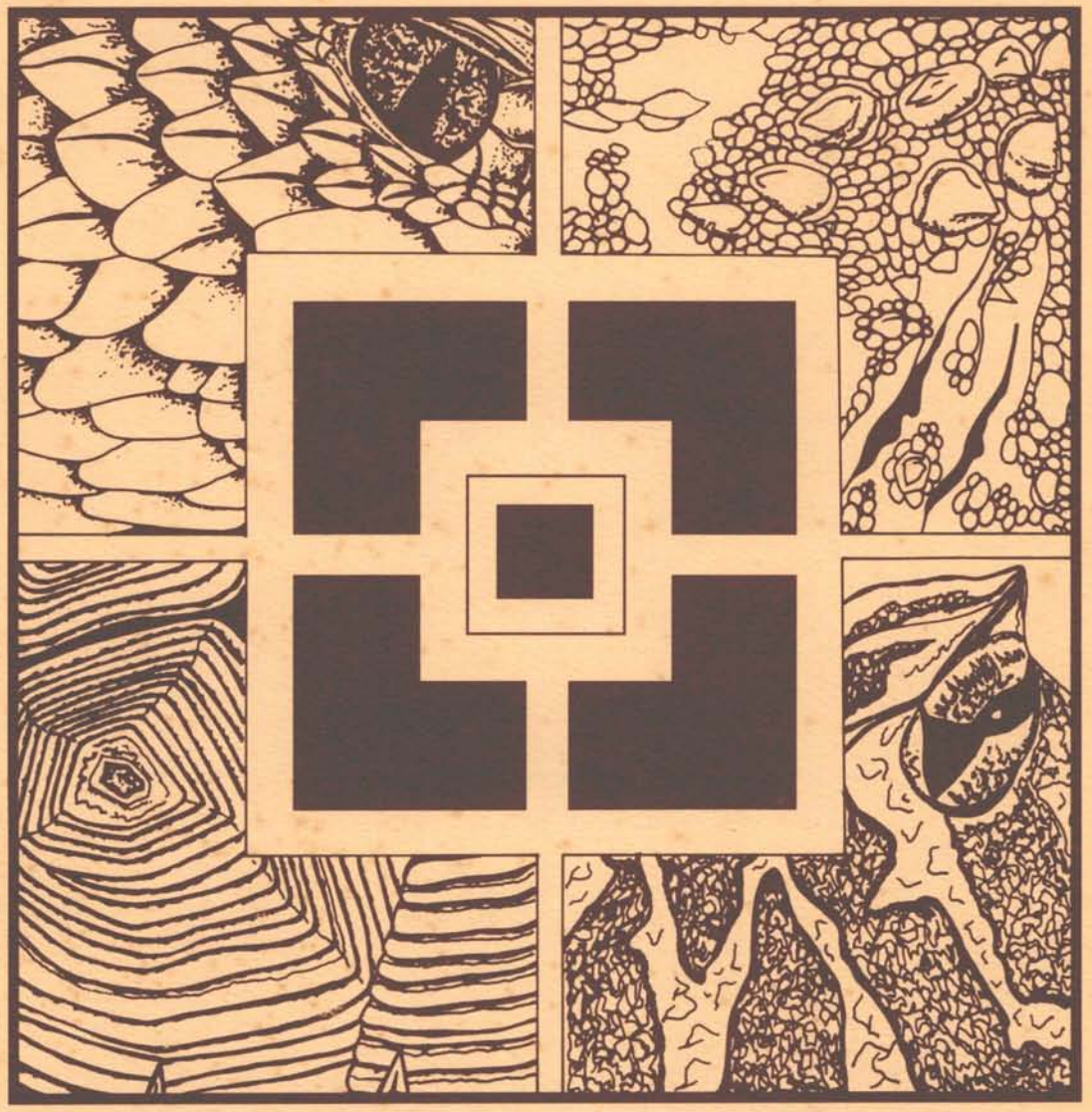
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Herpetology At The University Of Texas At El Paso



University of Texas at El Paso campus.

The University of Texas at El Paso ("Yoo-tep," *never* "Texas-El Paso") is the second oldest and third largest institutional component in the University of Texas system. Herpetology has been an active area at UTEP for the last thirty years, bolstered by many faculty and students who have employed amphibians or reptiles as research subjects during that period. Of the seventeen tenured and tenure-track faculty in the Department of Biological Sciences, more than half have published work on some aspect of the biology of amphibians and reptiles at some time in their careers. Moreover, several members of this faculty, including the ecologist W. P. MacKay, malacologist A. L. Metcalf, and paleobiologist A. H. Harris have recently pursued research projects that at least peripherally included amphibians and/or reptiles (see list of references). Seven individuals, however, constitute the historical and present-day core of herpetology at UTEP:

P. S. Chrapliwy: Pete Chrapliwy retired from the faculty in 1984 after twenty-five years of service at UTEP. Active in research herpetology early in his career, he later devoted his efforts to community service and teaching excellence. In fact, the University-wide student teaching award is named for him. At present he is one of our faculty *emeriti*, and still lives in El Paso.

L. N. Irwin: Louis Irwin, Chairman of Biological Sciences, joined the UTEP faculty in the Fall of 1991. His research interests focus on the gangliosides (cell membrane-imbedded glycolipids) found in amphibians and reptiles, and how the phylogenetic history of the pathways that produce these molecules interacts with environmental factors that influence their expression.

J. D. Johnson: Jerry Johnson, who earns his bread by serving on the faculty of the El Paso Community College, has an adjunct faculty position in the UTEP Department of Biological Sciences. In this latter capacity he carries out collaborative and independent research in the Department, liaises between the EPCC and UTEP at levels ranging from upper administrative to those of individual field courses, recruits students for our graduate and undergraduate programs, and teaches a course now and then. His research interests include systematics and biogeography of herps, especially those of southern Mexico; he is also co-chair of the SSAR Local Committee for the August 1992 meeting.

C. S. Lieb: Although he has been in and out of administrative, staff, and faculty assignments for the past eleven years, Carl Lieb anticipates beginning "normal" faculty life in the fall of 1992. Until then, however, his present duties are those of faculty member, coordinator of introductory biology laboratories, Director of the Indio Mts Research Station, and (in spare time) co-chair of the local committee for the August 1992 SSAR meeting. Active research projects include the systematics of anole lizards, evolutionary genetics of *Crotalus* venom proteins, and conservation biology of herps in the Rio Grande corridor.

E. D. Rael: Eppie Rael is an immunologist with a well-established research program involving the structure and function of snake venom proteins. He is not only concerned with biomedical implications and applications, but, in collaboration with Johnson and Lieb, is also vigorously pursuing studies of ontogenetic and populational variation in the five locally available species of rattlesnakes.

R. G. Webb: After thirty years of distinguished service at this institution, and after producing more than 100 scholarly publications in herpetology, Robert Webb has announced his retirement effective May, 1992. He will be continuing in an active *emeritus* capacity into the indefinite future, finishing up his monograph of the herps of Durango, México, and continuing several taxonomic projects on trionychid turtles, ranid frogs, and *Sceloporus* lizards of the *torquatus* group.

R. D. Worthington: Several years ago Richard Worthington deserted active herpetology for botany . . . but he still has his huge herp library, keeps up his memberships in herp organizations, and still contemplates an occasional herp research project. His future plans include working up parts of the amphibian and reptile material he collected during the year (1987) he spent in Malaysia on a teaching exchange program.

One of the supporting facilities for study of herpetology at UTEP is its collection of amphibian and reptile specimens, one of the six biosystematics collections of the Laboratory for Environmental Biology. This Laboratory is officially a research component of the Centennial Museum, the University's public-oriented museum of natural and cultural history. The herpetology collection, however, is housed in the Biology Building. The holdings consist of a modest 15,000 specimens, with synoptic breadth over much of the southern half of North America. Depth is mostly achieved only in regional material (primarily western Texas and southern New Mexico). The purposes of these collections reflect the past and present research interests of the faculty, as well as educational programs of the Department and the Museum. Components of this collection that might be of interest to portions of the SSAR membership include 1) a large proportion of R. G. Webb's Durango collection; 2) synoptic collections from Chiapas and the Isthmus of Tehuantepec made by J. D. Johnson; 3) R. D. Worthington's ambystomatid salamander collection, as well as his recent efforts in Malaysia; 4) Clayton May's Arizona collection (mostly lizards); and 5) over 1,000 dry osteological preparations of the regional herpetofauna. Specimen data for most of this collection are computerized, and information on UTEP holdings may be obtained free of charge by writing the Curator (Robert Webb).

Opportunities for field-oriented herpetology at UTEP are also enhanced by the University's commitments to the Indio Mountain Research Station (IMRS). This "station" consists of

a geographic area and set of facilities sponsored and managed by UTEP for research and education on the natural history of the Chihuahuan Desert. Station lands include 37,000 contiguous acres in southern Hudspeth County, Texas; the facilities consist of a small, rustic ranch house that provides shade, protection from the wind, and drinkable water.



Jerry Johnson measures frogs in the herp lab.

The Station terrain is dominated by a mixture of gently sloping bajadas and rugged slopes with limestone, sandstone, or conglomerate rock outcrops; elevations range from ca. 3200-5000 ft. Vegetation consists entirely of Chihuahuan Desert Scrub, especially catclaw acacia, lechuguilla, and arborescent yucca associations. The herpetofauna is heavy on the rattlesnakes (three species are abundant), and on the lizards with high thermal tolerance (it does get warm!). The area is completely uninhabited, and has not been used for grazing for at least ten years. The station is a three-hour drive from the UTEP campus; two hours to travel 120 miles on the Interstate, and then another hour for the last 20 miles over less than optimal roads. Once you are there, what is not accessible on the Station by 4x4 vehicles can only be reached on foot or horseback. In other words, the IMRS is a couch potato's hell and a field person's paradise. For details concerning access, contact the IMRS Director (Carl Lieb).



In the field at the Indio Mountain Research Station.

Given the size of the institution (ca. 17,000 students), the present economic difficulties for state-supported entities, and the mosaic devolution of academic biology nationwide, herpetology is fortunate to be holding its own at UTEP. We have the further advantage of our location, facilities, institutional mission, and a student population that appreciates the value of higher education. We thus look forward to the next thirty years with optimism and not a little excitement.

Recent Publications

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SSAR BUSINESS

Annual Report (1992) Of The Grants-In-Herpetology Committee

Committee: Dawn S. Wilson, University of South Florida; Joseph P. Ward, USAF; Charles W. Painter, New Mexico Department of Game and Fish; Carole L. Hom, University of California, Davis; Thomas H. Fritts, USNM; Maureen Donnelly, AMNH; Dale Belcher (Chair), Rio Grande Zoo.

Five awards in three categories were made this year of $345 each, as follows:

1. Conservation—Marion R. Preest, Section of Ecology and Systematics, Corson Hall, Cornell University, Ithaca, New York 14853, USA. Title of proposal: Mechanisms of reduced growth rates in acid-exposed larval salamanders.

2. Field Work—Brian P. Butterfield, Department of Zoology and Wildlife Science, 331 Funchess Hall, Auburn University, Auburn Alabama 36829-4201, USA. Title of proposal: The pattern of morphological and genetic variation of selected members of the introduced herpetofauna of Florida.

3. Field Work—Christopher L. Parkinson, Department of Biology, University of Louisville, Belknap Campus, Louisville, Kentucky 40292, USA. Title of proposal: The relationships within the *Agkistrodon* complex (Viperidae: Crotalinae) as determined by DNA-DNA hybridization.

4. Graduate Student Research—Debra L. Holland, Department of Biology, P.O. Box 42451, University of Southwestern Louisiana, Lafayette, Louisiana 70504-2451, USA. Title of proposal: Prey detection via substrate chemical cues.

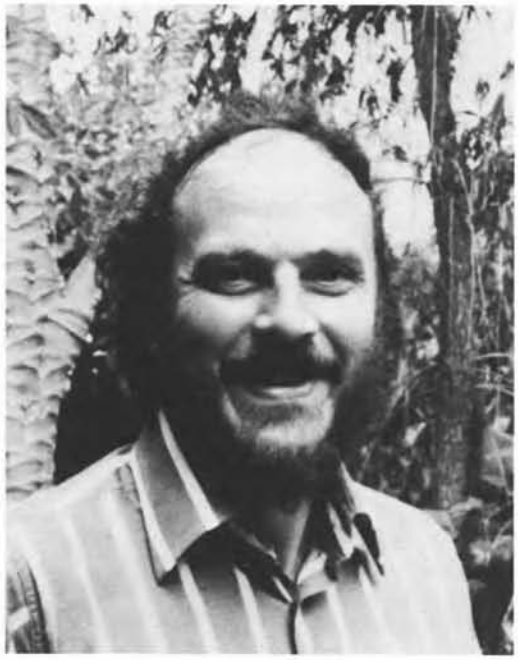
5. Graduate Student Research—Paul A. Stone, Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA. Title of proposal: Sexual selection in lava lizards (*Tropidurus* spp.): a pilot study.

IN MEMORIAM

J. W. Patterson (1944 – 1991)

Jeremy W. Patterson, a well-known specialist on the physiological ecology of reptiles and biology of tropical African reptiles, died in London on 24 July 1991 of an inoperable brain tumor. Jerry was born 31 December 1944 in Croydon, England, and his interest in reptiles began at a young age, as shown by his well-thumbed and annotated copy of Malcolm Smith's "The British Amphibians and Reptiles" that is dated 1957. He graduated with honors in zoology from St. Catherine's College, Cambridge, in 1967 and earned both a masters and doctorate in medical parasitology at the School of Hygiene and Tropical Medicine, University of London, the latter degree completed under the supervision of D. S. Bertram. His thesis results, on the influence of juvenile hormone mimics on metamorphosis and fertility in mosquitoes, were published in a long series of papers in *Journal of Insect Physiology*.

But Jerry's real passion was herpetology, to which he returned in 1974 while on a postdoctoral fellowship with



Peter Davies at University of Nottingham. This collaborative work led to a large number of papers on the thermal biology of lizards, most notably a paper on thermal acclimation in temperate lizards in the British journal *Nature* (1978).

In 1977 Jerry emigrated to Southern Africa where he spent the rest of his scientific career, first at the University of Zambia, later at University of Malawi and finally, in 1989, to the University of Zimbabwe in Harare. Initially, his work in Africa dealt with thermal adaptations in reptiles, but he later shifted to ecological energetics, faunal studies, and general natural history.

Jerry's work was becoming widely recognized at the time of his premature death. He presented an invited paper on glycogen and lipid cycles in lizards at the First World Congress of Herpetology in Canterbury, England, in 1989, and the many biologists who met him there will remember the high standard of his work and his collegiality. We greatly mourn his loss.—Kraig Adler.

NEWSNOTES

Declining Amphibian Populations Program: California–Nevada Working Group

The California/Nevada Working Group met for the first time at Point Reyes National Seashore on 4 February 1992. The group was chaired by Gary M. Fellers and included fourteen representatives from the National Park Service, U.S. Forest Service, University of Nevada–Las Vegas, St. Mary's College, University of California–Davis, University of California–Los Angeles, California Academy of Sciences, California Department of Fish and Game, and the U.S. Fish and Wildlife Service.

James Vial gave an overview of the Declining Amphibian Populations program (under the auspices of the IUCN/SSC).

Each member of the working group provided a short summary of their research relating to amphibians. Most of the summaries provided compelling evidence for dramatic declines in amphibian populations throughout all or part of a species' range. Though some of the losses were from obvious causes (e.g., habitat loss), there were numerous cases where declines had occurred for no clear reason. David Bradford presented strong evidence that acid precipitation was not the cause of the declines, though it might be acting in concert with other environmental stresses.

The status of the Smithsonian handbook (for monitoring amphibian populations) was discussed at some length. Further discussions centered on the need to gather data that are comparable across various studies. A data form used by the USFWS was examined in detail with the goal of determining the minimum amount of data that should be collected as part of any amphibian field study. A proposed minimum standard will be developed by the working group and a sample form will be made available to the community of amphibian field biologists.

GARY M. FELLERS
Point Reyes National Seashore
Point Reyes, California 94956, USA.



Collections Transferred To The California Academy Of Sciences

The Department of Herpetology, California Academy of Sciences, recently acquired parts or all of the following herpetological collections: California State Department of Fish and Game (CDFG); University of California at Riverside (UCR); University of Houston (UH); University of Montana, Missoula (UMM); and a series of *Sauromalus* from Portland State University (PSU).

A total of 2,411 specimens have been catalogued (see table below). Noteworthy collections consist of: 225 specimens from Bulgaria; 608 *Anolis* from Antigua, Dominica, Nevis, Saint Croix, Saint John, and Saint Martin; 116 *Crotalus* from the western United States, and 153 specimens from California's Central Valley.

	Salamanders	Frogs	Lizards	Snakes
CDFG	61	26	17	130
PSU	–	–	484	–
UCR	10	7	661	–
UH	4	808	4	139
UMM	9	42	1	8

The CAS herpetological collections are completely computerized. We welcome reasonable requests for information about our holdings. For further information on these collections or other material in the Department, please contact Jens V. Vindum, Collection Manager, Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118-4599, USA, telephone (415) 750-7037.

Manuscripts Solicited

The Society for Northwestern Vertebrate Biology (SNVB) is an association of biologists studying amphibians, reptiles, birds, and mammals in northwestern North America. *Northwestern Naturalist*, formerly *Murrelet*, is published triannually by Allen Press; recent volumes have totalled over 100 pages annually. The *Northwestern Naturalist* welcomes original contributions dealing with the biology of birds, amphibians, reptiles, and mammals in the region defined as Alaska, Yukon, District of MacKenzie, British Columbia, Alberta, Saskatchewan, Washington, Oregon, Idaho, Utah, Montana, Wyoming and Colorado west of the Great Plains; and Nevada and California north of the Mojave Desert. Manuscripts may be submitted as feature articles or general notes. All manuscripts are peer-reviewed. The journal strives for high standards and consequently has a significant rate of rejection. There has been a dearth of herpetological manuscripts, so this announcement is a reminder to those working in the Northwest that *Northwestern Naturalist* is a quality outlet with a moderately fast turn-around time. Manuscripts or requests for instructions for contributors should be directed to the Editor:

Stephen Corn
Editor, *Northwestern Naturalist*
U.S. Fish and Wildlife Service
4512 McMurry Avenue
Fort Collins, Colorado 80525-3400, USA.

Nixon Griffis Fund For Zoological Research— 1991 Grant Recipients

The Nixon Griffis Fund for Zoological Research (NGFZR), established in 1984 by New York Zoological Society Trustee Nixon Griffis, awarded six research grants on 10 December 1991. Three of the awards involved research on herpetological subjects, as follows:

Julian Duval, Indianapolis City Zoo, Scott Davis, and Edward Louis, Jr., Texas A&M University — "Subspecies Identification of the Grand Cayman Iguana (*Cyclura nubila lewisi*)."

Gary Ferguson, Texas Christian University, Richard Hudson and Stephen Hammack, Ft. Worth Zoological Park — "Effects of Varying Vitamin/Mineral Supplementation on the Growth, Adult Size, and Reproduction of the Panther Chameleon, *Fucifer (Chamaeleo) pardalis*."

James Jacobson, University of Houston, Joseph Flanagan, Denton A. Cooley Animal Hospital, Houston Zoo, and Stanley Mays, Houston Zoo — "Determining Sperm Retention and Parentage of African Spurred Tortoises (*Geochelone sulcata*), Using DNA Fingerprinting."

Nixon Griffis Fund for Zoological Research grants are available to members of the zoo and aquarium community. Fund recipients may be keepers, curators, veterinarians, or research and consulting biologists. Grants, not to exceed $3000, are awarded semi-annually. Closing periods are January 1st and July 1st. For information about the Fund and grant application procedures, contact John Behler, Coordinator, Nixon Griffis Fund for Zoological Research, c/o New York Zoological Society, Bronx Zoo, Bronx, New York 10460, USA.

Call For Student Proposals

The Gopher Tortoise Council is seeking proposals from undergraduate and graduate students who are planning or actively conducting research on the gopher tortoise (*Gopherus polyphemus*). Proposals that undertake pertinent research on upland habitats within the range of the gopher tortoise will also be considered. A maximum of $400 is available.

Proposals should be no more than four typed, double-spaced pages and should include a description and justification for the research, a budget indicating how the money will be spent, and a brief biographical sketch. Deadline for receipt of the proposal is 31 August 1992.

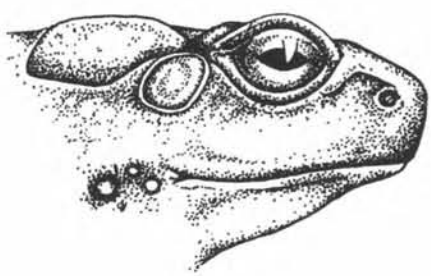
Proposals should be submitted to:

Dr. Bob Herrington
Student Awards Coordinator
Department of Biology
Georgia Southwestern College
Americus, Georgia 31709, USA.

Researchers' Paradise!

There has never been a greater need to study and preserve tropical ecosystems and their inhabitants than the present. Cano Palma Biological Station, located on the Caribbean coast of Costa Rica, is situated in a biological corridor between two national wildlife preserves. This virtually unstudied habitat, combined with that in adjacent Nicaragua, constitutes the largest tract of lowland tropical rainforest outside the Amazon basin. Wildlife census studies in the region document more than 100 species of reptiles and amphibians to date and much is unstudied. The station is located on ca. 750 acres bordered on two sides by rivers and on the remaining sides by rainforest. There is accommodation in dormitory style facilities for 12 people at a time with showers and toilet facilities available, plenty of potable water, and kerosene illumination. Electricity will installed in early 1992, along with a back-up generator. Cano Palma station is accessible only by river boat or small plane. It is administered by a non-profit group which accepts inquiries:

Canadian Organization for Tropical Education
and Rainforest Conservation (COTERC)
P.O. Box 335
Pickering, Ontario
Canada L1V 2R6
Tel. (416) 683-2116
Fax: (416) 427-1828.



MEETINGS

Second World Congress Of Herpetology

The Second World Congress of Herpetology will be held 29 December 1993 to 6 January 1994 in Adelaide, Australia. The Congress organizers would appreciate the timely return of the Provisional Registration Form from those persons planning to attend. Bookings for accommodations and possible arrangements for charter flights require accurate estimates of attendance. Those who have not received the pre-registration form but wish to do so should contact the Congress Director:

Michael J. Tyler
University of Adelaide
Department of Zoology
Box 498 GPO
Adelaide, South Australia 5001
Australia.

ASC Annual Meeting

The Association of Systematics Collections will hold its 1992 Annual Meeting in conjunction with the American Institute of Biological Sciences on 9-11 August 1992, in Honolulu, Hawaii. Featured events will be a workshop on "Data Sharing and Database Ethics," an informational session on "Systematics Agenda 2000" (the effort to determine research needs and priorities in systematics), and a discussion of the role of vice presidents for research at natural history institutions. A business meeting and discussion of NSF programs will be held on August 9th. For program information, contact:

ASC
730 11th St NW, 2nd Floor
Washington, DC 20001, USA
Tel: (202) 347-2850.

Organization Of A Symposium On The Conservation Of Florida Turtles

The Gopher Tortoise Council is requesting input from interested parties on the organization of a "Symposium on the Conservation of Florida Turtles." Over the last few years, several turtle biologists and conservationists have discussed the need for and possibilities of such a meeting. Interest in this subject has been expressed by conservation organizations, the environmental education community, and outdoor and environmental reporters/writers. The main intent would be to bring these groups together for the benefit of Florida turtle conservation. Persons interested in participating in such a meeting or wanting to exchange ideas should contact:

George Heinrich
Gopher Tortoise Council
P.O. Box 61301
St. Petersburg, Florida 33784-1301, USA.

AAZPA Herp Advisory Group Meeting

The Mid-Year Meeting of the American Association of Zoological Parks and Aquariums (AAZPA) Herpetological Advisory Groups will be hosted by the St. Louis Zoo, 21 - 23 June 1992. Anyone interested in additional information should contact:

Ron Goellner
Chairman, SSAR Zoo Liaison Committee
St. Louis Zoo
Forest Park
St. Louis, Missouri 63110, USA
Tel. (314) 781-0900
FAX: (314) 647-7969.



REGIONAL SOCIETIES

German Journal *Sauria* Now in English

Among terrarium-keepers, *Sauria* is known for its high quality and useful information. This German journal is published by the Society Terrariengemeinschaft Berlin. It is now produced in an English version, *Sauria (E).*

The first volume contains 176 pages (four issues + supplement), and costs $38.00 US. Subscription can be made to the following address:

HERPRINT INTERNATIONAL
P.O. Box 14117
Bredall 1623
R.S.A., South Africa.

Subscriptions to the German version are available for $22.00 US or DM 34.00 from:

TGB-Sauria
Peter Grossmann
Lepsiusstr. 53
D(W) - 1000 Berlin 41
Germany.

New Regional Societies

Please make note of the following new regional herpetological societies:

Chihuahuan Desert Herpetological Society
c/o Paul Hyder
Department of Biology
New Mexico State University
Las Cruces, New Mexico 88003 USA.

Utah Association of Herpetologists
195 West 200 North
Logan, Utah 84321-3905, USA.

San Joaquin Herpetological Society
P.O. Box 1104
Clovis, California 93612-1104, USA.

In addition, please note address or structural changes in the following groups:

California Turtle & Tortoise Club
P.O. Box 7300
Van Nuys, California 91409-7300, USA.

Oklahoma Herpetological Society
Oklahoma City Chapter
Oklahoma City Zoo
2101 NE 50th
Oklahoma City, Oklahoma 73111, USA.

Oklahoma Herpetological Society
Tulsa Chapter
5701 East 36th Street North
Tulsa, Oklahoma 74115, USA.

The Dallas Herpetological Society is no longer extant.

Regional society officers are encouraged to submit address changes to the SSAR Regional Society Section Editor (see inside front cover of HR) and new societies are invited to announce their existence in this column. Established groups are also invited to submit short descriptive articles about their societies for publication in this column.



ARTICLES

Criddle's Riddle: Where Do Young Garter Snakes Hibernate?

Studies of northern populations of garter snakes (*Thamnophis* spp.) indicate that parturition occurs away from communal dens, and that the majority of neonates (and yearlings) spend their first few winters hibernating in sites other than those used by adults (Gregory 1977, Larsen and Gregory 1989, MacMillan 1988). Exactly where overwintering of neonates occurs is unknown, although some clues are available. In 1937, Stuart Criddle published a short note describing the presence of 257 small snakes (*Thamnophis radix*, *Storeria occipitomaculata*, and *Opheodrys vernalis*) in an active mound of the ground-nesting ant genus *Formica*. Garter snakes and other reptiles and amphibians hibernating in ant mounds have also been reported by Carpenter (1953), Sharplin (1966), Lang (1971), and Roberts (pers. comm.).

If neonatal and juvenile garter snakes are able to rely on ant mounds as hibernacula, it would account for their absence from adult denning populations. In at least two ways, ant mounds seem to represent optimal hibernacula. Mounds of ground-nesting ant species are ubiquitous throughout the range of northern snakes, thus minimizing the distance snakes would have to travel to secure suitable hibernacula (distances between summer habitat and adult hibernacula may be quite extensive; Gregory and Stewart 1975, Larsen 1987). Further, northern ant colonies that persist over winter probably possess a mound that provides protection from sub-zero temperatures, as to our knowledge, freeze tolerance in ants has not been documented.

Given the abundance of ant mounds present in or near snake habitat, searching for hibernating snakes via haphazard excavation of mounds would be destructive, and quite possibly fruitless. Current technology does not permit radio-tracking of animals the size of neonatal or juvenile garter snakes. Hence, investigation into the relationship between overwintering snakes and ant mounds must come from fortuitous observations or experimental manipulation. Herein we report the results of a preliminary experimental study on the use of ant mounds as hibernacula by neonatal snakes. Our goal was to examine the overwinter survivorship of neonatal snakes in active ant mounds relative to those in subterranean pits of rock fragments. Although our results are not conclusive, we present our method for study, and the results thereof, in the hope that they will provide a basis for future investigations.

Ant mounds were established by excavating queenright colonies of *Formica fusca* in the field during mid-September (1988) and transporting them in 20-litre buckets to enclosures in a previously cultivated field at the University of Alberta farm (Edmonton, Alberta). The enclosures (1.55 m long by 0.6 m wide by 0.25 m high) were constructed using plywood (implanted ca. 5 cm in the ground) that was smeared on the inside upper 5 cm with petroleum jelly to prevent ants from emigrating (Hölldobler and Wilson 1990). One colony was established in each enclosure by digging a hole to approximate the depth and diameter of the transplant mound, and placing the original mound (soil and ants) in that excavation. We observed that the ants in all 15 enclosures reconstructed their mounds, and within two weeks of transplantation the "new" mounds appeared typical of those seen in natural settings. All 15 colonies survived the first winter, and throughout the ensuing spring and summer, the colonies were fed approximately 5 g of an ant diet (Bhatkar and Whitcomb 1970) and one *Tenebrio molitor* larva every three days. Seven of the 15 mounds became inactive during the summer (subsequently referred to as "failed" mounds), and three of those mounds were tunneled into by voles (*Clethrionomys* sp.). Prior to fall, Green Cross™ Ant Killer was administered to the active colonies in an attempt to extirpate those colonies. However, that protocol proved unsuccessful in extirpating ants from active mounds. Three of the seven "failed" mounds were excavated, and the soil replaced with an assortment of rock, brick and concrete fragments to a depth of 50 cm. Approximately 10 cm of soil was placed over each of those "rubble hibernacula." Soil was also repacked along the enclosure bottoms, particularly in areas subjected

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to vole tunneling. Thus, three replicates of three potential hibernaculum "types" were available for overwintering by immature snakes: active ant mounds, vole-tunneled mounds (without ants), and rubble hibernacula. Thermocouple probes (Macartney et al. 1989) were implanted into one replicate of each of the three hibernaculum types and wire screen was placed over the enclosures to exclude avian predators.

Neonatal garter snakes were obtained by collecting gravid females and allowing them to give birth in captivity. Prior to their introduction into the enclosures, the neonates were kept outdoors in a terrarium (exposed to seasonal temperature and photoperiod), given *ad libitum* access to diced earthworms (*Lumbricus terrestris*), and marked individually using indelible felt pens. On 28 September 1989, groups of 13 (two enclosures) or 11 (one enclosure) neonatal snakes were placed into three enclosures of each of the three hibernaculum types. During the next two days we observed the neonates investigating, entering, and emerging from the ant mound and rubble hibernacula. We witnessed individual snakes being attacked by small numbers of ants in the active ant mound condition; however, live snakes were observed protruding from the tunnels of the active ant mounds during that period. By 30 September, sub-zero air temperatures (°C) prevailed, and thereafter snakes were not observed. No evidence of vole-tunneling under any of the enclosure walls was observed prior to the first snow fall. Ambient air temperatures and sub-surface probe temperatures were recorded once a week throughout the winter.

By spring 1990, we became aware of two potential problems: i) inadequate drainage and drifting snow resulted in meltwater accumulation in several enclosures, and ii) during winter, voles continued to tunnel under enclosures, thus allowing snakes to move between or exit the enclosures altogether after emergence. The latter problem, coupled with our inability to continually monitor the enclosures during spring, rendered it impossible to ascertain the number of snakes emerging from each hibernaculum type. Only six of the 111 snakes originally introduced to the enclosures were recovered. Those six animals were apparently killed and were partially devoured by ants upon emergence. However, the markings on five of the snakes were still discernable. All of those snakes had presumably overwintered in ant mounds, with four of the five identifiable snakes overwintering in mounds which had been subjected to vole tunneling, and the fifth overwintering in an active ant mound. Temperature profiles did not differ among the three hibernaculum types as a maximum difference of 2°C (equivalent to measurement error) was recorded within depths over all readings. Our temperature records indicated that sub-zero temperatures were experienced no deeper than 51 cm below ground surface in all three of the hibernaculum types, so presumably the animals overwintered below that depth in vole-tunneled ant mounds or the active ant mound. Successful overwintering in rubble hibernacula would have been unlikely since those excavations extended only 50 cm below the surface, although garter snakes have been shown to tolerate short-term exposure to freezing temperatures (Costanzo 1988, Costanzo et al. 1988).

Despite the poor recovery of snakes, we find our results encouraging in that they provide evidence that neonatal snakes can survive overwinter in ant mounds, despite the somewhat unnatural conditions of our study. Given that observation, it would seem logical that natural mounds would afford safe hibernacula. Whether or not mounds with extinct ant populations are preferred to active mounds is unclear as snakes and frogs have been excavated from both active and inactive mounds (Carpenter 1953, Criddle 1937, Noble and Clausen 1936, Roberts pers. comm., Sharplin 1966). Further, work by Costanzo (1986, 1989) has indicated that successful overwintering by garter snakes is facilitated by partial or even total submergence in water. The deepest chambers in ant mounds may coincide with the water table, allowing snakes to avoid desiccation. Indeed, Criddle (1937) observed that some of the hibernating snakes he excavated had positioned themselves in standing water.

We believe more definitive results could be obtained by i) placing the artificial enclosures on a south-facing slope, thereby maximizing exposure to the sun in spring and ensuring adequate drainage, ii) preventing microtine rodent invasion of the enclosures by constructing a more effective barrier, iii) initiating more intensive ant extirpation at an earlier date, and iv) monitoring the enclosures regularly during the spring emergence period. We hope researchers will be encouraged to conduct further experiments of this nature, thereby increasing our knowledge of the life-history of neonatal snakes.

Acknowledgments.—Funding for this study was provided by a University of Alberta Central Research Fund grant and Natural Science and Engineering Research Council of Canada post-graduate scholarships to KWL and JFH. We thank E. R. Hare for caring for the ant colonies during the summer of 1989, and D. Farr, P. T. Gregory, W. R. Roberts, and J. O. Murie for providing comments on an earlier manuscript. M. A. Price and T. Macdonald facilitated access to the University's experimental farm. We also thank B. Letcher and W. J. Gallin for supplies, J. P. Costanzo for valuable input, and C. L. James, E. R. Hare, F. S. Chia, C. R. James, R. E. Peter, R. A. Ring, and B. L. Scarfe for support throughout this study. We are indebted to our respective supervisors, Stan Boutin and Jan O. Murie, for supporting this brief herpetological/entomological excursion outside the realms of our mammalogical dissertations.

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Ithaca, New York 14853-2702, USA.

Abronia chiszari (Reptilia, Anguidae), A Second Specimen From The "Los Tuxtlas" Region, Veracruz, México

Two species of *Abronia* have been reported from the "Los Tuxtlas" region of Veracruz: *A. reidi* Werler and Shannon and *A. chiszari* Smith and Smith (Pérez-Higareda et al. 1987). *Abronia reidi* is known from two specimens collected in the cloud forest at the rim of Volcan San Martín (Werler and Shannon 1961). *Abronia chiszari* was described from a single juvenile specimen collected on the rear bumper of a car in low cloud forest near Cuetzalapan, in the Santa Marta volcanic range (Smith and Smith 1981). Because *A. chiszari* is very similar to *A. bogerti* it has been suggested that *A. chiszari* could be conspecific with *A. bogerti* except for their difference in distribution and habitat (Good 1988; Smith and Smith 1981). The purpose of this note is to validate *A. chiszari* and provide morphological and ecological information on an additional individual.

The specimen reported here was collected on 4 June 1986, just after it fell onto the windshield of a moving truck, in the transition between tropical rain forest and cloud forest (Benabib and Congdon, in press) in Bastonal, Santa Marta volcanic range, Municipality of Catemaco, Veracruz, ca. 800 m elevation. On 17 July one of us (RCV) returned to the site and climbed 20 m into a large *Ulmus mexicanus*. Two other *Abronia* were seen at about 10 and 18 m, but were not captured. The general habitat where the specimen was collected was similar to that described by Smith and Smith (1981) for the holotype. Our specimen, a mature male, has a SVL of 74.4 mm, a tail length of 115 mm (tail tip regenerated), a head width of 9.7 mm, and weighed 5.25 g in life. The specimen is deposited in the Herpetological Collection at the Biological Station of Los Tuxtlas (UNAM-LT 3151).

Table 1. Selected characters of *A. chiszari* (data from Smith and Smith 1981), compared with *A. bogerti* (data from Tihen 1954), its closest relative.

Characters	*bogerti* (holotype)	*chiszari* (holotype)	*chiszari* (UNAM-LT 3151)
Transverse rows of dorsal scales	41	41	46
Longitudinal dorsal scale rows	14	16	15-16
Scales on nape region fewer than	8	7	8
Anterior temporals	2	3-3	3-3
Anterior internasals	2	2	2
Supraoculars	5-3,5-4	5-3	5-3
Supralabials	9-10	9-9	9-9
Infralabials	?	8-8	9-9
Scale whorls on tail	105	?	99*
Dark bands on body	10-11	11	11
Bands on tail	?	?	14-15

*regenerated tail

This specimen resembles the holotype illustrated by Smith and Smith (1981), and all of the diagnostic characters agree with those given in the type description. A comparison of characters between the holotype specimens of *A. chiszari* and *A. bogerti* and the specimen reported here are given in Table 1.

Smith and Smith (1981) discussed the similarity of *A. chiszari* to *A. bogerti* in several characters. Our specimen possesses characters that clearly separate it from *A. bogerti*. For example, our specimen of *A. chiszari* has the cantholoreal separated from the frontonasal by contact of the prefrontal and canthal, and the upper two primary temporals are relatively smaller than those of *A. bogerti*, as predicted by Smith and Smith (1981, p. 54). Also, the specimen from Los Tuxtlas has prefrontal-anterior superciliary contact on both sides, a characteristic that could be diagnostic of the species (Good 1988). The number of longitudinal dorsal scale rows and scale whorls on tail may be other differences (see Table 1). Besides the dark bands on body and tail, the ventral surface is white with small dark marks, the ventral surface of the head is immaculate, and

the dorsal head scales are gray with dark edges. Although this pattern is similar to that of *A. bogerti*, our specimen is an adult; we do not know if the coloration in the juvenile *A. chiszari* is different. Other characters are similar to *A. bogerti* as discussed by Smith and Smith (1981) and Good (1988).

In the context of other *Abronia* species *A. chiszari* seems to be a good member of the *deppii* species group as defined by Good (1988). The characters that clearly separate *A. chiszari* from other *Abronia* species are the higher count on transverse dorsal scale rows, 41 and 46 in the two known specimens, and the prefrontal-anterior superciliary contact. The habitat where *A. chiszari* occurs also is very atypical for a member of the genus (see below).

All known *Abronia* species are allopatric (Good and Schwenk 1985), and are associated with pine-oak and cloud forest communities. It is not surprising to find two species of the genus within the Los Tuxtlas region, one at San Martín and the other on Santa Marta. Although the two localities are only 20 km apart, they are separated by low elevations and different vegetation structure. Smith and Smith (1981) also discussed the possible distribution of *A. chiszari* within the Sierra de Los Tuxtlas. We do not believe that this species ranges beyond the Sierra de Santa Marta, where the transition between tropical rain forest and cloud forest seems to be restricted to lower elevations; further, rainfall is higher than in other localities (>8000 mm/yr, Benabib and Congdon, in press) within the Los Tuxtlas range. We are convinced that there is a complete segregation of both species of *Abronia* in the Sierra de Los Tuxtlas. Other differences exist in the herpetofauna at the two localities. For instance, each range has distinct and different species of the genera *Lepidophyma*, *Sibon*, and *Eleutherodactylus*.

Acknowledgments.—We are grateful to Santiago Sinaca for collecting the specimen and climbing into the canopy looking for others, and to Gonzalo Pérez-Higareda for providing the catalog number of the specimen discussed here. The corrections and recommendations of David Good, C. J. McCoy, and an anonymous reviewer are much appreciated.

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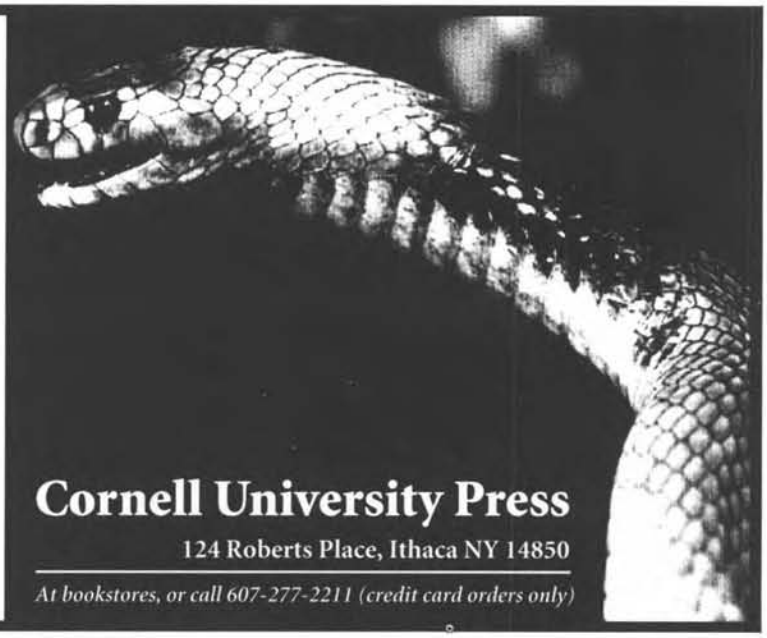
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POINTS OF VIEW

The Evolutionary Species Concept: A Reply To Van Devender et al. And Montanucci

Van Devender et al. (1992) and Montanucci (1992) have criticized my recent article (Collins 1991) in which I use the Evolutionary Species Concept (ESC) to define 55 allopatric, differentiated subspecies as species. I here rebut those criticisms.

VAN DEVENDER ET AL.

Van Devender et al. (1992), in their opening paragraph, state that "apparently field or museum specimens were not examined [by me] and [my recommended] changes were based on distribution maps and current subspecific status." Use of the word "apparently" in that statement is an attempt to bias readers into thinking that it was somehow necessary for me to examine field or museum specimens. In fact, the 55 subspecies in my list were already diagnosed (based on field and museum specimens) in their original descriptions and most had been accepted as legitimate taxa for many years—if they had not been so diagnosed, they would not be recognized at all. In addition, I determined from the best available published maps that they were also allopatric, and I chose the conservative interpretation that they were historically independent lineages (= species), not the radical and imparsimonious conclusion that they were "conspecific" (in the non-historical sense of Ernst Mayr) with other allopatric, distinctive, and historically isolated populations. My elevation of the 55 taxa to specific status was not arbitrary; my criteria were clearly stated. Further, my list was logical because all taxa on that list fulfilled the requirements for specific status using the Evolutionary Species Concept (as proposed and defined by Wiley 1978). In other words, each was (according to published sources) allopatric, each was (according to published sources) distinct (morphologically and/or genetically), and, without resorting to unwarranted assumptions, each was assumed to have its own evolutionary fate. A taxon on my list would have been ineligible for consideration only if the original description was flawed (i.e., based on errors), or if there were unpublished distributional data that showed the nominal taxon to intergrade smoothly with a nearby population. I accept no responsibility for being unaware of unpublished distributional data, but I suspect that the distributional gaps separating the 55 allopatric populations from their presumptive nearest relatives are real, and not an artifact of collecting. Further, if the original diagnoses of some of the taxa on my list are shown to be wrong, then they should not have been recognized (as subspecies or anything else) in the first place.

Van Devender et al. (1992) contend that it is incorrect to elevate to species status *Coluber mormon* because of evidence presented by Greene (1984) and Corn and Bury (1986). Frankly, I think this is an open question. I reject the taxonomic conclusions of Greene (1984) because of the small sample sizes for each of his isolated populations. Corn and Bury (1986) described an isolated, distinct population of *Coluber* in western Colorado and adjacent Utah, using a sample of only 11 specimens. Because this isolated population is located between the ranges of *mormon* and *flaviventris*, they assumed that *mormon* did not deserve specific status and that *Coluber constrictor* was, therefore, a single transcontinental species. I disagree and feel, based on their data, that the isolated population in western Colorado and adjacent Utah is likely a distinct species, a conservative conclusion rather than the radical one by Corn and Bury (1986) which assumes a relationship with other morphologically different, genetically isolated populations.

Van Devender et al. (1992) disagree with my recognition of *Tantilla cucullata* and *T. diabola* as species. They cite Degenhardt et al. (1976) as evidence that *cucullata* and *diabola* are the same species, but fail to note that those authors stated (p. 233) that in the western (Big Bend) populations (*cucullata*) the "white neck-ring is broken at the dorsal midline in all [specimens]" whereas in the Devil's River (eastern) populations (*diabola*) the "white neck-ring is continuous across the middorsal line." The neck-ring character shows no overlap among the two taxa, and thus, Degenhardt et al. (1976) made a very strong case for specific recognition of *Tantilla diabola* and *T. cucullata*. Van Devender et al. ask "would the Big Bend population with characters of both *cucullata* and *diabola* warrant full species status?" Probably not, but since *T. diabola* populations are the only ones with continuous neck-rings and do not share that character with *T. cucullata*, the question is irrelevant. Apparently *diabola* and *cucullata* are 100 per cent different based on the data presented by Degenhardt et al. (1976). Recognizing both populations at the specific level is certainly the most conservative conclusion based on evidence. Van Devender et al. assume that *diabola* and *cucullata* are conspecific; that conclusion is unscientific, because it does not rest on either distributional or phylogenetic evidence.

Van Devender et al. (1992) next discuss *Lampropeltis alterna*, although it is irrelevant to my article because it did not qualify for my list. They ask whether "'species' revert to 'subspecies' when intermediate specimens are found in intervening areas." My answer is: The recognition of taxa stems from evidence; if evidence is augmented or corrected, sometimes conclusions have to change. Since this is a discovery process (something I think Van Devender et al. would agree with) rather than invention, I don't really know whether to take their question seriously. However, just filling in a distributional hiatus does not ensure that two populations are conspecific. Also, to set the record straight, Collins (1990) did *not* follow Garstka (1982) in elevating *L. alterna* to specific status, as stated by Van Devender et al. That taxonomic change was accomplished by the vote of a group of snake systematists (see Collins 1990: p. 2).

Van Devender et al. (1992) disagree that *Lampropeltis pyromelana infralabialis* should be given specific status. Inclusion of this nominal taxon in my list of 55 species was based on the assumption that it was diagnosable and determined to be distinct. But apparently Van Devender et al. feel the characters which are the basis for recognizing it are suspect. I have no argument with this, because they have greater familiarity than I with this population. If the characters that supposedly distinguish *L. p. infralabialis* are not diagnostic, then its evidential support is flawed and it does not deserve even subspecific status. The same holds true for all other subspecies, not just those of *L. pyromelana*. Van Devender et al. are impressed that *L. pyromelana* north of the Grand Canyon differs so little after (minimally) 10,000 years of isolation. So am I,

and I recommend that it not be recognized as a subspecies, but instead just for what it really is, an undifferentiated northern population of the wide-ranging species *L. pyromelana*. Van Devender et al. also state that "strangely, according to these authors [Collins 1991; Frost and Hillis 1990], subspecies are apparently not included in biodiversity." While I never made that statement, it is definitely true. I have never seen a published work on biodiversity that equates species with subspecies, and for that reason the number of real species in the subspecies-heavy North American herpetofauna has been woefully underestimated.

Van Devender et al. (1992) disagree that the various races of *Lampropeltis zonata* should be given specific status, yet they provide no evidence that these populations are conspecific by any definition, nor do they demonstrate with proof that they are all even each other's closest relatives. They do cite as evidence a single "intergrade" specimen from an intermediate mountain range, a specimen that could just as easily be called a relictual hybrid between two distinct species. A single hybrid specimen is very weak proof of close relationship, so provided the differentiation is not a statistical artifact, these various populations of *L. zonata* are clearly independent evolutionary lineages (= species). If the interpopulational differences, however, are only artifacts of sampling, then none of the populations should be recognized at any level—they would then simply represent undifferentiated populations of a single species, *L. zonata*. The statements on past isolation and glacial patterns by Van Devender et al., while interesting, have no bearing on the evolutionary fate of *L. multifasciata, L. parvirubra,* and *L. pulchra* (or necessarily on their past; the estimates by Van Devender et al. for last interpopulational interchange are necessarily restricted to the last time they *could* have exchanged genes). Each is apparently a distinct, allopatric population, and they deserve recognition as evolutionary entities. Any other taxonomic arrangement would be unscientific, since its conclusions would be based on assumptions about an unproven past and an unknown future, conclusions that could be obtained with similar accuracy by reading tea leaves.

Van Devender et al. (1992) state that "Hundreds, if not thousands, of isolated, slightly and clearly differentiated populations in woodlands and forests on southwestern mountaintops have *not* been described as subspecies or plant varieties." They then inexplicably leap to the unwarranted conclusion that "Under the Phylogenetic Species Concept (PSC)... where species are defined on the basis of monophyletic lineages, isolated populations with any discernible differences whatever are species ..." Aside from the fact that I did not utilize the PSC (nor the outdated biological species concept) in preparing my list, I would point out that their conclusion is faulty because they neglect to mention that all phylogenetic approaches require allopatric, isolated, montane populations to have fixed, or nearly fixed characteristics (i.e., those that are historically informative) before they would be recognized.

Van Devender et al. (1992) discuss *Crotalus lepidus*, although it is irrelevant to my article because it did not qualify for my list. They correctly point out the tremendous variability exhibited by two races (*klauberi* and *lepidus*) of this snake and indicate this raises the question of whether those two subspecies should be combined (as one race). But again, they inexplicably leap to the unwarranted conclusion that under the ESC the "two variable subspecies of *C. lepidus* would be immediately divided into 20 or 30 species with greater geographic than genetic differences!" Their conclusion is specious, because they again neglect to recognize that I require that taxa show differentiation at an historically informative (fixed, or nearly fixed) level. Obviously, few if any of the "complex mosaic of modestly differentiated populations [of *Crotalus lepidus*] in various habitats, rock types, and elevations" would qualify for recognition at any level. Of more interest is the contention by Van Devender et al. that "most of the populations [of *Crotalus lepidus*] have undoubtedly only been isolated 9000 years or less and *are likely to be reconnected in the future*" (italics are mine). This statement exposes major biases in approach by Van Devender et al., because they assume that most populations of this rattlesnake were connected in the past and will be connected in the future, but they have no evidence to support either assumption. Again, prognostications on the future (and guesses about the past) make for interesting speculation, but are hardly the stuff of objective classifications, and thus are irrelevant. If Van Devender et al. "guess" right, I'm sure that herpetologists of the future will be glad to change their classifications right along with the snakes.

Much of the rest of the paper by Van Devender et al. (1992) discusses various topics—cladistics, phylogenetic systematics, fossil record, biogeography, adaptive responses to geologic events, Pleistocene climates, the age of taxa, evolution through geologic time using as examples numerous taxa that I did not address in my list—but these topics are irrelevant to my list. For example, they state that "subspecies in widespread continental species are more likely to be millions of years old than to have formed in response to the most recent glacial/interglacial climatic cycles," even though they have no hard evidence of this to use in evaluating my list, and even though it has no bearing on classification using the ESC. Actually, it matters not one whit whether a taxon differentiated 10 million years ago or 10,000 years ago; if it is allopatric and diagnosable, it has its own evolutionary fate, and using the ESC, it is a good species. This is a conservative classification, and one that does not brook the abuses of the radical subspecific assignments that occurred during the middle part of this century. Van Devender et al. state that "Barring other information, [*Drymarchon*] *erebennus* could be the living ancestor of [*Drymarchon*] *couperi*." On the contrary, there is no reason to suppose that *couperi* might not be primitive in many ways with respect to *erebennus*—to do so assumes a model of "centrifugal" isolation and differentiation that is hardly supported by historical analyses. But whatever taxon is the presumed nearest living relative, that relationship has no bearing on the specific status of the allopatric *Drymarchon couperi*, any more than between less controversial species pairs like *Bufo retiformis* and *B. debilis*.

Van Devender et al. (1992) state that "The subspecies concept has been very useful in describing patterns of variation within species." I agree that it has been useful in describing variation, but it has also been so abused and twisted over the last 75 years to create so many unnatural relationships in herpetology that it is worthless as a scientific tool and its use is now restricted almost entirely to herpetoculturists who wish to discuss organismal pattern-classes rather than historical entities. Assignment of subspecific names to distinctive allopatric populations is pretty radical taxonomy, at least in an age when a salamander once thought to be a single wide-ranging species can be shown, conservatively, to comprise 13

genetically distinct species (Highton et al. 1989). Van Devender et al. again completely misinterpret the use of the ESC when they state that "*Lampropeltis* would change from a genus with six species with various numbers of subspecies to over 50 species." Even the most casual reading of my article and that of Frost and Hillis (1990) would reveal that the ESC requires much more objectivity and rigor in studies of historical analysis and geographic variation than has ever been applied to that poorly understood genus in the past.

Van Devender et al. (1992) conclude with some statements such as "The new 'species' proposed by Collins reflect a methodology that cannot separate subspecies from species." To the contrary, the ESC can indeed define the difference (Van Devender et al. just don't like the results), and my article reveals a lot of ill-defined subspecies and either replaces them with a list of properly and rigorously defined species, or shows them to be invalid at any level. Put simply, the ESC just defines species differently and conservatively (using evidence instead of assumption). Finally, Van Devender et al. conclude that "a thorough analysis of a taxon with documented evidence should precede any proposed taxonomic change." This statement apparently calls into question the original descriptions of all the taxa on my list. I correctly assumed such an analysis was already done for each of those taxa, otherwise none of them would qualify for recognition at any level. So I encourage readers to not bother with *another* data analysis, just go back and read the original descriptions. If you do so, it will be obvious that you are dealing either with a distinct species or with a population that does not deserve recognition at any level.

Montanucci

Montanucci (1992) states that "the subspecies concept has been abused, that cases of character discordance, polytypic characters, and smooth clinal variation have limited its application . . . and that some subspecies are, in fact, good 'biological' or evolutionary species." Unfortunately, the now outdated biological species concept has nothing to do with the ESC, the latter of which was used to prepare my list of 55 taxa. Thus I reject that linkage by Montanucci, but certainly agree with the rest of his statement. However, he goes on to say that "These variational patterns, in most cases, lend themselves to recognition of geographical subdivisions," and with this I disagree. Some subspecies have been described as the distinctive extremes of clinal variation, but the concept has also been stretched to create such unnatural subspecific assemblages as *Lampropeltis triangulum* (with 25 races from New England to northern South America—this complex actually contains at least four species), *Thamnophis sirtalis* (with 11 races from the Atlantic to the Pacific coasts of North America—this complex contains at least two species), and *Ensatina eschscholtzii* (with 7 distinctive races that badly need re-evaluation). Too often this has been the case, and my list is the opening salvo (at least outside of the journals *Systematic Zoology* and *Cladistics* where this view has been predominant for some time) in an attempt to correct the improper application of the subspecies concept so prevalent during the middle part of this century. The use of subspecies in major herpetological field guides is an historical anomaly that is on the wane (see Collins 1990: Table 3), and very few new subspecies have been described from the United States (only one in the three major English-language herpetological journals in the last quarter of a century). To all this add the elimination of the use of subspecific names in many of the major herpetological preserved collections in this country (e.g., The University of Kansas Museum of Natural History), and it becomes clear that the current unnatural assemblage of subspecies listed in Collins (1990) has fallen into disfavor and is being widely ignored. Montanucci's contention to the contrary, my position is quite tenable. And my list should serve to show how poorly understood the North American herpetofauna is in terms of relationships and geographic variation.

Montanucci (1992) justifies the retention and use of subspecies by referring to them as a common early stage in the speciation process and by implying that using a trinomial calls attention to a distinctive population. This view rests on a particular model of evolution that has been largely replaced. I contend that a large number of the subspecies listed in Collins (1990) would not survive modern analysis. Thus, my recent list (Collins 1991), which was prepared without testing the validity of the subspecies in question, is certain to contain "taxa" that do not merit taxonomic recognition at any level. Indeed, Van Devender et al. (1992) reveal the first of these insignificant variations when they imply that *Lampropeltis pyromelana infralabialis* is only statistically differentiated. Thus, *L. p. infralabialis* obviously does not deserve recognition at any level. These statistically defined populations, when inflated with a trinomial, cause taxonomic distraction and misinterpretation, and undermine the credibility of other taxa that have evolutionary significance.

Montanucci (1992) states that my "proposed taxonomic arrangement is no less arbitrary than the existing taxonomy." That is false. My proposed taxonomy applies a far more rigorous standard to the 55 taxa and at least represents an attempt to be logically consistent with history. After all of the only statistically differentiated variations (that is, where average difference can be discussed without appeal to evolutionary novelties) are exposed and relegated to the synonymy of other populations, my proposed list establishes the most conservative taxonomic arrangement, based on logic and evidence, with none of the assumptions of relationship that resulted in the radical and anomalous taxonomy of the past.

Montanucci (1992) points out that the proximity between the allopatric populations which I elevated to species is variable. I agree, but this has no bearing on their evolutionary fate—it does not matter whether they are separated by 12 inches or 3,000 miles, provided there is no effective gene exchange and they are diagnosable. He also states that the distributional gaps (presumably those shown in Stebbins 1985, and Conant and Collins 1991) may not be real, but until proven otherwise by discovery of new records, that is speculation and has no bearing on the situation. Montanucci also states that distributional boundaries of species are not static, but exceedingly dynamic. I question this for amphibians and reptiles in North America. There have been some spectacular range expansions among North American fishes (e.g., the spread of *Gambusia*), mammals (e.g., the northward migration of armadillos), and birds (the westward expansion of eastern species due to increasing numbers of forests in formerly treeless regions such as the Great Plains), but I know of no comparable examples among our native herpetofauna. Reptiles and amphibians are a comparatively sedentary lot, and I think that most of the distributional gaps in Stebbins (1985) and Conant and Collins (1991) reflect reality, give or take a few miles, and are not an artifact of collecting.

Montanucci (1992) (as do Van Devender et al. 1992) puts forth the arguments that allopatric populations may, through time, come back into contact, and also that the level of morphological distinctness amongst populations is variable. I agree, but both are irrelevant to my proposed list. As stated above, a population is either diagnosable, or it is not. If so, and it is allopatric (or allochronic), it is a species, the most conservative conclusion that can be reached. If not, it does not merit recognition as a subspecies, and I again contend that a number of the subspecies listed in Collins (1990) would not survive investigation, nor would a number of them in my recent list (Collins 1991).

Finally, Montanucci (1992) suggests the herpetological community review my list on a case by case basis, and I find that agreeable, but if they do, it must be by the same criteria that I used in making that list. If a minimal standard of diagnosis and historical independence is applied to each of them, we will see a good number recognized as full species while the remainder will be relegated to synonymy, and the herpetological biodiversity of North America will be clarified. And, seriously, if we are trying to talk about taxic diversity, wouldn't this give us a better measure than the Rube Goldberg classification we have had to put up with for so long? It does not take long and laborious research to evaluate such populations as in my list. The data, if any, are already published in the original descriptions. Historical inertia should not again be allowed to camouflage the amphibian and reptilian diversity of North America.

Summary

The viewpoints of Van Devender et al. (1992) and Montanucci (1992) are based on the outmoded biological species concept and are irrelevant when evaluating my list, because I used the Evolutionary (historical) Species Concept alone to define allopatric populations that had long been held to be morphologically distinct. Because Van Devender et al. (1992) and Montanucci (1992) are wedded to an outmoded concept, they want to keep allopatric, undiagnosable populations as subspecies, but are against specific recognition of allopatric, diagnosable populations that deserve such status. I disagree with them both and reject the biological species concept, and again recommend that the herpetological community adopt my list (Collins 1991). If nothing else, adopting it will set in motion a process whereby the real entities in nature are recognized and those that are inventions will be cast aside.

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Species In Contemporary Herpetology: Comments On Phylogenetic Inference And Taxonomy

We thank Robert Hansen, editor of *Herpetological Review*, for allowing us to comment on the criticisms directed at Collins (1991) specifically, and at current systematic theory and practice generally, which appeared in the previous issue of this journal (vol. 23, no. 1). Before responding to specific criticisms we will make some general comments regarding this controversy.

The larger issue in this interchange is not species or subspecies taxonomy; it is that a phylogenetic (= historical) philosophy has replaced the earlier nonhistorical philosophy of systematics. Because the biggest paradigm shift in systematics in the last 140 years has occurred during the last two decades few systematists now defend the philosophy or methods of phenetics or evolutionary systematics. (Note that "evolutionary systematics" is a label for a particular viewpoint that is preoccupied with "biological" species and not evolutionary history.) For philosophical and evidential reasons the clock will not be turned back to the days when classifications were based on overall similarity (either genetic or morphological) or interbreeding (whether actual or potential) rather than on evolutionary (= historical) relationships.

Although a detailed discussion of the "species controversy" is beyond the scope of this reply, it should be noted that the "species problem" persists because it is really several controversies (Kluge 1990: 417). First, there is confusion

between the ontological status (i.e., the *real* nature) of species and how to recognize species practically. While most systematists might be more comfortable formulating diagnoses and dichotomous keys, deciding what they are attempting to discover must logically precede how they search for these items. Second, there is disagreement over the role of species in evolutionary-ecological theory. Some biologists treat species as epiphenomena (e.g., Damuth 1985), while others consider species to be participants *per se* in processes (e.g., Mayr and Ashlock 1991: 26). Third, there is disagreement over the taxonomic treatment of biparental and uniparental organisms. Obviously, the two kinds of organisms cannot be judged in the same way if the criterion of interbreeding is part of the species definition. And fourth, there is confusion over the application of the concept of monophyly to species. Most of Collins' critics make arguments typical of the first controversy, but some of the assumptions they make are related to the second.

The underlying presumption made by several of the critics is that the "biological species concept" (e.g., Mayr 1942) has been, and continues to be, the monolithic view of systematists. However, several of Mayr's own contemporaries (e.g., Blackwelder 1962; Wilson and Brown 1953) found serious problems with the application and underlying philosophy of that particular species definition and it never became popular in botanical or entomological circles. Even in disciplines in which the "biological" species concept did become popular it has been challenged, such as in ornithology (McKitrick and Zink 1988) and herpetology (Frost and Hillis 1990). The primary problem that phylogeneticists have with the concept of "biological species" is that it is not historical (i.e., it is "nondimensional" [Mayr 1942, 1963]) and that classifications based on reproductive compatibility are often inconsistent with the recovered history of evolution. Rosen (1978), Hillis (1988), and McKitrick and Zink (1988) have documented examples of poor correlation of reproductive compatibility with phylogenetic history in fishes, frogs, and birds. The incongruence is thought to be even more widespread in plants (e.g., Grant 1981). As a result of this incongruence and the failure to document that species are direct players in evolutionary processes, most systematists (and other evolutionary biologists) who have followed the controversies have come to the conclusion that the "biological species" of Mayr has no special role in the study of phylogenetic patterns or evolutionary-ecological processes. Also, it has become clear that although systematists can recover the history of evolution with some accuracy, the logical techniques that allow this recovery are unrelated to the existence of potentially interbreeding populations.

Some may argue that reproductive compatibility among allopatric populations is of fundamental interest to evolutionary biologists and that knowledge of the potential to interbreed has improved our understanding of the historical pattern of evolution. However, these advocates must answer what is fundamental about this, and in what pattern or process theories of evolution is *potential* important. Further, what is so fundamental about "species" identified on the basis of *potential* interbreeding that to preserve them we should distort or reject classifications that reflect evolutionary history?

The historically coherent views of species that have supplanted the nonhistorical (= nondimensional) view were discussed recently by Frost and Hillis (1990) and Kluge (1990) so they will not be considered in detail here. What has been generally agreed upon by most phylogeneticists is that species are the largest lineages that lack long-term internal cladistic structure and that species have something analogous to ontogenies, which is organismal character evolution. Further, because there is no particular level of organismal character differentiation or reproductive isolation that is perfectly indicative of the reality or histories of lineages, species can be difficult to discover. Although most phylogeneticists agree that species are lineages, a consensus has not been reached as to how inclusive the recovered entities should be that we hypothesize to be lineages (e.g., compare Donoghue 1985, to Frost and Hillis 1990, and Kluge 1990). In practice, however, entities considered to be species in a phylogenetic context are often smaller than hypothesized "biological" species. However, contrary to the apocalyptic visions of some (e.g., Van Devender et al. 1992), the application of phylogenetic philosophy and methods has not resulted in the unrestrained naming of all allopatric populations.

Although "biological" species are defined on the basis of reproductive compatibility, the reality of lineages does not turn on the basis of allopatry, diagnostic features, intrinsic reproductive closure, or the presence of humans to delimit them. Species are real entities rather than convenience constructions, so there seems to be no way to avoid their inherent slipperiness. That is, there is no way to avoid the inherent difficulty of analyzing real data. Because intrinsic reproductive closure is the rule for identifying "biological" species, it might seem useful to have analogous standards for recognizing lineages as binominals (Highton 1989, or Smith 1990). However, there is no reason to assume that we should be able to recover all lineages, so any recognition rule would necessarily be arrived at by pact rather than by discovery.

However, it should be difficult to retrieve historical patterns below the level of species (bisexual) (except for clonally inherited portions of the genome such as mitochondrial DNA) because we *expect* historical reticulation of populations below that level. We know that as the species level is approached evidence for distinguishing lineages becomes more ambiguous (Arnold 1981), particularly when dealing with such kinds of data as allozyme frequencies (see Crother 1990, and Gaines et al. 1978). Therefore, even when confronted with a plethora of statistically identifiable local populations, the lack of recoverable historical structure among them indicates to most phylogeneticists that the level of species has been reached. However, even if we do occasionally slip below the level at which we are aiming (i.e., if the populations that we mistakenly call species will reconnect and genetically swamp each other in the future), this might give us additional information about the history of evolution, which is really our primary objective. Even so, errors of species identification are not limited to attempts to discern lineages, and, indeed, also seem characteristic of the search for "biological" species.

Regardless of continuing philosophical and operational controversies, the action of Collins in recognizing as species the allopatric, differentiated (at least enough that previous taxonomists thought they were recognizable) populations of amphibians and reptiles in the United States is in step with most recent discussion of species (e.g., de Queiroz and Donoghue 1988; Eldredge 1985; Eldredge and Cracraft 1980; Frost and Hillis 1990; Kluge 1990; Wiley 1978, 1980). Although we have some misgivings about promoting taxonomic innovation not based on specific discussion of evi-

dence, we feel strongly that the time has arrived to move away from nonhistorical (= nonevolutionary) classifications and toward classifications that reflect what we can recover of evolutionary history. That a translation from a nonhistorical to a historical taxonomy cannot be made totally without error is little reason to avoid the change. There is no special revealed truth in traditional taxonomy and there are good reasons to think that traditional practices can hinder progress. Also, we do ourselves little good in continuing to base classifications on predictions of the future of evolution (i.e., that differentiated populations will reconnect). Regardless of our ability to reconstruct the pasts of lineages, we can never know their futures. Only where laws of nature apply is it reasonable to make such kinds of predictions.

The issue of "subspecies" is not whether they are useful as "pattern classes" for the vague generalities of casual discussion, but whether subspecies are discoverable items (i.e., temporarily isolated sublineages) or invented (in which case they are simply artifacts of idealizing diagnoses to fit our notions of process). If they are discoverable, then they clearly are elements of evolutionary biology; if they are invented they are an impediment to the formulation of historical hypotheses. Within the historical context of phylogenetic inference the use of subspecies (= *temporarily* isolated sublineages; *not* "incipient" lineages) is severely restricted. This is because identifying a sublineage requires the same kind of evidence for recognizing a lineage, not less, and also requires the additional assumption that the sublineages will reconnect in the future to reconstitute the lineage. That is, not only does one have to supply evidence that the sublineage in some diagnostic sense is "apart," one must supply evidence of its phylogenetic closeness to some other sublineage, and provide evidence that they will become confluent in the future (i.e., that they are really subunits of some larger evolving lineage and not lineages themselves). As mentioned previously, no theoretical justification exists for such predictions. Nevertheless, even within traditional practice the use of subspecies is problematic. When considering the papers by Collins' critics and their views on traditional subspecies application, bear in mind the following quotations from Mayr (1982):

> "Hence, it became clear that the subspecies was not a concept of evolutionary biology but simply a handle of convenience for the clerical work of the museum curator. The subspecies was likewise found deficient when studied as the adaptive response to local environmental conditions. During the study of clines, workers found the more-or-less arbitrarily determined subspecies borders to be often more of a hindrance than a help . . ." (p. 594).
>
> "Today, however, the primary use of subspecies is as a sorting device in collections, that is as an index to populations that differ from each other 'taxonomically.'" (p. 595).

By "taxonomically" Mayr meant that "subspecies" designation is heuristic and refers both to items that are discovered (elements of evolutionary biology; entities we would consider to be evolutionary species) or invented (not elements of evolutionary biology; items excluded from historical classifications). Based on our collective experience of curating large herpetological collections, we have found only two clerical uses for the subspecies category, both of arguable value: (1) trinominals (particularly those representing diagnosable allopatric or parapatric populations) often turn out to be species under any popular definition of that term, so it is frequently easier to retain preexisting trinominals on jar labels than reidentify and rebottle specimens when taxonomic revisions are made; and (2) trinominals can allow us to set aside controversies over whether one or two species are involved within some binominals. However, particularly for North American taxa, subspecies designations more frequently make for curatorial hassles, technician make-work, and misinformation for uncritical collection users. For these reasons many collections have either abandoned the use of trinominals or severely restrict their use (e.g., American Museum of Natural History, Natural History Museum of Los Angeles County, University of Arizona, University of Kansas, and University of Michigan).

Secondarily, having trinominals do double-duty in traditional taxonomy has been detrimental to communication and therefore science. They have been used to aggregate evolutionarily independent lineages into one binominal on the basis of inferred potential to interbreed and they have been used as nonhistorical geographically continuous convenience classes so that morphological generalities could be idealized (the trinominal usually illustrating one or two geographically variable features at the cost of ignoring other geographically incongruent trends). The possibility of any scientific generalizations about "subspecies" is precluded by this confusion of definitions. For example, in the current subspecific taxonomy of *Crotaphytus* (Axtell and Montanucci 1977; Ingram and Tanner 1971; Montanucci et al. 1975; Sanborn and Loomis 1979; Smith and Tanner 1972) the mixture of evolutionary species (*bicinctores* [variably considered a binominal], *vestigium, insularis,* and likely *nebrius*) with convenience inventions (*auriceps, baileyi, collaris,* and *fuscus*) renders the scientific utility of these trinominals minimal without specific information about particular taxa. Note that if "subspecies" in the "biological species" sense really had anything to do with that concept of species, taxonomists trying to apply the concept of "biological" species would require that subspecies be recognized on the basis of developing reproductive incompatibility, i.e., that the populations designated "subspecies" were demonstrably undergoing "speciation." One hears the claim that "subspecies" (particularly allopatric ones) are incipient "biological" species (e.g., Mayr 1982), but the data to support this notion (i.e., demonstration of partial reproductive isolation) are rarely produced, largely because in traditional taxonomic practice morphological differentiation and the development of intrinsic reproductive isolation are frequently conflated (Larson 1989). Traditional subspecies recognition rests on notions that are unrelated to the biological species concept. That is, the "multidimensional" species concept (the operational aspect of the "biological" species concept wherein potential "biological" species are divined on the basis of overall similarity) really is an uncomfortable mixture of the "nondimensional" species concept (the theoretical aspect of the "biological species concept") with pre-1940's taxonomic practice. Even if one thought that "biological species" were acceptable and useful, it would seem that fifty years after the formulation of the notion of "nondimensional" species it would be time to jettison a notion of "subspecies" that is unrelated to the development of intrinsic reproductive closure, the only measure of "biological" species.

So, for the reasons discussed above, we think that Collins' paper is just the stimulus that herpetologists need to take up seriously the issues of species discovery, phylogenetic infer-

ence, and the development of classifications that are logically consistent with recovered history. With respect to the social inertia that Collins' note has uncovered, we are less dismayed that so many herpetologists would use and promote the use of subspecies than we are that they would concomitantly object when these nominal taxa are expected to measure up to being elements of evolutionary biology.

Collins' use of allopatric distribution and morphological distinctness may be criticized because those data are not as refined as we might like. However, they do constitute evidence, and to ignore such is to be nonscientific. Collins has merely noted those allopatric populations that previous taxonomists have regarded as distinctive enough to warrant names and taken that as evidence that the populations are on unique phylogenetic trajectories. If workers have disagreements with the published evidence (e.g., with the diagnoses supporting the distinction of allopatric populations and the concomitant hypotheses of their ontological status) then they should publish corrections, regardless of the rank of the taxon. However, although the older "polytypic" species classifications have tradition on their side, most recent studies (e.g., Highton 1989, on *Plethodon;* or Platz 1989, on *Pseudacris*) suggest that species, even "biological" species, are generally considerably smaller geographically and less variable than once supposed. Moreover, it is rare that evidence has been presented to support the historical propinquity of allopatric subspecies. So, tradition aside, it seems that we would be better served by scientifically more conservative classifications (i.e., ones making fewer claims of relationship) than those in general use now.

We agree that the wholesale recognition of allopatric but occasionally erroneously diagnosed populations will cause some nominal taxa that have either ambiguous or no evidential support to be recognized as binominals. We find it revealing that most trinominals appear to have been accepted uncritically and used broadly, and only the hypothesis that many are species has elicited any recent scientific interest in them. This change in Linnaean rank, however, does not change the fact that these nominal *taxa* are no more problematical now than they were as nominal subspecies. Collins' paper may have missed the mark with respect to a number of particulars (e.g., in the unexplained [and spotty] retention of apparently arbitrary subspecies in some binominals such as *Rana capito* and in the omission of some well-differentiated species such as in *Uma*), but he merely applied existing evidence to a field that has otherwise been stultified by tradition and a desire for stability even when this might promote misinformation about evolutionary history.

Unfortunately, phylogenetics (= cladistics) and its underlying philosophy are not accurately portrayed by Collins' critics, particularly by Van Devender et al. (1992). Because it is the basis for most recent systematic work and for the current revolution in evolutionary-ecological biology (Brooks and McLennan 1991), herpetologists would be well advised to become familiar with phylogenetic inference. To do so will obviate almost all of the concerns addressed by these authors.

Replies To Individual Critics

Reply to Grobman (1992).—We think that Grobman's (1984) erection of a number of arbitrarily delimited "subspecies" of *Opheodrys aestivus* has been largely ignored by the herpetological community for sound reasons. Although we encourage the study of geographic variation as a vehicle for discovering historical entities, Grobman's infraspecific taxonomy of *Opheodrys aestivus* is illustrative only of the arbitrary delimitation of nonhistorical taxa and the moribund 75% rule of subspecies distinction. Activities of fundamentally different kinds, invention and discovery, are not distinguished by Grobman in his infraspecific taxonomy. Indeed, Grobman never suggested that his defined races were (or had been) historically independent entities at all, and certainly not subspecies in any *historical* use of the term. Therefore, because his taxonomy does not tell us about historical lineages, his trinominals are clearly not elements of evolutionary biology. Grobman's raw data might have helped discern historical entities, but unfortunately those data were presented in such a way as to presuppose the existence of his nominal subspecies, with no formal discussion of the broadness or narrowness of intergrade zones, no detailed documentation of species-wide geographical trends or homogeneity of populations, nor any discussion of what the patterns he discovered might mean historically.

That Collins (1990) and Conant and Collins (1991) did not include these nominal subspecies but did include other arbitrary races (e.g., several in *Coluber constrictor* and *Lampropeltis getula*) does not mean that they should have included Grobman's nominal races. It means that there still are many other arbitrarily delimited races that need to be addressed by taxonomists and removed from field guides. Further, field guides and checklists, as useful as they are, are not arbiters of anything, and, more often than not, merely reflect the social conservatism of the community rather than the *evidential* conservatism of scientific inquiry. That systematists generally have not accepted Grobman's trinominals reflects that they represent a taxonomic tradition that has been discarded, even by most nontheoretical systematists.

Reply to Lazell (1992).—We agree with Lazell that herpetologists, like other biologists, must become informed about what the species controversy is, and judge for themselves the merits of each taxonomic change suggested, rather than just blindly accept all proposals. However, Lazell should know that acceptance of taxonomic novelty rests on published evidence and philosophical argumentation rather than on the popularity of the animals. For instance, his repeated assertion that *Thamnophis* is a synonym of *Natrix* (Lazell 1972, 1976, 1989a, b) has not been accepted because the preponderance of evidence (Lawson 1986; McDowell 1961; Rossman and Eberle 1977) shows that at least eight other genera of snakes (including *Storeria,* which Lazell 1989b, retains as distinct) are more closely related to *Thamnophis* than is *Natrix*. Similarly, there has been no acceptance of his contention that *Brachylophus* is a synonym of *Iguana* (Lazell 1973, 1989c) because the preponderance of the evidence shows that there are five other genera of iguanid lizards (including *Sauromalus* [chuckwallas] and *Amblyrhynchus* [marine iguanas]) that are more closely related to *Iguana* than is *Brachylophus* (de Queiroz 1987; Norell and de Queiroz 1991).

We agree with Lazell that considerable work remains to be done to retrieve the historical patterns among taxa of amphibians and reptiles, and that any classification suggested is only as good as the evidence that has been presented to support it. Where we seem to disagree is over whether much of the taxonomy for polytypic amphibians and reptiles has much in the way of critical support, or whether it has just been anointed by tradition.

Response to Montanucci (1992).—Although Montanucci says that he is a strong supporter of the evolutionary species concept, he retains the traditional "biological" concept of "speciation" and wants to retain the use of nominal subspecies because of their purported heuristic value. His position appears identical to that of Mayr (1982) and Mayr and Ashlock (1991), who are not supporters of the lineage species concept. Our objections to this approach are taken up earlier in this paper and in those previously published (Frost and Hillis 1990; Kluge 1990).

We do not understand the reason for Montanucci's appeal to tradition (the widespread use of subspecies in field guides and other literature) to support the use of trinominals. This has nothing to do with scientific discourse. We do not agree with Montanucci's assertion that Collins did not provide evidence for the previous paradigm being outmoded. We suggest that his literature citation to Frost and Hillis (1990) accomplished that. Contrary to Montanucci's statement that use of "subspecies" is a practice that continues to be well thought of, he will have to explain why the naming of subspecies has become so uncommon relative to practice twenty years ago. Neither do we accept his assertion of the overriding utility of trinominals, which is obviated not only by evidential limitations but by definitional ambiguity (see our earlier discussion and example of *Crotaphytus* taxonomy). Additionally, Montanucci's citation of Wiley's (1981) models of speciation in support of subspecies is spurious; Wiley specifically abjured the "biological" species concept and its attendant subspecies concept, and he still does (E. O. Wiley, pers. comm.).

Although we agree with Montanucci that the evidence for the recognition of the binominals recognized by Collins varies (although we think that Montanucci's number of 32-38 being undiagnosable is too high), the reality of lineages does not depend on any particular level of organismal differentiation. We worry that Montanucci is confounding a notion of "lineageness" with organismal morphological distinctiveness, much as morphological divergence has been confounded with the development of intrinsic reproductive closure by many traditional taxonomists (Larson 1989). Montanucci does not seem to be bothered that this "problem" is also evident among many "biological" species and certainly among traditional "subspecies." Of course, we too would be hesitant to recognize taxa on the basis of poorly sampled populational variation (at least when and where adequate sampling is possible). However, that allopatric subspecies have been recognized as distinctive enough to be named by earlier authors certainly renders these as hypothesized lineages, i.e., species. As hypotheses they are open to continued investigation and acceptance or rejection, just like hypotheses of allopatry. If a taxon is not diagnosable, it should have never been recognized as a subspecies, much less a species.

We agree with Montanucci that, in some better world where evidence and hypotheses are continually reinvestigated and tradition has no role in science, we would want to wait for the problems that Collins has uncovered to be dealt with on a case by case basis. However, we see little evidence that herpetologists were aware that these are problems that need to be tackled.

Reply to Van Devender, Lowe, McCrystal, and Lawler (1992).—These authors misunderstand or misrepresent much of what has been written on the topics of species and phylogenetic inference. Additionally, they make several unwarranted assumptions about the evolutionary process as well as unsupported claims—largely on the basis of "unpublished data"—about the plethora of binominals that would be recognized under a historically coherent view of species.

The paramount confusion that we detect in these critics' views is between (1) what species are, and (2) how these are identified. The identification and ranking rule of "actually or potentially interbreeding populations" (the biological species concept) does not tell us that polytypic species composed of allopatric subspecies are evolutionary entities. It merely says that the constituent subspecies share a characteristic (reproductive compatibility) that logically must be a primitive feature, and is therefore uninformative phylogenetically. That is, there is no necessary relation between Van Devender et al.'s definition of "conspecific" and their definition of "relationship" (which they consider synonymous with "genetic similarity"—see below). Even though Van Devender et al. have levelled the accusation (pp. 10-11) that species have been redefined as lineages to make life easier for phylogeneticists, the issue is not ease of application; it is whether we should make exceptions to a taxonomy designed to reflect evolutionary history in order to preserve "potential" entities and traditional notions about "kinds" of organisms.

With respect to these authors equating "relationship" with genetic similarity (p. 12) rather than evolutionary (= historical) relationship, there is considerable evidence that their definition of relationship is incompatible with some of their other beliefs. Genetic similarity and "speciation" (by their definition, development of intrinsic isolating mechanisms) are poorly correlated in many cases, such as is demonstrated by the observation that some Mexican populations of *Ambystoma tigrinum* are genetically more similar to *A. dumerilii* (a morphologically and reproductively distinctive species) than to some other Mexican populations of *A. tigrinum* (Shaffer 1984). Moreover, it seems incautious for Van Devender et al. to presume that assessing a few morphological characteristics (some of which, like ventral and subcaudal counts, can show strong epigenetic effects) is a good way to measure genetic similarity.

Van Devender et al. (pp. 11-12) supply a number of examples where phylogeneticists, if they were privy to unpublished data, would be forced to arrive at taxonomic conclusions that Van Devender et al. consider unacceptable. Their statements aside, we would have to evaluate their data to see if any historical structure were recoverable and/or the populations of snakes that they address met some evidentially unambiguous level of diagnosis before we would agree with their undocumented assertion that recognition of many species is consistent with the data. It would be interesting if they could rigorously diagnose the different populations of *Crotalus lepidus* in Texas without appeal to frequency data or casual discordant trends. More informative would be any historical patterns that might be discovered. We would have hoped that as biologists interested in the history and biogeography of southwestern North America that this would have been their primary preoccupation, rather than maintaining traditional practices that impede recovering evolutionary history. Ironically, Van Devender et al. criticize phylogeneticists (p. 13) for using "fixed" characteristics for taxon recognition (see below) and then apparently assume that phylogeneticists would use some lesser evidential requirement in order to validate their apocalyptic vision of the "breakup" of *Crotalus lepidus*.

The discussion of *Lampropeltis mexicana* group taxonomy

shows an unwillingness of Van Devender et al. to follow their own underlying philosophy when it requires the taxonomic "lumping" of well-marked species. It is well-known in herpetoculture circles that crossing of *L. triangulum*-group taxa with other *Lampropeltis* "tricolors" requires behavioral manipulation to overcome premating isolating mechanisms. However, it is also well-known that such premating isolating mechanisms (or postmating isolating mechanisms) are either poorly developed and insufficient ("incipient") or do not exist between *L. alterna, L. mexicana, L. pyromelana, L. ruthveni,* and *L. zonata* (Garstka 1982; Frank Retes and Ernie Wagner, pers. comm.). It has been argued that captive breeding is not a legitimate means of testing for the presence of pre- or postmating isolating mechanisms. However, wholesale rejection of data from captive breeding renders hollow the claim that potential to interbreed is the touchstone of species-level taxonomy. Inasmuch as Van Devender et al. use evidence from captive breeding (Garstka 1982; and reporting that *L. alterna* breeds freely in captivity with *L. mexicana*) to support their taxonomic views, they should not stop with synonymizing *L. alterna* with *L. mexicana*; they should consider *L. alterna, L. mexicana, L. pyromelana, L. ruthveni,* and *L. zonata* to be representatives of a more extensive *L. zonata*.

The listing by Van Devender et al. of particular subspecies with associated biomes is illustrative of an approach to phylogenetic inference and biogeography that we reject as lacking rigor. To cite some examples (and using their classification), the characterization of *Lampropeltis g. splendida* as a Great Plains form is obviated by the central Great Plains distribution of *L. getula* being an intergrade zone between *L. g. splendida* and *L. g. holbrooki* (*L. g. nigrita, L. g. splendida, L. g. holbrooki,* and *L. g. nigra* likely intergrading insensibly for the entire length of their combined distributions [data from Blaney 1977]). Another subspecies that they characterize as being a Great Plains race, *Lampropeltis triangulum gentilis,* does not overlap "pure" *L. getula splendida,* but only the *L. g. splendida X L. g. holbrooki* "intergrade" zone, and when the distribution of another of their Great Plains subspecies, *Crotalus v. viridis,* is taken into account, it becomes unclear what the geographic and evolutionary commonalities are that Van Devender et al. think are so obvious. The presence of only one of these "subspecies" (*L. t. gentilis*) is limited to the Great Plains so it seems that the generalities about geography and "adaptive response" made by Van Devender et al. are as imprecise as their systematic generalities. Van Devender et al. imply that the underlying cause of the evolution of these nominal subspecies is the "Great Plains." Would not their implied hypothesis of the evolution of these "subspecies" be more compelling if the "entities" hypothesized to have had a shared cause of origin had congruent distributions and congruent phylogenies? In fact, would not it be best if the "entities" that they were discussing were actually entities, rather than convenience inventions? In effect, they run into the same problem as do those who want to treat nominal biomes as if they were entities, rather than convenience inventions. In this vein, what does "mainland Mexico Sonoran Desert" mean ecologically and "adaptively" with respect to *Masticophis flagellum cingulum* (an arbitrarily defined pattern class [data from Wilson 1970] which is found from lower Sonoran desert to mesquite desert-grassland to Sinaloan thornscrub)? The characterization of *Crotalus viridis cerberus* as a "Mediterranean chaparral" element ignores the wide distribution of this snake in the Transition and Canadian Zones of Arizona (Lowe et al. 1986). Additionally, we find the implied hypothesis of a Miocene origin (8-20 million years ago) (p. 12) of many Southwestern subspecies surprising in light of the implication by Van Devender et al. that species usually are readily identifiable (i.e., "usually distinctive"). Few reptiles from the North American midcontinental Miocene can be identified with any certainty to Recent species (much less subspecies), and frequently not beyond genus (Estes 1983; Robinson and Van Devender 1973).

Van Devender et al. claim (p. 13) that phylogenetics cannot separate species from subspecies. Of course, this assertion rests on their definitions of speciation, species, and subspecies, so they may be correct. However, inasmuch as they have not provided evidence supporting the hypothesis of incipient intrinsic reproductive isolation of any of their "subspecies" or distinguished between convenience inventions (arbitrary "subspecies") and lineages, we suggest that *their* approach is deficient. Proponents of "biological" species are on *very* shaky ground if they attempt to claim ease of application for their particular concept (Ehrlich 1961).

The repeated assertion by Van Devender et al. that under a phylogenetic world view "species" can revert to "subspecies" reveals their misunderstanding of the nature of evidence, their confusion between the entities to be discovered (lineages) and the species rank in the Linnaean hierarchy, and their failure to distinguish between discovery and invention. Yes, the evidential basis for discovering species (or any taxon) is *necessarily* faulty. Mistakes are made, and with additional evidence (published) we revise our conclusions. This is hardly radical and, instead, is a central characteristic of all scientific inference.

Van Devender et al. evidence several beliefs that extend beyond or are contrary to evidence. They state (p. 10) "the allopatric populations of Collins (1991) are, *of course* [italics ours], potential interbreeding populations." What data do they have to support this blanket assertion? They repeatedly claim that ancestor-descendant relationships among living species are more common than paired sister-taxa. Beyond our theoretical disagreement with this statement, they present no evidence that would support the notion that relatively completely primitive "ancestors" are more common than sister-species (or that they are common at all); it has not been supported by the study of *Coleonyx* (Grismer 1988; Kluge 1975), pygopodids (Kluge 1976), or leopard frogs (Hillis 1988). The implied commonness of "speciation" by peripheral isolation also does not seem to be predominant. In the only phylogenetically controlled study known to us, Lynch (1989) found that among 66 cases of species pairs in fish, frogs, and birds, 71% were explained by more-or-less equal vicariance and only 15% were explained by peripheral isolation. Van Devender et al.'s statement (p. 12), "An ancestor and its descendant will always have a greater genetic similarity and fewer character changes than paired descendants of the same ancestor," is another unsupported claim made for no discernible reason. Their assertion (p. 12) that "the temporal coexistence of ancestral species or subspecies in older habitats with their descendants in derived habitats is the normal state of affairs" rests not on data, but on unsupported notions of evolutionary process and a belief that biomes are integrated evolutionary entities rather than convenience inventions. Additionally, in light of the stability and antiquity of subspecies (see above) claimed by Van Devender et al. (and using their taxonomy), why is it necessary for them to posit that

"stabilizing selection is very strong" to explain why *Lampropeltis pyromelana infralabialis* is similar to *L. p. pyromelana*, which they claim is only 10,000 years separated from *L. p. infralabialis*? What body of data supports their assertions of particular selection regimes on their other examples of *Coluber* and *Drymarchon* populations? From these examples and others in their text it is clear (regardless of the discussion of Miocene orogenies and Pleistocene climates and biotic communities in the southwestern United States) that Van Devender et al. are not supporting their preferred taxonomy on recovered history, but on assertions about the future of populational interactions and unwarranted (or wrong) presumptions about the evolutionary process.

Van Devender et al.'s statement (p. 11) that—"Reticulate evolution, a common evolutionary mechanism in plants, has occurred in many animal populations currently recognized as subspecies. Cladistics cannot reconstruct the phylogeny of groups with reticulate evolution"—disregards or misrepresents the literature and evidence. Although we have noted (see above) that we cannot recover histories of populations once reticulation has obscured the trail, with regard to "subspecies" (sense of Van Devender et al.) we know of none for which data support a reticulate origin rather than vicariance (or arbitrary christening) so we do not know how Van Devender et al. could have reached their conclusion. Those working on taxa of hybrid origin are not dealing with "subspecies" in the sense of Van Devender et al. But, with respect to reticulate evolution among lineages, there are data (e.g., hybrid karyotypes) that can allow detection and several phylogeneticists (including several botanists) seem to deal happily with the phenomenon in their taxonomic work (e.g., Bremer and Wanntorp 1979; Buth 1984; Funk 1981, 1985). Those working on parthenogenetic lizards derived from hybrid origins (e.g., Wright and Lowe 1967) have certainly applied the rule of evidence to the problem to good effect. Regardless, how can reticulate evolution be studied or even identified except within the context of a covering phylogenetic hypothesis? Apparently Van Devender et al. have mistakenly tried to restrict phylogenetics to the construction of dichotomous cladograms. But, cladistics is about rigorous methods of inferring the history of evolution, the rule of evidence (not just morphological evidence as asserted by Van Devender et al. on p. 10), and minimizing assumptions about how evolution proceeds. Compare this with the casual scenarios and unsupported assertions offered by Van Devender et al.

Finally, because this seems to be the real objective of their criticisms, Van Devender et al. summarize the putative logical errors of phylogenetics (= cladistics) in four points (p. 12), which we quote:

1. "All characters are equally important and potentially species characters." Contrary to Van Devender et al.'s opinion, we do not claim that there are "species characters"; we merely claim that all organismal characters may provide evidence of the history and existence of taxa. Although Van Devender et al. imply that there is only one "species character," which is intrinsic reproductive closure, they also seem to believe that there are differences in the relative importance of characters to particular taxonomic levels. If species are real things rather than just a rank in the Linnaean hierarchy there is nothing that could support this assertion.

The related claim by Van Devender et al. (p. 13) that phylogenetic techniques taken to discover species render the recovered entities typological is palpably wrong. In typology, membership in *invented* sets (nominal taxa) extends from the definition used for set identification regardless of tokogenetic (= interorganismal) relationships; there is no concern for discovering real entities. In phylogenetics, we attempt to discover entities which are difficult to apprehend and because of this the techniques that we use are conservative. Because of the inherent difficulty of evidence near the level of species, the tendency among phylogeneticists is to use "fixed" (= *very* widespread) characteristics in analysis (although "fixation" is clearly a methodological fiction). If anything, accepting the arbitrary delimitation of insensibly intergrading subspecies is much closer to the original tradition of typology than anything going on in modern systematics.

2. "The degree of genetic similarity or divergence is irrelevant." As stated before, we agree with this statement inasmuch as we are not asking questions about similarity or divergence—we are asking questions about history.

3. "Most ancestors [= ancestral species] are assumed to become extinct at the time of speciation." No one, to our knowledge, has ever made the claim that *most* species go extinct at speciation, but the issue that Van Devender et al. obviously are trying to get at is that many phylogeneticists take the position that *all* branching points in a phylogenetic tree constitute lineage originations (= speciations). This is hardly a fundamental principle of phylogenetics, as evidenced by well-known cladists who have not taken this position (e.g., Brooks and Wiley 1986; Wiley 1981). Nevertheless, we do accept it. To do otherwise requires taxonomy to rest on the subjective evaluation of organismal similarity rather than on evolutionary history. See the following point.

4. "The most closely related species are paired descendants sharing their ancestor's derived characters." This point rests on the definitions of relationship and species that Van Devender et al. think are applicable. Nevertheless, lineages are not hydras or humans (i.e., they are not what philosophers refer to as interactors or replicators) so to talk about "ancestry" of one lineage to another requires appeal to a subjective measure of organismal similarity rather than appeal to the evolutionary history of lineages. The analogy of organismal reproduction to lineage origination is not gestation and birth; it is mitosis or schizogyny. The ancestral lineage, once divided, must be taken to be *all* of its descendant lineages, not just the lineage among them with the most conservative organismal diagnosis. However, this and the previous issue have no impact on the recognition of extant species, so in this context they are red herrings.

In conclusion, we urge Van Devender, Lowe, McCrystal, and Lawler, biologists who clearly are interested in evolutionary history, to not let their notions of evolutionary process overwhelm their analyses of evolutionary pattern. We also invite these authors to publish the data on which so many of their assertions and examples rest so that the community can evaluate their claims.

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TECHNIQUES

An Efficient Marking Technique For Softshelled Turtles

Ferner (1979) and Plummer (1979) summarized conventional marking techniques for freshwater turtles and discussed criteria for marking and tagging. Ernst et al. (1974) reviewed marking techniques and proposed a coding system for capture/recapture studies of hardshelled turtles. The marking of softshelled turtles (*Apalone*: Trionychidae) was first described by Breckenridge (1955). Breckenridge utilized several techniques (including "bolt tagging," leather punching, and Woodbury's [1948] ink tattooing) with varying degrees of success, and concluded that "notching" of the periphery of the shell was the only satisfactory method. Breckenridge (1955) noted that the notches healed readily but remained discernable for up to five years. Plummer (1977) noted that triangular notches carved into the edge of the shell of *Apalone mutica* healed within a year but left distinct scars.

Edge notching, however, may be obscured in older specimens as the periphery of the carapace can become frayed or damaged with age, and regeneration can quickly obscure notch scars in juveniles. In addition, we have found 28 specimens of *Apalone spinifera* and 24 specimens of *Apalone mutica* which displayed bite scars near the edge of the carapace that resembled the scars left by shell notching. These individuals were from shallow water localities with high softshell densities. We attribute these "bite" scars to aggressive behavior which may be related to high population densities. These scars have been observed in comparable frequencies both during and out of reproductive season, so they do not appear to be related to breeding behavior. Aggressive biting may be a factor which serves to regulate population density or promote dispersal in the water system.

The following is a technique, refined from Breckenridge (1955) and Plummer (1979), which is an efficient, effective, and convenient method for positive identification of individual softshells. This technique satisfies the marking criteria of Ferner (1979) and Plummer (1979), minimizes time and effort for the investigator while maximizing the number of turtles marked, requires little equipment, appears to demonstrate a low loss of marks, and eliminates confusion due to bite scars.

A standard, office supply, handheld paper hole punch (hole diam = 4 mm), may be used to mark the periphery of the carapace, preferably in patterns which yield the most scientific information, such as the coding proposed by Cagle (1939). Holes punched through the carapace are clean, uniform, and provide numerous possible combinations of patterns. The marking leaves little, if any, bleeding and the turtle shows very little reaction to being marked. It is recommended that the holes be made at least 5 mm from the edge of the carapace to ensure that the hole retains its integrity and leaves a recognizable scar.

This method is superior to edge notching (usually accomplished with a knife blade) and marks made with a leather punch due to the following: it is accomplished more quickly and with less chance of damage to either the turtle or the investigator; it eliminates the potential for misidentification due to bite scars or shell fraying; it completely removes all of the tissue, whereas leather punches leave a hinged, uncut portion of the shell.

Punched holes also provide a suitable tie-off for wire or line which may be attached to a tracking balloon. Plummer (1979) and the authors found balloon tracking to be useful for short term observations. In these cases, distance of the hole to the edge of the carapace should be minimized to facilitate escape if the animal becomes entangled by the wire. Even minimal pressure on the line will pull it through the edge of the carapace, preventing entrapment and drowning.

This technique has been successfully utilized for four years (1988-1992) in mark-recapture studies of *Apalone spinifera* and *Apalone mutica* in Louisiana. One hundred thirty-seven individuals of the two species were marked in the above manner and recapture rates were recorded. Of 137 individuals, 10 have been recaptured; of these, 2 have been recaptured 3 times. The recaptures occurred between 10 and 706 days after the initial marking. The hole showed signs of healing at 10 days, and was 30% – 70% healed in animals recaptured at 23, 36, and 39 (n = 3) days. The hole was completely healed (filled in and showing scar tissue) within a minimum of 70 days and was discernable in animals recaptured at 306, 345, 399, 403, and 706 days. The scar is most visible on the ventral surface and can be remarked at recapture, if desired. The scar appears as an area of lighter color than the surrounding tissue and the periphery of the original hole is marked with minute surface striations.

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An Efficient Method For Measuring Salamanders

Many experimental protocols involving salamanders require accurate morphometric measurements of living animals. Measuring salamanders can be problematic because of their slimy skins and sinuous movements, especially if these measurements must be obtained in the field. Several techniques have been described previously for standard measurements, such as snout-vent length, tail length, total length, and head width. For example, the red-backed salamander, *Plethodon cinereus*, has been measured in several ways. Taub (1961) measured a salamander by placing it on a white paper card, prodding it to move into a straightened posture, and marking with a pencil the snout, tip of tail, and an "estimated" position of the vent. Mathis (1991) placed a salamander in a clear graduated (in millimeters) plastic tube (110 mm length, 0.9 mm diam). Fraser (1980) described a technique for detecting and measuring oocytes (visible through the abdominal wall) by placing a salamander on a piece of glass. Hairston (1980) measured other species of plethodontid salamanders by placing them on a piece of glass and restraining them with a towel. The problems with these techniques are (1) when the salamander is forced to stay still (i.e., is restrained) as in a tube, under a towel, or on a piece of paper, it tends to contort its body, making precise measurements difficult, and (2) when the salamander is allowed to move freely across a substrate (e.g., a piece of paper) such that the body may straighten, measurements must be made rapidly or must be estimated before the salamander changes position.

The keys to the precise and accurate measurement of salamanders are (1) to allow the salamander to assume a body position such that the vertebral column is straight along its complete length and (2) to maintain the salamander in this straightened position for a period of time that is adequate to obtain the desired measurements. Animals could be anesthetized to achieve accurate measurements; however, for many behavioral tests and ecological studies, it is preferable to avoid anesthesia because of the possibility of altering the behavior of the test animals (Buchanan and Jaeger, in press) and because anesthetization can be time-consuming and difficult to employ in the field.

As an alternative to anesthesia, we describe an accurate and efficient measuring device for obtaining morphometric measurements of salamanders in the laboratory or in the field. This device (the "mander masher") has been used successfully to measure species of plethodontid salamanders including adults and juveniles of *P. cinereus* and *P. glutinosus*, but sizes and materials can be altered for the measurement of other salamanders as well.

The design includes a transparent cover plate (21 x 13 cm piece of 2.5 mm thick Plexiglass), base plate (23 x 13 cm sheet of 1.5 mm thick aluminum), sponge with small pores (20 x 11 cm, 1.5 cm thick), two hinges, and two stop bolts (nuts and bolts) (Fig. 1). The transparent Plexiglass cover plate is attached, using hinges, to the aluminum base plate to which the sponge is glued. Two adjustable stop bolts should be placed in the corners of the base plate such that the ends of the bolts extend nearly to the top edge of the sponge.

For measuring a salamander, the device is opened so that the salamander can be placed on the inside surface of the transparent cover plate (the surface opposite the sponge). Before the salamander is placed (ventral side down) on the cover plate, the cover plate should be wetted. In the field, it is convenient to carry a small squirt bottle of water for this purpose. The device is then tilted so that to move forward, the salamander would have to ascend the tilted cover plate. Because the cover plate is wetted, the salamander cannot achieve sufficient traction to ascend the plate. If the salamander is prodded at the tail, the animal will generally attempt to climb the plate, and although its forward motion is retarded,

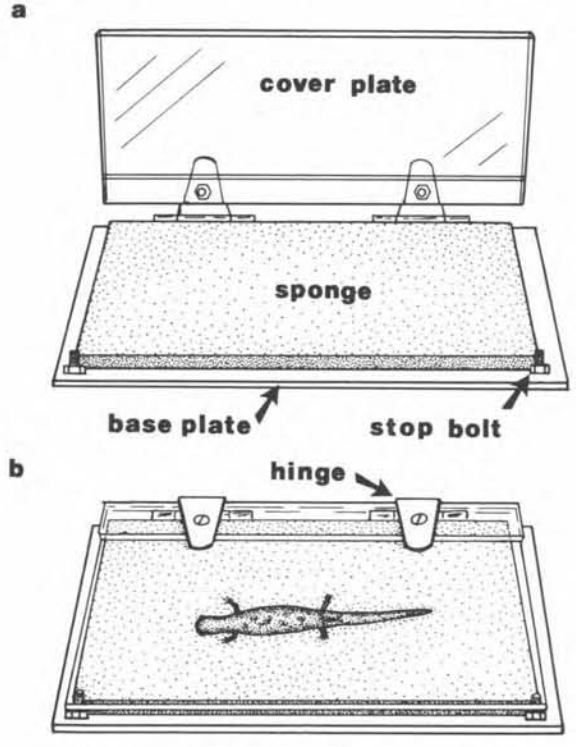


FIG. 1. An apparatus for measuring salamanders. (a) The open apparatus. (b) The ventral surface of a salamander pressed against the transparent cover plate of the closed apparatus.

its body will straighten. Then the base plate can be shut quickly on top of the cover plate, trapping the salamander in the cushioned sponge. The sponge prevents the salamander from moving and the stop bolts prevent the salamander from being crushed by maintaining a space between the base and cover plates. The apparatus can then be held shut by hand, or with a clothespin, rubber band, or similar device. After the salamander has been immobilized, if the tip of the tail is not straight, a thin object (such as a straightened paper clip or the metal rod that extends from calipers when in an open position) may be inserted between the sponge and the cover plate, and the tail may be manipulated into a straight position. The straightened salamander's ventral surface is now fully visible through the transparent cover plate, and measurements can be obtained using calipers or a ruler. The entire process of preparing a salamander for measurement generally requires approximately 30 s.

This basic design can be modified for larger salamanders by making the cover and base plates larger, using a thicker sponge, and adjusting the stop bolts to a longer length. Also, a simpler model can be made by replacing (1) the hinges with duct tape, (2) the stop bolts with blocks of wood or lids to bottles, (3) the cover plate with a piece of glass (tape the edges with duct tape to prevent the glass from breaking), and (4) the base plate with any thick rigid material that will hold the glued sponge (e.g., plastic), or the sponge can be taped to the base plate using duct tape. The aluminum/Plexiglass design is recommended over modified designs for field conditions because it is both lightweight and durable.

Acknowledgments.—We thank R. G. Jaeger, H. M. Wilbur, and three anonymous reviewers for critically reviewing this manuscript. Support was provided by Louisiana Board of Regents Doctoral Fellowships for B. W. Buchanan [LEQSF(1988-94)-GF] and S. E. Wise [LEQSF(1990-95)-GF-19] to R. G. Jaeger.

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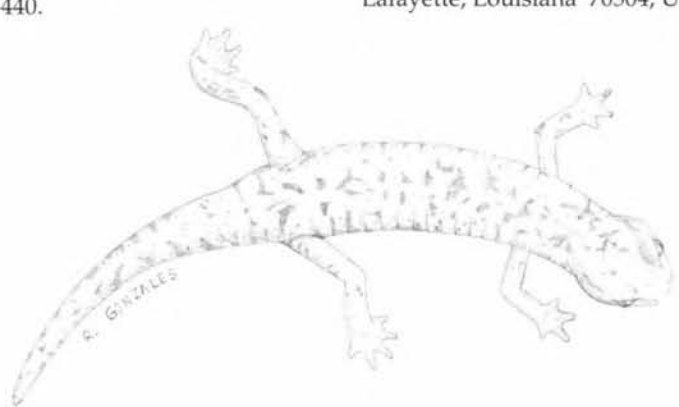
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LIFE HISTORY NOTES

Life History Notes is analogous to Geographic Distribution. Individual notes should, with few exceptions, concern only one species, and authors are requested to choose a keyword which best describes the nature of their note (e.g., Reproduction, Longevity, Morphology, etc.). Figures are permissible to illustrate any data, but should **replace** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles submitted to this section will be reviewed and edited prior to acceptance.

Standard format for this section is as follows: SCIENTIFIC NAME (in caps), COMMON NAME (lower case, in parentheses) as it appears in Collins (1990. *Standard Common and Current Scientific Names for North American Amphibians and Reptiles*, 3rd ed., Herp. Circ. 19:1-41), KEYWORD (in caps). DATA on the animal. Place of deposition or intended deposition of specimen(s), and catalog number(s). Then skip a line and close with SUBMITTED BY (Name(s) in caps, and address(es) in full). (NCN) should be used for common name where none is recognized. References may be briefly cited in text (refer to this or a recent issue for citation format).

CAUDATA

PSEUDOTRITON RUBER RUBER (Northern Red Salamander). **DIET**. Although *Pseudotriton ruber* feeds primarily on small invertebrates, adults occasionally prey on other salamanders (Martof et al. 1980. Amphibians and Reptiles of the Carolinas and Virginia. Univ. North Carolina Press, Chapel Hill, 264 pp.) including *Plethodon cinereus* (Dunn 1926. Salamanders of the Family Plethodontidae. SSAR, 1972, 446 pp.). However, no information is available on the size of the salamanders consumed. On 16 October 1991, we collected two juvenile *P. ruber* from beneath decayed logs in the middle of a spring-fed stream (Denison University Biological Reserve, Granville, Licking Co., Ohio). The salamanders were brought back to the laboratory, placed in 0.2% chloretone anesthetic solution, measured with digital calipers, weighed, and allowed to recover overnight in a shallow pan of spring water. The following morning, we discovered that one juvenile (SVL=47.76 mm, TL=74.70 mm, HW=7.21 mm, mass=2.32 g) had regurgitated an adult lead-backed phase *P. cinereus*. Although the body was partially digested, the tail of the regurgitated *P. cinereus* was intact and measured 32.95 mm. The *P. ruber* (SVL=52.3 mm, TL=87.2 mm, HW=7.9 mm, mass=3.67 g) was then sacrificed, and it also contained a *P. cinereus*. The tail of this *P. cinereus* was intact and measured 38.37 mm.

We sampled 21 *P. cinereus* on 17 October 1991. The size of the regurgitated *P. cinereus*, based on linear regressions of measurements from this sample, was estimated to be: SVL=36.2 mm, TL=69.1 mm, HW=4.1 mm, mass=0.64 g, while that from the stomach of the larger *Pseudotriton* was SVL=39.4 mm, TL=77.8 mm, HW=4.4 mm, mass=0.78 g.

Although there was a considerable difference between predators and prey in HW and mass, the two *P. cinereus* were only 5.59 mm shorter (TL) and 9.41 mm (TL) than the two juvenile *P. ruber*.

Submitted by **STEVEN F. BOCK** and **JOHN E. FAUTH**, Department of Biology, Denison University, Granville, Ohio 43023, USA.

ANURA

PIPA CARVALHOI (NCN). **BEHAVIOR**. On 23 February 1990, while crossing the Sierra Negra on Highway 90 PE in Pernambuco, Brasil, we stopped on a bridge over the Tacuaritinga River about 3 km E of Vertentes. Summer had been dry and the river was well below its normal level, but some pools were left by the side of the main stream. We reached the river at about 1130 hrs. Skies were clear and air temperature was 35°C.

In one spot, four small, continuous overflow pools were separated from the river by an area of grasses and a small mound covered by shrubs. The depth of the pools did not exceed 10 cm. Several small black frogs were observed jumping in various directions out of the water. We observed frogs crawling rapidly among cushion plants in grass about 35 cm tall. Only one animal was observed jumping over the tops of the grass. We identified the frogs as *Pipa carvalhoi*. About 40 to 50 individuals were observed.

Most authors have indicated that *Pipa carvalhoi* is fully aquatic, but this report agrees with Myers and Carvalho (1945. Bol. Mus. Nacional [N.S] 35:1-24) that they can walk, jump, and do other activities out of the water. One of us (JEP) has observed similar activity in *Pipa parva* in northwestern Venezuela and northeastern Colombia where, far from the ponds, the frogs walk or jump in a very cumbersome elliptic curve, reaching a height of 70 cm but covering a distance of no more than 40 cm.

We thank CONICIT and the Universidad de Los Andes in Venezuela, and CNPq and the Universidad Estadual de Campinas in Brasil for financing a project (P1-011) devoted to the comparison of herpetofaunas.

Submitted by **JAIME E. PEFAUR**, Ecologia Animal, Facultad de Ciencias, Universidad de Los Andes, Mérida 5101, Venezuela, and **ADAO JOSE CARDOSO**, Departamento de Zoologia, I.B., Universidad Estadual de Campinas, Campinas, S. P., Brasil.

RANA SPHENOCEPHALA (Southern Leopard Frog). **VARIATION**. On 7 April 1990, I collected a dorsally unspotted *Rana sphenocephala* (62 mm SVL) near the Rt. 190 Sabine River overpass, ca. 3 km E of Bon Wier, Newton County, Texas (T.4S, R.12W, Sec. 5, NE 1/4). The specimen has several dark spots and bars on its hind limbs (Fig. 1). The phenotype of this specimen is similar to that of the *burnsi* morph in *R. pipiens* (Merrell 1965. Evolution 19:69-85). Unspotted specimens of *R. sphenocephala* have been reported from New Jersey, Alabama, Kentucky, eastern Mississippi, and southern Illinois (Brown and Funk 1977. Herpetologica 33:290-293).



FIG. 1. Unspotted *Rana sphenocephala*, FMNH 241347.

The specimen was caught in a water-filled tire rut. Surrounding habitat consisted of a sandy river bank, and extensive bottomland forest. The specimen was deposited in the Field Museum of Natural History, Chicago, Illinois (FMNH 241347).

I thank R. A. Brandon, Southern Illinois University at Carbondale, for comments on this manuscript.

Submitted by **MICHAEL REDMER**, 21 West, 103 Par Lane, Itasca, Illinois 60143, USA.

TESTUDINES

GOPHERUS POLYPHEMUS (Gopher Tortoise). **DIET**. Grasses and legumes comprise a major portion of the diet of *Gopherus polyphemus*, but rare instances of coprophagy and carrion feeding have been reported (Garner and Landers 1981. Proc. Ann. Conf. S. E. Assoc. Fish & Wildl. Agencies 35:120-134). We report here on two additional observations of *G. polyphemus* feeding behavior.

On 18 May 1989, on of us (REH) observed a small adult *G. polyphemus* (20.5 cm CL) feeding on fox scat by the edge of a dirt road, 16 km SW of Butler, Taylor Co., Georgia. The remaining scat consisted primarily of small mammal hair.

On 19 August 1989, we located a road-killed adult male *G. polyphemus*, 25 km NW of Sopchoppy, Wakulla Co., Florida. Inspection of the stomach contents revealed several teeth and intact ribs that were later identified to be from a small opossum (*Didelphis virginiana*). The opossum also probably was a road fatality, although the carcass was not located. We thank Dick Franz for confirming the identification of the skeletal material.

Submitted by **OWEN F. ANDERSON**, Institute of Natural Resources, University of Georgia, Athens, Georgia 30602, USA, and **ROBERT E. HERRINGTON**, Department of Biology, Georgia Southwestern College, Americus, Georgia 31709, USA.

GOPHERUS POLYPHEMUS (Gopher Tortoise). **DIET**. The diet of *Gopherus polyphemus* in the western parts of its range is poorly known, and probably differs from that in the east, where *Aristida* is a major dietary component (MacDonald and Mushinsky 1988. Herpetologica 44:345-353). Lohoefner and Lohmeier (1981. J. Herpetol. 15:239-242) observed tortoises feeding on grasses (*Digitaria sanguinalis* and *Panicum* spp.) in southern Mississippi.

On 24 April 1991, I observed a juvenile *G. polyphemus* (ca. 9 cm long) foraging on a sunny hillside on the Chickasawhay Ranger District of the DeSoto National Forest, Wayne County, Mississippi (T.6N, R.8W, Sec. 26). At 1542 hrs CDST this tortoise was eating leaves of lupine (Fabaceae: *Lupinus diffusus*) and morning glory (Convolvulaceae: *Stylisma* sp.). The animal took a couple of bites from each plant before moving to the next. At 1600 hrs CDST it entered a burrow ca. 9 cm diam. I thank W. McDearman for verifying plant identifications.

Submitted by **C. A. JONES**, Mississippi Museum of Natural Science, 111 N. Jefferson St., Jackson, Mississippi 38201, USA.

LEPIDOCHELYS KEMPII (Kemp's Ridley Sea Turtle). **REPRODUCTION**. Mating by *Lepidochelys kempii* in the wild has not previously been documented. There are anecdotes of mating pairs in Mexican waters offshore from coastal Tamaulipas and Veracruz, before the nesting season commences (about 1 April) or during the nesting season (April-July) (R. Byles, pers. comm.). The first confirmed observation of *L. kempii* mating in Texas waters was made on 3 June 1991. Mr. Walt Kittleberger observed and photographed a pair of turtles in the Mansfield Channel, Willacy Co., Texas, ca. 230 m E of marker 22 (26°33'35"N, 97°22'25"). Mr. Kittleberger related that the pair was first observed at 1200 h. The male had mounted the female and both turtles were on their sides, at the surface, in the center of the channel. They soon turned so that their carapaces were upward, with the male located above the female. The pair submerged for 30 s periods and drifted N out of the channel with an outgoing tide. Diving depths could not be detected because of murky water conditions. They were last seen at 1315 hrs, still coupled and in water ca. 0.6 m deep within the lower Laguna Madre.

Mr. Kittleberger forwarded his photographs to me, and I identified the turtles as *L. kempii* based upon color, shape of the carapace, and size. Identity of the turtles was verified independently by R. Byles, U.S. Fish and Wildlife Service, Albuquerque, New Mexico. I could not determine whether they were wild or individuals from an attempt to establish a secondary breeding colony of this species at Padre Island National Seashore (Shaver 1990. Park Science 10(1):12-13), because tags, tag scars, or living tags could not be seen. No sea turtle nests were found along the Texas coast subsequent to the mating.

This is also the first documentation of this species within Willacy Co. inshore waters (including the Mansfield Channel and lower Laguna Madre) and the first observation of mating in inshore waters. The photographs were deposited in the collection at Padre Island National Seashore (PAIS 2520), Corpus Christi, Texas. I thank Richard A. Byles for his comments.

Submitted by **DONNA J. SHAVER**, National Park Service, Padre Island National Seashore, 9405 S. Padre Island Drive, Corpus Christi, Texas 78418-5597, USA.

SAURIA

ANOLIS CAROLINENSIS (Green Anole). **MAXIMUM SIZE**. Conant and Collins (1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, 3rd ed., Houghton Mifflin Co., Boston, 450 pp.) give the maximum size of *Anolis carolinensis* as 203 mm TL and 75 mm SVL. This appears to be a typographical error, because in 1986 I informed Collins of Tulane 19830 that had a 208 mm TL. Dundee and Rossman (1989. The Amphibians and Reptiles of Louisiana, Louisiana State University Press, Baton Rouge, 300 pp.) gave the 208 mm figure. Overlooked by me was an uncataloged specimen, now Tulane 20781, taken in 1979, that measured 209 mm TL in life (it now measures 208 mm in preservative). Subsequent to the publication of Dundee and Rossman, on 22 June 1989 I captured a specimen, now LSUMZ 53000, that measured 209.5 mm TL. All three of these very large males were taken from the yards of my previous and present homes in New Orleans and its suburb, Metairie, Louisiana. The largest SVL of any of these specimens is 70.5 mm, substantially less than the maximum of 75 mm reported

by Conant and Collins. Five new specimens, however, taken between 3 October and 19 October 1991 in the vicinity of Sorrento, Ascension Parish, Louisiana, and brought by collectors to Buck Prima, a commercial reptile dealer at LaPlace, Louisiana have the following measurements: LSUMZ 53620, SVL 73 mm, TL 211 mm; LSUMZ 53621, SVL 73 mm; LSUMZ 53622, SVL 79.5 mm, TL 227 mm; LSUMZ 53623, SVL 76.5 mm, TL 217.5; LSUMZ 53624, SVL 74 mm, TL 220 mm. A sixth specimen, LSUMZ 53625, taken 24 October 1991 near Sorrento, measures 80 mm SVL, 231 mm TL, and appears to have ca. 1 mm of tail missing.

Submitted by **HAROLD A. DUNDEE**, Department of Ecology, Evolution, and Organismal Biology, Tulane University, New Orleans, Louisiana 70118, USA.

LIOLAEMUS LUTZAE (Sand Lizard). **CANNIBALISM**. Intraspecific predation or cannibalism is a behavioral trait widespread within animal groups (Fox 1975. Ann. Rev. Ecol. Syst. 6:87-109; Polis 1981. Ann. Rev. Ecol. Syst. 12:225-251). Intraspecific predation of juveniles by adult lizards has been reported in some species (Hews 1989. Herpetol. Rev. 20(3):71; Polis and Myers 1985. J. Herpetol. 19:99-107; Wilson 1990. Herpetol. Rev. 21(3):61-62). During a study on seasonal variation in feeding habits I examined the stomach contents of 58 adults of *Liolaemus lutzae* (collected from December 1985 to December 1986) from coastal sand dune habitats of southeastern Brazil. Two of the lizards (1.3%), both males (67.2 and 67.6 mm SVL) had conspecific juveniles (29.0 and 30.0 mm SVL, respectively) in their stomachs. One stomach (collected 18 February) was entirely occupied by an undigested juvenile, and the other (collected 14 January) had a partially digested juvenile together with other prey items (coleopteran, ants, and lepidopteran larvae) common to *L. lutzae* (Rocha 1989. J. Herpetol. 23(3):292-294). That both predators were male supports the observation of Wilson (1990), who suggested that sexual differences in frequency of cannibalism could be related to the larger size of the males. *L. lutzae* males are significantly larger in body and head size (Rocha 1989. Masters Thesis. Universidade Estadual de Campinas, Campinas, São Paulo, Brazil, 104 pp.). Both instances of cannibalism occurred in the summer when *L. lutzae* is at peak abundance. This supports the conclusion that these observations represented opportunistic foraging (Polis and Myers, op. cit.). I thank Helena Bergallo for suggestions on the text and the Fundacão de Amparo a Pesquisa de Estado do Rio de Janeiro for financial support (process No. E-29 1708864/90).

Submitted by **CARLOS FREDERICO DUARTE ROCHA**, Setor de Ecologia, Departamento de Biologia Animal e Vegetal, Instituto de Biologia, Universdade do Estado do Rio de Janeiro, Rua São Francisco Xavier, 524, 20550 Maracaña, Rio de Janeiro, R.J., Brazil.

OPHISAURUS VENTRALIS (Eastern Glass Lizard). **REPRODUCTION**. On 10 August 1990, an adult *Ophisaurus ventralis* and six eggs were dug up by workers at the Back Bay National Wildlife Refuge, Virginia Beach, Virginia. The adult lizard escaped and the eggs were collected. The eggs were measured and placed in moist sandy soil from the capture location and allowed to continue development. The six eggs measured 21.0 x 13.8 mm, 22.2 x 13.3 mm, 20.7 x 13.4 mm, 21.0 x 13.4 mm, 21.0 x 14.1 mm, and 20.0 x 13.4 mm, similar in size to eggs deposited in June and July (Schwab 1988. Catesbeiana 8(2):31). On 19 August 1990, three eggs hatched. On 20 August 1990, the remaining three eggs were opened and contained three dead but fully formed lizards. The three dead specimens were preserved and measured (TL = 123, 124, and 139 mm).

Submitted by **DONALD J. SCHWAB**, Virginia Wildlife Division, P.O. Box 847, Suffolk, Virginia 23434, USA.

UROSAURUS ORNATUS (Tree Lizard). **MORTALITY**. While conducting observations on the social behavior of tree lizards in outdoor enclosures during the reproductive seasons of 1988 and 1990, several lizards died. There was an apparent relationship between those males that succumbed and their social status, as well as between the number of lizards that died and the air temperature.

The experiments were conducted in 2 m x 4 m x 0.5 m high sheet metal pens with cinder blocks for perching and hiding. All pens were housed within a chainlink fence and were covered on the top and sides with chicken wire to prevent avian and mammalian predation. One female and three males were present in each pen. In June 1988, nine groups of three males were matched for size and throat coloration and in June 1990, ten groups of three males were matched for size but differed in throat coloration. The lizards for both sets of experiments were collected from the Doña Ana Mountains, 25 air km NNE of Las Cruces, Doña Ana County, New Mexico. In all pens, a dominance hierarchy arose in which one male assumed the high ranking position; he was the only male in each group to perform dominance displays such as assertions, challenges, and chases.

Temperature differed between years. The mean maximum air temperature was 34.4°C in June 1988 and was 37.8°C in June 1990. In June 1988 no days reached above 38°C, while in June 1990, 17 days did so. Mean June maximum from 1870-1987 is 34.4°C. In both years, observations were made from about 0630 to 0900 hrs. Initial and ending air temperatures were significantly higher (t-test; $P<0.001$) in 1990 compared to 1988. In 1988, one of 27 males, a subordinate, either died or managed to escape from the pen during the course of the experiment. In 1990, eight of 30 males died; all were subordinates. They died between 10 and 22 days after being placed in the pens (each experiment ran for 28 days). Thus, significantly more subordinates died than dominants (log-likelihood ratio $G = 8.12$; $P = 0.004$), and significantly more lizards died in 1990 than in 1988 ($G = 6.37$; $P = 0.012$).

Differences in survivorship during the course of the two experiments were more likely explained by heat stress in 1990 as opposed to differences in severity of injury suffered by subordinate males. Dominant males in 1990 were not more aggressive (based on number of dominance behaviors performed) than those in 1988 (unpubl. data). Subordinate males might be more susceptible to heat stress due to minor injuries inflicted by dominant males, or, dominant males may have been able to keep subordinate males away from cooler microhabitats. In either case, one benefit of being a dominant individual appears to be an increased chance of survival during periods of environmental stress, especially in populations with high densities and limited territorial sites as occurred in these experiments and sometimes in the wild (Zucker 1989. J. Herpetol. 23:389-398).

Submitted by **NAIDA ZUCKER**, Department of Biology, New Mexico State University, Las Cruces, New Mexico 88003-0001, USA.

SERPENTES

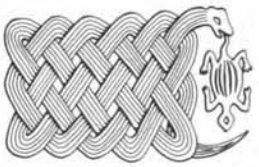
FARANCIA ABACURA ABACURA (Eastern Mud Snake). **REPRODUCTION**. Parental care of eggs in *Farancia abacura* was confirmed by Meade (1940. Herpetologica 2:15-20), Goldstein (1941. Copeia 1941(1):49-50), and Riemer (1957. Herpetologica 13:31-32). Parental care is a rare behavior in snakes, reported in 2.8% of the suborder (Shine 1988. *In* Gans and Huey (eds.), Biology of the Reptilia, vol. 16, Alan R. Liss Inc. New York, pp. 276-329). On 18 September 1991 a female *F. a. abacura* (1380 g, 145 cm TL) was discovered sitting on a clutch of eggs. The nest was in discarded potting soil in a self-constructed chamber (30 cm x 21 cm x 11 cm from soil to top of snake). A pad of 6 cm thick, loosely rooted soil rested directly on the snake. The nest was at an open disturbed site on level ground beside a greenhouse, 15 m up a slight incline from the SE side of Lake Alice on the campus of the University of Florida, Gainesville (T.10S., R.20E., Sec. 7). The female was tightly coiled on top of 53 nonadhesive eggs in a double layer, with none of the eggs visible from above. Seven eggs were damaged, with three very dry, two quite dry, and two recently punctured (probably not slit by hatchlings) and nearly fully hydrated. All damaged eggs were in the bottom layer in the nest, and the punctures faced the soil. The top of the clutch was practically free of loose soil, indicating the snake may not have left the nest since the eggs were laid. The temperature of the nest at the top of the eggs under the female was 27.0°C at 1500 hrs. Both female and clutch were removed to the laboratory.

Length of 46 viable eggs varied from 30.0–38.3 mm ($\bar{x}$ = 31.8 mm, SD = 6.54); width varied from 20.3–24.7 mm ($\bar{x}$ = 22.9 mm, SD = 0.96); and mass varied from 7.90–10.96 g ($\bar{x}$ = 9.41 g, SD = 1.50). Assuming the mean mass of the seven damaged eggs was the same as the mean mass of undamaged eggs, the total clutch mass was 507.8 g or 36.8% of the female mass.

The eggs were spaced out on top of moist soil in a closed container and incubated at an undetermined room temperature. The soil was taken from the walls of the nest chamber. Until water was added to this soil three hours after the eggs were removed from the nest, dehydration caused a significant dimpling of each egg. Hatching began at ca. 2200 hrs on 22 September, just over four days after removal from the nest. Eighteen hours elapsed from first slit to first emergence, at which time 24 of the 46 eggs were slit. Successful emergence of all 46 hatchlings took place at a constant rate, requiring 50 hrs from first slit to last emergence at midnight on 24 September. Hatchlings made 1–12 straight slits in the shell ($\bar{x}$ = 4.8, SD = 2.2), usually less than 1 cm long and mostly restricted to the top and one half of the egg. I observed heads of hatchlings extended partially outside the slit, but they quickly withdrew when disturbed. Hatchling mass varied from 4.47–7.53 g ($\bar{x}$ = 6.91 g, SD = 0.52) and TL varied from 198–242 mm ($\bar{x}$ = 221 mm, SD = 9.7). Eggshell mass (air-dried) varied from 0.11–0.23 g ($\bar{x}$ = 0.16 g, SD = 0.02). Almost all hatchlings remained in a tight clump for the first night following emergence.

Eight hatchlings were retained in a shallow water aquarium, and all shed over a 44-hr period, starting at 2200 hrs on 2 October, almost eight days after completion of hatching. During their sixteen days before release, the eight hatchlings did not eat, despite being offered, live earthworms, freshwater shrimp, and small fish (*Gambusia affinis*).

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Submitted by **DAVID L. AUTH**, Herpetology Division, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611, USA.

THAMNOPHIS PROXIMUS RUTILORIS (Western Ribbon Snake). **NATURAL HISTORY**. During the spring and summer of 1985 we captured eight active adult *Thamnophis proximus* during a study of diet and activity patterns of the water snake *Nerodia rhombifera* in a swamp in the mouth of Papaloapan River in Alvarado Port (18°46'N, 95°44'W), Veracruz, México. Two males (370 and 395 mm SVL) and six females (290–415 mm SVL), were captured. Snakes were forced to regurgitate and all had fed on frogs (*Leptodactylus melanonotus*, n = 7 stomachs), or toads (*Bufo valliceps*, n = 1). Five species of small fish present in the swamp were not found to be consumed. Snakes were active during daylight hours in the grasslands surrounding the swamp. Although we searched for snakes during monthly visits from March 1985 to June 1986, we found them only between March and October 1985, coinciding with periods of high abundance of anurans.

On 12 October 1985 at 1015 hrs, we observed an adult female *Thamnophis proximus* (290 mm SVL) arrive at the pond, where she was attacked and killed by an aquatic bug (Belos-

tomatidae). The neck of the snake had been grasped with the claws and the head of the snake was submerged. Air temperature was 26°C. There are few published reports of invertebrates preying upon amphibians or reptiles, and this parallels a single report of predation on snakes by a diving beetle larva (Drummond and Wolfe 1981. Coleop. Bull. 35(1):121-124).

On 15 June 1985, one gravid female (410 mm SVL) was collected and transported to the laboratory and on 21 August gave birth to four males (150-158 mm SVL) and two females (155 and 157 mm SVL).

Submitted by **JAVIER MANJARREZ**, and **CONSTANTINO MACIAS-GARCIA**, Centro de Ecología, Universidad Nacional Autonoma de México, AP 70-275, CP 04510, Ciudad Universitaria, DF, México.

GEOGRAPHIC DISTRIBUTION

Three Species New To The Herpetofauna Of New Mexico

While no comprehensive up-to-date treatment of the herpetofauna of New Mexico exists, work is currently underway to compile that information (Degenhardt, Painter, and Price, in prep.). This accelerated interest in the distribution of New Mexico's amphibians and reptiles led to recent collections that have yielded three species new to the herpetofauna of New Mexico.

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). Doña Ana Co: Las Cruces, trailer court on Stearn Drive, ca. 4 km S jct El Paseo Drive. 10 September 1991. John Waters. Verified by Geoff C. Carpenter. New Mexico State University (NMSU 6612). Numerous specimens have been collected at the above and nearby localities. All collection sites have been associated with human dwellings. The establishment of a population of *H. turcicus* in Las Cruces is not surprising, as a population has been known to exist in El Paso, Texas, for almost ten years (Selcer 1986, Copeia 1986(4):956–962; R. G. Webb, pers. comm., UTEP 9539).

LAMPROPELTIS ALTERNA (Gray-banded Kingsnake). Eddy Co: Carlsbad Caverns National Park. DOR on New Mex. Rt. 7. 15 June 1991. Gary & Shane Swinford. Verified by W. G. Degenhardt. University of New Mexico Museum of Southwestern Biology (MSB 52000). The occurrence of this secretive species in adjacent Texas is well documented and its presence in southeastern New Mexico (Guadalupe Mountains) is not unexpected (Gehlbach 1967, Cat. American Amphib. Rept. 55.1–55.2). This specimen was collected under the authority of a Carlsbad Caverns National Park scientific collection permit and will be considered for listing as state-endangered by the New Mexico State Game Commission. Unconfirmed sight records exist for this species in the western foothills of the Guadalupe Mountains and on Otero Mesa.

TANTILLA YAQUIA (Yaquia Blackhead Snake). Hidalgo Co: Peloncillo Mountains, Skeleton Canyon, ca. 27.4 km S Rodeo, Sec 24, T31S, R22W. 25 August 1991. Paul W. Hyder. Verified by Joseph L. LaPointe. New Mexico State University (NMSU 6618). Because this species is often encountered in the riparian woodland near Portal in the Chiricahua Mountains of southeastern Arizona (McDiarmid 1977, Cat. American Amphib. Rept. 198.1–198.2), its presence in similar habitat in New Mexico is not unexpected.

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New County Records For Amphibians And Reptiles From Pennsylvania

McCoy (1982, Amphibians and Reptiles of Pennsylvania: Checklist, Bibliography, and Atlas of Distribution. Spec. Publ. Carnegie Mus. Nat. Hist. (6):1–91) provided the first recent treatment of the distribution of the herpetofauna of Pennsylvania. This extensive work has added much to our knowledge of the state's herpetofauna, yet many gaps in the distribution of individual species remain to be filled. All specimens in this report constitute new county records. Unless otherwise stated all specimens were collected by the authors, and are deposited in the Carnegie Museum of Natural History (CM). Identifications have been verified by C. J. McCoy.

CAUDATA

CRYPTOBRANCHUS A. ALLEGANIENSIS (Eastern Hellbender). Forest Co: Tionesta Creek at Kelletville. 25 August 1991. CM 123202. Tionesta Creek, 1.3 km downstream from confluence with Minister Creek. 25 August 1991. CM 123203.

NECTURUS M. MACULOSUS (Mudpuppy). Forest Co: Tionesta Creek, 2.2 km upstream from mouth of Blue Jay Creek. 2 August 1991. CM 123204.

AMBYSTOMA JEFFERSONIANUM (Jefferson Salamander). Adams Co: 8 km S Pine Grove Furnace State Park on Rt. 233. 15 June 1989. CM 119143. Erie Co: Harborcreek Twp., Behrend College, Station Rd. 26 March 1987. M. Lethaby. CM 115957. Franklin Co: Michaux State Forest, 2.5 km S Old Forge. 19 May 1987. R. W. Van Devender. CM 116340–42. McKean Co: Fuller Brook Creek on Glendora Estate, 1.6 km W Corydon St. 26 March 1987. T. Pauley. CM 119101–102.

AMBYSTOMA OPACUM (Marbled Salamander). Leigh Co: Penn. Gameland Unit 217, 0.2 km SW Bake Oven Knob on Appalachian Trail. 27 November 1984. M. R. Collie. CM 113362. Monroe Co: Snowhill Rd, 6.4 km E Rt. 447. 24 May 1990. CM 123158–159.

NOTOPHTHALMUS V. VIRIDESCENS (Red-spotted Newt). Armstrong Co: Spring Church. 10 April 1991. CM 123194–3200. Greene Co: pond below the causeway at the SW edge of Ryerson Station State Park. 5 May 1990. CM 123155.

DESMOGNATHUS OCHROPHAEUS (Mountain Dusky Salamander). Huntingdon Co: along Little Juniata River, 1.2 km upstream from Rt. 305 on Twp. Rd 492. 7 June 1989. CM 123126. Pike Co: pond eddy along the Delaware River. 23 May 1990. CM 122157. Partly fills in the distribution of this species along the southern edge of the Valley and Ridge Province and along the northeastern corner of the state.

GYRINOPHILUS P. PORPHYRITICUS (Northern Spring Salamander). Adams Co: Caledonia State Park near Hosack Run Campground. 19 June 1989. R. W. Van Devender. CM 118756. Greene Co: Legislative Rt. 30039, 1.1 km SE Ryerson Station State Park. 4 May 1990. CM 122156. Confirms the presence of this species in the southwestern corner of the state.

PLETHODON WEHRLEI (Wehrle's Salamander). Clarion Co: Penn. State Gameland 74 on Mill Creek, 0.8 km upstream from Legislative Rt. 16055. 1 April 1981. R. McPherson. CM 89574.

PSEUDOTRITON R. RUBER (Northern Red Salamander). Elk Co: Belle Draft Rd, 5.4 km N Dents Run Rd in Elk State Forest. 8 June 1991. CM 123193. Forest Co: Pigeon Hill Rd, 3.3 km E Rt. 62. 25 May 1988. CM 118452–453. McKean Co: Willow Creek, under bridge on Forest Rd 602. 28 May 1985. T. K. Pauley. CM 112204.

EURYCEA BISLINEATA (Northern Two-lined Salamander). Forest Co: West Hickory Creek at Rt. 227. 17 August 1989. CM 119141–142.

EURYCEA L. LONGICAUDA (Longtail Salamander). York Co: Anderson Creek at Lock No. 12 Picnic area along Susquehanna River. 8 July 1989. CM 119140. Fills in a gap in the distribution of the species along the southern border of the state.

ANURA

BUFO A. AMERICANUS (Eastern American Toad). Jefferson Co: Rt. 949 at entrance to Clear Creek State Park. 21 July 1989. CM 119144.

BUFO WOODHOUSII FOWLERI (Fowler's Toad). Greene Co: 4.8 km SE Rt. 21 on Legislative Rt. 30038. 4 May 1990. CM 123154. York Co: Susquehanna River at Lock No. 12. 7 July 1989. CM 119145. Yellow Breeches Creek at SR 74. 10 July 1989. CM 119146. Begins to fill in the distribution in the lower Susquehanna drainage.

HYLA VERSICOLOR (Gray Treefrog). Erie Co: Presque Isle State Park near waterworks. 23 May 1989. D. M. McKinstry & H. N. Cunningham. CM 119119.

PSEUDACRIS C. CRUCIFER (Northern Spring Peeper). Adams Co: Quarry Gap at Penn. Rt. 233. 20 May 1987. R. W. Van Devender, CM 118708. Luzerne Co: Lake Jean. 6 June 1990. CM 123173.

RANA CATESBEIANA (Bullfrog). Forest Co: Tionesta Creek, 1 km S confluence with Minister Creek. 16 August 1989. CM 123215.

RANA CLAMITANS MELANOTA (Green Frog). Susquehanna Co: Martin's Creek at Rt. 11, 18 km N county line. 1 June 1990. CM 123165–168.

RANA PALUSTRIS (Pickerel Frog). Greene Co: N Fk of Dunkard Fork, 0.5 km W Ryerson Station State Park. 21 May 1989. CM 119150.

RANA SYLVATICA (Wood Frog). Adams Co: 8 km S Pine Grove Furnace State Park on Rt. 233. 15 June 1989. CM 119147–148. York Co: Bald Eagle Creek, 3 km N Rt. 851 on Rt. 425. 8 July 1989. CM 119149. Fills in the species range in the southern border counties.

TESTUDINES

APALONE SPINIFERA SPINIFERA (Eastern Spiny Softshell). Clarion Co: Allegheny River at mouth of Clarion River, 1.6 km N Parker. 22 August 1986. M. A. Ewert. CM 114446. Mercer Co: Shenanhgo Bridge at Reynolds Heights. 17 June 1987. M. A. Ewert. CM 117881.

CHELYDRA S. SERPENTINA (Common Snapping Turtle). Armstrong Co: Allegheny River, 3.2 km W Reston. 28 August 1986. M. A. Ewert. CM 114449. Bedford Co: Dunning Creek at Rt. 96, N New Paris. 30 June 1990. CM 123177. Raystown Branch of Juniata River in Bedford. 1 July 1990. CM 123178–179. Bradford Co: Rt. 414, 16.5 km W jct. with Rt. 220 near Towanda Creek. 6 June 1990. CM 123172. Elk Co: mouth of Mason Creek at Ridgeway. 1974. V. Rogers. CM 107451. Forest Co: Allegheny River, 1.6 km SSW Tionesta. 23 August 1986. M. A. Ewert. CM 114444. Montour Co: Penn. Rt. 44, 2.6 km W Exchange. 23 April 1982. G. J. and J. F. Jacobs. CM 116305. Northumberland Co: Rt. 147, 1.3 km S Rt. 45 along Susquehanna River. 15 June 1990. CM 119163. Codorus Creek at Rt. 616. 11 July 1989. CM 119162. Fills in the species range in the southern border counties and in the northeastern portion of the state.

CHRYSEMYS PICTA MARGINATA (Midland Painted Turtle). Cameron Co: near Sinnemahoning Creek along Rt. 555, 6.7 km E Cameron/Elk county line. 15 July 1991. CM 123187–88. 12.5 km S Potter County line on Rt. 872 near First Fork Creek. 15 July 1991. CM 123189–191. Sullivan Co: Rt. 154, 4 km N Rt. 220. 6 June 1990. CM 123175. Susquehanna Co: Martin's Creek along Rt. 11, 25 km N county line. 31 May 1990. CM 123163–164.

CLEMMYS INSCULPTA (Wood Turtle). Fulton Co: 0.8 km E New Grenada along Sideling Hill Creek. 2 June 1989. CM 119157. Somerset Co: Rt. 219, 5.4 km S jct. with Rt. 30. 24 July 1991. CM 123201. Begins to fill in the distribution along the southern border of the state.

CLEMMYS MULHENBERGII (Bog Turtle). New localities have been discovered in Adams and York counties and voucher specimens are on deposit at the Carnegie Museum, but due to the endangered status of the species the exact localities are being withheld.

TERRAPENE C. CAROLINA (Eastern Box Turtle). Armstrong Co: N end Keystone Lake. 31 July 1990. CM 123180.

SAURIA

EUMECES A. ANTHRACINUS (Northern Coal Skink). Elk Co: Elk State Forest, Belle Draft Rd, 5 km N Dents Run Rd. 27 July 1990. CM 123185. Somerset Co: 7.6 km S Somerset. May 1985. K. J. Stairs. CM 112207.

EUMECES FASCIATUS (Five-lined Skink). Erie Co: 0.8 km N Rt. 6, N off of Cherry Hill Rd, about 0.6 km W Albion. 24 April 1990. M. Lethaby and J. Tucci. CM 119167–168. Franklin Co: 4 km N Doylesburg on Rt. 274. 10 June 1989. CM 119155. Perry Co: Horse Valley Rd, 13.4 km NE Rt. 75. 10 June 1989. CM 119153–154.

SERPENTES

CARPHOPHIS A. AMOENUS (Eastern Worm Snake). Perry Co: Horse Vally Rd, 9.8 km NE Rt. 75. 28 April 1990. CM 123150.

COLUBER C. CONSTRICTOR (Northern Black Racer). Cameron Co: Rt. 555, 0.9 km W Houston Hill Rd. 15 July 1991. CM 123186. Clearfield Co: 1.1 km N Newtonburg on Twp Rd 333. 26 July 1989. CM 119132.

DIADOPHIS PUNCTATUS EDWARDSII (Northern Ringneck Snake). Blair Co: 3.6 km SE Martinsburg on Rt. 164. 1 June 1989. CM 119129–130. Greene Co: 11.6 km S Morrisville on Rt. 19. 19 May 1989. CM 119121. N Fork Dunkard Fork, 0.5 km W Ryerson Station State Park. 21 May 1989. CM 119123. Rt. 88, 21 km S jct. with Rt. 21. 21 May 1989. CM 119124–126. Rt. 18, 8.2 km N jct. with Rt. 21. 20 May 1989. CM 119122. Juniata Co: 3.2 km N of Perry County line on Rt. 74. 8 June 1989. CM 119159–160. Susquehanna Co: Rt. 262, 1.6 km S Choconut. 30 May 1990. CM 123160. Hwy 706, 1.5 km E Montrose. 30 May 1990. CM 123181–182. Rt. 295, 11 km S of New York State line. 30 May 1990. CM 123183. Fills in the species range in the southern and northeastern portions of the state.

ELAPHE O. OBSOLETA (Black Rat Snake). Chester Co: Freemont Rd, Nottingham Twp. 1987. D. Owens. CM 118320. Columbia Co: Rt. 118, 3.2 km E Rt. 239. 6 June 1990. CM 123171.

LAMPROPELTIS T. TRIANGULUM (Eastern Milk Snake). Armstrong Co: 1.5 km N Elderton, Plum Creek Twp. 19 June 1988. CM 118141. Fills in the species distribution in the western half of the state.

OPHEODRYS VERNALIS (Smooth Green Snake). Columbia Co: 2.7 km S Red Rock on Rt. 487. 4 June 1990. CM 123169. Susquehanna Co: 11.5 km S Choconut on Rt. 267. 30 May 1990. CM 123161. Rt. 11, 4.8 km S jct. with Rt. 31 May 1990. CM 123162.

REGINA SEPTEMVITTATA (Queen Snake). Lycoming Co: 8 km N Trout Run. 7 May 1949. G. Jacobs. CM 86826–28.

STORERIA D. DEKAYI (Northern Brown Snake). Columbia Co: Rt. 239, 6.5 km S jct. with Rt. 118. 6 June 1990. CM 123174. McKean Co: Forest Service Rd 602 near Warren County line. No date. T. Pauley. CM 115333. 0.8 km from Bridge over Willow Creek at Willow Bay. 4 May 1984. T. Pauley. CM 109051. Wyoming Co: River Street, Tunkhannock. 21 April 1957. G. C. Shaffer. CM 91540. York Co: York Furnace. 22 May 1987. R. W. Vandevender. CM 118719.

STORERIA O. OCCIPITOMACULATA (Northern Redbelly Snake). Berks Co: 0.4 km from Bird Creek at Camp Northkill, Upper Tulpenhocken Twp. 26 April 1986. J. A. Eckert. CM 114643. Columbia Co: Rt. 487, 2.7 km S Red Rock. 4 June 1990. CM 123170. Huntingdon Co: Rt. 994, 16 km E Trough Creek Road. 28 April 1990. CM 123151. Perry Co: Horse Valley Rd, 13.7 km NE Rt. 75. 28 April 1990. CM 123152–153.

THAMNOPHIS BRACHYSTOMA (Shorthead Garter Snake). Clearfield Co: 11.5 km N Mud Run Rd on Rt. 153. 23 July 1989. CM 119161.

THAMNOPHIS S. SAURITUS (Eastern Ribbon Snake). Bedford Co: Bard Rd, 3.3 km E Rt. 31. 22 June 1989. CM 119139.

THAMNOPHIS S. SIRTALIS (Eastern Garter Snake). Armstrong Co: 1.5 km N Elderton, Plum Creek Twp. 14 June 1988. CM 118144. Montour Co: Rt. 44, 3.7 km E Rt. 54. 6 June 1990. CM 71379.

VIRGINIA VALERIAE PULCHRA (Mountain Earth Snake). Clearfield Co: 7 km S Mud Run Rd on Rt. 153. 23 July 1989. CM 119133–134. 1 km N Mud Run Rd on Rt. 153. 23 July 1989. CM 119135. Elk Co: Belle Draft Rd, 5.4 km N Dent's Run Rd, Elk State Forest. 4 June 1991. CM 123192. Begins to fill in the gap in the species distribution in the north central portion of the state.

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Erratum

The last two lines of the last sentence in Lutterschmidt (1992. Herpetol. Rev. 23(1):26) concerning a range extension for *Crotalus horridus* should read: "and extends the Louisiana range ca. 96.5 km E Grangeville and 67.6 km N Mandeville."

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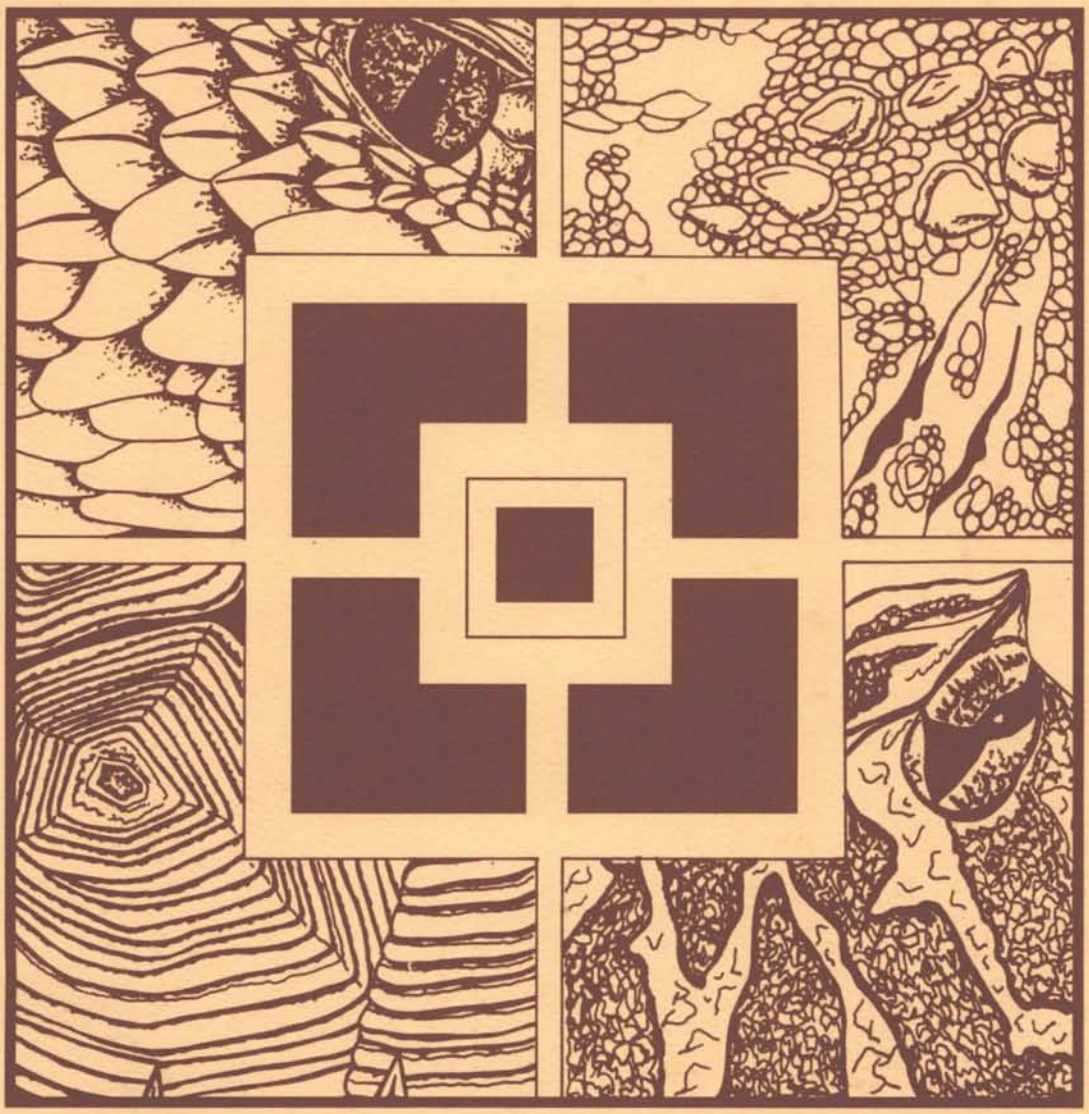
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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the ***Journal of Herpetology*** (4 issues annually), ***Herpetological Review*** (4 issues annually), and occasional issues of ***Facsimile Reprints in Herpetology***. Members may purchase other Society publications at reduced rates.

ANNUAL DUES 1992

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1992 SSAR MEETING HIGHLIGHTS

Dates: 2-6 August 1992.

Place: University of Texas at El Paso (El Paso, Texas).

Co-host: El Paso Community College.

Co-sponsor: Sociedad Herpetología Mexicana.

Keynote Lecture: "A Random Walk Among the Anura," concerning the evolution and phylogenetics of frogs, by Linda R. Maxson (Pennsylvania State University).

Symposium: "Chelonian Systematics, Evolution and Zoogeography." *Organizers:* Edward O. Moll and John Carr. *Speakers:* John Bickham, Brian Bowen, John Carr, Charles Crumley, Brian Hanks, J. Alan Holman, John Iverson, John M. Legler, Jeff Lovich, Samuel B. McDowell, Peter Meylan, Pat Minx, Edward O. Moll, Anders G. J. Rhodin, and Roger Conant Wood.

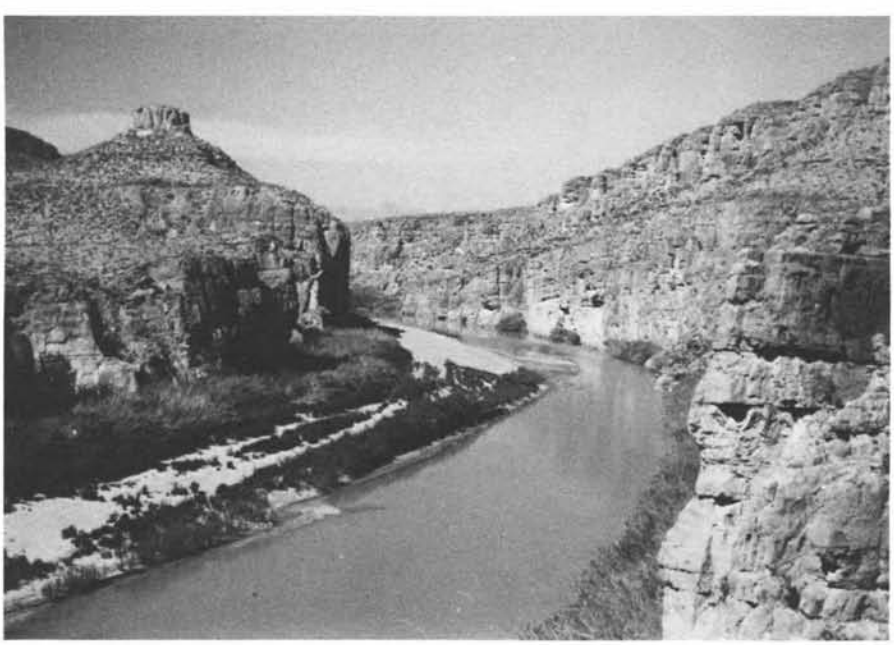
Symposium: "Conservation of Amphibians and Reptiles." *Organizers:* Tom R. Johnson and Paul Moler.

Herpetological Travelogue Slide Shows: James R. Dixon (Venezuela), Aaron M. Bauer (Pacific Ocean and Australia), Aurelio Ramirez-Bautista (México), and Edward O. Moll (Turtles of South Asia).

Oral and Poster Presentations: Several concurrent sessions each day.

Student Paper Awards: Seibert Prizes will be awarded to the two best student papers ($250 first prize, $150 second).

Herpetological Art Show: A juried herpetological art show, at the Centennial Museum. $200 awards in each category: Best Painting, Best Drawing, Best Photo, and Best Sculpture. (Entry Form in the December 1991 *Herpetological Review*, p. 108).



Rio Grande and limestone cliffs near Rio Grande Village, Big Bend National Park, Texas. This is the lowest (600-610 m), driest area in the Chihuahuan Desert. Photo courtesy of T. R. Van Devender.

Audiovisual Shows: "Herps of the West," "Amphibians of the Appalachians" (updated), and "Herpetology Past and Present."

Field Trips: Chihuahuan Desert Research Institute in Alpine, Texas, including a BBQ cookout. Trips to Franklin Mountains Wilderness State Park (hiking trip) or an all-day visit to Indio Mountains Research Station.

Social Activities: Welcoming Reception; "Fajita Fiesta"; the annual SSAR Auction; trip to Ciudad Juarez, México (optional).

Live Exhibit: Collection of local and southwestern amphibians and reptiles, arranged by the El Paso Herpetological Society and Chihuahuan Desert Herpetological Society (set-ups for photography will be provided).

Regional Herpetological Societies Conference: "Federal and State Wildlife Laws and Regulations and How They Affect Regional Herpetological Societies." *Organizer* Eric M. Rundquist.

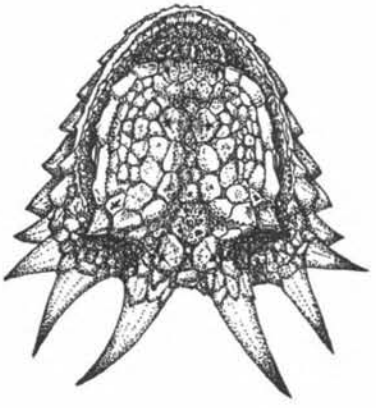


Toad (horned) burgers—a gastronomic highlight and conservation lowpoint to mark annual SSAR meeting. Photo courtesy of T. R. Van Devender.

Costs: Registration fee, regular $60, students $35. Housing: On campus dormitory $15 per night single, $8 per night double; Off campus hotels, ranging from $40 to $55 per night (details in Meeting Announcement to be mailed to SSAR members in March 1992).

Further details in the December 1991 issue of *Herpetological Review* (pages 107-109) or on request from Carl S. Lieb, Department of Biological Sciences, University of Texas at El Paso, El Paso, Texas 79968-0512, USA *(Telephone 915-747-5844)*.


Succulent desert scrub with ocotillo, blind prickly pear, and chino grass on limestone slopes near Rio Grande Village. Photo courtesy of T. R. Van Devender.



SSAR BUSINESS

SSAR Election Results

Results of the recent SSAR election are as follows:

President-elect (to serve as president for 1993): Thomas H. Fritts.

Secretary: J. Eric Juterbock (unopposed).

Treasurer: Douglas H. Taylor (unopposed).

Directors: Robin M. Andrews, Bern W. Tryon.

SSAR El Paso Meeting—Conservation Symposium Announcement and Extended Call for Papers

This is the third Conservation Symposium announcement to appear in HR and extends the deadline for abstracts until 15 June 1992. The SSAR Conservation Committee is planning a one-day symposium dedicated to conservation efforts for amphibians and reptiles. A number of papers have been selected but fall short of the number needed to warrant a one-day session.

The Conservation Symposium will be devoted to specific topics such as the conservation of taxonomic groups (sea turtles, iguanid lizards, high elevation frogs), regions (desert, rain forest, wetlands), and conservation/management methodology. Papers of particular interest will be those dealing with "hands on" projects directly related to habitat improvement, mitigation, reproductive enhancement, and restocking or relocation of rare or endangered amphibians and reptiles.

To be considered for participation in the Symposium at the El Paso meeting, send a typed abstract (200-300 words) with a cover letter, by 15 June 1992, to:

Tom R. Johnson
Herpetologist
Missouri Department of Conservation
P.O. Box 180
Jefferson City, Missouri 65102-0180, USA.

Notice: Request to Amend Constitution

The SSAR Board expects to discuss amending the Constitution and Bylaws to make them gender-neutral at the Board and Business Meetings conducted at the 1992 Annual Meeting in El Paso, Texas, 2-6 August.

New Regional Society Section Editor for HR

The new Section Editor for Regional Society News is Eric Rundquist. Information concerning regional society news, activities, address changes, etc. should be sent to him (address on inside front cover).

IN MEMORIAM

Ruth M. Zantzinger

On 8 November 1991 the herpetological community lost one of its most ardent and beloved members, Ruth M. Zantzinger, of Philadelphia. Ruth lost her fight against a hepatic carcinoma which was diagnosed late in September 1991. Many were stunned by the suddenness of Ruth's passing and deeply saddened for the loss to SSAR and the herpetological community, for Ruth had truly become, in the words of one colleague, the "Grand Lady of the Society."

A self-taught biologist and herpetoculturist, Ruth attended many national and regional meetings, and participated in numerous workshops and field trips. The national conferences of the American Association of Zoological Parks and Aquariums (AAZPA) and the International Herpetological Symposium (IHS) allowed Ruth to become acquainted with prominent leaders of the zoo and husbandry communities across the country. Thus, she aptly described her professional role as a liaison person between zoos, museums, and universities for programs in herpetological research and education. Her favorite, and the one professional society with which Ruth was most closely allied, was SSAR. The 1983 SSAR/HL meeting in Salt Lake City, Utah, was the first national herpetological meeting Ruth attended, and this was to become the main meeting she subsequently would look forward to attending with great excitement.

Ruth Barnes Mull was born in Philadelphia on 2 June 1941, the only daughter and second child of John Barnes Mull of Philipsburg, Pennsylvania, and Helen Carlin of Philadelphia. Ruth is survived by her mother, four children, two grandchildren, her brother, sister-in-law, and six nieces and nephews. Following a memorial service, a reception was held in the Library of The Academy of Natural Sciences of Philadelphia, attended by a large number of Ruth's friends and colleagues. The reception was a fitting tribute to Ruth who was tremendously committed to the Academy. For years she volunteered her considerable intellect and organizational skills to support the Academy's scientific and educational missions.

After attending high school at Notre Dame Academy in Philadelphia from the first grade through her graduation in 1958, Ruth enrolled at Rosemont College, outside Philadelphia, and at Catholic University in Washington, D.C., majoring in drama. In 1960, when she was nineteen years old, Ruth married an ethno-



Ruth M. Zantzinger
1941–1991

graphic film-maker, and over the next several years she traveled to many countries in Asia and Africa on filming excursions. During one of these trips, Ruth's first-born daughter was taken fatally ill and was interred in Malaysia. Following her divorce in 1977, Ruth raised her four additional children, born between 1963 and 1970, in a rural house in Chester County, southeastern Pennsylvania.

Ruth was a master at working with people in a number of civic and service organizations. In 1990, she was elected Chairperson of the Womens' Committee of The Academy of Natural Sciences, and she effectively gave it leadership and coordinated its large membership. The Womens' Committee is an active organization of women volunteers that plans and sponsors a number of fund-raising events on behalf of the Academy's scientific programs. In Philadelphia, one of the largest and most successful of the annual events put on by the Womens' Committee is "Super Sunday," a day-long street fair held in October along the beautiful Benjamin Franklin Parkway and which the *New York Times* in the late 1970s described as "the nation's biggest block party." In 1991, as she had for several years since 1982, Ruth led the planning committee for "Super Sunday" and was instrumental in conducting the business negotiations that made it a success, both for the people of all racial and ethnic groups that attended and the City of Philadelphia, and for The Academy of Natural Sciences.

Another of Ruth's dedications was her volunteer work at the Zoological Society of Philadelphia. Her membership in the Docent Council, where she conducted many guided tours of the Philadelphia Zoo for the public, made her well versed in the natural history and behavior of vertebrates. In recent years, she devised training classes on the biology of amphibians and reptiles for new docents at the zoo. In late October 1991 Ruth received a rarely-awarded commendation by her peers for outstanding service to the Docent Council and to the Zoo. Each Saturday since 1981, whenever she could squeeze in a few hours during times when staff were not in evidence and she could work uninterrupted, she made entries into the animal ledgers. These large books contain historical data on every specimen of every species that became a part of the Philadelphia Zoo's animal collection from around 1874 to the present, and the modern ledgers are used to report pedigree data for global management. Ruth continued a long tradition by restoring beautiful handwriting to the ledgers, but more importantly she made many taxonomic and indexing revisions to them.

Within SSAR, Ruth served as a member of the Zoo Liaison Committee for several years. She presented the results of her survey of zoo snakebite procedures on behalf of the committee at the Missouri meeting in 1986. For the past three years she held the position of Elector, a presidential appointment. She showed eagerness and dedication in her committee work and in voluntarily attending many of the annual Board of Directors' meetings, a classic example of the society's openness in welcoming contributions from the full breadth of its membership. Although she did not have the usual academic credentials that would be considered the norm for entry to positions of responsibility in a scientific society, SSAR later entrusted her with the very heart of its democratic traditions in appointing her as Elector.

A straightforward and honest person, Ruth quickly won the affections of many who would become her most loyal friends. Half amused by this quality in herself, and somewhat proudly complaining of it, when her young nephew and his friend brought home some spring salamanders they had caught in a small stream and the boys begged Ruth to go salamander hunting with them, she said *"Why is it that 14-year old boys are always wanting me to go out in the woods with them? It's been like that all my life!"* Indeed, Ruth had the rare quality of being able to establish a close rapport with nearly everyone whom she respected, young and old alike.

Ruth especially looked forward to SSAR's annual meeting in August of each year. Her contribution to the Society's auction was her most public activity, yet the word 'auction' does not begin to convey the great social extravaganza that these events have become at the annual meetings. As the co-organizer with the auctioneer, Ruth was an elegant hostess, unafraid to take charge in the limelight. She purposely dressed beautifully and was attractively visible to the large gathering of assembled herpetologists. Far beyond her public visibility, however, she devoted much time to pre-selecting the order of items, assisting in displaying them, and, with her typical good humor, elevating the auction to an EVENT. Ruth frequently prepared little prompt cards for various items to be auctioned, and her rapport with the auctioneer was such that she often had only to write a single word on the card to clue Joe Collins as to how best to extract money from the somewhat besotted and pliable audience. Her suggestions (e.g., using credit cards, relegating small duplicate items to a "silent auction," having plenty of beer flowing throughout the evening) accounted in no small way for its technical improvements as well as its success as a major fund-raising event for the Society.

Completing yet another important project for the herpetological community, in 1987 Ruth began compiling an index to the international quarterly publication, *Herpetological Review*. This task, begun innocently enough with her co-author George Pisani, was to consume much of her "spare" time over four years. The publication, *General Index to Herpetological Review*, will be published in 1992. Her work on the *Index* was to her an adventure in which she could learn while performing a useful task in a field she loved. The meticulous nature of the work soon became all too apparent, and as Ruth eschewed computers she carefully hand-typed all records on some 3500 index cards.

Ruth Barnes Mull Zantzinger is loved deeply by her family members and many close friends, and we miss her dearly. Her loss has been devastating in its untimely prematurity. She is irreplaceable. Ruth was warm and joyous, and had a wonderful sense of humor. Who could not recall Ruth's hearty laughter whenever an irreverent comment might have been made by a speaker, and later that same unmistakable laugh as she mingled through the crowd at the evening social functions? Her generosity was appreciated by those to whom she gave her level-headed and candid analyses, donations of material goods, or even financial assistance, in some cases. In mid-October 1991, just weeks before her passing, she displayed her inner strength and her realistic, direct approach to her illness when she wrote: *"I am very much at peace with all of this. I have had a life full of everything and find very few days without some small treasure in them. My regrets are few and I certainly don't feel cheated in any way."* Ruth's deep sense of loyalty to others, her caring about people and about what they did, and her remarkable courage through her final illness serve as model guideposts for our own lives.

WILLIAM S. BROWN
Past President (1990), SSAR
Department of Biology
Skidmore College
Saratoga Springs, New York 12866, USA.



NEWSNOTES

Charles Stearns Grants-in-Aid for Herpetological Research at the California Academy of Sciences

The Department of Herpetology has established a program that provides limited financial aid to graduate students who wish to visit our collections to support their research in systematics.

Proposals should include a short—no more than one page—description of the research project, as well as a letter of support from the student's faculty advisor.

For this fiscal year only, proposals will be due on 15 April, 1992, and grantees will be notified by 15 May, 1992. Grantees will be expected to complete their Academy visit by 15 September, 1992. Proposals submitted for ensuing academic years will be due on 15 October, with notification by 1 December.

Send proposals to:

Herpetology Research Grants
Department of Herpetology
California Academy of Sciences
Golden Gate Park
San Francisco, California 94118-4599, USA
Tel. (415) 750-7037.

Request for Assistance

We are investigating the genetics of threatened populations of black rat snakes (*Elaphe o. obsoleta*) and eastern massasauga rattlesnakes (*Sistrurus c. catenatus*) in Ontario in order to develop appropriate genetic management strategies. Our findings will be of direct value to resource managers and conservation biologists concerned with recovery or protection of these species.

For comparative purposes we require blood samples from populations located outside Ontario. We wish to hear from persons able to assist us in the field collection of blood or identification of local populations. For further information please contact:

Kent Prior
Department of Biology
Carleton University
Ottawa, Ontario K1S 5B6 Canada
Tel. (613) 788-2600 ext. 3862
(613) 230 5991.

MEETINGS

Turtle and Tortoise Symposium

The New York Turtle & Tortoise Society will sponsor the Second International Symposium on Turtles & Tortoises: Conservation and Management, to be held in August 1992.

The three-day event will include lectures and workshops by turtle scientists, conservationists, zookeepers, and veterinarians from all over the world. There will also be a room for vendors.

For further information, contact the Society at (212) 459-4803 or write to 163 Amsterdam Avenue, Suite 365, New York, New York 10023, USA. All persons requesting information on the Symposium will be put on a special mailing list to be notified when details are final.

II Congreso Luso-Español y VI Congreso Español de Herpetologia

The Second Portuguese and Spanish Meeting and the Sixth Spanish Meeting on Herpetology will be held in the city of Granada (southern Spain) 24-27 September 1992, under the auspices of the Spanish Herpetological Society (A.H.E.). It will include plenary lectures, posters, and working groups concerning amphibians and reptiles, mainly of the western Mediterranean area.

On the final day, a full-day excursion will be arranged to the Sierra Nevada Natural Reserve. We may travel by four-wheel drive vehicles, climbing to more than 3,000 m above sea level.

We will welcome anyone working on or interested in Iberian and Mediterranean herptiles. Persons interested in making paper or poster presentations should correspond with the organizing committee by 30 March 1992. Please send your name, address, institution, type of presentation (oral and/or poster) and title(s) to:

Dr. J. M. Pleguezuelos (Organizing Committee)
Departamento de Biología Animal
Facultad de Ciencias
Universidad de Granada
18071 Granada, Spain
FAX: 34-58-243238.

15th Annual All Florida Herpetology Conference

The All Florida Herpetology Conference will be held on 18 April 1992 on the campus of the University of Florida at Reitz Union Auditorium. The Conference is cosponsored by the Florida Museum of Natural History and the Gainesville Herpetological Society. Speakers include David Chiszar (University of Colorado, Boulder), James Gillingham (Central Michigan University, Mt. Pleasant), William Haast (Punta Gorda, Florida), Dale Marcellini (National Zoological Park), Sherman A. Minton, Jr. (Indiana University Medical Center, Indianapolis), Edward Moll (Eastern Illinois University), Ron Tremper (Reptile Breeding Center, Inc., Fresno, California), Trooper Walsh (National Zoological Park), and Peer Zwart (University of Utrecht, The Netherlands).

Other events include a panel discussion, exhibition and sale of herpetological books, art, etc., a workshop for young herpetologists, and an evening barbeque and auction at the Florida Museum of Natural History. For registration material or additional information, contact:

David Auth
Division of Herpetology
Florida Museum of Natural History
University of Florida
Gainesville, Florida 32611, USA
Tel. (904) 392-1721.

Symposium on Eastern Massasauga

Metro Toronto Zoo is hosting a two day International Symposium and Workshop on the Conservation of the Eastern Massasauga Rattlesnake, 8-9 May 1992. Papers on conservation, status, and field research will be presented from all states and provinces within the range of this threatened species. Keynote speaker will be a European researcher who will provide an update on similar conservation programs for viperids in Europe. A post conference

trip to view *Sistrurus catenatus catenatus* in the wild is planned. The workshop will address the international conservation efforts required to protect populations throughout the range in Canada and the U.S.

Papers are solicited. For further information contact Bob Johnson, Curator of Amphibians & Reptiles, Metro Toronto Zoo, P.O. Box 280, West Hill, Ontario, Canada M1E 4R5, Tel. (416) 392-5968, FAX (416) 392-4979.

REGIONAL SOCIETIES

International Iguana Society

The International Iguana Society (IGS), a non-profit corporation filed with the Secretary of State of Florida, is dedicated to the preservation of the biological diversity of iguanas. Many species of iguanas are in immediate danger of extinction, especially the West Indian rock iguanas of the genus *Cyclura*. IGS believes that the best way to protect iguanas and other native faunas and floras is to preserve natural habitats and encourage the development of sustainable economies, i.e., those compatible with the maintenance of biodiversity. IGS hopes to influence and help governments and agencies to protect the unique natural heritage of the West Indian region before it is lost. They also hope to garner the support of other conservation groups and the scientific community to accomplish their mission. IGS encourages the dissemination and exchange of information of all aspects of the ecology, population biology, behavior, captive husbandry, taxonomy, and evolution of iguanas.

Membership dues are $25 US Regular and $30 US Organizational. Dues support active conservation projects and members receive a subscription to the *Iguana Times*, a quarterly newsletter. Those interested in joining IGS or receiving information about the group should contact:

International Iguana Society
Finca Cyclura
Route 3, Box 328
Big Pine Key, Florida 33043, USA
Tel. (305) 872-9811.



LEGISLATION & CONSERVATION ALERT

This column serves to update the herpetological community on the regulatory status and protection measures implemented for rare, threatened, and endangered herps. We are in need of more information, especially at state and regional levels. Please send pertinent information to the Section Editor.

The following final and/or proposed listings, regulations, and general information have been announced by governmental regulatory agencies. Pertinent Federal Register (FR) citations are given for U.S. notices.

USA, Virginia: *Crotalus horridus atricaudatus* (canebrake rattlesnake). On 1 January 1992, the Virginia Department of Game and Inland Fisheries (VDGIF) listed the subspecies as Endangered. *Clemmys insculpta* (wood turtle), *Ophisaurus ventralis* (eastern glass lizard), *Ambystoma mabeei* (Mabee's salamander), and *Hyla gratiosa* (barking treefrog) were listed as Threatened by VDGIF on 1 January 1992. All five threatened species have restricted geographical ranges within Virginia and all are suffering reductions in populations and loss of habitat due to development. For further information contact the Virginia Department of Game and Inland Fisheries, 4010 West Broad Street, Richmond, Virginia 23230, USA.

USA: *Clemmys marmorata* (western pond turtle) and *Rana aurora draytoni* (California red-legged frog). The U.S. Fish and Wildlife Service, Region 1, Portland, Oregon has been sent a petition from Dan C. Holland, Mark R. Jennings, and Marc P. Hayes to list *R. aurora draytoni* as federally Endangered throughout its range and *C. marmorata* as federally Endangered in Washington, Nevada, Oregon (Columbia, Willamette, and Klamath drainages), and California (Klamath River downstream to confluence with Scott River, Clear Lake drainages, Central Valley drainages from Mokelumne River south, Mojave River and all desert drainages, and all southern California drainages including the Santa Clara River and south), and as federally Threatened in Oregon (Umpqua, Rogue, and coastal drainages) and California (Klamath River from downstream of Scott River confluence, all north coast drainages, Central Valley drainages from Mokelumne River north, all non-Central Valley drainages from San Francisco Bay south to Santa Clara River). For further information contact: Dan C. Holland, 2310 Alturas, Bakersfield, California 93305, USA.

USA: *Conraua goliath* (goliath frog). The U.S. Fish and Wildlife Service proposes to determine Threatened status for the goliath frog of Central Africa. This amphibian is rare and narrowly distributed, and is threatened by habitat loss, commercial trade, and local hunting. If listed, permits would be available to enhance propagation or survival of the species and for scientific purposes that are consistent with the purposes of the Endangered Species Act of 1973 (FR 56, no. 177, 12 September 1991, pp. 46397-46400).

Japan: *Eretmochelys imbricata* (hawksbill sea turtle). Japan has agreed to end all hawksbill imports by 31 December 1992, and to sharply reduce its imports until that time (Endangered Species Tech. Bull. 16, nos. 7-8, July/August 1991).

USA: The U. S. Fish and Wildlife Service has produced an updated compilation of amphibian and reptile taxa native to the United States that are being reviewed for possible addition to the List of Endangered and Threatened Wildlife under the ESA (FR 56, no. 225, 21 November 1991, pp. 58804-58836). In revising this compilation the USFWS relied on information from status surveys, State Natural Heritage Programs, other State and Federal agencies, knowledgable scientists, and comments received in response to previous notices of review. Taxa are assigned to one of several categories. For example, C1 = taxa for which there is substantial information on biological vulnerability and threats to support proposals to list them as Threatened or Endangered; C2 = taxa for which information indicates that proposing to list them as Threatened or Endangered is probably appropriate; 3C = taxa that have proven more abundant or widespread than previously believed, but may be re-evaluated for C1 or C2 status if declines are documented; 3A = taxa for which the USFWS has persuasive evidence of extinction.

TABLE 1. Number of species and subspecies of amphibians and reptiles native to the U.S. that are being reviewed for possible addition to the List of Endangered and Threatened Wildlife under the Endangered Species Act of 1973.

	C1	C2	3C	3A
Salamanders	2	35	1	0
Anurans	3	20	0	2
Lizards	1	24	0	0
Turtles	1	12	0	0
Snakes	3	29	0	0
TOTAL	10	120	1	2

Grand Total = 133 taxa

The SSAR Conservation Committee strongly urges those herpetologists with conservation interests to obtain a copy of the above mentioned Federal Register and scan it for taxa of interest. The USFWS hopes that their review notice will encourage necessary research on vulnerability, taxonomy, and/or threats for these taxa. Federal Register vol. 54, 6 January 1989, pp. 554-579 contained the previous review of this list.

KURT A. BUHLMANN
SSAR Conservation Committee.

Gopher Tortoise Council Initiates Upland Habitat Protection Project

The Gopher Tortoise Council, a conservation organization based in the southeastern United States, has launched an effort to protect the Southeast's rapidly disappearing xeric upland habitats. Host to an array of uniquely adapted reptilian, mammalian, and avian faunas and floras, these dry, well-drained sandy habitats are sought equally by development, agriculture, forestry, and mining interests. Although the Council's activities focus on the gopher tortoise, the organization's goal is to preserve the entire spectrum of plants and animals—from scrub morning glories to fox squirrels and indigo snakes—in these native upland communities.

Gopher tortoises belong to a group of land tortoises that originated almost 60 million years ago in North America. Of the 23 species that once existed on our continent, only four are alive today; the gopher tortoise (*Gopherus polyphemus*) is the only species found in the eastern United States. Gopher tortoise populations are scattered throughout the southeastern coastal plain from South Carolina to Florida and west to Mississippi. The highest concentrations are located in north-central Florida and southern Georgia. Gopher tortoises have been greatly reduced throughout their range; in Florida alone populations have dwindled to an estimated 30% of their historical levels.

The burrow system of the gopher tortoise provides refuge to more than 360 other species of animals. For this reason, the gopher tortoise has been designated as a keystone species in upland communities. Other reptilian species such as the eastern indigo snake (*Drymarchon corais couperi*), gopher frog (*Rana areolata*), and short-tailed snake (*Stilosoma extenuatum*) are on state and federal threatened or endangered species lists due to severe declines in their numbers, resulting from destruction of their habitat. Although a decade of effort by the Council has given the gopher tortoise legal protection in the six states in which it occurs, neither federal nor state laws protect the habitat on which the tortoise and hundreds of other species depend for survival. The delusion that legal protection of animals implies species preservation is epitomized by continued decline of tortoise populations.

In the face of this threat, the Council has created the Upland Habitat Protection Project (UHPP), the only land conservation effort which specifically targets uplands. The central focus of the UHPP is to identify and monitor specific upland sites most in need of preservation. The UHPP will coordinate a region-wide inventory effort that will culminate in the production of a list of priority sites in need of protection. The Council will prepare proposals to submit to agencies and organizations which have funds earmarked for environmental land acquisition. In Florida alone, more than $600 million per year are potentially available for this. The Council will work closely with state natural heritage programs, governmental agencies, academic institutions, and private individuals to provide a comprehensive review and analysis of existing information, which will be supplemented by focused field investigations.

GTC is seeking additional contributions in any amount from individuals and organizations. These funds will subsequently be used to solicit matching funds from appropriate agencies. Tax-deductible donations may be sent to the Gopher Tortoise Council c/o 1018 Thomasville Rd. Suite 200-C, Tallahassee, Florida 32303, USA. For additional information or a copy of GTC's brochure, contact Leslie HaySmith at the above address (tel. 904/224-8207).

ARTICLES

Intraspecific Oophagy in Stream-breeding California Newts (*Taricha torosa*)

The jelly coat on the egg mass of many aquatic breeding salamanders is thought to protect developing embryos from predation (Semlitsch 1988, Ward and Sexton 1981). In addition to having a firm jelly coat, eggs of California newts (*Taricha torosa*) are believed to be unpalatable to many predators because they contain a potent toxin (Buchwald et al. 1964, Mosher et al. 1964). Two studies have shown that pond-breeding adult California newts will cannibalize newly deposited egg masses (Kaplan and Sherman 1980, Marshall et al. 1990). While studying the microsite (runs, riffles, or pools) oviposition preferences of female newts in a California stream, we documented oophagy by adult newts over a five week period.

Our study site is a first order stream in the Santa Monica Mountains (Los Angeles Co., California). This is a fishless, perennial stream. We began weekly surveys of a 1.5 km stretch of the stream for adults and egg masses on 25 March 1991. Breeding adults were observed on the first week in April and egg masses were present by the second week in April. No new egg masses were observed after 25 April. Although the stream consisted of runs, riffles, and pools, most oviposition occurred in stream pools (unpublished data). We carefully counted the number of egg masses in seven stream pools between 1 and 10 May and compared these data to the number of masses present in the same pools five weeks later (masses counted between 10-12 June) just as larvae were hatching. A few larvae had hatched from some masses. Pools were small (generally $<10 m^2$). Adults and egg masses were relatively easy to observe and count. On 11 visits to the stream between 1 May and 21 June we recorded and observed

all oophagic events. In addition, we used water lavage to examine the stomach contents of 15 adult newts between 6 and 17 June.

We observed adult newts feeding on newt egg masses on five occasions. We observed one adult preying on egg masses on 8 May, 6 June, and 10 June. On 18 June six adults were observed in a pool and three of the six were observed eating eggs. On 21 June nine adults were observed in a stream pool and four individuals consumed egg masses. All masses being eaten contained embryos and all embryos were Harrison stage 38 or older. Between 6 June and 17 June, we flushed the stomachs of 15 adult newts and found newt embryos or egg mass remnants in six of them. Sexes of the animals were difficult to determine since by this time of the year adults had lost their conspicuous secondary sex characteristics. We elected not to sacrifice any animals for sex determination.

We found a significant reduction in the number of egg masses present in the seven stream pools between May and June (paired t-test, t=3.46, P=0.013, df=6; Table 1). Although hatching had begun in some egg masses there were no empty egg masses (where hatching was complete) found in the June survey even in sections of the stream that did not contain adult newts. Thus, all masses consumed by the adults likely contained embryos.

The significant reduction in egg masses in stream pools was likely caused by oophagic adults. In over 40 different visits to the stream pools in the spring and summer no other egg mass predators were observed in the stream. *T. torosa* egg mass jelly is very firm and appears to be quite resistant to predation by stream invertebrates (unpublished data). Invertebrates in this stream are capable of damaging the egg masses, but there is no indication that they are capable of completely removing egg masses. Stream current in May and June was 20-25 l/min and was incapable of dislodging attached egg masses or even relocating the few masses that were unattached.

TABLE 1. A comparison of the number of California newt egg masses present in stream pools in May, 1991 and five weeks later.

Pool #	# masses in May	# masses in June
1	30	13
2	5	2
3	43	30
4	50	20
5	5	0
6	7	1
7	45	34

Although oophagy is apparently not rare in amphibians (see for example Baldauf 1947, Marshall et al. 1990, Wood and Clarke 1955), previous observations on pond-breeding *T. torosa* noted that oophagy only occurred within a few hours after oviposition and before egg mass jelly hardened (Kaplan and Sherman 1980, Marshall et al. 1990). In addition, adults typically leave the aquatic habitat soon after breeding (Stebbins 1972). In our stream system, adults stayed in the stream long after breeding and oophagy occurred throughout the developmental period. Egg masses were still being consumed six to seven weeks after oviposition. Our direct observations of oophagy revealed that adults are very persistent in ripping off pieces of egg mass. Adult newts were observed biting egg masses and then completely twisting their bodies in attempts to tear off portions of the masses.

Given that cannibalism was observed in 45% of the visits to the stream (5 occasions out of 11 visits) and stomach flushes produced remnants of egg masses or larvae 40% of the time, we feel that cannibalism is a strong selective force on this population of California newts. In subsequent years we will investigate variation between adult tendencies to cannibalize and whether oophagic adults can discriminate between their own eggs and eggs that are unrelated. Since causes of cannibalism are often uncertain or varied (Polis and Myers 1985), we plan to continue tracking potential changes in the intensity of cannibalism with each breeding season.

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Observations on the Tolerance to Freezing by the Lizard, *Sceloporus grammicus*, from Iztaccihuatl Volcano, México

Five species of vertebrates (four anurans and one turtle) are known to tolerate intercellular freezing during winter by producing cryoprotectant chemicals (Storey and Storey 1988, Storey et al. 1988). Recently, freeze tolerance was reported in the lizard,

Podarcis muralis (Claussen et al. 1990). We provide preliminary observations on the freeze tolerance in a high altitude lizard, *Sceloporus grammicus* from the slopes of Iztaccihuatl Volcano on the border between the states of Puebla and México, México.

On 29 June 1991, seven adult specimens of *Sceloporus grammicus* (collected at 3600 m in the Campo Experimental Forestal de San Juan Tetla, Puebla, 17 km W of San Felipe Teotlatzingo) and seven specimens (one juvenile and six adults) of *S. mucronatus* (from 3000 m altitude from KM 41 on Mex. Hwy. 15, Edo. de México) were placed in a home freezer (ca. 0°C) to kill them prior to preservation. The following day (after 28 h) the specimens were removed from the freezer. They appeared solidly frozen, some ice was evident on the external body scales, but after approximately one half hour of warming at room temperature (25°C), movement was noticed among the *Sceloporus grammicus*. After thawing completely, all seven *S. grammicus* were alive and active whereas all *S. mucronatus* were dead.

Additional preliminary experiments were conducted with *S. grammicus* to substantiate these field observations. Specimens from the Iztaccihuatl Volcano location were collected (14 August 1991) and transported to Lincoln, Nebraska. On 6 September 1991, four *S. grammicus* (two adult males, 52 and 55 mm SVL, and two adult females, 47 and 49 mm SVL) were placed in a freezer at -2.5°C for 37 h. These specimens were checked periodically during this time and all appeared to have frozen solidly within a few hours. Upon removal from the freezer, these lizards warmed rapidly (5-10 min) while being held, and all survived. Three additional specimens (two adult males and one adult female) were placed in a freezer at -6.5°C until solidly frozen. After 3 h these specimens were removed from the freezer to thaw; none survived. On 27 October, after approximately ten weeks in captivity, two of the above males were placed in a freezer at -1.7°C and survived for 32 h and then at -2.3°C; these two survived to 6 h but were dead at 20 h.

These observations are consistent with the general phenomenon of freeze tolerance reported in vertebrates (Storey et al. 1988). *Sceloporus grammicus* naturally encounters freezing temperatures frequently during the year. We recorded (with max-min thermometers) temperatures as low as -3°C in the summer of 1991 at a high altitude site of 4400 m on Iztaccihuatl Volcano where population studies are underway. Temperatures of 0°C were recorded twice at 3600 m where the above specimens were collected between late May and late August (typically the hottest months of the year). Because *Sceloporus grammicus* may be exposed to frequent low temperatures its tolerance to freezing is not surprising.

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POINTS OF VIEW

Commentary on a Proposed Taxonomic Arrangement for Some North American Amphibians and Reptiles

Collins (1991) believes that a relatively large number of North American species of amphibians and reptiles are camouflaged by the subspecies taxonomy currently in use. He considers this taxonomic concept out-dated, and presents a list of 55 allopatric subspecies which he proposes should be elevated to the rank of full species. My purpose here is to comment and take issue with some of the views expressed in his paper.

Collins offers no explanation or supporting evidence for his contention that the subspecies concept is outdated. In fact, there is little evidence to suggest that this is so. Subspecies are used in all major field guides for reptiles and amphibians, and new subspecies continue to be named and described in the primary literature. There is no doubt that the concept has been abused, that cases of character discordance, polytopic characters, and smooth clinal variation have limited its application (Wilson and Brown 1953), and that some subspecies are, in fact, good "biological" or evolutionary species. Despite such problems, the concept retains its usefulness in taxonomic practice (Mayr 1982).

The subspecies concept persists for theoretical reasons as well. The allopatric speciation model (models I and II of Wiley 1981) explains, by far, the majority of recognized species. The formation of geographical races (subspecies) is considered to be a common early stage in the speciation process, and the pervasiveness of geographical variation supports this theory. An extensive literature documents geographical variation in the vast majority of vertebrate and invertebrate species. These variational patterns, in most cases, lend themselves to the recognition of geographical subdivisions. Although recent revisionary studies of the herpetofauna have shown some widespread, polytypic species to consist really of several evolutionary or "biological" species (see Frost and Hillis 1990, for cases), this does not invalidate the theoretical concept of how these species arose.

Collins refers to his listed taxa as "camouflaged" or "hidden" species, but these terms are misleading, implying that the taxa are somehow lost and unavailable for study. On the contrary, the Latinized trinomial calls attention to the fact that the taxon is considered distinctive in some way. Publication of the subspecific name with designation of type and paratype material ensures that the taxon remains available for systematic reassessment. Use of the trinomen in any information storage and retrieval system ensures the accessibility of such taxa for various studies, e.g., faunal surveys, biodiversity studies, and listings of endangered and threatened taxa.

Collins is critical of the taxonomy in use by herpetologists today, calling it arbitrary and lacking historical reality. But, in my opinion, his proposed taxonomic arrangement is no less arbitrary than the existing taxonomy. The specific status of his listed taxa is "revealed," he claims, by their allopatric distributions and morphological distinctness. Several points need to be made concerning allopatry. Some of his listed taxa are separated by tremendous distances, but others show varying degrees of prox-

imity, and in some cases, the hiatus may be an artifact of collecting effort, not biological reality. The absence of records in the distributional gap by no means confirms the absence of populations there. Furthermore, the distributional boundaries of species are not static, but exceedingly dynamic (MacArthur 1972). The existence of peripheral isolates, far removed from the main distribution of a species, is evidence of profound changes in the range boundaries having occurred during the past. Etheridge (1958), Holman (1977), and others cite examples of distributional changes in the North American herpetofauna since the Pleistocene. The condition of allopatry, therefore, does not preclude the possibility, or even the likelihood, of interactions occurring through time.

In reviewing the diagnostic comparisons between listed forms and the nominate taxa of the species, I find considerable variation in the level of morphological distinctness. In some cases, the allopatric taxa differ strongly by a single, conservative character, or combination of traits (e.g., morphology, color pattern, behavior), so that identification is possible 100 percent of the time or nearly so (e.g., *Scaphiopus h. holbrookii* and *S. h. hurterii*). At the other extreme, the differentiation is patently trivial, involving mean values of meristic characters that overlap considerably and which are not likely to meet the accepted level of statistical significance. In other cases, slight differences in color pattern are noted between populations that show considerable individual variation, dorsal pattern polymorphism, and/or ontogenetic variation (e.g., *Masticophis b. bilineatus* and *M. b. lineolatus*; *Eumeces g. gilberti* and *E. g. arizonensis*). Approximately 32 to 38 of the 55 taxa listed by Collins are, in my judgement, weakly differentiated.

Frost and Hillis (1990:93) caution "As a practical matter, no one wants to name weakly differentiated or undifferentiated allopatric populations if there is no phylogenetic reason . . . to do so. In fact, to start down this path is to end up imposing the 'phylogenetic' species concept with its possible over-reductionism." Unfortunately, I believe this is the path Collins is taking. Considering the highly dynamic property of organismal distributions, and the modest levels of differentiation exhibited by many of these allopatric taxa, it is reasonable to assume that most are interacting or likely to interact with other members of the binomial taxon, and are therefore conspecific. The burden of "proof" that these allopatric taxa are distinct evolutionary species rests with the advocates. Smith (1990) noted that the evolutionary species concept championed by Frost and Hillis (op. cit.) requires certain standards to justify the assumption of attainment of an independent evolutionary trajectory. He proposed as a suitable standard for allopatric populations 100 percent recognizability by some character or suite of characters. Few of the taxa listed by Collins meet this standard.

I believe that it is inappropriate for Collins to encourage the herpetological community to accept his proposed taxonomic arrangement in toto. Some of the listed taxa have been named and described in a piecemeal fashion, while others have been described following the study of geographical variation and phylogenetic analysis. In my opinion, the only reasonable position on this matter is to review these taxa on a case by case basis. Reassessment is a normal part of systematics, and systematists should do the job using all the technology now available. While I support the rigorous application of the evolutionary species concept, I would rather wait for specialists to evaluate these taxa tomorrow than commit taxonomic mayhem today.

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Viewpoint: Reconsider Suggested Systematic Arrangements For Some North American Amphibians and Reptiles

Collins (1991) recently proposed that 55 allopatric, morphologically distinct subspecies of amphibians and reptiles be raised to species rank because "a relatively large number of species . . . have been camouflaged by the 'subspecies' taxonomy that I think is an outdated viewpoint." Apparently, field or museum specimens were not examined and changes were based on distribution maps and current subspecific status. Responding to Collins' taxonomic proposals necessarily involves discussion of concepts, methods, and assumptions that cannot be addressed here in full. Here we discuss various aspects including (1) unsubstantiated taxonomic changes based primarily on our knowledge of the animals, and the literature, (2) the significance of geographic isolation as a criterion for recognizing species, (3) the antiquity of species and subspecies, and (4) the validity and importance for taxonomy of several assumptions in cladistic analysis.

Collins' "outdated viewpoint" is the Biological Species Concept (BSC)—species are groups of actually or potentially interbreeding natural populations reproductively isolated from other such groups (Mayr 1942, 1963, and elsewhere). The "actually or potentially" is often left out by BSC critics; the allopatric populations in Collins (1991) are, of course, potentially interbreeding populations. Simpson (1961) defined the species in the Evolutionary Species Concept (ESC) as "an ancestral-descendent sequence of populations evolving separately from others and with its own unitary role and tendencies." His ESC species are BSC species moving through time. For cladistic purposes Wiley (1981) embraced the ESC and would restrict its application to populations defined by "recovered historical relationships"—i.e., cladistic analyses of morphological characters. Collins (1991) stated that "a rigorous application of the evolutionary species concept (as discussed in Frost and Hillis 1990) would also reduce the number of arbitrarily defined subspecies dramatically." Frost and Hillis (1990) state that "intelligent use of trinomials could only follow phylogenetic analyses; otherwise their application in alpha taxonomy would be precluded." A cladistic analysis of

characters is claimed necessary to recognize subspecies, but not to elevate them to species.

Collins' proposed taxonomic changes reflect populations that have been isolated for different lengths of time and have varying degrees of morphological differentiation. He raised the western subspecies, *mormon*, of the widespread polytypic *Coluber constrictor* to a species, apparently following Fitch et al. (1981). However subsequent papers by Greene (1984) and Corn and Bury (1986) provided evidence for intergradation in New Mexico and western Texas south of the Rocky Mountains, and in Colorado, Wyoming, and Utah to the north. They concluded that the elevation of *mormon* to species status was not supported by morphological, reproductive, or zoogeographical evidence. If the predicted global warming of 2°C mean annual temperature by 2000 comes to pass, the intermediate relict populations could well disappear, qualifying the newly isolated *mormon* as a species only under Collins' system. There is no reason to think that widespread subspecies such as *mormon* or *flaviventris* will acquire new characters through natural selection in response to such a climate change or to being separated from each other. In this case, range fragmentation would not be coupled with evolutionary change.

The subspecies of *Tantilla rubra* (*cucullata* and *diabola*) in the United States were elevated to species rank. Degenhardt et al. (1976) have already reported an intermediate population in the Chisos Mountains of Big Bend National Park with the distinctive nuchal collar absent (*cucullata*), complete (*diabola*) or partially present. The intergrade zone actually covers much of the Big Bend from Black Gap to Terlingua (H. K. McCrystal, unpubl. data). With further collecting, the Trans-Pecos populations of these secretive snakes will undoubtedly prove to be continuous, as desertscrub populations tend to be. Using Collins' criteria, would the Big Bend population with characters of both *cucullata* and *diabola* warrant full species status? In contrast, we suspect that if enough specimens were available to assess geographic variation, only a single subspecies would be recognized in Texas.

Collins (1990) and Conant and Collins (1991) followed Gartska (1982) in elevating *Lampropeltis mexicana alterna* to a species using characters (iris color, head shape) that could as well reflect infraspecific adaptive responses (subterranean crevice dwelling, nocturnal activity) to the Chihuahuan Desert. In this case, *alterna* freely interbreeds in captivity with other *L. mexicana* subspecies but not sympatric *L. triangulum*. The presence of alternating reduced markings in Gartska's captive-bred offspring of *L. m. thayeri* from Nuevo Leon could be interpreted as gene flow from *alterna* rather than invalidating the use of color pattern in recognizing subspecies. Gelbach and McCoy (1965) reported *alterna* x *mexicana* (including *greeri*) intergrades from Durango. Collecting bias cannot be neglected when discussing secretive, widely distributed polymorphic taxa; intergrades between *alterna* and *thayeri* were subsequently found in southeastern Coahuila (S. F. Hale, pers. comm. 1989). Would Collins' "species" revert to "subspecies" when intermediate specimens are found in intervening areas?

Lampropeltis pyromelana infralabialis, the subspecies isolated north of the Grand Canyon in Arizona, Nevada, and Utah, is a barely distinguishable population raised to species by Collins. Tanner's (1953) description separated *infralabialis* from other subspecies on one less infralabial scale and white annuli complete across the ventrals in 50% or more of the body annuli. A careful study of *L. pyromelana* specimens throughout the species' range (independently by W. H. Woodin and C. H. Lowe, unpubl. data) reveals that color pattern is highly variable throughout the range with *knoblochi* and, *infralabialis* more weakly so, the only populations divergent at the subspecific level. The would-be elevation in rank of little-differentiated subspecies (as by Collins, and by Frost and Hillis) dilutes and weakens our understanding of species while only appearing to increase biodiversity. Strangely, according to these authors, subspecies are apparently not included in biodiversity. As Cole (1990) correctly pointed out, overestimating the number of species for ulterior motives including conservation will only injure the image and credibility of systematists. We are impressed only that *infralabialis* differs so little from other *L. pyromelana* after 10,000 yrs of isolation and over 2000 generations in the present interglacial; stabilizing selection is very strong.

The subspecies of *Lampropeltis zonata* raised to species (*multifasciata, parvirubra, pulchra*) in Collins (1991) are examples of slightly differentiated kingsnake populations in isolated mountain ranges with which we are again familiar. An intergrade specimen between *multifasciata* and *zonata* from an intermediate range cited by Zweifel (1952) was overlooked or disregarded, and others are unreported. The extensive fossil record of plants and animals preserved in ancient packrat (*Neotoma* spp.) middens throughout the southwestern United States and northern Mexico have shown that most montane populations have been isolated for about 9000 yrs (Betancourt et al. 1990, Van Devender et al. 1991a). During each of 15 to 20 glacial periods during the Pleistocene, montane woodlands were reconnected in the intervening lowlands. Glacial climates with widespread woodland biotas were the typical situation for perhaps 90% of the last 1.8 million yrs (Imbrie and Imbrie 1979).

Packrat middens have provided records of presently montane reptiles in lowlands in ice age woodlands in Texas: e.g., *Gerrhonotus liocephalus* (Texas alligator lizard) in the Big Bend (Van Devender and Bradley, in press), and *Phrynosoma douglassi* (short-horned horned lizard) near Van Horn (Montanucci 1987). The middens also record montane animals in Arizona ranges where they no longer occur: e.g., *Gerrhonotus kingii* (Arizona alligator lizard) at 29,000, 14,500, and 9570 yrs B.P. (radiocarbon years before 1950) in the Ajo Mountains, and *Tamias* sp. (chipmunk) at 21,840 and 13,500 yrs B.P. in the Ajos, and 12,430 yrs B.P. in the Tucson Mountains (Van Devender et al. 1991b).

Prediction based on clear patterns in data is an integral part of science; a new glacial could begin any millenium unless man alters the earth's climate system too drastically. Would *multifasciata, parvirubra*, and *pulchra* then be reduced to subspecies status again when their ranges reconnect with each other and with *zonata* as they undoubtedly have many times in the past? Reticulate evolution, a common evolutionary mechanism in plants, has occurred in many animal populations currently recognized as subspecies. Cladistics cannot reconstruct the phylogeny of groups with reticulate evolution (Donoghue 1985).

Hundreds, if not thousands, of isolated, slightly and clearly differentiated populations in woodlands and forests on southwestern mountaintops have *not* been described as subspecies or plant varieties. The divergence may have occurred in the last 10,000 yrs or represent the cumulative natural selection of many Pleistocene interglacials. Under the Phylogenetic Species Concept (PSC) proposed by Donoghue (1985) where species are defined on the basis of monophyletic lineages, isolated populations with *any* discernible differences whatever are species (see discussion in Echelle 1990). This dubious definition frees the cladist from making troublesome taxonomic decisions—most infraspecific groups including demes, forms, varieties, subspecies, and semispecies become species. The montane populations noted above would become "species" regardless of how slightly differentiated.

Crotalus lepidus (rock rattlesnake) is widespread in the southwestern United States and much of northern Mexico. Four subspecies have been described (*klauberi, lepidus, maculosus, morulus*) in broad biogeographic regions. In the United States the ranges

of *klauberi* and *lepidus* span 1030 km from Arizona to Texas. A complex mosaic of modestly differentiated populations in various habitats, rock types, and elevations makes rigorous definition of *klauberi* and *lepidus* difficult, raising the question of whether they should be combined (H. K. McCrystal, unpubl. data). Under Wiley's ESC and the PSC, two variable subspecies of *C. lepidus* would be immediately divided into 20 or 30 species in the United States alone with greater geographic than genetic differences! Again, most of the populations have undoubtedly been isolated only 9000 yrs or less and are likely to be reconnected in the future.

In fact, over 400 species of animals and plants have been identified from packrat midden deposits radiocarbon dated 10,000 to 50,000 yrs B.P. Although species were described on obvious distinctive characters such as color pattern and scalation in snakes, or flower and fruit structure in plants, many other structures are usually distinctive. Teeth, bones, scales, heads, elytra, seeds, fruits, leaves, twigs, spines, etc. in middens are readily matched to modern reference specimens with virtually no differences. Even if a few cryptic species were missed, the last major glacial/interglacial climatic change (the Wisconsin/Holocene) did not produce many new species in the southwestern United States. There is little reason to believe that earlier Pleistocene climatic changes were of greater magnitude with more speciation.

The rich fossil record of beetles in Europe (Coope 1991) and the Rocky Mountains (Elias 1991) has challenged the idea that most living species evolved continuously throughout the Pleistocene with rapid speciation during massive environmental perturbations. All insect fossils dating to the last million years are morphologically identical down to details of the genitalia to existing species. Beetles responded to ice age climatic cycles through great shifts in geographical range rather than evolution of new adaptive types or extinction.

Many reptilian subspecies are mostly restricted to major biogeographical regions, e.g., the Great Plains: *Crotalus viridis viridis, Elaphe guttata emoryi, Lampropeltis calligaster calligaster, L. getulus splendida, L. triangulum gentilis, Pituophis melanoleucus sayi*; the Chihuahuan Desert: *Lampropeltis mexicana alterna, Trimorphodon biscutatus vilkinsoni*; mainland Mexico Sonoran Desert: *Masticophis flagellum cingulum*; Baja California Sonoran Desert: *Arizona elegans pacata, M. f. fuliginosus, Pituophis m. bimaris, Salvadora hexalepis klauberi*; Sinaloan thornscrub and tropical deciduous forest: *Lampropeltis g. nigritus, Rhinocheilus lecontei antoni*; Great Basin Desert: *Crotalus v. lutosus, C. v. nuntius, Pituophis m. deserticola*; Mediterranean chaparral: *Crotalus v. cerberus, C. v. helleri, Pituophis m. annectens*. These distributions strongly reflect adaptive responses of species to geologic events and their climatic consequences predating the Pleistocene. The most important geologic events were the uplifts of the Rocky Mountains and the Sierras Madre Occidental and Oriental resulting in regional weather patterns and the modernization of North American biotic provinces—mostly 8 to 20 million years ago in the Miocene (Axelrod 1979).

Pleistocene climates mostly shifted biotic provinces southward with increased species richness under equable climates. Except for tortoises there are very few extinct species of amphibians and reptiles described from the Pleistocene of North America. *Phrynosoma josecitensis*, a problematic species known from a single squamosal bone from late Pleistocene sediments in San Josecito Cave, Nuevo Leon, México, may be an aberrant specimen of a living species (Montanucci 1987). Even in tortoises, species such as *Gopherus flavomarginatus* (Bolson tortoise) may have evolved in the Pliocene at least two million years ago (Bramble 1982). Thus, subspecies in widespread continental species are more likely to be millions of years old than to have formed in response to the most recent glacial/interglacial climatic change. Subspecies are undoubtedly much more stable than their geographic ranges—one of Collins' main criteria for species.

We view modern species as fundamental, stable, long-lived evolutionary entities that usually do not evolve or go extinct in response to environmental fluctuations; most species simply shift their ranges. When speciation in isolated populations does occur, the fate of the parent population (extinction, stasis, speciation) is independent of its descendants' fate, and would rarely, if ever, be coupled as they are in the divaricate branching of shared, derived (apomorphic) characters in cladistic analyses (Wiley 1981). In spite of cladistic assumptions, the temporal coexistence of ancestral species or subspecies in older habitats with their descendants in derived habitats is the normal state of affairs. With the first glacial climates about two million years ago, boreal forests moved almost to the Gulf of Mexico, disrupting the Gulf Circumferential Corridor between the southeastern United States and northeastern México (Auffenberg and Milstead 1965), splitting the range of *Drymarchon corais* (indigo snake). There is no reason to believe that the natural selection that formed the southeastern *D. c. couperi*, elevated to species rank by Collins (1991), had any affect on the parental populations in south Texas or northeastern México. Barring other information, *D. c. erebennus* could be the living ancestor of *couperi*.

The subspecies concept has been very useful in describing patterns of geographic variation within species. While concurring, O'Neill (1982) nevertheless incorrectly viewed Mayr's (1963) definition of a subspecies ("an aggregate of local populations of a species inhabiting a geographic subdivision of the range of the species, and differing taxonomically from other populations of the species") to be that of a taxonomic unit rather than an evolutionary one.

Johnson (1982) argues correctly as has Mayr from 1942 onward that a great deal of information on evolutionary variation in species is already cast in a subspecies framework, and that the names call attention to distinctive populations with significant research potential. Difficulty in delineating subspecies in widespread complex species like *L. triangulum* with 25 subspecies (Williams 1988) would in no way justify the elimination of all subspecies with little if any gain in knowledge. *Lampropeltis* would change from a genus with six species with variable numbers of subspecies to over 50 so-called species!

Actually the naming of populations with discontinuous clinal or allopatric variation inherently expresses inferred relationships. We use the concept of "related" in the traditional sense to mean the degree of genetic similarity between two taxa rather than the limited cladistic redefinition of sharing a derived character (Wiley 1981). Because species are as stable and long-lived as the fossil record indicates, the most closely related species are ancestor and descendent(s) that differ only in the new characters evolved by the descendent(s). A single species could be the closest relative of any number of descendents with the same degree of divergence. An ancestor and its descendent will always have a greater genetic similarity and fewer character changes than paired descendents of the same ancestor.

Cladistics or phylogenetic systematics is a methodology guided by rules outlined in an extensive body of literature accumulated in the last two decades. We encourage herpetologists to learn enough about the methodology to be able to evaluate these basic assumptions: (1) all characters are equally important and potentially species characters, (2) the degree of genetic similarity or divergence is irrelevant, (3) most ancestors are assumed to become extinct at the time of speciation, and (4) the most closely related species are paired descendents sharing their ancestors' derived characters. The new "species" proposed by Collins

(1991) reflect a methodology that cannot separate subspecies from species; the species concepts derived from cladistic methodology have an inherent bias toward narrowly defined taxonomic units (Donoghue 1985, Echelle 1990, Wiley 1981).

In practice, populations designated as "species" using Wiley's ESC and Donoghue's PSC are essentially derivatives of the original typological species concept—i.e., groups of organisms that differ from others in constant characters. In the nineteenth century Linnaeus had the advantage of using the degree of divergence to recognize different species. As O'Brien and Mayr (1991) point out "typological species concepts are fraught with interpretive difficulties such as . . . full species assignment to reproductively compatible (BSC) subspecies, arbitrary selection of diagnostic characters, and numerous species designations that err in the direction of excessive taxonomic splitting." Phillips (1982) notes that "subspecies, despite all misleading attacks, remain basic units in ornithology" and "if we cease recognising subspecies, we must elevate all notable ones, at least, to species rank, thus destroying the biological species and plunging our classification back toward the early 19th century."

We encourage examination of Collins' proposed taxonomic changes on a case by case basis using knowledge of the animals concerned rather than accept such changes wholesale, and to consider the assumptions that they reflect. Regardless of the philosophy embraced by the systematist, a thorough analysis of a taxon with documented evidence should precede any proposed taxonomic change.

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Taxonomic Tyranny and the Exoteric

The vast majority of readers of this journal are not broad-based general biologists steeped in the arcane theories and esoteric practices of systematic biology. That certainly includes most professional herpetologists of my acquaintance. There are today three major schools of taxonomic thought (and uncounted splinter factions) promulgating mutually exclusive, irreconcilable principles and methodologies. Adherents of any one school—evolutionary, phenetic, or cladistic—tend to regard the proponents of the others as hopelessly old-fashioned, insane, and/or dishonest, often with excellent reasons. There is simply no hope that any unified consensus, resulting in a stable scientific nomenclature, will evolve in the foreseeable future. We are in for decades of taxonomic turmoil.

There are no "official," binding lists of "correct" or "accepted" names, and most name-change proposals stand or fall on the basis of the popularity of the animals (big, flashy animals and snakes are split; little, inconspicuous creatures are not) or the popularity of the proposal's author. Almost no one ever critically reviews proposed changes. No journal in herpetology publishes reviews of articles printed in its own pages. There is, therefore, little recourse for those who disagree with a taxonomic change, or who know of proof that facts have been misstated in print.

The burgeoning plethora of taxonomic changes—especially splits—in the last decade or so has gone virtually unanswered by those of us with more classical, broad-based biological or evolutionary points of view. Nevertheless, I have personally questioned and sought to verify statements and judgments made, with dismally disappointing results. Most of the split papers I have read contain faulty observations and simple untruths. I determine these by examination of museum specimens, finding character states are frequently not as reported in the splitting literature.

A great deal of real work—specimen examination, more collecting in geographically critical areas, and use of techniques like mt-DNA and electrophoresis—will have to go into determining the real evolutionary status of dichopatric, geographically replacing forms. My word to the exoteric is beware. Just because somebody publishes a new taxonomic arrangement does not mean anyone has to follow it. Consider carefully the source of opinions and pronouncements, and—whenever possible—try to review the facts. Especially, do not blindly accept proposed changes because you imagine there is some "law" that says you have to. There is none. You do not. For a long time to come we will have to live with taxonomic chaos, which means we will have to constantly make judgments.

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Editor's Note: An in-depth rebuttal by J. T. Collins to the commentaries by Montanucci, Van Devender et al., and Lazell will be published in the June issue of *HR*.

On Races, Clines, and Common Names in *Opheodrys*

It is not the purpose of this note to enter the long standing debate about the preferred criteria for designating subspecies in systematic herpetology. Rather, a more limited consideration is addressed: how should the interpreters of the herpetological literature present the findings of that literature in their field guides and lists of common names?

Two questions provide the focus for the present discussion. (1) Should reptiles differing only by having distinctive color patterns that are associated with identifiable geographic ranges be recognized as nominal forms in field guides and lists of common names? (2) Should reptiles differing only by having distinctive scutellation patterns that are associated with identifiable geographic ranges be recognized as nominal forms in field guides and lists of common names? Some current authors have responded affirmatively to the first question and negatively to the second. An examination of the reasons proposed by those authors for the difference in their responses is the basis for this note.

In the first edition of *Standard Common and Current Scientific Names for North American Amphibians and Reptiles*, Collins et al. (1978) give common names for the two races of *Opheodrys vernalis* that had been described previously (Grobman 1941) and do so in the second edition (Collins et al. 1982). In the third edition, however, Collins (1990) does not provide common names for the two races of *O. vernalis* nor for the four races of *O. aestivus* that had been described in the interim (Grobman 1984). The reason given was that the racial differences found in those two species are based on clinal variations in scutellation characteristics (Collins 1990).

Presumably the precedent established in Collins (1990) was followed in the third edition of *A Field Guide to Reptiles and Amphibians of Eastern and Central North America* (Conant and Collins 1991). Conant and Collins explain that the races of *Opheodrys vernalis* and of *O. aestivus* are not included because the differences in scutellation patterns are not correlated with color pattern differences. Thus, they suggest, it would be difficult for a user of the book to identify the races of *Opheodrys* without counting scales. Elsewhere they recommend that the forms of *Trachemys, Pseudemys,* and *Chrysemys* (p. 64), of *Cryptobranchus* (p. 241), of *Acris* (p. 218), and of the Plethodontidae (p. 259), could best be identified by reference to geography. That recommendation would appear to be equally appropriate for unicolored snakes.

For the recognition of races of snakes, differences in scutellation patterns presumably are as systematically significant as are differences in color patterns. The uneven treatment of the two groups of morphological characters, as indicators of racial differences, misleads readers of the third edition of the *Field Guide*.

The related reasons are faulty, both in fact and philosophy. There are north/south clines, associated with ambient temperature gradients, in scutellation characteristics in the two races of *O. vernalis*, but the scutellation differences between the two races are associated with vegetational differences and are not clinal

(Grobman 1941:27). A considerable number of statistical details are given about *O. aestivus* (Grobman 1984:155-157) demonstrating that there are north/south, not east/west, clines in scutellation and that the metameric variation, upon which the four races are partially based, is not primarily clinal.

The example given by Frost and Hillis (1990) in support of their reasonable position that, ". . . the subspecies category has been long abused for use in naming arbitrarily defined 'slices' of clines (e.g., the arbitrary delimitation of a number of 'subspecies' in *Opheodrys aestivus* by Grobman, 1984) . . ." is therefore inappropriate. In the paper referred to it is clearly indicated (p. 155) that the clinal variation in ventrals and caudals is north/south whereas the races (except for *O. a. carinatus*) are east/west divisions. The data are exhibited in Tables 1 and 2 (pp. 156-157). *O. a. carinatus* is separated from the other races (p. 165) by the degree of keeling and Figure 2 (p. 169) indicates that *O. a. majalis* is a relatively short-tailed race and that *O. a. conanti* is a diminutive subspecies. The described races are not arbitrary slices of clines.

Smith (1990) found that five male hatchlings of *O. aestivus*, incubated at ca. 27.8°C, had a mean ventral count of 155.6 and three male hatchlings, from the same clutch of eggs, incubated at ca. 24.8°C had a mean ventral count of 159.0. That observation led him to suggest that ". . . if many ophidian species respond to temperature during development, these counts may not be satisfactory criteria of gene flow. . ." The demonstrated effect of the north/south temperature gradient (Grobman 1984:155) would appear to be sufficient to account for Smith's observation. His study does not provide an adequate basis for his extended suggestion that ventral counts are not indicative of racial differences. Furthermore, as indicated above, the races of *O. aestivus* are distinguishable on other characteristics as well.

The readers of the third edition of the *Field Guide* would be better served had the races of *Opheodrys* been identified and the users of common names would be better served had the third edition of Collins (1990) supplied such names for those races. The underlying reason for those omissions apparently was the assumption that the scutellation clines in *Opheodrys* were used to define the described races. A more careful reading of the descriptive accounts would have made it clear that the north/south clines in *Opheodrys* are not the basis for recognition of the essentially east/west races.

A demonstration that color patterns (used in classification schemes) are primarily under genetic control and that scutellation patterns are not, would provide a reasonable basis for questioning the use of the latter as indicators of taxonomic distinctions. I know of no such demonstrations, however.

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Reply to Grobman on Variation in *Opheodrys aestivus*

Grobman (this issue of *Herpetological Review*) disagrees with the taxonomic arrangements for the green snakes, *Opheodrys aestivus* and *O. vernalis*, in Collins (1990) and Conant and Collins (1991). He points out that, in the first two editions of *Standard Common and Current Scientific Names for North American Amphibians and Reptiles*, Collins et al. (1978, 1982) initially recognized the races of *Opheodrys vernalis*, but did not do so in the third edition (Collins 1991), and questions why neither these races nor those proposed by him (Grobman 1984) for *Opheodrys aestivus* were recognized.

With respect to Collins (1990), the decision to not recognize races of the snake genera *Opheodrys* (and *Tropidoclonion*) was made by vote of a committee of snake systematists (see p. 2), an action initiated by the publication of Grobman's (1984) taxonomic proposals for *O. aestivus*. Conant and Collins (1990) had independently decided to not recognize races for *Opheodrys* because the diagnoses for the subspecies were suspect. Nothing in Grobman's paper (this issue) dispels that concern.

Grobman (1984) proposed four new races of *Opheodrys aestivus*, presenting his data in tabular form (Tables 1–10). None of the scutellation data contained in those tables was tested for statistical significance, nor were they subjected to univariate or multivariate analysis, and all are suspect. Further, the main characteristics defining his races reside in his key (p. 167), in which he created a situation whereby intergrades between his proposed four populations would, minimally, have to exhibit 127.5 ventral scales—in other words, his statements in this issue to the contrary, he has arbitrarily sliced clines, whether they be east-west or north-south. Grobman (this issue) attempts to discredit Smith (1990), who incubated the eggs of *O. aestivus* and varied the ventral counts by varying the temperature, when in fact this phenomenon was earlier revealed by Fox et al. (1961), when they sounded the death knell for defining subspecies based on ventral and subcaudal scale count variation over 30 years ago.

Grobman (this issue) further questions the continued recognition of subspecies based on pattern and color in both Collins (1990) and Conant and Collins (1991). With respect to Collins (1990), a committee of snake systematists evaluated all taxonomic changes proposed *between* editions. These proposals, published from 1982 to 1989, were submitted to the snake subcommittee, and they voted not to recognize the races of *Opheodrys* and *Tropidoclonion*. The decision was not an arbitrary one—Grobman just doesn't like the result. If, in the same time frame, articles had been published proposing the elimination of races based on color and/or pattern, the snake subcommittee would

have evaluated and voted on those also. With respect to Conant and Collins (1991), the decision not to recognize subspecies of *Opheodrys* and *Tropidoclonion* was reached early (in the mid-1980s), was a personal decision, and was unrelated to the list published by Collins (1990).

In conclusion, it is my opinion that Grobman (1984) presented no evidence that justifies the recognition of subspecies in *Opheodrys aestivus* and, for that reason, I recommend that the herpetological community not recognize his subspecies and hold future such proposals to standards of analysis designed to divulge evolutionary (historical) reality.

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The Adoption of the Poison-arrow Frogs of the Genera *Dendrobates* and *Phyllobates* in Appendix II of CITES

Conservation of amphibians and reptiles involves scientific herpetology in many ways. One of these is that species protection must be based on scientific investigations. The inclusion of *Dendrobates* spp. and *Phyllobates* spp. in Appendix II of CITES (Convention on International Trade in Endangered Species) is being discussed widely among herpetologists. In Hoogmoed's (1990) book review the protection of dendrobatids is emphasized in a singular way. Since there is obviously a general interest in protection, I will in the following give comments on that subject.

The inclusion of *Dendrobates* spp. and *Phyllobates* spp. in Appendix II of CITES was decided upon at the biennial meeting in Ottawa during July 1987. Its basis has been strongly criticized (cf. Mrosovsky 1988; Pickett 1987). After Hoogmoed's (1990) review I feel there is more than ever a need to cast light on this inappropriate action. The Appendix II listing means a regulation of the trade; however, for these common and abundant frogs it will merely mean a regulation for the sake of regulation. The proponents (Surinam and The Netherlands) were unable to provide any indication of decreasing populations; in the supporting material it was merely stated: "Population data are scarce." Scattered statistics on the international trade in various species were given.

Prior to the Ottawa meeting the proposals were analyzed in two reports by the IUCN Trade Specialist Group. These were largely based on the work of Charles Myers (American Museum of Natural History), one of the few herpetologists who has studied dendrobatids extensively in the wild. The other reviewers were Stephen Edwards, Stefan Gorzula, and Marinus S. Hoogmoed. The reports contain many interesting comments; I shall quote or summarize a few of these factual details.

1. The species are easy to identify (only Hoogmoed comments on the small genus *Phyllobates* comprising 5 species: ". . . some species are likely to be confused with others").
2. Those dendrobatids that most often appear in international trade have generally large ranges and are among the most abundant vertebrates in their habitats—e.g., species densities of up to 10 adults per m^2.
3. There is no knowledge of range contractions in historic times.
4. No species are threatened.
5. *D. histrionicus* occurs in countless dense populations throughout many thousands of km^2 of undisturbed rain forest in western Colombia and Ecuador; however, in Surinam's proposal *histrionicus* is just described as "relatively common."
6. The few heavily collected populations of *D. auratus* and *D. pumilio* remain as dense as ever.
7. There is no evidence that dendrobatids are dependent on primary forests. Certainly they are to be found in undisturbed forest, but the highest densities are frequently in disturbed areas, such as mixed secondary growth.
8. Myers reports that during a four-year study on *D. histrionicus*, during which he collected 7600 specimens from one population for scientific purposes, the population actually increased rather than decreased. This number greatly exceeds the imports of all dendrobatids into the U.S. in 1985 and The Netherlands in 1984-1985. Similar cases are known. In no single instance has collecting appeared to adversely influence the population.

TRAFFIC Network (funded by WWF and coordinated by IUCN) gave a clear recommendation to each of the two proposals before the CITES meeting in Ottawa: "This proposal should be rejected as it does not provide any evidence of a threat arising from trade."

The decision at the Ottawa meeting was evaluated by Mrosovsky (1988): "The proposal . . . was passed largely with the support of the South American countries who may have voted more in a spirit of regional solidarity than on the basis of scientific evidence." Also, the EEC countries as a whole supported the proposals. Again, indiscriminate block voting undermines the credibility of CITES in such cases. Mrosovsky (op. cit.) fears that this "could turn CITES into a circus for political exhibitionism."

As soon as *Dendrobates* spp. and *Phyllobates* spp. had been included in Appendix II of CITES, they were also adopted in Annex C part 2 of the EEC Regulation (accomplishing the Convention within the European Community). WWF-Denmark protested in a letter by Arne Schiøtz (former Director of Conservation of WWF-International) to the Danish National Forest and Nature Agency; Peter Kramer (Director of Conservation, WWF-International) and all WWF National Organizations within EEC received copies. Schiøtz stated:

> "One of WWF's consistent arguments for conserving natural habitats is that they can, if exploited sustainably, benefit local people and the countries in which they occur. The argument is of course difficult to maintain if, equally consistently, groups with other interests prevent such sustainable utilization."
> "There are many well-founded reservations about keeping wild

animals in captivity or against the exploitation of wild animals at all, based on animal welfare, but we must be aware that they are contrary to one of the strongest arguments for conservation of the natural habitats."

Hoogmoed (1990) states that all species of *Dendrobates* and *Phyllobates* were listed for look-a-like reasons as this would facilitate the protection of an endangered species which may be confused with other species. Firstly, according to the IUCN reports there are no real look-alike problems. Secondly, no dendrobatid species has been demonstrated or suggested to be endangered. Thirdly, if one should manage to find an endangered dendrobatid species which may be confused with another species, it would be fully sufficient merely to protect these two species. This has been done with the Asian look-alike species *Rana tigerina* and *R. hexadactyla*, which were included in Appendix II in 1985—although it is especially *R. tigerina* that has been over-exploited for the export of frog legs. It would have been senseless to adopt the entire genus *Rana* in Appendix II just because *R. tigerina* needs protection and may be confused with another species!

In addition to the issue of conservation, Hoogmoed (1990) also expresses an undertone of disapprobation of terrarium-keeping. By maintaining non-threatened species (e.g., poison-arrow frogs) properly in a rain forest terrarium and reading literature on how to fulfill their captive requirements, the terrarium-keeper may gain valuable insight in rain forest ecology. What may be even more important is the personal engagement in the ecological world crisis and the awareness and understanding of the natural world. In professional journals the amateurs seldom meet a forum to defend their activities or to take positions against unfounded imputations of being the culprits of destruction. Böhme (1990) has stressed the important role of amateur terrarium-keeping to herpetology (although in a discussion of national German legislation). That issue deserves a separate forum.

For the larger public, unjustified CITES protection impugns the reputation of the Convention. In the case of *Dendrobates* spp. and *Phyllobates* spp., the only way to improve the reputation and to clear this embarrassing issue will be to remove these frogs from CITES as soon as possible.

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TECHNIQUES

Methods of Sampling Snake Populations and Their Relative Success

Snakes are difficult subjects for field study because of their secretive habits. During 43 seasons of continuous field work on the University of Kansas' Fitch Natural History Reservation (FNHR), northeastern Kansas, several sampling methods used have had variable degrees of success. Here I compare the numbers of captures, by species, using (1) live-traps (LT), (2) artificial shelters (AS), and (3) random encounters (RE) during the decade of the 1980s, through May 1991.

Three areas sampled included the 240-ha FNHR, the University's 175-ha Nelson Environmental Area adjoining the Reservation's north side, and Chester Fitch's property of 4.2 ha, 0.8 km west of the Reservation. Various types of woodland occurred on the FNHR, with former pastures and cultivated fields undergoing invasion by trees and shrubs. The Nelson Environmental Area, and the Chester Fitch property at the edge of the Kaw River Valley mainly consist of naturally vegetated fields kept in an early stage of succession by periodic mowing. My snake sampling operations were scattered over an area of several hundred hectares, but were relatively concentrated within 28 sampling units in all, each limited to only a few hectares. Only a few of these units were sampled in any one year, with occasional testing of new units and abandonment of the less productive units.

The live-traps used have been described elsewhere (Fitch 1951, 1987). Most were of quarter-inch (6 mm) wire "hardware cloth" shaped into cylinders ca. 370 mm long and 125 mm diam, with funnel openings 25 mm diam, but some were larger and some were of finer mesh wire. On the FNHR each spring and early summer through 1989, about 100 of these traps were used in pairs—one at each end of a drift fence 4–7 m long. In the fall, the same traps were used at hilltop limestone outcrops where many snakes came to hibernate, and the exposed vertical rock faces provided natural barriers that served as drift fences. Fourteen such outcrops with total linear extent of 3.25 km were sampled. In 1990-91 trapping operations were transferred to the Nelson Experimental Area where there were six enclosures of several hectares each, fenced with fine wire mesh to confine or exclude small mammals. Traps were placed in linear patterns along the hilltop outcrops and enclosure fences, but in three upland fields and one lowland field they were used in random patterns.

Artificial shelters (AS), 300 in all, consisted of corrugated roofing metal or wood; many were 0.6 X 1.2 m, while others were of irregular sizes. They were placed in seven series with 25–100 AS in each. Two arrays were at the edge of the Kaw River Valley and five were in adjacent uplands. Three of the latter were arranged linearly and were checked at irregular intervals. Three series (installed in 1989) that were relatively unproductive were seldom checked. By far the most productive were 40 in "Quarry Field," an upland 3.7-ha area on the northern edge of the FNHR. A series of 100 AS in the southeastern corner of the Nelson Environmental Area and 30 on the Chester Fitch property also yielded substantial numbers of records and a variety of species. Shelters had the advantage of avoiding injury or mortality to snakes, whereas live-traps caused occasional injuries and some mortality when temperatures were extreme, when predators such as raccoons tore open the traps, when trapped snakes became stuck between the wires, or when confined snakes were attacked by shrews and rodents caught with them. Another important advantage of AS was that snakes using them often

were digesting meals and a relatively high percentage of them had stomach items that could be palped and identified. Thus 23 of 90 *Agkistrodon contortrix* (25.6%) had food in their stomachs whereas only 34 of 559 from LT (6.1%) had such items.

The random encounter (RE) category included all captures that were not from LT or AS. Some snakes were found in open places including roads and driveways (DORs were not counted), some were beneath natural shelters, and some in thick cover were revealed by the scolding of birds, but overall, RE constituted only 3.2% of the total captures.

Numbers and proportions of snakes captured by the three different methods are given in Table 1. The most productive method, accounting for slightly more than 67% of the total records, was AS, while the LT method comprised 29% of the captures. Four species were obtained only from shelters, and for two others shelters provided the majority of records. Snakes obtained mainly or exclusively from shelters included the small, secretive species *Carphophis amoenus, Diadophis punctatus, Storeria dekayi, Tantilla gracilis*, and *Tropidoclonion lineatum*. These snakes are too small to be retained in traps with quarter-inch wire mesh. The two largest snakes on the area, *Pituophis catenifer* and *Crotalus horridus*, were the only species for which RE was the most productive method.

Live trapping was most successful with snakes of intermediate size (0.4–1 m SVL): *Agkistrodon contortrix, Coluber constrictor, Elaphe obsoleta, Lampropeltis calligaster, L. getula*, and *Thamnophis sirtalis*. For each of these, LT yielded more records than AS and RE combined. Snakes much longer than 1 m SVL may have been too large to pass through a funnel's entrance, and those that were much less than 0.4 m SVL could pass through the mesh of the traps unimpeded. Such relatively large or small snakes could have been caught by adjusting the size of the trap body, the type of material used, and the diameter of the funnel opening. For instance, in the 1960s, with effort concentrated on catching small snakes such as *Carphophis* and *Diadophis*, traps were made using one-quart (0.95 l) glass "Mason" jars as bodies and eighth-inch (3 mm) wire for funnels, with entrances 1 cm diam (cf. Clark 1966). In the 1966 season, when about 50 such traps were used, a total of 1639 *Diadophis* captures were recorded; 698 (42.6%) were in the small funnel traps, and, simultaneously these traps also caught numbers of *Carphophis amoenus, Storeria dekayi*, and first-year young of *Thamnophis sirtalis, Nerodia sipedon*, and *Coluber constrictor*.

For the 16 species of snakes captured during the 1980-1991 sampling, the three methods (LT, AS, and RE) combined yielded the following capture percentages:

Diadophis punctatus	59.1%
Coluber constrictor	12.2%
Thamnophis sirtalis	10.5%
Agkistrodon contortrix	9.6%
Elaphe obsoleta	3.1%
Elaphe guttata	1.4%
Lampropeltis triangulum	1.4%
Lampropeltis calligaster	1.1%
Nerodia sipedon	0.6%

The seven rarest species, *Pituophis catenifer, Carphophis amoenus, Crotalus horridus, Storeria dekayi, Lampropeltis getula, Tantilla gracilis*, and *Tropidoclonion lineatum* combined were less than one percent of the total captures.

The incidence of recaptures from the three sampling methods combined differed among the various species, as follows:

Lampropeltis triangulum	85.0%
Elaphe guttata	58.0%
Coluber constrictor	42.5%
Lampropeltis calligaster	36.9%
Agkistrodon contortrix	29.6%
Thamnophis sirtalis	27.0%
Pituophis catenifer	25.0%
Elaphe obsoleta	23.0%
Nerodia sipedon	13.3%

There were no recaptures of *Carphophis amoenus, Crotalus horridus, Lampropeltis getula, Storeria dekayi, Tantilla gracilis*, or *Tropidoclonion lineatum*. The high ratio of recaptures in *Lampropeltis triangulum* and *Elaphe guttata* stems from their relatively low vagility and tendency to return to the same cover; few individuals of each were captured but most of these were taken on several or many occasions. No *Diadophis* were individually marked during the decade of the 1980s, so the ratio of recaptures in the 4179 records of Table 1 is unknown. However, in 1969, the year after marking was discontinued, 503 captures included 79 (15.7%) of marked snakes.

TABLE 1. Snakes captured by three methods, 1980-1991, on three areas in Douglas, Jefferson, and Leavenworth Counties, northeastern Kansas.

Species	Total Number of Captures	Percentage Captured by Method: Live-Traps (LT)	Artificial Shelters (AS)	Random Encounters (RE)
Agkistrodon contortrix	678	83.0	13.3	3.7
Carphophis amoenus	16	0.0	100.0	0.0
Coluber constrictor	862	87.5	12.1	0.4
Crotalus horridus	13	38.5	15.4	46.2
Diadophis punctatus	4,179	0.0	98.4	1.6
Elaphe guttata	100	0.0	100.0	0.0
Elaphe obsoleta	218	54.6	24.3	21.1
Lampropeltis calligaster	76	55.4	26.4	18.2
Lampropeltis getula	2	100.0	0.0	0.0
Lampropeltis triangulum	99	18.2	78.8	3.0
Nerodia sipedon	45	35.5	57.8	6.9
Pituophis catenifer	20	25.0	25.0	50.0
Storeria dekayi	7	0.0	100.0	0.0
Tantilla gracilis	1	0.0	100.0	0.0
Thamnophis sirtalis	744	71.5	23.0	5.5
Tropidoclonion lineatum	2	0.0	100.0	0.0
Totals	7,062	29.0	67.7	3.3

In summary, a twelve-year record of 16 snake species on an area of several hundred hectares demonstrated that each species differed in abundance, distribution, and probability of capture by three different methods. The data demonstrate that each method of sampled used was successful to varying degrees, depending on the species, and was totally ineffective for some species. The most effective method of sampling for eight species was AS, followed by LT for six species, and RE for two species (Table 1). One advantage of AS over LT was that shelters greatly reduced the risks of mortality or injury, and they yielded a high percentage of snakes with food in their stomachs that could be identified. Installation of AS involved relatively little time and effort (and expense) compared with installation of LT with drift fences. Also, AS are less restrictive for the investigator as they can be checked when convenient or left untended, whereas LT need to be tended regularly and involve a major commitment of time. Effective use of AS requires, however, that they be checked at the time of day when snakes are most likely to take shelter beneath them. I found it was futile to check shelters when they were too hot or too cold to be attractive. In most community studies of snakes, a combination of field sampling methods may be desirable in order to ameliorate the biases that arise from sexual, seasonal, and ontogenetic differences in behavior among the local assemblage of species.

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Blood Collection From *Macroclemys temmincki* (Troost)

Several methods are available for the collection of blood samples from turtles, including heart puncture through the plastron (Dessauer 1970; Maxwell 1979), toenail clipping (Frye 1991), and cutting off the end of the tail or sacrificing the animal (Duguy 1970). Blood samples also can be obtained from the femoral vein, jugular vein, or the carotid artery (Maxwell 1979). Microliter amounts of blood can be obtained from orbital vessels (Maxwell 1979), and blood can be collected from the dorsal cervical sinus of hatchlings (Bennett 1986). Blood sampling from alligator snapping turtles (*Macroclemys temmincki*) by heart puncture, however, presents several difficulties, especially in larger individuals with thick plastrons. The size and aggressiveness of these turtles make the use of limbs or neck vessels difficult. Sacrificing the animal is not desirable as they are rare, and toenail or tail clipping often does not provide a blood sample sufficient for multiple analyses. Following the methods suggested by Galbraith (pers. comm.), we have adapted his procedure for obtaining blood samples from the ventral caudal vein of *Chelydra serpentina* for use in *Macroclemys temmincki*.

To obtain a blood sample, the turtle was placed on its carapace. We found one or two metal crates (47 cm x 32 cm x 27 cm) to provide an adequate work surface upon which to balance the turtle. When handling turtles over 20 kg it was safer to use two persons to position the animal. The limbs were left unrestrained and the head allowed to hang free. The elevation of the work area was such that the turtle could not use its head for leverage. In this position, the turtle remained docile. Precautions were taken to avoid the immediate area of the head and claws of the hind limb, and movement in the vicinity of the head agitated the animal and provoked snapping.

After positioning the turtle, the ventral surface of the tail posterior to the cloaca was washed with Betadine (Povidone-iodine 10%, Purdue Frederick Co., Norwalk, Connecticut) solution. The tail was then grasped firmly with one hand, and a 1 inch, 22-gauge, Luer-Lok hypodermic needle attached to a 5-cc syringe (rinsed with sodium heparin) was used to obtain the blood sample. The ventral midline of the tail was palpated until the protrusions of the adjacent chevron bones which descend from the caudal vertebrae and form the haemal arches were felt (Galbraith 1991). The needle was inserted at a right angle into the space between the fourth and fifth chevron bones, and the caudal vein punctured. Gentle vacuum was applied until blood appeared in the syringe, then stronger vacuum applied until a sufficient sample of blood was drawn (usually 1-3 ml). The needle was withdrawn and pressure applied to the area until bleeding stopped. Excess blood was washed off the tail, and the area was swabbed with Betadine. Use of a syringe rather than Vacutainer blood collection tube was found to give better control of the process.

After collection, the blood was transferred to sterile tubes (Monoject Blood Collection Tubes/143 USP units sodium heparin) for storage until analyzed. Heparin was used as the anticoagulant instead of EDTA because hemolysis of the red blood cells is known to occur with EDTA (Dessauer 1970). Although not available for this study, it should be noted that lithium heparin is now the anticoagulant of choice for chelonian blood studies (Frye 1991).

Using this technique, blood samples have successfully been collected from 25 alligator snapping turtles ranging in size from 14 to 56 cm carapace length and weighing 2 to 45 kg (Powell and Knesel 1991). Repetitive blood sampling from these turtles over a six-month period has not produced visible harm to the animals.

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An Alphanumeric Code for Toe Clipping Amphibians and Reptiles

Toe clipping is one of the most widely used techniques for individual marking of anurans and lizards. The system proposed by Martof (1953), and other systems cited by Ferner (1979), require the amputation of four or more toes to obtain several two or three-digit numbers. Hero (1989) proposed a system that

Table 1. All codes possible by clipping one, two, or three toes. The codes available only for animals with five fore toes are printed in bold.

ONE	A4B2	**B5C5**	A1A3D4	A3A4C2	B1B4D5	**B3B5C3**	C2C3A1	C4C5B4	D2D4A2	A1B1D5	**A2B5C3**
TOE	A4B3	**B5D1**	A1A3D5	A3A4C3	**B1B5A1**	**B3B5C4**	C2C3A2	**C4C5B5**	D2D4A3	A1B2C1	**A2B5C4**
	A4B4	**B5D2**	A1A4B1	A3A4C4	**B1B5A2**	**B3B5C5**	C2C3A3	C4C5D1	D2D4A4	A1B2C2	**A2B5C5**
A1	**A4B5**	**B5D3**	A1A4B2	A3A4C5	**B1B5A3**	**B3B5D1**	C2C3A4	C4C5D2	**D2D4A5**	A1B2C3	**A2B5D1**
A2	A4C1	**B5D4**	A1A4B3	A3A4D1	**B1B5A4**	**B3B5D2**	**C2C3A5**	C4C5D3	D2D4B1	A1B2C4	**A2B5D2**
A3	A4C2	**B5D5**	A1A4B4	A3A4D2	**B1B5A5**	**B3B5D3**	C2C3B1	C4C5D4	D2D4B2	A1B2C5	**A2B5D3**
A4	A4C3	C1C2	**A1A4B5**	A3A4D3	**B1B5C1**	**B3B5D4**	C2C3B2	C4C5D5	D2D4B3	A1B2D1	**A2B5D4**
A5	A4C4	C1C3	A1A4C1	A3A4D4	**B1B5C2**	**B3B5D5**	C2C3B3	D1D2A1	D2D4B4	A1B2D2	**A2B5D5**
B1	A4C5	C1C4	A1A4C2	A3A4D5	**B1B5C3**	**B4B5A1**	C2C3B4	D1D2A2	**D2D4B5**	A1B2D3	A3B1C1
B2	A4D1	C1C5	A1A4C3	**A3A5B1**	**B1B5C4**	**B4B5A2**	**C2C3B5**	D1D2A3	D2D4C1	A1B2D4	A3B1C2
B3	A4D2	C1D1	A1A4C4	**A3A5B2**	**B1B5C5**	**B4B5A3**	C2C3D1	D1D2A4	D2D4C2	A1B2D5	A3B1C3
B4	A4D3	C1D2	A1A4C5	**A3A5B3**	**B1B5D1**	**B4B5A4**	C2C3D2	**D1D2A5**	D2D4C3	A1B3C1	A3B1C4
B5	A4D4	C1D3	A1A4D1	**A3A5B4**	**B1B5D2**	**B4B5A5**	C2C3D3	D1D2B1	D2D4C4	A1B3C2	A3B1C5
C1	A4D5	C1D4	A1A4D2	**A3A5B5**	**B1B5D3**	**B4B5C1**	C2C3D4	D1D2B2	D2D4C5	A1B3C3	A3B1D1
C2	**A5B1**	C1D5	A1A4D3	**A3A5C1**	**B1B5D4**	**B4B5C2**	C2C3D5	D1D2B3	D2D5A1	A1B3C4	A3B1D2
C3	**A5B2**	C2C3	A1A4D4	**A3A5C2**	**B1B5D5**	**B4B5C3**	C2C4A1	D1D2B4	D2D5A2	A1B3C5	A3B1D3
C4	**A5B3**	C2C4	A1A4D5	**A3A5C3**	B2B3A1	**B4B5C4**	C2C4A2	**D1D2B5**	D2D5A3	A1B3D1	A3B1D4
C5	**A5B4**	C2C5	**A1A5B1**	**A3A5C4**	B2B3A2	**B4B5C5**	C2C4A3	D1D2C1	D2D5A4	A1B3D2	A3B1D5
D1	**A5B5**	C2D1	**A1A5B2**	**A3A5C5**	B2B3A3	**B4B5D1**	C2C4A4	D1D2C2	**D2D5A5**	A1B3D3	A3B2C1
D2	**A5C1**	C2D2	**A1A5B3**	**A3A5D1**	B2B3A4	**B4B5D2**	**C2C4A5**	D1D2C3	D2D5B1	A1B3D4	A3B2C2
D3	**A5C2**	C2D3	**A1A5B4**	**A3A5D2**	**B2B3A5**	**B4B5D3**	C2C4B1	D1D2C4	D2D5B2	A1B3D5	A3B2C3
D4	**A5C3**	C2D4	**A1A5B5**	**A3A5D3**	B2B3C1	**B4B5D4**	C2C4B2	D1D2C5	D2D5B3	A1B4C1	A3B2C4
D5	**A5C4**	C2D5	**A1A5C1**	**A3A5D4**	B2B3C2	**B4B5D5**	C2C4B3	D1D3A1	D2D5B4	A1B4C2	A3B2C5
	A5C5	C3C4	**A1A5C2**	**A3A5D5**	B2B3C3	C1C2A1	C2C4B4	D1D3A2	**D2D5B5**	A1B4C3	A3B2D1
TWO	A5D1	C3C5	**A1A5C3**	**A4A5B1**	B2B3C4	C1C2A2	**C2C4B5**	D1D3A3	D2D5C1	A1B4C4	A3B2D2
TOES	A5D2	C3D1	**A1A5C4**	**A4A5B2**	B2B3C5	C1C2A3	C2C4D1	D1D3A4	D2D5C2	A1B4C5	A3B2D3
	A5D3	C3D2	**A1A5C5**	**A4A5B3**	B2B3D1	C1C2A4	C2C4D2	**D1D3A5**	D2D5C3	A1B4D1	A3B2D4
A1A2	A5D4	C3D3	**A1A5D1**	**A4A5B4**	B2B3D2	**C1C2A5**	C2C4D3	D1D3B1	D2D5C4	A1B4D2	A3B2D5
A1A3	A5D5	C3D4	**A1A5D2**	**A4A5B5**	B2B3D3	C1C2B1	C2C4D4	D1D3B2	D2D5C5	A1B4D3	A3B3C1
A1A4	B1B2	C3D5	**A1A5D3**	**A4A5C1**	B2B3D4	C1C2B2	C2C4D5	D1D3B3	D3D4A1	A1B4D4	A3B3C2
A1A5	B1B3	C4C5	**A1A5D4**	**A4A5C2**	B2B3D5	C1C2B3	C2C5A1	D1D3B4	D3D4A2	A1B4D5	A3B3C3
A1B1	B1B4	C4D1	**A1A5D5**	**A4A5C3**	B2B4A1	C1C2B4	C2C5A2	**D1D3B5**	D3D4A3	**A1B5C1**	A3B3C4
A1B2	**B1B5**	C4D2	A2A3B1	**A4A5C4**	B2B4A2	**C1C2B5**	C2C5A3	D1D3C1	D3D4A4	**A1B5C2**	A3B3C5
A1B3	B1C1	C4D3	A2A3B2	**A4A5C5**	B2B4A3	C1C2D1	C2C5A4	D1D3C2	**D3D4A5**	**A1B5C3**	A3B3D1
A1B4	B1C2	C4D4	A2A3B3	**A4A5D1**	B2B4A4	C1C2D2	**C2C5A5**	D1D3C3	D3D4B1	**A1B5C4**	A3B3D2
A1B5	B1C3	C4D5	A2A3B4	**A4A5D2**	**B2B4A5**	C1C2D3	C2C5B1	D1D3C4	D3D4B2	**A1B5C5**	A3B3D3
A1C1	B1C4	C5D1	**A2A3B5**	**A4A5D3**	B2B4C1	C1C2D4	C2C5B2	D1D3C5	D3D4B3	**A1B5D1**	A3B3D4
A1C2	B1C5	C5D2	A2A3C1	**A4A5D4**	B2B4C2	C1C2D5	C2C5B3	D1D4A1	D3D4B4	**A1B5D2**	A3B3D5
A1C3	B1D1	C5D3	A2A3C2	**A4A5D5**	B2B4C3	C1C3A1	C2C5B4	D1D4A2	**D3D4B5**	**A1B5D3**	A3B4C1
A1C4	B1D2	C5D4	A2A3C3	B1B2A1	B2B4C4	C1C3A2	**C2C5B5**	D1D4A3	D3D4C1	**A1B5D4**	A3B4C2
A1C5	B1D3	C5D5	A2A3C4	B1B2A2	B2B4C5	C1C3A3	C2C5D1	D1D4A4	D3D4C2	**A1B5D5**	A3B4C3
A1D1	B1D4	D1D2	A2A3C5	B1B2A3	B2B4D1	C1C3A4	C2C5D2	**D1D4A5**	D3D4C3	A2B1C1	A3B4C4
A1D2	B1D5	D1D3	A2A3D1	B1B2A4	B2B4D2	**C1C3A5**	C2C5D3	D1D4B1	D3D4C4	A2B1C2	A3B4C5
A1D3	B2B3	D1D4	A2A3D2	**B1B2A5**	B2B4D3	C1C3B1	C2C5D4	D1D4B2	D3D4C5	A2B1C3	A3B4D1
A1D4	B2B4	D1D5	A2A3D3	B1B2C1	B2B4D4	C1C3B2	C2C5D5	D1D4B3	D3D5A1	A2B1C4	A3B4D2
A1D5	**B2B5**	D2D3	A2A3D4	B1B2C2	B2B4D5	C1C3B3	C3C4A1	D1D4B4	D3D5A2	A2B1C5	A3B4D3
A1A3	B2C1	D2D4	A2A3D5	B1B2C3	**B2B5A1**	C1C3B4	C3C4A2	**D1D4B5**	D3D5A3	A2B1D1	A3B4D4
A1A4	B2C2	D2D5	A2A4B1	B1B2C4	**B2B5A2**	**C1C3B5**	C3C4A3	D1D4C1	D3D5A4	A2B1D2	A3B4D5
A2A5	B2C3	D3D4	A2A4B2	B1B2C5	**B2B5A3**	C1C3D1	C3C4A4	D1D4C2	**D3D5A5**	A2B1D3	**A3B5C1**
A2B1	B2C4	D3D5	A2A4B3	B1B2D1	**B2B5A4**	C1C3D2	**C3C4A5**	D1D4C3	D3D5B1	A2B1D4	**A3B5C2**
A2B2	B2C5	D4D5	A2A4B4	B1B2D2	**B2B5A5**	C1C3D3	C3C4B1	D1D4C4	D3D5B2	A2B1D5	**A3B5C3**
A2B3	B2D1		**A2A4B5**	B1B2D3	**B2B5C1**	C1C3D4	C3C4B2	D1D4C5	D3D5B3	A2B2C1	**A3B5C4**
A2B4	B2D2	THREE	A2A4C1	B1B2D4	**B2B5C2**	C1C3D5	C3C4B3	D1D5A1	D3D5B4	A2B2C2	**A3B5C5**
A2B5	B2D3	TOES	A2A4C2	B1B2D5	**B2B5C3**	C1C4A1	C3C4B4	D1D5A2	**D3D5B5**	A2B2C3	**A3B5D1**
A2C1	B2D4		A2A4C3	B1B3A1	**B2B5C4**	C1C4A2	**C3C4B5**	D1D5A3	D3D5C1	A2B2C4	**A3B5D2**
A2C2	B2D5	A1A2B1	A2A4C4	B1B3A2	**B2B5C5**	C1C4A3	C3C4D1	D1D5A4	D3D5C2	A2B2C5	**A3B5D3**
A2C3	B3B4	A1A2B2	A2A4C5	B1B3A3	**B2B5D1**	C1C4A4	C3C4D2	**D1D5A5**	D3D5C3	A2B2D1	**A3B5D4**
A2C4	**B3B5**	A1A2B3	A2A4D1	B1B3A4	**B2B5D2**	**C1C4A5**	C3C4D3	D1D5B1	D3D5C4	A2B2D2	**A3B5D5**
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A2D2	B3C3	A1A2C1	A2A4D4	B1B3C2	**B2B5D5**	C1C4B3	C3C5A1	D1D5B4	D4D5A2	A2B2D5	A4B1C3
A2D3	B3C4	A1A2C2	A2A4D5	B1B3C3	B3B4A1	C1C4B4	C3C5A2	**D1D5B5**	D4D5A3	A2B3C1	A4B1C4
A2D4	B3C5	A1A2C3	**A2A5B1**	B1B3C4	B3B4A2	**C1C4B5**	C3C5A3	D1D5C1	D4D5A4	A2B3C2	A4B1C5
A2D5	B3D1	A1A2C4	**A2A5B2**	B1B3C5	B3B4A3	C1C4D1	C3C5A4	D1D5C2	**D4D5A5**	A2B3C3	A4B1D1
A3A4	B3D2	A1A2C5	**A2A5B3**	B1B3D1	B3B4A4	C1C4D2	**C3C5A5**	D1D5C3	D4D5B1	A2B3C4	A4B1D2
A3A5	B3D3	A1A2D1	**A2A5B4**	B1B3D2	**B3B4A5**	C1C4D3	C3C5B1	D1D5C4	D4D5B2	A2B3C5	A4B1D3
A3B1	B3D4	A1A2D2	**A2A5B5**	B1B3D3	B3B4C1	C1C4D4	C3C5B2	D1D5C5	D4D5B3	A2B3D1	A4B1D4
A3B2	B3D5	A1A2D3	**A2A5C1**	B1B3D4	B3B4C2	C1C4D5	C3C5B3	D2D3A1	D4D5B4	A2B3D2	A4B1D5
A3B3	**B4B5**	A1A2D4	**A2A5C2**	B1B3D5	B3B4C3	C1C5A1	C3C5B4	D2D3A2	**D4D5B5**	A2B3D3	A4B1C1
A3B4	B4C1	A1A3D5	**A2A5C3**	B1B4A1	B3B4C4	C1C5A2	**C3C5B5**	D2D3A3	D4D5C1	A2B3D4	A4B2C2
A3B5	B4C2	A1A3B1	**A2A5C4**	B1B4A2	B3B4C5	C1C5A3	C3C5D1	D2D3A4	D4D5C2	A2B3D5	A4B2C3
A3C1	B4C3	A1A3B2	**A2A5C5**	B1B4A3	B3B4D1	C1C5A4	C3C5D2	**D2D3A5**	D4D5C3	A2B4C1	A4B2C4
A3C2	B4C4	A1A3B3	**A2A5D1**	B1B4A4	B3B4D2	**C1C5A5**	C3C5D3	D2D3B1	D4D5C4	A2B4C2	A4B2C5
A3C3	B4C5	A1A3B4	**A2A5D2**	B1B4A5	B3B4D3	C1C5B1	C3C5D4	D2D3B2	D4D5C5	A2B4C3	A4B2D1
A3C4	B4D1	**A1A3B5**	**A2A5D3**	B1B4C1	B3B4D4	C1C5B2	C3C5D5	D2D3B3	A1B1C1	A2B4C4	A4B2D2
A3C5	B4D2	A1A3C1	**A2A5D4**	B1B4C2	B3B4D5	C1C5B3	C4C5A1	D2D3B4	A1B1C2	A2B4C5	A4B2D3
A3D1	B4D3	A1A3C2	**A2A5D5**	B1B4C3	**B3B5A1**	C1C5B4	C4C5A2	**D2D3B5**	A1B1C3	A2B4D1	A4B2D4
A3D2	B4D4	A1A3C3	A3A4B1	B1B4C4	**B3B5A2**	**C1C5B5**	C4C5A3	D2D3C1	A1B1C4	A2B4D2	A4B2D5
A3D3	B4D5	A1A3C4	A3A4B2	B1B4C5	**B3B5A3**	C1C5D1	C4C5A4	D2D3C2	A1B1C5	A2B4D3	A4B3C1
A3D4	**B5C1**	A1A3C5	A3A4B3	B1B4D1	**B3B5A4**	C1C5D2	**C4C5A5**	D2D3C3	A1B1D1	A2B4D4	A4B3C2
A3D5	**B5C2**	A1A3D1	A3A4B4	B1B4D2	**B3B5A5**	C1C5D3	C4C5B1	D2D3C4	A1B1D2	A2B4D5	A4B3C3
A4A5	**B5C3**	A1A3D2	**A3A4B5**	B1B4D3	**B3B5C1**	C1C5D4	C4C5B2	D2D3C5	A1B1D3	**A2B5C1**	A4B3C4
A4B1	**B5C4**	A1A3D3	A3A4C1	B1B4D4	**B3B5C2**	C1C5D5	C4C5B3	D2D4A1	A1B1D4	**A2B5C2**	A4B3C5

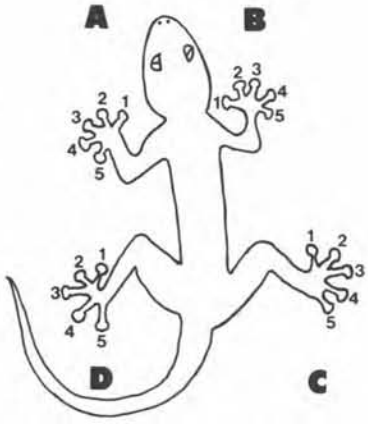


Fig. 1. Labeling system for feet and toes.

A4B3D1	**A5B5C1**	C2D1B1	C3D3A1	C4D4B3
A4B3D2	**A5B5C2**	C2D1B2	C3D3A2	C4D4B4
A4B3D3	**A5B5C3**	C2D1B3	C3D3A3	**C4D4B5**
A4B3D4	**A5B5C4**	C2D1B4	C3D3A4	C4D5A1
A4B3D5	**A5B5C5**	**C2D1B5**	**C3D3A5**	C4D5A2
A4B4C1	**A5B5D1**	C2D2A1	C3D3B1	C4D5A3
A4B4C2	**A5B5D2**	C2D2A2	C3D3B2	C4D5A4
A4B4C3	**A5B5D3**	C2D2A3	C3D3B3	**C4D5A5**
A4B4C4	**A5B5D4**	C2D2A4	C3D3B4	C4D5B1
A4B4C5	**A5B5D5**	**C2D2A5**	**C3D3B5**	C4D5B2
A4B4D1	C1D1A1	C2D2B1	C3D4A1	C4D5B3
A4B4D2	C1D1A2	C2D2B2	C3D4A2	C4D5B4
A4B4D3	C1D1A3	C2D2B3	C3D4A3	**C4D5B5**
A4B4D4	C1D1A4	C2D2B4	C3D4A4	C5D1A1
A4B4D5	**C1D1A5**	**C2D2B5**	**C3D4A5**	C5D1A2
A4B5C1	C1D1B1	C2D3A1	C3D4B1	C5D1A3
A4B5C2	C1D1B2	C2D3A2	C3D4B2	C5D1A4
ARB5C3	C1D1B3	C2D3A3	C3D4B3	**C5D1A5**
A4B5C4	C1D1B4	C2D3A4	C3D4B4	C5D1B1
A4B5C5	**C1D1B5**	**C2D3A5**	**C3D4B5**	C5D1B2
A4B5D1	C1D2A1	C2D3B1	C3D5A1	C5D1B3
A4B5D2	C1D2A2	C2D3B2	C3D5A2	C5D1B4
A4B5D3	C1D2A3	C2D3B3	C3D5A3	**C5D1B5**
A4B5D4	C1D2A4	C2D3B4	C3D5A4	C5D2A1
A4B5D5	**C1D2A5**	**C2D3B5**	**C3D5A5**	C5D2A2
A5B1C1	C1D2B1	C2D4A1	C3D5B1	C5D2A3
A5B1C2	C1D2B2	C2D4A2	C3D5B2	C5D2A4
A5B1C3	C1D2B3	C2D4A3	C3D5B3	**C5D2A5**
A5B1C4	C1D2B4	C2D4A4	C3D5B4	C5D2B1
A5B1C5	**C1D2B5**	**C2D4A5**	**C3D5B5**	C5D2B2
A5B1D1	C1D3A1	C2D4B1	C4D1A1	C5D2B3
A5B1D2	C1D3A2	C2D4B2	C4D1A2	C5D2B4
A5B1D3	C1D3A3	C2D4B3	C4D1A3	**C5D2B5**
A5B1D4	C1D3A4	C2D4B4	C4D1A4	C5D3A1
A5B1D5	**C1D3A5**	**C2D4B5**	**C4D1A5**	C5D3A2
A5B2C1	C1D3B1	C2D5A1	C4D1B1	C5D3A3
A5B2C2	C1D3B2	C2D5A2	C4D1B2	C5D3A4
A5B2C3	C1D3B3	C2D5A3	C4D1B3	**C5D3A5**
A5B2C4	C1D3B4	C2D5A4	C4D1B4	C5D3B1
A5B2C5	**C1D3B5**	**C2D5A5**	**C4D1B5**	C5D3B2
A5B2D1	C1D4A1	C2D5B1	C4D2A1	C5D3B3
A5B2D2	C1D4A2	C2D5B2	C4D2A2	C5D3B4]
A5B2D3	C1D4A3	C2D5B3	C4D2A3	**C5D3B5**
A5B2D4	C1D4A4	C2D5B4	C4D2A4	C5D4A1
A5B2D5	**C1D4A5**	**C2D5B5**	**C4D2A5**	C5D4A2
A5B3C1	C1D4B1	C3D1A1	C4D2B1	C5D4A3
A5B3C2	C1D4B2	C3D1A2	C4D2B2	C5D4A4
A5B3C3	C1D4B3	C3D1A3	C4D2B3	**C5D4A5**
A5B3C4	C1D4B4	C3D1A4	C4D2B4	C5D4B1
A5B3C5	**C1D4B5**	**C3D1A5**	**C4D2B5**	C5D4B2
A5B3D1	C1D5A1	C3D1B1	C4D3A1	C5D4B3
A5B3D2	C1D5A2	C3D1B2	C4D3A2	C5D4B4
A5B3D3	C1D5A3	C3D1B3	C4D3A3	**C5D4B5**
A5B3D4	C1D5A4	C3D1B4	**C4D3A5**	C5D5A1
A5B3D5	**C1D5A5**	**C3D1B5**	C4D3B1	C5D5A2
A5B4C1	C1D5B1	C3D2A1	C4D3B2	C5D5A3
A5B4C2	C1D5B2	C3D2A2	C4D3B3	C5D5A4
A5B4C3	C1D5B3	C3D2A3	**C4D3B5**	**C5D5A5**
A5B4C4	C1D5B4	C3D2A4	C4D4A1	C5D5B1
A5B4C5	**C1D5B5**	**C3D2A5**	C4D4A2	C5D5B2
A5B4D1	C2D1A1	C3D2B1	C4D4A3	C5D5B3
A5B4D2	C2D1A2	C3D2B2	C4D4A4	C5D5B4
A5B4D3	C2D1A3	C3D2B3	**C4D4A5**	**C5D5B5**
A5B4D4	C2D1A4	C3D2B4	C4D4B1	
A5B4D5	**C2D1A5**	**C3D2B5**	C4D4B2	

requires less amputation and allows the individual marking of 736 anurans by removing up to three toes. However, this system does not use all available combinations of toes because it assigns numerical series to the digits. Also, one must remember which combinations are not available.

I propose a system that assigns letters to the feet and numbers to the toes (Fig. 1). Therefore, all the combinations available for two and three toes can be obtained, with the single condition of not amputating more than two toes for each limb (Table 1). Using this code, clipping up to three toes allows marking of a maximum of 959 individual anurans (4 toes/forelimb, 5 toes/hindlimb), and 1310 lizards (5 toes/forelimb, 5 toes/hindlimb). The researcher can discard combinations that require the amputation of more than one toe on the same limb, or avoid other inappropriate combinations, such as those that involve clipping thumbs in species that use these for amplexus or fighting.

A number can be assigned to each code without the necessity of discarding codes. This also minimizes the mistakes due to two numbers having the same code in Hero's system (e.g., 708 and 807). However, with the ready availability of microcomputer spreadsheets that can sort and find codes on any alphanumeric system, most researchers will probably simply scratch each toe code off the list as it is used rather than risk the added complication of parallel numeric and alphanumeric systems. The code system can be photocopied and used by any researcher with the assurance that, within any self-imposed restrictions, the maximum number of two and three toe combinations are being utilized.

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Cyclura carinata from Pine Cay, Turks and Caicos Islands, British West Indies (Iverson 1978, 1979). Iverson (1979) recorded the systematic decline from 1973 to 1976 of a very large population to a relatively small one, that ended in total extirpation by 1978 (Iverson 1978). This extirpation was believed to have been caused by feral cats and dogs introduced during modern human settlement of the island. Nearby undeveloped islands lacking feral mammals (Ft. George and Little Water Cays) apparently have maintained relatively large iguana populations.

During a visit to Pine Cay from 13 to 28 July 1991, I searched for evidence of a return of *Cyclura carinata* to the island. Of 107 h spent walking the entire island, 22 h were spent on two study sites (see Fig. 1). Iguana tracks were found at several locations on the island. At one location opposite Ft. George Cay, many tracks were found, whereas at other locations only a single set of tracks was found. No iguanas were directly observed. However, residents of Pine Cay informed me that there are at least two individuals on the island, one of which is a large male. Indeed, sightings by residents occurred during my stay on Pine Cay. Residents also reported that these sightings began only within the previous year, and that no iguanas had been seen in the preceding ten years.

Two observations lead me to believe that the tracks and sightings were of *Cyclura carinata*. First, the tracks consisted of a single, continuous tail track bracketed by claw marks similar to other iguana tracks previously observed by the author (photographic slides were taken of several sets of tracks), and second, I believe that the sightings by the residents are reliable. All residents reporting iguanas were present when the iguanas previously inhabited the island, and all have also seen iguanas on the nearby Ft. George and Little Water Cays. Finally, *Cyclura carinata* is the only large lizard found in the Turks and Caicos Islands (Schwartz and Henderson 1988).

Therefore, it appears as though the rock iguana has returned to Pine Cay, although the source(s) of the recolonizing individuals is unknown. Three possible sources of iguanas exist: 1) Ft. George Cay, which is consistent with numerous tracks on the northeast end of the island; 2) Little Water Cay, a doubtful source because it would necessitate dispersal across Water Cay (an island approximately the same size as Pine Cay); and 3) reintroduction by humans.

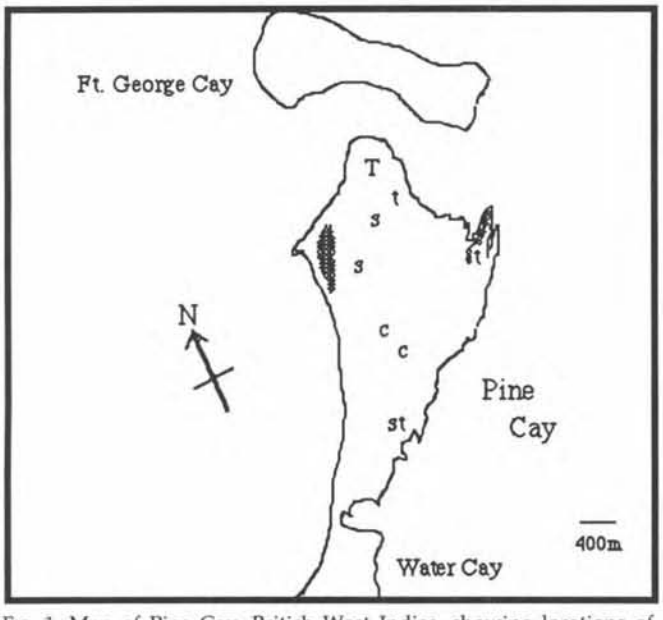


FIG. 1. Map of Pine Cay, British West Indies, showing locations of reported sightings (s) and tracks (T or t) of *Cyclura carinata*. The capital 'T' indicates area where several tracks were found on many occasions. Sightings of feral cats or presence of cat tracks are shown by the 'C's. Shaded areas indicate locations of the main study sites. Little Water Cay is found to the southwest of Water Cay. For a more detailed map see Iverson (1979).

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Prospects for survival of the returning iguanas are tenuous. The size of the current population is probably very small (< 10). Human development on Pine Cay continues and may present some future danger to the continued presence of the iguanas. At present, however, iguana habitat is being preserved and human disturbance appears minimal. Finally, the initial cause of the extirpation from the island (i.e., feral cats) is still present. Cat tracks were seen on all parts of the island, and cats were observed twice during my fieldwork (see Fig. 1). These cats may reduce the likelihood of successful repopulation of Pine Cay by iguanas.

Acknowledgments.—I thank J. Garis, manager of the Meridian Club, and the residents of Pine Cay (especially W. and Z. Brewer and G. Nipanich) and P. Neis for their assistance and hospitality during my stay on Pine Cay. Support was provided by an NSF predoctoral fellowship, an ASIH Gaige Fund award, the H. Holck fund of the University of Nebraska School of Biological Sciences, and T. and J. Smith. J. Iverson, R.

Ballinger, and J. Rowe provided useful comments on early drafts of this manuscript.

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These geographic distribution records will be accepted in a **standard format** only, and all authors *must* adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in Collins, 1990, *Standard Common and Current Scientific Names for North American Amphibians and Reptiles, Third Edition*, Herp. Circ. 19:1–41), LOCALITY (use metric for distances and give precise locality data), DATE (day-month-year), COLLECTOR, VERIFIED BY (*cannot* be verified by an author — curator at an institutional collection is preferred), PLACE OF DEPOSITION (where applicable, use standardized collection designations as they appear in Leviton et al., 1985, *Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology*, Copeia 1985(3):802–832) and CATALOG NUMBER (required), COMMENTS (brief), CITATIONS (brief), SUBMITTED BY (give name and address in full — spell out state names — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged; institutional collection records will receive precedence in case of conflict). A good quality color slide or photograph may substitute for a preserved specimen *only* when the live specimen could not be collected for the following reasons: it was a protected species, it was found in a protected area, or the logistics of preservation were prohibitive (such as large turtles or crocodilians). Color slides and photographs *must* be deposited in a university or museum collection along with complete locality data, and the color slide catalog number(s) must be included in the same manner as a preserved record. All specimen identifications *must* be verified by another authority (not one of the authors). Before you submit a manuscript to us, check Censky (1988, *Index to Geographic Distribution Records in Herpetological Review: 1967–1986*) to make sure you are not duplicating a previously published record.

Please submit any geographic distribution records in the **standard format only** to the Section Co-editors, Joseph T. Collins (USA & Canadian records only), Museum of Natural History — Dyche Hall, The University of Kansas, Lawrence, Kansas 66045–2454, USA, or Darrel Frost (the rest of the world), American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024, USA. Short manuscripts are strongly discouraged, and are only acceptable when data cannot be presented adequately in the standard format.

Recommended citation for new distribution records appearing in this section is: Phillips, C. A. 1991. Geographic Distribution. *Ambystoma maculatum*. Herpetol. Rev. 22:133.

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). USA: TENNESSEE: Rutherford Co: Fall Creek Road, 1.5 km N jct. Mona Road (36°00'42"N, 86°26'18"W). 5 February 1991. B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 46C). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

CRYPTOBRANCHUS ALLEGANIENSIS ALLEGANIENSIS (Eastern Hellbender). USA: TENNESSEE: Marion Co: Little Sequatchie River at new Rt. 28 crossing. 7 June 1991. J. L. Miller & B. T. Miller. Middle Tennessee State University (MTSU Photograph 48-C). New county record that verifies suspected distribution in the Cumberland Plateau physiographic region of middle Tennessee (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.); Warren Co: Collins River at Rt. 127 crossing. 6 June 1991. J. L. Miller & B. T. Miller. MTSU 47-C. Found dead along shoreline two days after heavy rains and flash floods. New county record that verifies suspected distribution in the eastern Highland Rim physiographic region of middle Tennessee (Redmond op. cit.). Both collected under Tennessee Scientific Study Permit 418 and both verified by D. E. Metter.

Submitted by **BRIAN T. MILLER** and **JOYCE L. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

PSEUDOTRITON RUBER (Red Salamander). USA: TENNESSEE: Coffee Co: small spring-fed creek off Lyndell Bell Road, 2.9 km S Blantons Chaple Road. 20 March 1991. B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 43C). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

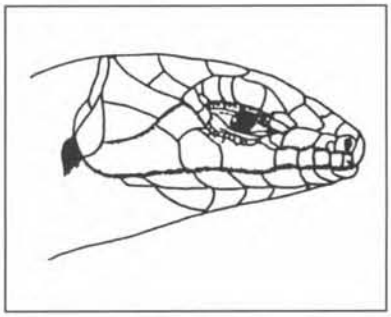
Submitted by **BRIAN T. MILLER** and **JOYCE L. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

ANURA

BUFO BRONGERSMAI (Brongersma's Toad). MOROCCO: Prefecture of Marrakech: Skhour-des-Rehamna, 137 km S Casablanca on road to Marrakech (32°30'N, 07°55'W). 29 March 1991. Ignacio de la Riva. Verified by M. Garcia Paris. Museo Nacional de Ciencias Naturales, Madrid, Spain (MNCN 16616). Second extra-Saharan record, 120 km NE from the first one by Distre et al. (1989 Bull. Soc. Herp. Fr. 51:19–26).

Submitted by **IGNACIO DE LA RIVA**, Departamento de Biologia, Facultad de Veterinaria, Universidad de Las Palmas, C/Francisco Inglott Artiles 12A, 35016 Las Palmas de Gran Canaria Islands, Spain.

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BUFO COGNATUS (Great Plains Toad). USA: NEBRASKA: Cherry Co: ca. 30 km N Mullen, Nebraska on State Hwy. 97, Sec. 15, T27N, R32W. 27 July 1991. A. T. Holycross. Verified by John Lynch. University of Nebraska State Museum (UNSM 15062). New county record, fills significant gap in known distribution in Nebraska. (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **ANDREW T. HOLYCROSS**, Department of Biology, University of Nebraska at Omaha, Omaha, Nebraska 68182–0040, USA.

BUFO COGNATUS (Great Plains Toad). USA: NEBRASKA: Otoe Co: Camp Creek Cemetery, Sec. 13, T7N, R14E. 26 May 1991. John Lokke. University of Nebraska State Museum (UNSM 15053); Nemaha Co: ca. 4 km S of Little Nemaha River on Nebr. Rt. 67, Sec. 25, T4N, R15E. 1 June 1991. K. B. Malmos and A. T. Holycross. UNSM 15061; Washington Co: ca. 2 km NW Nathan's Lake, Sec. 17, T17N, R13E. 26 April 1991. K. B. Malmos. UNSM 15054. All verified by John Lynch. New county records, fill significant gap in known distribution in Nebraska (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **ANDREW T. HOLYCROSS** and **KEITH B. MALMOS**, Department of Biology, University of Nebraska at Omaha, Omaha, Nebraska 68182–0040, USA.

GASTROPHRYNE CAROLINENSIS (Eastern Narrowmouth Toad). USA: TENNESSEE: Rutherford Co: cedar glade along northern border of Fall Creek Road (36°00'42"N, 86°26'18"W). 4 May 1991. B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 36A, 37A). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

HYLA GRATIOSA (Barking Treefrog). USA: TENNESSEE: Warren Co: Pigeon Hill Road, 1 km N Rt. 70-S near Centertown. 27 May 1991. J. L. Miller and B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 42A). New county record that extends the known distribution into the eastern Highland Rim physiographic region of middle Tennessee (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER** and **JOYCE L. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

PSEUDACRIS REGILLA (Pacific Chorus Frog). USA: ALASKA: Alexander Archipelago, Revillagigedo Island: 11 km NW of Ketchikan adjacent to Ward Creek Recreation Area (55°40'N, 131°75'W). 22 June 1991. R. Hauver (U. S. Forest Service). Verified by Nora Foster. Five frogs were observed (incl. 2 females, 1 male) in a muskeg pond, probably breeding. Two specimens were deposited at the University of Alaska, Fairbanks. Liver and leg muscle tissue are in ultracold storage (AF 0010–11) and the carcasses are in 95% ethanol (UAF 1992–5). These specimens represent the first observation of this species within the state of Alaska. The nearest known populations of this species are from

a locality on Graham Island (North Queen Charlotte Island, British Columbia), 185 km SW, where they may be native, and at Eutsuk Lake (B. C.), 380 km SE, where they were introduced (Stebbins 1985, A Field Guide to Western Reptiles and Amphibians. Second Ed. Houghton Mifflin Co., Boston, 336 pp.). It is uncertain whether the Ketchikan population was introduced. Other species of herpetofauna with similar distributions in British Columbia (e.g., *Thamnophis elegans, Elgaria coerulea, Ascaphus truei*) occur in disjunct populations, notably at Kitimat and in the Skeena River (Stebbins, op. cit.). This species was previously placed in the genus *Hyla*.

Submitted by **DANA L. WATERS**, U. S. Fish and Wildlife Service, California Cooperative Fishery Research Unit, Humboldt State University, Arcata, California 95521, USA.

RANA CATESBEIANA (Bullfrog). USA: TENNESSEE: Warren Co: jct. Rts. 127 & 30. 27 May 1991. J. L. Miller and B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 38A). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER** and **JOYCE L. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

RANA SYLVATICA (Wood Frog). USA: WISCONSIN: Waukesha Co: Menomonee Falls Tamarack Swamp, Sec. 22, T8N, R20E. 22 October 1991. Donald M. Reed & Rachel E. Lang. Verified by G. S. Casper. Milwaukee Public Museum (MPM 25307). New county record (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Museum, 205 pp.)

Submitted by **DONALD M. REDD** and **RACHEL E. LANG**, Environmental Planning Division, Southeastern Wisconsin Regional Planning Commission, P. O. Box 1607, Waukesha, Wisconsin 53187, USA.

RANA UTRICULARIA (Southern Leopard Frog). USA: TENNESSEE: Coffee Co: small spring-fed creek off Lyndell Bell Road, 2.9 km S Blantons Chapel Road. 5 May 1991. B. T. Miller (Tennessee Scientific Study Permit 418). Verified by D. E. Metter. Middle Tennessee State University (MTSU 35A). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Dissertation, Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA.

SPEA BOMBIFRONS (Plains Spadefoot). USA: ARIZONA: Navajo Co: Partnership Tank on F. R. 88, 4.8 km E, 6.4 km N of Heber. 3 July 1988. J. Boundy. SJSU A3330–3332. Verified by D. L. Martin. Extends range ca. 60 km SW from NE Arizona Colorado Plateau range (Stebbins 1985, A Field Guide to Western Reptiles and Amphibians. Second Ed. Houghton Mifflin Co., Boston, 336 pp.).

Submitted by **JEFF BOUNDY**, 113 South U Street, Apt. 46, Lompoc, California 93436, USA.

SPEA BOMBIFRONS (Plains Spadefoot). USA: NEBRASKA: Nemaha Co: ca. 2 km S of Honey Creek on Nebr. Rt. 67, Sec. 3, T5N, R15E. 1 June 1991. K. B. Malmos & A. T. Holycross. University of Nebraska State Museum (UNSM 15059); Otoe Co: ca. 5 km SE of Nebraska City, Sec. 35, T8N, R14E. 1 June 1991. K. B. Malmos and A. T. Holycross. UNSM 15058. Both verified by John D. Lynch. New county records, fill significant gap in known distribution in Nebraska. (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57).

Submitted by **ANDREW T. HOLYCROSS** and **KEITH B. MALMOS**, Department of Biology, University of Nebraska at Omaha, Omaha, Nebraska 68182–0040, USA.

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TESTUDINES

MACROCLEMYS TEMMINCKII (Alligator Snapping Turtle). KANSAS: Labette Co: Neosho River at Oswego. Summer 1886. W. S. Newlon. KU 197329. County record and earliest record for the state. Montgomery Co: Onion Creek, Sec. 9, T15E, R34S. 10 April 1986. C. D. Blex. KU 204668 (scute from carapace) and KU Color Slide 7406. County record. Both verified by Joseph T. Collins. The Labette County record had never been verified by voucher (Collins 1982, Amphibians and Reptiles in Kansas, Second ed., Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356) until I discovered its skull in a study collection at Washburn University, Topeka, Kansas.

Submitted by **KELLY J. IRWIN**, 2861 West 32nd Avenue, Manhattan, Kansas 66502, USA.

TERRAPENE CAROLINA TRIUNGUIS (Three-toed Box Turtle). USA: GUAM (Mariana Islands): Mangilao Municipality: Mangilao. May 1991. Anonymous donation to DAWR. Verified by Thomas H. Fritts. Michael J. McCoid Private Collection (MJM 2956); deposited at USNM. First verified record for the island. This is the fourth adult individual seen by DAWR officials although there have been unverified sightings of 'hatchlings' in Mangilao. Other sightings include the Nimitz Hill area of Guam. The status of this turtle on Guam is uncertain. It is likely that this species has been repeatedly brought to Guam because high

numbers of military and civilian personnel are transferred to Guam from the mainland USA where this reptile is a commonly kept pet.

Submitted by **MICHAEL J. MCCOID**, Guam Department of Agriculture, Division of Aquatic and Wildlife Resources, P.O. Box 2950, Agana, Guam 96910.

TERRAPENE ORNATA ORNATA (Ornate Box Turtle). USA: COLORADO: Elbert Co: 5.6 km E & 0.8 km N Agate (SE 1/4, Sec. 3, T7S, R58W). June 1990. David Chiszar, Adam Chiszar & Kevin Fitzgerald. Verified by Todd Gleeson. University of Colorado Museum of Natural History (UCM Color Slides 61–62). First county record (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Division of Wildlife, Department of Natural Resources, Denver, 131 pp.).

Submitted by **DAVID CHISZAR**, Department of Psychology and Museum of Natural History, and **HOBART M. SMITH**, Department of EPO Biology and Museum of Natural History, University of Colorado, Boulder, Colorado 80309, USA.

TRACHEMYS SCRIPTA ELEGANS (Red-eared Slider). USA: GUAM (Mariana Islands): Mangilao Municipality: Lalo Mangilao. 11 March 1991. Anonymous donation to DAWR. Verified by Thomas H. Fritts. Michael J. McCoid Private Collection (MJM 2955); deposited at USNM. First verified record for the island. Individuals of this species have been observed in southern Guam in the Ugum, Namo, and Talofofo Rivers. Other sightings have been made in the Fena Valley Reservoir and the Agana Swamp. It is certain that the species is well established in Guam and should be expected in central and southern Guam where permanent and semi-permanent bodies of water exist. Nesting of this species has been observed along the Ugum River (G. Davis, DAWR, pers. comm.). Sightings of this species have also been made on Saipan (Commonwealth of the Northern Mariana Islands) in Lake Susupe, but it is unknown if this population is established. It is likely that this species was established on Guam due to releases or escapes from turtles present in the pet trade.

Submitted by **MICHAEL J. MCCOID**, Guam Department of Agriculture, Division of Aquatic and Wildlife Resources, P.O. Box 2950, Agana, Guam 96910.

LACERTILIA

FEYLINIA ELEGANS (NCN). CENTRAL AFRICAN REPUBLIC: Bouar. MNHN 1991-389; hill of Bangui: behind President's House. MNHN 1991-390; Zimba: 50 km downstream from Bangui. MNHN 1991-391 & 392. 27 January 1991 MNHN 1991-389; 6 March 1991. MNHN 1991-390; 23 May 1991. MNHN 1991-391 & 392. L. Chirio. Verified by Edouard R. Brygoo. First record for Central African Republic (Joger 1990. *In* Peters and Hutterer, eds. Vertebrates in the tropics. Museum Alexander Koenig, Bonn, 1990:85–102). Known before from N Zaïre (Brygoo and Roux-Esteve 1983, Bull. Mus. Natl. Hist. Nat., Paris, 4e Ser., 5, Section A, n° 1:307–341).

Submitted by **LAURENT CHIRIO**, 14 rue des Roses, F-06130 Grasse, France, and **IVAN INEICH**, Muséum National d'Histoire Naturelle, Laboratoire de Zoologie (Reptiles et Amphibiens), 25 rue Cuvier, F-75005 Paris, France.

OPHISAURUS ATTENUATUS (Slender Glass Lizard). USA: ILLINOIS: Jersey Co: Elsah, Sec. 17, Elsah Twp. 15 April 1962. Robert C. Brown. Southern Illinois University at Edwardsville Collection (SIUE 2537). Verified by Ralph W. Axtell. Lee Co: Green River Hunting Area. 19 April 1979. W. E. Southern. Northern Illinois University-H. D. Walley Collection (NIU-HDW 1449). Verified by Peter Merserve; 6 mi N Ohio, Thomas Ernot Farm. 12 July 1972. Michael D. Johnson. INHS 9842. Verified by Kevin S. Cummings. Madison Co: Melville, Sec. 29, Godfrey Twp. 4 May 1963. R. E. Adams. SIUE 2535. Verified by Ralph W. Axtell; Melville. 7 August 1964. R. E. Adams. SIUE 1536. Verified by Ralph W. Axtell. All the above represent new county records and/or extensions of range in Illinois. Will Co: Braidwood Dunes, Sec. 16, Reed Twp. 15 May 1987. John Levell. INHS 10779. This record helps substantiate a former record of this lizard from Custer Park, collected by Seymour Levy on 27 June 1956 (FMNH 75340). In addition, Smith (1961, Illinois Nat. Hist. Surv. Bull. 28(1):164) noted that this lizard was "more common in the dissected hills of Calhoun and Pike counties than elsewhere in the state," but he plotted only one locality for Calhoun County and none for Pike County on his distributional map. We herein report three specimens (UIMNH 50736–738) from near Pearl, Sec. 10, Pearl Twp., collected on 7 September 1951 by Robert Schroder. These specimens, verified by Christopher Philips, as well as a fourth (Western Illinois University Collection 14094 DOR) collected by Gordon R. Thurow from Napoleon Hollow Canyon, substantiate this lizard's presence in Pike County.

Submitted by **HARLAN D. WALLEY**, Department of Biology, Northern Illinois University, DeKalb, Illinois 60115, USA and **JOHN LEVELL**, 1454 West Grace Street, Chicago, Illinois 60613, USA.

SERPENTES

AMBLYODIPSAS UNICOLOR (NCN). CENTRAL AFRICAN REPUBLIC: Bangui: found dead and dried on the parking lot of the French Embassy. 28 November 1990. Laurent Chirio. Verified by Hidetoshi Ota. MNHN 1991–325. A second specimen is present in MNHN collections; area of Gribingui river, south of Chad. 1921. Baudon. Verified by Hidetoshi Ota. MNHN 1921–27. First record for Central African Republic (Joger 1990. *In* Peters and Hutterer, eds. Vertebrates in the Tropics. Museum Alexander Koenig, Bonn, 1990:85–102). Known before from NE Zaire, SW Sudan and N Cameroon (Broadley 1971, Occ. Pap. Nat. Mus. Rhodesia B4(33):629–697).

Submitted by **IVAN INEICH**, Muséum National d'Histoire Naturelle, Laboratoire de Zoologie (Reptiles et Amphibiens), 25 rue Cuvier, F-75005 Paris, France, and **LAURENT CHIRIO**, 14 rue des Roses, F-06130 Grasse, France.

CROTALUS HORRIDUS (Timber Rattlesnake). USA: LOUISIANA: Washington Parish: between Ards and Fords Creeks, 5.6 km E Angie, crossing a gravel road 50 m off La. Rt. 438 (30°58'39"N, 89°45'31"E), Sec. 46, TIS, R14E. 2 October 1991. W. Glen Knight. Verified by Richard A. Seigel. Southeastern Louisiana University Vertebrate Museum (SLU-1004). First documented record for Washington Parish (Dundee and Rossman 1989, The Amphibians and Reptiles of Louisiana. Louisiana State University Press, 300 pp.) and extends the Louisiana range ca. 96.5 km W Grangeville and 67.6 km N Mandeville.

Submitted by **WILLIAM I. LUTTERSCHMIDT**, Department of Zoology, University of Oklahoma, Norman, Oklahoma, 73019, USA.

DRYMARCHON CORAIS COUPERI (Eastern Indigo Snake). USA: FLORIDA: Pasco Co: north of Land-O-Lakes. 27 October 1990. Verified by Ronald A. Brandon. Four color slide vouchers, Southern Illinois University at Carbondale herpetology collection (SIUC R-2303). Fills a gap between Hernando, Sumter, Polk, Hillsborough, and Pinellas counties (Moler 1985, Distribution of the eastern indigo snake, *Drymarchon corais couperi*, in Florida. Herpetol. Rev. 16(2):37–38). On 5 November 1990, the Illinois Department of Conservation contacted me and asked if I would hold an eastern indigo snake they had confiscated. It had been

collected illegally in Florida and brought into Illinois. The collector provided information on the collection locality. On 8 November 1990, the IDOC issued me a temporary holding permit for the 68-inch male. On 2 January 1991, the IDOC issued a letter authorizing the snake's return to Florida. The snake was shipped back to Florida on 9 September 1991, where regional nongame biologist Nancy D. Joiner of the Florida Game and Fresh Water Fish Commission released the animal at its capture site. The fourth ventral scale anterior to the cloaca was clipped with two V-notches so that the snake may be identified if recaptured.

Submitted by **SCOTT R. BALLARD**, Department of Zoology, Southern Illinois University at Carbondale, Carbondale, Illinois 62901–6501, USA.

ELAPHE OBSOLETA LINDHEIMERII (Texas Rat Snake). KANSAS: Barber Co: Sec. 13, T32S, R12W. 19 July 1983. J. T. Collins, K. J. Irwin, F. B. Cross, & R. E. Moss. KU 193399; Sec. 6, T35S, R12W. 14 May 1987. L. Miller & G. Trott. KU 207295; Sec.9, T35S, R14W. 19 May 1988. L. Miller. KU 211379; Cowley Co: 6.4 mi S & 6.4 mi E Winfield along Walnut River. 1 April 1978. L. Miller & M. Capron. KU 179036; Sec. 21, T32S, R3E. 24 May 1989. D. Phipps. KU 216190; Harper Co: 4.8 km W Anthony on Ks. Rt. 14. 25 May 1980. H. Guarisco. KU 186004; Kingman Co: 100 yards W jct. Rt. 14 & Rt. 42. 1 June 1990. C. Mammoliti. KU 216080; Sumner Co: 3 mi N Oxford. 23 September 1934. A. B. Leonard & W. S. Long. KU 18886; 8 km E Caldwell. 10 May 1986. L. Miller. KU 206231; Caldwell. 15 May 1986. L. Miller. KU 206232; Sec. 27, T34S, R3W. 8 June 1986. L. Miller. KU 206233; Caldwell.10 June 1986. L. Miller. KU 206234; Caldwell. 1 August 1986. L. Miller. KU 206400; Sec. 12, T35S, R3W. 8 October 1986. S. Schmidt. KU 206490. All verified by Joseph T. Collins. These 14 specimens all exhibited color and pattern variations typical of *E. o. lindheimerii*, as per Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston, 450 pp.). Two other specimens, one from Cowley County (KU 206174) and the other from Harper County (KU 22209), exhibited the color and pattern typical of the nominate race, and thus we consider this south-central Kansas population to be intergrades between the two subspecies.

Submitted by **KELLY J. IRWIN**, 2861 West 32nd Avenue, Manhattan, Kansas 66502, USA, **LARRY MILLER**, 920 SW 33rd Street, Topeka, Kansas 66611, USA, and **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, Kansas 67601, USA.

LAMPROPELTIS GETULA (Common Kingsnake). KANSAS: Morton Co: Cimarron National Grasslands, SE 1/4 Sec. 20, T34S, R43W. 12 May 1991. Robert L. Ball. KU 218810; Cimarron National Grasslands, NE 1/4 Sec. 16, T33S, R43W. 20 May 1991. Robert L. Ball. KU 218811. Verified by Joseph T. Collins. First records for county (Collins and Collins 1991, Reptiles and Amphibians of the Cimarron National Grasslands, Morton County, Kansas. U.S. Forest Serv. Publ. viii + 60 pp.).

Submitted by **ROBERT L. BALL**, HCR 2, Box 70, Brewster, Kansas 67732, USA.

LAMPROPELTIS TRIANGULUM AMAURA (Louisiana Milk Snake) USA: TEXAS: Rockwall Co: FM 550, ca. 4.8 km SW jct. FM 205 and I-30. 14 October 1991. Stacy Burnett. Verified by Jonathan A. Campbell. UTA R-30283. New county record. (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CLAY M. GARRETT**, Department of Herpetology, Dallas Zoo, 621 East Clarendon Drive, Dallas, Texas 75203, USA.

NATRICITERES OLIVACEA (Banded Olive Snake). CENTRAL AFRICAN REPUBLIC: Zimba: 50 km aval of Bangui. 30 December 1990. Laurent Chirio. Verified by Hidetoshi Ota. MNHN 1991–329. First record for Central African Republic (Joger 1990. *In* Peters and Hutterer, eds. Vertebrates in the Tropics. Museum Alexander Koenig, Bonn, 1990:85–102). Known before from far NW Zaïre, Zongo (Loveridge 1958, Bull. Mus. Comp. Zool. Harvard Univ. 119(1):25–49).

Submitted by **LAURENT CHIRIO**, 14 rue des Roses, F-06130 Grasse, France, and **IVAN INEICH**, Muséum National d'Histoire Naturelle, Laboratoire de Zoologie (Reptiles et Amphibiens), 25 rue Cuvier, F-75005 Paris, France.

REGINA SEPTEMVITTATA (Queen Snake). USA: TENNESSEE: Stewart Co: Land Between The Lakes (LBL), LBL Road 227, 2.0 km E LBL 100 (The Trace). 19 July 1991. Eugene Zirkle (Tennessee Permit 482). Verified by David H. Snyder, Austin Peay State University (APSU 4308). Female (750 mm TL, 580 mm SVL), with 14 near-full-term young (mean TL = 215.2 mm, SD = 32.9; mean SVL = 164.9 mm, SD = 28.5) in body cavity, found DOR in wooded area near Lake Barkley (impounded Cumberland River). First record for Stewart County and LBL (Snyder 1972, Amphibians and Reptiles of Land Between The Lakes, Tennessee Valley Authority, Golden Pond, Kentucky); extends known range in Tennessee 35 km NW of nearest known voucher (SW Montgomery County, APSU 3666), to W edge of the Highland Rim, and slightly NW of that shown by Conant and Collins (1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third ed. Houghton Mifflin Co., Boston, 450 pp.).

Submitted by **A. FLOYD SCOTT** and **EUGENE ZIRKLE**, Department of Biology and Center for Field Biology, Austin Peay State University, Clarksville, Tennessee 37044, USA.

SONORA SEMIANNULATA (Ground Snake). USA: NEW MEXICO: Socorro Co: DOR US Rt. 60, 7 km E jct. I-25, ca. 33 km NNE Socorro. 15 August 1984. Paul W. Hyder. Verified by Michael A. Williamson. University of New Mexico Museum of Southwestern Biology (MSB 51882). Extends range approximately 56 km NE from the central New Mexico population (Conant and Collins 1991, A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third ed. Houghton Mifflin Co., Boston, 450 pp.).

Submitted by **PAUL W. HYDER**, Department of Biology, New Mexico State University, Las Cruces, New Mexico 88003, USA.

STORERIA DEKAYI (Brown Snake). USA: NEBRASKA: Webster Co: Wilma and Boyd Jones Native Prairie, Sec. 35, T1N, R10W. 13 July 1991. A. T. Holycross. Verified by John Lynch. University of Nebraska State Museum (UNSM 15014). New county record, extends range ca. 80 km W in Nebraska (Lynch 1985, Trans. Nebraska Acad. Sci. 13:33–57). This specimen probably represents a population contiguous with Kansas populations to the south as opposed to Nebraska populations to the east.

Submitted by **ANDREW T. HOLYCROSS**, Department of Biology, University of Nebraska at Omaha, Omaha, Nebraska 68182–0040, USA.

THAMNOPHIS CYRTOPSIS (Blackneck Garter Snake). MÉXICO: SONORA: Caborca, Rancho La Bachata, 2 km NE of railroad station El Coyote. 27 July 1991. Sialia Karina Mellink. Centro Ecológico de Sonora (CES 670). Verified by C. H. Lowe. Four additional individuals were seen by E. Mellink on 29 July 1991. The site is a seasonal cattle tank, surrounded by mesquite (*Prosopis juliflora*) trees, close to a ranch house and cattle corral. The species was previously reported as "throughout Sonora (except extreme western part . . ." (Smith and Taylor 1945, An annotated checklist and key to the snakes of Mexico. U. S. Natl.

Mus. Bull. 187). The locality reported herein is in western Sonora, and is likely that of a small disjunct population, similar to those occurring in western Arizona (Lowe 1964, Amphibians and reptiles of Arizona. *In* Lowe (ed.), The Vertebrates of Arizona. Univ. Arizona Press, Tucson, pp. 153–174).

Submitted by **ERIC MELLINK**, Centro de Investigación Científica y Educación Superior de Ensenada, Apartado Postal 2732, Ensenada, Baja California, México.

THAMNOPHIS SIRTALIS ANNECTENS (Texas Garter Snake). USA: KANSAS: Meade Co: 2.4 km S Meade County State Park on Ks. Rt. 23. 13 June 1980. K. J. Irwin (KU 187499); 0.4 km E Meade County State Park dam, Sec. 24, T33S, R29W. 21 May 1986. K. J. Irwin (KU 206182); Meade County State Park headquarters. June 1991. M. Goldsberry (KU 218777). All verified by Joseph T. Collins. First records for state (Collins 1982, Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356). None of the specimens shows evidence of intergradation with *T. s. parietalis.*

Submitted by **KELLY J. IRWIN**, 2861 SW 32nd Avenue, Manhattan, Kansas 66502 USA.

TYPHLOPS HYPOMETHES (Culebrita Ciega Universitaria). PUERTO RICO: Isabela, Punto Sardina: 2.7 km E of intersection with PR 466. 20 November 1991. Manuel S. Leal. Verified by R. Thomas. Museum of Biology, University of Puerto Rico, Rio Piedras, UPRRP 5744 (adult female), and UPRRP 5745 (juvenile). First record for the NW part of the island; extends the range about 45 km W (airline) from the prior most western locality (7 km W Palmas Altas). This species was described by Hedges and Thomas (1991, Herpetologica 47(4):448–459).

Submitted by **MANUEL S. LEAL**, Department of Biology, P. O. Box 23360, University of Puerto Rico, Río Piedras, Puerto Rico 00931–3360.

Graptemys kohnii in the Pearl River: An Alternative Explanation

Jones et al. (1991) reported the Mississippi map turtle, *Graptemys kohnii* (*G. pseudogeographica kohnii* sensu Vogt 1978) from the Pearl River in the vicinity of Jackson, Mississippi. They attributed the presence of this species, previously found only in the Mississippi River Drainage in Mississippi, to introduction by release of captives. This is a plausible explanation, as hatchling *Graptemys* are commonly sold and kept as aquarium pets and equally commonly released into the nearest aquatic habitat when no longer wanted. However, on the basis of our field work during 1978 and 1979 we suggest an alternative explanation for the occurrence of this species in the Pearl River.

During the summers of 1978 and 1979 we conducted a turtle population study (McCoy and Vogt, in prep.) on the Pearl River near Georgetown, Copiah Co., Mississippi. We trapped turtles using non-selective techniques (Vogt 1980) during 21 days between 1 July and 13 August 1978, and 25 days between 10 June and 4 August 1979. A total of 716 turtles were taken in 1978 and 851 in 1979. Most of the turtles were marked and subsequently released at the original site of capture.

The natural turtle fauna of the Pearl River at the study site conslsts of 10 species. The seven most abundant (both years) were *Sternotherus carinatus, Pseudemys concinna, Trachemys scripta, Graptemys oculifera, G. pulchra, Apalone mutica,* and *A. spinifera. Macroclemys temminckii* was present in small numbers, and one or two specimens of *Chelydra serpentina* and *Sternotherus odoratus* were caught each year. In 1979 a single specimen of *G. kohnii* was taken, a subadult female (CM 95653),carapace length 58.7 mm , in its third year (from growth rings). The animal appeared healthy, and showed no signs of having been in captivity.

In April 1979, between the two trapping seasons, the most extensive flood in the history of the Pearl River occurred, surpassing even the great flood of 1874 (Edelen et al. 1986). Maximum discharge at the gauging station at Monticello, Mississippi, 64 river km below the study site was 3,424.3 m^3/sec, more than 60 times summer normal ($x = 56$ m^3/sec, 1978 and 1979 trap days combined). The river at the study site, usually 15-20 m wide at summer low water, was several kilometers out of banks.

At normal river levels tributaries of the Pearl River (Copiah Creek and Little Copiah Creek) approach Mississippi River tributaries (Bayou Pierre) within 3 km in central Copiah County. At maximum flood stage in April, 1979 these watersheds may have been in communication. We suggest that an explanation for the appearance of *Graptemys kohnii* in the 1979 samples, and an alternative explanation for the presence of the species in the Pearl River, is natural dispersal into the Pearl River from Mississippi River tributaries during the April 1979 flood.

Acknowledgments.—Field work was supported by the Netting Research Fund, Carnegie Museum of Natural History and the U. S. Fish and Wildlife Service (Contract No.14-16-0004-79-038). D. G. Cook, P. S. Freed, J. F. Jacobs, J. F. Norton, and M. J. Pappas assisted in the field. We thank the Mississippi Department of Wildlife, Fisheries and Parks for issuing collecting permits, the Jackson Office, U.S. Geological Survey for flood data, and the Rainey Family of Georgetown for their hospitality.

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BOOK REVIEWS

A Field Guide to Reptiles and Amphibians of Eastern and Central North America, by Roger Conant and Joseph T. Collins. 1991. Houghton Mifflin Company, Boston, Massachusetts. Peterson Field Guide Series Number 12. Third edition. xviii + 450 pp., 48 color plates, 333 maps. Hardcover $24.95, Softcover $16.95.

What can one say about a field guide that has withstood the test of time? It is the best source of accurate identification of the amphibians and reptiles of eastern North America. This new

edition, like its predecessors, will inspire and educate those already committed to natural history and many who will become our future herpetologists. Accuracy, attention to detail, and the illustrations set this book apart from the other field guides on the market. In many respects the third edition is similar to the second, but it does contain some substantial differences.

The first paragraph of the introduction to the second and third editions identifies three groups for whom the book was written, professional herpetologists, herpetoculturists, and field naturalists. Accurate identification of amphibians and reptiles is central to the activities of these people. This field guide has become an overwhelming success because its primary focus is accurate identification. Almost anyone can take this book into the field and properly identify adults and juveniles of most species encountered.

The chapter sequence remains the same. A thorough introduction is followed by chapters on capture and transportation techniques and care in captivity. An important new contribution is the reminder in the beginning of the techniques chapter to check with state authorities for lists of protected species and laws regulating collecting. Many states have enacted laws that restrict collecting native species and owning certain others. This trend will likely continue. The chapter on snakebite was carefully rewritten under the direction of Drs. S. A. Minton and D. L. Hardy. There is a short but useful glossary, a completely revised list of general, regional, and state references, and an index that allows one to find any species by common, scientific, and many vernacular names. The latter is especially important for the layman.

Each species account follows a rigid format established in the first edition. The common name is given before the scientific name, and the number of the plate on which its illustration appears is noted. The range of adult body length is listed in inches and centimeters, followed by known maximum total length. Head-body length (snout-vent length, SVL) is also given for lizards, but not salamanders and snakes. The comment (p. 12) that lizards often possess shorter than normal tails due to partial regeneration is well taken, but salamanders and snakes often possess partial tails. SVL is a standard measure used in the scientific literature and this information should be provided for all appropriate groups.

The verbal descriptions are the most accurate of those in field guides currently on the market. Adults and juveniles, where appropriate, are included in the description. The habitat and some aspects of behavior are noted for most species. Additional notes on unique aspects of the biology of each species and preferred prey are provided in some cases. Similar species are listed with brief descriptions to allow accurate comparisons, and the geographic distribution is described and the corresponding map number indicated.

The second edition covered 331 species and 574 subspecies, whereas the third edition includes 379 species and 595 subspecies. The increase stems from three sources: new discoveries, systematic changes, and introduced species. Several new species have been discovered outright since 1975 (e.g., *Rana okaloosae*, Moler 1985; *Ophisaurus mimicus*, Palmer 1987; *Plethodon petraeus*, Wynn et al. 1988), cryptic species have been discovered in what were formerly single widespread species (13 species in the *Plethodon glutinosus* complex, Highton et al. 1989; *Ambystoma barbouri*, Kraus and Petranka 1989), and subspecies have been elevated to specific status (e.g., *Eurycea bislineata*, *E. cirrigera*, *E. wilderae*, Jacobs 1987; *Nerodia floridana*, Lawson 1987). Fourteen introduced species were described in the second edition compared to 27 in the third edition. Most have become established in southern Florida. Unfortunately, introduced species often adversely affect native species and communities. It remains to be seen if the amphibian and reptile introductions are benign.



A substantial number of taxonomic changes have occurred since the publication of the second edition. Most have been incorporated into this book, but some have not. For example, emydid turtles formerly lumped into the single genus *Chrysemys* are now in the genera *Chrysemys*, *Pseudemys*, and *Trachemys*, water snakes formerly in *Natrix* are now *Nerodia*, *Regina*, and *Clonophis*, and the spring peeper *Hyla crucifer* and the little grass frog *Limnaoedus ocularis* are now in the genus *Pseudacris*. Conant and Collins have rejected several proposed changes, such as dividing *Gopherus* into *Gopherus* and *Xerobates* for the gopher and desert tortoises, and *Scaphiopus* into *Scaphiopus* and *Spea* for the spadefoot toads. They reject outright the suggested synonymy of *Sternotherus* into *Kinosternon* for the musk turtles and *Thamnophis* into *Nerodia* for garter snakes. A substantial taxonomic modification above the generic level was the recent splitting of the large lizard family Iguanidae into eight families, following Frost and Etheridge (1989). Members of six of the families occur in eastern North America. Where are the explanations for these decisions? Readers unfamiliar with systematic herpetology will wonder why these names were changed. The authors missed an opportunity to educate the general public about the importance and dynamics of systematics. It would have taken only a few paragraphs, and it would have helped readers understand that names are not cast in stone.

Any reader familiar with the second edition will quickly see that many common names have been changed substantially. The new ones follow Collins (1990). Collins is a proponent of standardization of common names for North American amphibians and reptiles. Unfortunately for the herpetological community and the reader, some of the names used are controversial and will not be used by everyone. For example, the red-bellied turtle (*Pseudemys rubriventris*) is now the redbelly turtle, the plains black-headed snake (*Tantilla nigriceps*) is the plains blackhead

snake, and the shovel-nosed salamander (*Leurognathus marmoratus*) is the shovelnose salamander. On first glance hyphenated names ending in -ed have been changed to single names with the ending dropped. However, we still find black-striped snake, broad-banded copperhead, red-eared slider, bird-voiced treefrog, and broken-striped newt. One has to wonder what criteria were used to select these standard common names. Unlike bird watchers, amateur and professional herpetologists have long used scientific names instead of common names. Because of the controversy, readers should make their own choice of whether to use scientific names, the common names in the third edition, or the common names in the second edition. It remains to be seen whether the controversy will be settled by the time the fourth edition appears.

Tom Johnson followed in the footsteps of Isabelle Hunt Conant by providing accurate and beautiful illustrations of many species. These include many not seen in the second edition. He hand-colored all of the previously black and white plates and provided several new ones. He deserves our accolades for his important contributions to this book.

The second edition contained a plate on capture and handling techniques and one on first aid for snakebite. The first plate now appears in the techniques chapter, and the second one was omitted. Thus, the 48 plates found in the center signature contain color illustrations of most of the species and subspecies covered in the text. Excellent drawings of tadpoles of 14 species of frogs appear on pages 348-353. I hope this sampling will tantalize some readers to learn more about this fascinating life history stage. Perhaps Tom Johnson can provide illustrations of aquatic salamander larvae in the next edition of the book.

As Conant and Collins point out (p. 9), accurate identification of many of the subspecies of amphibians and reptiles is quite possible. Conant resolved the question of whether to include them or not in the first edition. Those subspecies that could be distinguished visually without a microscope, recourse to scale counts, internal anatomy, or sophisticated laboratory techniques were illustrated in the plates. This was an important decision, for it increased the utility of the field guide. It also made readers pay more attention to geographic variation in these animals. Treating subspecies in the text is another matter, but was resolved by including each of those illustrated in the color plates under a separate main entry. Despite the discussion of the subspecies category, clinal variation, and some of the problems with delineation of this taxon, separate main entries have, in my experience, led amateurs to equate subspecies with species. On numerous occasions I have found myself explaining that subspecies are races of the same species and members of those subspecies can freely interbreed. In one instance an amateur herpetologist collecting salamanders for someone conducting a reproductive study in a zone of overlap retained only those specimens that looked like the subspecies in which the researcher said she was interested. The other phenotype, and presumably some intergrades, were not collected. When queried, the collector found it difficult to understand the concept of population variation, especially in areas of contact between subspecies. The subspecies was in his mind a separate entity. I do not know how widespread this problem is, but I wonder if there may be a way of arranging the descriptions in the text of the field guide so that there is little confusion over the relationship between subspecies and species.

A difficult and largely thankless task in the preparation of a field guide is the construction of distribution maps. Collins took over this job for the third edition of this book and spent several years accumulating information. The 333 shaded range maps are reasonably accurate for most species. I understand from the authors that several errors have been brought to their attention. They and the book's readers should realize, however, that it is nearly impossible to make all shaded range maps completely error-free. These maps reflect the philosophy of their maker: areas without confirmation (museum specimens or slides) are unshaded to stimulate collectors to obtain scientific vouchers to prove him wrong. Hence, maps of riverine species (e.g., *Graptemys kohnii*, *Apalone mutica*) are shown with shaded fingers instead of illustrating broad sweeps of geography where they may occur. There are also more open areas in the distribution maps of the third edition than in the second edition (see for example *Necturus maculosus* and *Elaphe guttata*). The subspecific problem rears its head here as in the text (see above). Most maps containing subspecies are shown with distinct lines indicating ranges abutting those of adjacent subspecies. Only a few, such as the maps for *Agkistrodon contortrix* and *Desmognathus fuscus*, show overlap zones. Illustrating contact zones with overlapping shading would help reduce some of the misunderstandings about subspecies.

The book is well-written, well-bound for long term wear, and attractive. I found only a few minor errors and problems, and no misspellings. Figure 20 refers to *C. texana* when the text uses *Cophosaurus texanus*. The family for *Rhinophrynus dorsalis* was left out of both editions, whereas all other species fall under a family heading. In the Index, under "moccasin," one finds "see cottonheads and coppermouths." Names for turtle scutes on the inside of the front cover reflects outdated terminology; nuchal should be cervical and costal should be pleural (see Ernst and Barbour 1989). The illustrations in Plate 3 are considerably darker in my hardbound copy than in my softbound copy. In the review copy Plate 3 has a green spot on the plastron of *Emydoidea blandingii* and on the carapace of *Kinosternon subrubrum*.

It should be clear from this review that a few improvements can be made in this book. I remain concerned about some of the common names, and how difficult it is for books such as these to convey to the general public the concepts and dynamics inherent in the fields of systematics and taxonomy. I also fear that some readers will come away thinking that there is little left to do with North American species, when in fact there are huge information gaps.

These concerns not withstanding, I highly recommend this book to anyone seriously and even casually interested in the amphibians and reptiles of eastern North America. Buy a copy for yourself and additional copies for friends interested in natural history. The price is reasonable, especially for a softbound copy. Obviously much can be said for the best field guide on the market.

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A Field Guide to Reptiles and Amphibians of Eastern and Central North America.

Because of its enormous importance to herpetologists and naturalists alike, the editors of *Herpetological Review* thought it advisable to have the new edition of Roger Conant's famous *Field Guide* reviewed by two people with somewhat different approaches to herpetology. Joseph Mitchell, the author of the preceding in-depth review, emphasizes natural history and ecology in his research; my own field is systematics, with an emphasis on biochemical techniques.

Mitchell has done a fine job of describing the contents of this updated field guide, and he has provided many useful comments and criticisms, all of which I agree with. Much of what I would have written in my review therefore has been said already. I will not repeat the points Mitchell has covered, except to emphasize topics that I feel are particularly important.

The third edition of Conant's field guide, updated with the help of his new co-author, Joseph T. Collins, follows essentially the format of the previous editions. There are several changes, however. Some of these are improvements, some are not.

The most obvious improvement, and undoubtedly the major reason for producing a new edition, is the updating of species diagnoses and taxonomy to reflect the results of systematic work conducted since the second edition appeared in 1975. The 1975 edition was published just as biochemical techniques were beginning to be used in the analysis of geographic variation and species boundaries in reptiles and amphibians, and the ever-expanding use of biochemistry in the intervening 16 years has demonstrated the existence of numerous cryptic species. This is particularly true among the salamanders. In the second edition, there were 72 recognized species of salamanders. By the third edition the total is 98, of which only a few (e.g., *Plethodon petraeus*) were newly discovered since 1975. Others were deleted from the third edition because they turned out to be parthenogenetic hybrids (*Eurycea latitans* and *E. troglodytes*) or synonymous with another species (*Plethodon longicrus* with *P. yonahlossee*). Significantly, 27 of the newly included species (27.6% of the total) were identified largely on the basis of biochemical methodologies. This upward trend in the number of identified species continues and this third edition soon will be out of date. I personally am aware of data suggesting that there are probably further unrecognized species of *Siren*, *Pseudobranchus*, *Desmognathus*, *Aneides*, and *Eurycea*. Nothing, of course, can be done about this; the authors cannot document future knowledge.

The use of biochemical techniques has allowed us to better understand the diversity of reptiles and amphibians. It has also allowed us to recognize units in nature, including species, that are only identifiable using biochemical characters. This, although it is a boon to herpetology as a whole, is a problem when one is trying to produce a guide to field identification. Most biochemical techniques cannot be used in the field, and in any case such techniques are not available to the vast majority of potential users of the guide. The authors have handled this problem in a variety of ways. In some cases (e.g., *Desmognathus santeetlah* and *D. fuscus*) recognition of the appropriate units in nature has allowed for the identification of minor morphological differences that were previously unrecognized. In these cases the species are listed separately using the standard format. In cases in which species are morphologically indistinguishable, the authors are inconsistent in their format. For example, *Ambystoma barbouri* and *A. texanum* are morphologically identical, but they are listed separately. Alternatively, *Plethodon glutinosus* recently has been

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divided into 13 essentially morphologically indistinguishable species. Unlike *A. barbouri*, these are listed under the single heading "*Plethodon glutinosus* complex."

Problems with the way species, subspecies, and species complexes have been presented in this field guide are discussed at length in the preceding review. I would, however, like to add my voice to Mitchell's in his criticism of this format. Subspecies are sometimes presented as distinct entries apparently with the same "weight" as species while others are simply listed within the species entry. Hence, to the layman some of the subspecies come across as somehow more "important" than others. Admittedly, Conant and Collins explain their formatting criteria in the introduction to the book (readily identifiable subspecies are accorded separate accounts, more obscure ones are listed within species accounts), but unfortunately very few users of the guide will read the introduction (I probably never would have read it if I had not been asked to do this review).

The range maps in the third edition have been updated and much improved. The edges of the distributions of many species are much more dissected than in the second edition, and this undoubtedly reflects an improved knowledge of exact distribution patterns. In some cases, however, distributional margins appear to have been drawn to reflect accurate knowledge where such knowledge does not exist. For example, several species (e.g., *Rana septentrionalis* and *Thamnophis sirtalis*) have ranges that extend northward into northern Ontario and Quebec where herpetological reconnaissance has been minimal. Yet these margins are drawn as wavy lines suggestive of great accuracy. The current knowledge of distribution patterns in this part of the world would be better displayed as straight lines (which better suggest a lack of knowledge), or perhaps with a series of question marks.

Something that I think would be very useful to many users of this field guide would be the inclusion of at least minimal literature citations. The example Mitchell cited in his review was the division of the Iguanidae into multiple families. This is liable to be very confusing to many users, but this confusion would be cleared up by the inclusion of a citation to Frost and Etheridge (1989). Another example can be seen in *Acris crepitans*. Conant and Collins accept the subspecies *A. c. paludicola* for populations in southeastern Texas and southwestern Louisiana although Dundee and Rossman (1989) were unaware of the use of the name for Louisiana populations. I think the book would be much improved if statements such as "subspecific taxonomy according to . . ." or "familial designations according to . . ." were included. A single citation in each case would be sufficient.

One of Mitchell's major criticisms, and one I wish to emphasize as well, is the modification of the common names in the third edition of the field guide to follow Collins (1990). I have no problem with standardizing common names but I do not understand why the "standard" common name chosen in many cases differs from the one most commonly used for a given species. Why, to use Mitchell's example, change "red-bellied turtle" to "redbelly turtle"? "Redbelly" sounds like a blues musician. I hesitate to suggest what the "blackhead" in "blackhead snake" brings to mind. Neither Mitchell nor I are by any means the first to make this complaint (e.g., Huheey 1978; Rossman et al. 1978).

I have discussed a number of criticisms of the new edition of the *Field Guide to the Reptiles and Amphibians*, but in truth none of these criticisms is really very important. The book is excellent and I cannot imagine that anyone even remotely interested in herpetology or in natural history in general can do without a copy. It, like the previous two editions, is head and shoulders above any of the other amphibian and reptile guides currently on the market.

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Annotated Checklist and Bibliography of Amphibians and Reptiles of Tennessee (1835 through 1989), by William H. Redmond, Arthur C. Echternacht, and A. Floyd Scott. 1990. Miscellaneous Publications of The Center for Field Biology, Austin Peay State University, Number 4. Center for Field Biology Publications, Department of Biology, Austin Peay State University, Clarksville, Tennessee 37044, USA. (no ISBN No.) $4 + $1 s&h. iii + 173 pp.

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ERRATUM

In the first complete paragraph on p. 6 of Ritke and Babb (199l. Herpetol. Rev. 22(1):5-6,8) the third sentence should read: "These frogs may have been waiting to ambush prey; we once observed (22 Oct., 1343 h, 27.3°C) male #2 leap ca. 0.3 m from his resting position and consume a prey item." This correction in the time of observation of feeding behavior by *Hyla chrysoscelis* is significant because it indicates that a nocturnal species such as the gray treefrog may feed during the day to facilitate the production of energy reserves before the onset of winter dormancy.

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No. 5. *Endangered and Threatened Amphibians and Reptiles in the United States* compiled by Ray E. Ashton, Jr. (chair) and the 1973–74 SSAR Regional Herpetological Societies Liaison Committee. 1976. 65 p. Out-of-print.

No. 6. *Longevity of Reptiles and Amphibians in North American Collections* by J. Kevin Bowler. 1977. 32 p. $3.00.

No. 7. *Standard Common and Current Scientific Names for North American Amphibians and Reptiles* (1st ed.) by Joseph T. Collins, James E. Huheey, James L. Knight, and Hobart M. Smith. 1978. 36 p. $3.00. [see also numbers 12 and 19].

No. 8. *A Brief History of Herpetology in North America Before 1900* by Kraig Adler. 1979. 40 p., 24 photographs, 1 map. $3.00.

No. 9. *A Review of Marking Techniques for Amphibians and Reptiles* by John W. Ferner. 1979. 42 p., illus. $3.00.

No. 10. *Vernacular Names of South American Turtles* by Russell A. Mittermeier, Federico Medem and Anders G. J. Rhodin. 1980. 44 p. $3.00.

No. 11. *Recent Instances of Albinism in North American Amphibians and Reptiles* by Stanley Dyrkacz. 1981. 36 p. $3.00.

No. 12. *Standard Common and Current Scientific Names for North American Amphibians and Reptiles* (2nd ed.) by Joseph T. Collins, Roger Conant, James E. Huheey, James L. Knight, Eric M. Rundquist, and Hobart M. Smith. 1982. 32 p. $3.00. [see also numbers 7 and 19].

No. 13. *Silver Anniversary Membership Directory*, including addresses of all SSAR members, addresses and publications of the herpetological societies of the world, and a brief history of the Society. 1983. 56 p., 4 photographs. $3.00.

No. 14. *Checklist of the Turtles of the World with English Common Names* by John Iverson. 1985. 14 p. $3.00.

No. 15. *Cannibalism in Reptiles: A World-Wide Review* by Joseph C. Mitchell. 1986. 37 p. $4.00.

No. 16. *Herpetological Collecting and Collections Management* by John E. Simmons. 1987. 72 p., 6 photographs. $6.00.

No. 17. *An Annotated List and Guide to the Amphibians and Reptiles of Monteverde, Costa Rica* by Marc P. Hayes, J. Alan Pounds, and Walter W. Timmerman. 1989. 70 p., 32 figures. $5.00.

No. 18. *Type Catalogues of Herpetological Collections: An Annotated List of Lists* by Charles R. Crumly. 1990. 50 p. $5.00.

No. 19. *Standard Common and Current Scientific Names for North American Amphibians and Reptiles* (3rd ed.) compiled by Joseph T. Collins (coordinator for SSAR Common and Scientific Names List). 1990. 45 p. $5.00. [see also numbers 7 and 12].

No. 20. *Age Determination in Turtles* by George R. Zug. 1991. 32 p., 6 figures. $5.00.

PUBLICATIONS OF THE OHIO HERPETOLOGICAL SOCIETY

OHS was the predecessor to the Society for the Study of Amphibians and Reptiles. All publications international in scope. Paperbound as issued.

Volume 1 numbers 1–4, plus Special Publications 1–2 (all 1958), facsimile reprint, out-of-print.

Volume 2 (1959–1960), four numbers, $2.00 per number; numbers 3 and 4 out-of-print.

Volume 3 (1961–1962), four numbers, $1.00 per number; numbers 1 and 3 out-of-print.

Volume 4 (1963–1964), four numbers; double number 1–2, $4.00, numbers 3 and 4 $2.00 each.

Volume 5 (1965–1966), four numbers, $2.00 per number.

Special Publications 3–4 (1961–1962), $2.00 per number; number 3 out-of-print.

OTHER MATERIALS AVAILABLE FROM THE SOCIETY

The following color prints and brochures may be purchased from the Society. (*Extra postage required; see "Shipping and Handling Costs.")

HOLBROOK PORTRAIT. Full-color print (8¾ x 11¼ inches) of John Edwards Holbrook, father of North American herpetology, reproduced from the Daniel Huntington oil portrait of 1856–1857. Edition limited to 1000 copies. $6.00 each or $4.00 in quantities of 10 or more.

FIJI IGUANA PRINTS. Two full-color prints (7 x 10 inches) of *Brachylophus fasciatus* and *B. vitiensis*, as published in Journal of Herpetology, vol. 15, 1981. Special printing limited to 50 sets, individually signed by the artist, David M. Dennis. Set of two, $15.00.

*SILVER ANNIVERSARY COMMEMORATIVE PRINT. Full-color print (11½ x 15¼ inches) of a Gila Monster (*Heloderma suspectum*) on natural background, from a watercolor by David M. Dennis. Issued as part of Society's 25th Anniversary in 1982. Edition limited to 1000. $6.00 each or $5.00 in quantities of 10 or more.

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HERPETOLOGY AS A CAREER, by Henri C. Seibert, Ralph W. Axtell, Neil B. Ford, and Martin J. Rosenberg. 1985. 4 p. Brochure developed as an aid to students and counselors. Single copies free of charge; additional copies available for $0.25 each.

GUIDELINES FOR THE USE OF LIVE AMPHIBIANS AND REPTILES IN FIELD RESEARCH, by George R. Pisani, Stephen D. Busack, Herbert C. Dessauer, and Victor H. Hutchison, representing a joint committee of ASIH, HL, and SSAR. 1987. 16 p. Brochure covers animal care, regulations, collecting, restraint and handling, marking, housing and maintenance in field, and final disposition of specimens. $4.00 ($3.00 each in quantities of five or more copies).

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Herpetological Review is a peer-reviewed quarterly that publishes, in English, articles and notes of a semi-technical or non-technical nature, as well as book reviews, institutional features, commentaries, regional and international herpetological society news, research requests of SSAR members, and letters from readers directed to the field of herpetology. Articles reporting the results of experimental research, descriptions of new taxa, or taxonomic revisions are not published in ***HR***, but should be submitted to the ***Journal of Herpetology*** (see inside front cover for Editor's address). ***HR*** especially encourages the submission of articles of broad interest to the herpetological community.

Authors should submit an original and two copies of manuscripts. Manuscripts should be typewritten, double-spaced, on 21.5 x 28 cm (8.5 x 11 inch) white paper. Refer to this issue of ***HR*** for style and format information, including correct format for literature citations. More detailed information for submissions to Geographic Distribution, Life History Notes, and Recent Population Changes appear in a recent issue of ***HR*** under their respective headings.

Originals of illustrative material (e.g., tables, photographs, or diagrams) should be submitted with the text, with appropriate precautions taken to ensure delivery without damage. Illustrations should be discussed in the text and numbered sequentially with Arabic numbers. References to illustrations should be placed in parentheses at the end of sentences. Original photographs should be submitted as black and white glossy prints (8 x 10 inch preferred).

For further guidelines, authors should consult the *CBE Style Manual* (5th edition, 1983, Council of Biology Editors, Inc., 9650 Rockville Pike, Bethesda, Maryland 20814, USA).

Submissions for Life History Notes, Geographic Distribution, Herpetological Husbandry, Recent Population Changes, Regional Society News, and Legislation & Conservation Alert should be sent directly to the appropriate section editor (see inside front cover for names and addresses). Review copies of books should be sent to the Book Review Section Editor (name and address on inside front cover). Manuscripts intended for publication as Feature Articles, Techniques Articles, Points of View, as well as news notes and other material, should be sent to the Editor.

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Herpetological Review

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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (4 issues annually), **Herpetological Review** (4 issues annually), and occasional issues of **Facsimile Reprints in Herpetology**. Members may purchase other Society publications at reduced rates.

ANNUAL DUES 1991

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HERPETOLOGICAL REVIEW
Volume 22 December 1991 Number 4

1992 ANNUAL MEETING
OF
THE SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

THE UNIVERSITY OF TEXAS AT EL PASO
EL PASO, TEXAS

2-6 AUGUST, 1992

Meeting Site

The University of Texas at El Paso (UTEP) is located in the Paso del Norte region of southwestern North America, at the junction of the states of Chihuahua, New Mexico, and Texas. El Paso is a major border city, its population of about 500,000 being augmented by that of Ciudad Juarez to a metropolitan area of 1.5 million people. The human population is considerably less dense for hundreds of kilometers in all directions from the two cities, forming an urban island in the otherwise xeric basin and range topography of the northern Chihuahuan Desert. The cultural milieu and biotic setting of the region thus offer an impressive range of entertainments. The meeting will be held about a month into the summer rainy season; warm to hot mornings, afternoon thundershowers, and balmy evenings can be generally expected.

Accommodations and Dining

The principal accommodations for the meeting will be at three downtown hotels: Travelodge Motor Hotel Central, Park Place Holiday Inn, and the Downtown Ramada Inn; these are located about 1.5 miles from the University campus. A shuttle bus will transport attendees every morning and evening to and from these hotels and the paper session locations. There are also several other hotels in the downtown areas, plus an assortment of motels within a short drive of the campus. A relatively small number of on-campus dormitory accommodations will also be available, perhaps for as many as 200 persons. Students are asked to reserve these dormitory spaces while they last (915-747-5352); comparatively wealthy faculty and other permanently employed persons are encouraged to make use of the off-campus accommodations.

On-campus eating facilities are limited during the intersession period, but arrangements have been made with the dormitory commons to serve meals to all meeting participants on a pay-as-you-go basis. Additionally, there are a few fast-food eateries, bar-restaurants, and restaurants on the eastern campus periphery within short to moderate walking distance of the Union.

Travel to El Paso

Overland travel to El Paso is facilitated by several roads, both paved and unpaved, leading into it. The city is served daily by several intercity bus lines: El Paso-Los Angeles Limousine Express, Greyhound Trailways Bus Lines, Texas, New Mexico, and Oklahoma Coaches, Inc., and Turismos Rapidos, S.A. Moreover, there is twice-a-week AMTRAK service here (info: 1-800-872-7245). The UTEP campus is located on the west side of the city, just north of downtown; on-campus parking is free and should not be a limiting resource. However, it is a good idea for attendees driving their personal vehicles to check their insurance provisions beforehand; like many border cities, we have many uninsured motorists.

El Paso has an international airport, located on the east side of the city and some eight miles from the campus. Shuttle transportation from the airport to the hotel will be provided by the hotels, and there are special rates for car rental (Avis) for UTEP conference attendees. Those participants coming from México should consider using the Ciudad Juarez airport and arranging for subsequent ground transportation across the border to El Paso.

Board and Business Meetings

The SSAR Board meeting will be held at 10AM on 2 August at the El Paso downtown Travelodge. The SSAR Business meeting is scheduled for after the lunch break on Thursday afternoon, 6 August, on the UTEP campus.

Traditional Events, Symposia, and Special Activities

The registration desk will open on Sunday, 2 August at noon at the Travelodge Hotel in downtown El Paso, and thereafter be moved to the UTEP campus for all day Monday and Tues-



HERP ART SHOW

AUG. 1 - OCT 3, 1992

The Centennial Museum at The University of Texas at El Paso

Wiggins and University, El Paso, Texas, 79968-0533 - 915-747-5565

All artists are invited to submit slides of paintings, drawings, photographs and sculpture of amphibians and reptiles for this juried show which will coincide with the 1992 annual meeting of The Society for the Study of Amphibians and Reptiles to be held at The University of Texas at El Paso, August 2-6, 1992. Best Painting, Best Drawing, Best Photograph and Best Sculpture awards of $200 each will be presented at the Opening Reception, August 3, 5-8 pm.

RULES:

1. Size of works must not exceed the following dimensions: Paintings (4 ft x 4 ft); Drawings (4 ft x 4 ft); Photography (4 ft x 4 ft); and Sulpture (Base 34 inches square x 6 feet in height, 300 pounds).

2. Two dimensional work must be framed ready for hanging with wire across back.

3. Below form must accompany slide of art work and must reach the Centennial by May 1, 1992. Please send slides of all sides of sculptures.

4. Shipping and insurance coverage costs to and from the Museum will be paid by the artist. An appropriate re-usable container must be used.

DATES:

May 1	Receipt of entry form and slides at the Centennial Museum for jurying.
June 1	Show selected and artists advised
July 1	Receipt of art work at the Centennial Museum
Aug. 1-Oct. 3	Exhibit: HERP ART
Aug. 3, 5-8 pm	Reception
Oct. 30	Works of art returned to artists

ENTRY FORM: Herp Art Show, Aug. 1- Oct 3, 1991
Mail to The Centennial Museum, UTEP, Wiggins and University, El Paso, TX 79968-0533

Name_____Title_____

Address_____Phone(W)_____

City,State, Zip_____Phone(H)_____

Media_____Title of Work_____

Size_____(l)_____(h)_____(w)_____weight_____Insurance value_____

Check here if not for sale _____For more information, call 915-747-5565.

Museum Use: Date Received_____Letter of receipt sent dated_____

Date return shipment _____ by _____

day. The paper and poster sessions, and symposia, will be held in the University Union Building (East), with some ancillary activities taking place in the Centennial Museum.

A plenary session with keynote speaker will open the meeting at 10AM on Monday, followed by a group photograph. The concurrent paper sessions, and the Chelonian Systematics symposium, will begin in the afternoon.

The first-day welcoming social will be held Monday, 3 August from 5-7PM in and on the grounds of the Centennial Museum, the University's museum of natural and cultural history. It will be followed by the Presidential Slide Show, in the University Union East.

The second day of the meeting will include contributed paper sessions, the continuation of the turtle symposium, the evening picnic dinner ("Fajita Fiesta"), and the traditional and infamous herpetological auction in the late evening. Tuesday will also begin the exhibit of live regional reptiles and amphibians (sponsored by the El Paso Herpetological Society and the Chihuahuan Desert Herpetological Society). This exhibit will gather together as many as possible of our 60+ species of local amphibians and reptiles.

Wednesday will be devoted to paper sessions, a continuation of the live exhibit, and a symposium on herp conservation in México. The near-traditional Dennis/Juterbock slide show will take place in the evening.

Thursday continues as the day before, with the addition of the Regional Societies conference. The SSAR Business Meeting scheduled for early afternoon and an (optional) trip to the Juarez race track for the evening. For Friday, a field trip to the Chihuahuan Desert Research Institute in Alpine will be available; this trip will include a BBQ cookout sponsored by the CDRI. Alternative Friday field trips consist of a hiking visit to Franklin Mountains Wilderness State Park, or an all-day visit to UTEP's Indio Mountains Research Station. Additionally, inexpensive "border-jumper" trolley excursions into Ciudad Juarez are available on a daily basis.

As an all-time first for SSAR, a juried herpetological art show will take place. Artists are encouraged to submit color slides of their work for this event; we hope to raise (very) modest monetary prizes for the winners in each of four categories. The show is being conducted under the auspices of the Centennial Museum, whose galleries have been reserved for this event during the meeting and an eight-week period afterward. Last year, the Museum had over 100,000 visitors; the serious artists among the membership will no doubt appreciate what this kind of public exposure can mean to them. For full explanation, see the entry form that appears elsewhere in this issue of *Herp. Review*. We are also contemplating a *Salon de Refusé* for artwork that a) either doesn't make it into the formal show in the Museum, or b) that attendees would like to bring with them for exhibition, but did not wish to enter into the formal show competition.

The 1992 meeting will also mark the debut of the Seibert Awards for outstanding student presentations. Provided by an anonymous donor and named in honor of lifetime SSAR supporter Henri Seibert, these cash awards will be presented for the best two orally-presented student papers ($250 for first prize, $150 for second). Entry requirements for the awards will be described in the forthcoming Call for Papers, but interested students are advised to begin working on their data, figures, and prose now.

Collecting Permits

Collection of reptiles and amphibians for scientific or educational purposes, or for recreational/private purposes in Texas and New Mexico is regulated by their respective state wildlife management authorities. Both these states require a permit for scientific collecting purposes, and a resident or non-resident hunting/fishing license for recreational take. Direct inquiries for scientific permits to: Resource Protection Branch, Texas Parks & Wildlife Department, 4200 Smith School Rd., Austin, Texas 78744, USA and/or New Mexico Department of Game and Fish, Villagra Building, Santa Fe, New Mexico 85703, USA.

Collection and/or export of herps in the sovereign nation of México for any reason is prohibited except by federal permit issued by the Dirección General de la Fauna y Flora Silvestre, an agency of the Secretaria de Desarrollo Urbano y Ecología (SEDUE). Illegally collected specimens may not be brought across the border into the United States without violating both Mexican and U.S. law.

Meeting Announcement

The 1992 annual meeting of the SSAR is being jointly sponsored by the El Paso Community College, the Sociedad Herpetología Mexicana, and the University of Texas at El Paso.

All interested persons, whether members of SSAR or not (and who are willing to pay the registration fee) are welcome to attend this meeting. The full meeting announcement, description of activities, call for papers and preregistration, and full information on accomodations will be mailed out to the SSAR membership no later than early March, 1992. For information in the interim, call Carl S. Lieb (915-747-5844) or Jerry Johnson (915-594-2214) during weekday business hours (Mountain Time). Overseas members will not automatically receive the meeting announcement, but may request a mailing either in writing or by calling one of the conference co-chairmen.

SSAR BUSINESS

SSAR ANNUAL MEETING REPORT: STATE COLLEGE 1991

Between 5 and 11 August 1991, State College, Pennsylvania was invaded by just over 500 herpetologists from the U.S. and overseas, as SSAR held its 34th annual meeting. The meeting, held jointly with the Herpetologists' League, was hosted by Pennsylvania State University; Linda Maxson, current SSAR president, chaired the local committee.

As a preliminary, President Maxson hosted a meeting of the Intersociety Liaison Committee at her house between 1600 and 1730 hours on 5 August 1991. This meeting was followed that evening by a dinner for SSAR and HL board members, editors, etc.; President Maxson was again the gracious and generous host.

The annual meeting of the SSAR Board of Directors was held on 6 August 1991, between 1000 and 1710 hours, in the Keller Conference Center on the Penn State campus; box lunches were available to minimize down time and allow informal business discussion to continue. Attending the board meeting were 11 of 12 board members, editors of three of the six publications, most committee chairs, and several members; reports were available for those publications and committees not represented.

A summary of business conducted was later presented at the Business Meeting (see below).

PRESENTATIONS

The meeting was officially called to order at 0900 hours on 7 August 1991 by President Maxson. Penn State President Joab Thomas (a member of the Biology faculty who referred to "his boss, Linda Maxson") welcomed us and recalled that HL President Gibbons was a student in the first Biology class he ever taught. Gibbons, in turn, introduced HL Distinguished Herpetologist Raymond B. Huey, who presented the lecture—Evolution of Performance: Reptiles and Amphibians as Models for General Biological Questions.

Distinguished Herpetologist Huey proffered both the theme that the evolution of performance is most effectively studied with animals that are well known demographically, and a plea for collaboration between those interested in functional biology and in demography. Huey noted that behavior, morphology, and physiology all affect performance, which affects genetic fitness. Approaches to the study of the evolution of performance include genetic historical patterns, functional bases, contemporary processes, and potential trajectories. Among several examples of interesting "performance questions" discussed, were: how does the performance (e.g., maximum speed or stamina) of an animal change as it ages; and, how does the performance of average animals change from year to year, or vary among populations?

Approximately 200 authors presented approximately 125 papers at 11 contributed paper sessions between 1300 hours 7 August 1991, and 1700 hours, 10 August 1991. There were also 37 poster presentations scheduled by 77 authors during two sessions. Two symposia, **Amphibian Declines and Habitat Acidification** and the **Conant Symposium,** involved another 92 authors and 58 presentations.

SOCIAL BEHAVIOR

Fortunately, as great as were the presentations and subsequent discussions among all of these scholarly sessions, we were well supplied with lighter fare by host Maxson, with able assistance from her local committee.

An opening mixer, with music by PSU Biology's Matt Bouchard, at the Nittany Lion Inn on 6 August 1991, welcomed a large crowd of annual meeters. It is doubtful that any appreciated the effort more than those who had spent the rest of the day in one of the two board meetings! We were again entertained and enlightened on the evening of 7 August 1991 by the annual multimedia presentations. **Herpetologists Past and Present** by Adler and Dennis, and **Amphibians of the Appalachians and Herpetology of the American West,** both by Dennis and Juterbock, played to an appreciative standing room crowd at Keller Auditorium. On 8 August 1991, we were all treated to a picnic at Beaver Stadium; entertainment was by PSU's Ben Ruth and the M & M's. Although the weather did not totally cooperate, it did not rain until the waning moments when we were all too sated to care. There was an unsubstantiated rumor that the post-prandial shower was planned by Linda to sober up the crowd before we got back to the dorms! The social pinnacle of this year's meeting, however, undoubtedly occurred at the auction, on 9 August 1991! Whereas auctioneer Collins performed his duties in his usual superb fashion, the spotlight that evening was really shining on the Ohio Herpetological Society Chorus. At least it was shining on those few members who were unable to hide from choral leader Kraig Adler. Best received was the debut of **The Ballad of Roger Conant.** Roger, of course, was also honored by a two-day symposium in recognition of his long and distinguished herpetological career; and, he was presented with a bound book of letters of recognition at a reception in his honor on 9 August 1991.

BUSINESS MEETING

President Maxson called the Annual Business Meeting to order at 1630 hours on Thursday, 8 August 1991 in the Keller Conference Center. She began by announcing the formation of a Grants in Herpetology endowment program. Maxson had previously solicited officers and former society presidents to become Founders of the endowment by contributing cash and/or special items for the annual auction (PSU football coach Joe Paterno donated an autographed football!). At the Board Meeting, earlier in the week, the SSAR Board budgeted a substantial contribution to this endowment.

Secretary Juterbock briefly summarized the annual meeting of the SSAR Board. He reported that the Board engaged in a substantial discussion of future meeting sites. SSAR voted to pursue an invitation from Craig Nelson to meet at Indiana University 10-14 August 1993. SSAR will soon produce a directory of the current (end of 1991) membership. SSAR will also pursue the possibility of publishing a directory of U.S. herpetologists (membership in any of the three major societies) plus North American Regional Societies and world herpetological societies with contact persons' names and addresses.

Publications Secretary Aldridge informed the board that he would need to be replaced, at least while he is on sabbatical. The committee to review the *Catalogue of American Amphibians and Reptiles* reported to the board that recent editor Villa had done a great job in getting the *Catalogue* published in a timely manner and converting the editorial process to desktop publishing. They also recommended, though noting that there is "no need to fix what isn't broken," that the *Catalogue* return to its original focus by completing accounts for North American taxa and that an editorial board be established.

Treasurer Taylor reported that the Society is in good financial shape with a stable membership base. All budgetary officials have been holding down costs and book sales have been good. The only dues categories with rates changing for 1992 are those for sustaining and contributing members. The board voted to close life memberships at the end of 1991.

Secretary Juterbock then presented a very brief summary of editorial and committee business that had transpired at the board meeting. Bob Hansen was introduced as the new editor of *Herpetological Review.* Both the *Journal of Herpetology* and *Herpetological Review* now enjoy minimal lag time between acceptance of articles by the editors and their subsequent appearance in print. The Conservation Committee reported that they are investigating the possibility of producing a "Monetary Values of Reptiles" report paralleling the one produced for amphibians. The Grants in Herpetology were announced (see *Herp. Review* 22:76). The Kennedy Student Award was announced (elsewhere in this issue). Both the Regional Society and Zoo Liaison Committees are working on symposia/paper sessions for the El Paso meeting.

Bob Webb reported for the 1992 Local Committee on plans for the El Paso meeting, 2-6 August 1992. The meeting will be cohosted by the University of Texas at El Paso (where we will meet in the student union) and El Paso Community College; it will be cosponsored by the Sociedad Herpetologia Mexicana. Descriptions of the meeting site and plans have been, and will continue to be, found in issues of *Herp. Review.* The meeting should be a great one!

Meg Stewart, Chair of the Nominating Committee, announced the candidates for terms of office beginning in 1992. President-elect: Thomas H. Fritts and Stephen G. Tilley; Secretary: J. Eric Juterbock; Treasurer: Douglas H. Taylor; Director: Robin Andrews and Stephen A. Perrill; and, Director (Zoos): Peter Tolson and Bern Tryon. There being no further nominations from the floor, Mushinsky moved (Christiansen seconded) to close the nominations; the motion passed unanimously.

A long series of resolutions (see below) were unanimously accepted by the gathering. President Maxson then announced that the picnic was ready to begin.

Finally, President Maxson presented the official SSAR Presidential Gavel to President-elect Moll, who adjourned the meeting at 1730 hours.

Respectfully submitted,

J. ERIC JUTERBOCK
SSAR Secretary ●

RESOLUTIONS

San Diego Natural History Museum (Joint)

Whereas the San Diego Natural History Museum has, over its distinguished 119-year history, become one of the nation's major repositories of knowledge and representative flora and fauna of the Southwest; and,

Whereas the San Diego Natural History Museum's extensive and high-quality collections of plants and animals (notable among which is the Laurence M. Klauber herpetological collection) are major resources for the study of regions far beyond San Diego County; and,

Whereas these holdings represent thousands of hours of collection, identification, and cataloguing, which at current wages would require millions of dollars to duplicate; and,

Whereas the growing population and industrial pressures on the Southwest mean that the Museum's collections, and the research and public education that San Diego Natural History Museum scientists are in a unique position to perform will become increasingly more important in the future to scientists, to environmental policy makers and those charged with implementing such policy, to urban planners, to agricultural interests, and to the general public;

Therefore, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles (SSAR) and the Herpetologists' League (HL), professional scientific societies devoted to the study of amphibians and reptiles, emphatically reaffirm to the San Diego Natural History Museum Board of Trustees and to corporate and civic leaders in San Diego County the importance of the extensive systematics collections of the Museum, representing a tremendous, and for many habitats irreplaceable, chronological database of the changing biota of California, the Southwest, and of tropical habitats; and, be it further

RESOLVED that these Societies similarly reaffirm the importance of adequate professional staff to assure the maintenance, strengthening and timely utilization of these collections; and, be it further

RESOLVED that these Societies do indeed recognize and appreciate the financial obstacles faced by the Board of Trustees in finding adequate funding to assure the ongoing excellence of the Museum; and finally, be it

RESOLVED that these Societies will communicate with those in other disciplines to seek unanimous scientific support for the Board of Trustees in its effort to sustain and enhance the Museum.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, August 8, 1991 at their joint Annual Meeting.

Honoring Outgoing SSAR Officers

Whereas the following individuals have given freely of their time, skills, insight, and knowledge to the Society for the Study of Amphibians and Reptiles in this past year, thereby advancing its goals and furthering its growth and development as an international society; and,

Whereas these persons have, in the finest tradition of the Society, passed on to their institutions as much of the associated costs of this service to SSAR as was possible; and,

Whereas said Society is greatly indebted to these persons for their continual efforts in its behalf; and,

Whereas the Society urges these persons not to ride off into the sunset, but rather to, with or without official titles, continue to be available as resources to help those who follow better guide SSAR;

Therefore, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles offers its most sincere thanks to the following persons who have served in these capacities:

ROBERT D. ALDRIDGE— Herpetological Translations Coordinator
DONAL BOYER— Chair, Zoo Liaison Committee
WILLIAM S. BROWN— President
HAROLD DUNDEE— Chair of the 1990 Local Committee
CARL GANS— Chair, Nominating Committee
ERNEST A. LINER— Director
MARTIN J. ROSENBERG— Director
HENRI SEIBERT— Immediate Past-President
JOHN SIMMONS— Managing Editor, *Herpetological Review*

Adopted by the Society for the Study of Amphibians and Reptiles August 8, 1991 at its Annual Business Meeting.

Honoring Outgoing SSAR Editors

Whereas 1990-1991 was a period of significant restructuring and change in the way two of the Society's publications are composed; and,

Whereas the bumpy but successful transition to in-house computer composition of these publications has allowed far more efficient utilization of SSAR's publications budget, thereby providing members with far more information than was previously financially possible; and,

Whereas the editors of these publications have stepped down to pursue other professional activities they have long neglected during their extensive time commitment to the Society; and,

Whereas this same period also marked the end of Jim Vial's long and distinguished career as Managing Editor of the *Journal of Herpetology* so that he too might pursue long-neglected things; and,

Whereas these persons have made notable constructive impacts on the publications they served so well and upon the Society in general;

Therefore, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles offers its most sincere appreciation to:

MARTIN J. ROSENBERG— Editor, *Herpetological Review*
JAMES L. VIAL— Managing Editor, *Journal of Herpetology*
JAIME VILLA— Editor, *Catalogue of American Amphibians and Reptiles;*
and be it further

RESOLVED that the Society wishes these persons the very best success in their endeavors.

Adopted by the Society for the Study of Amphibians and Reptiles August 8, 1991 at its Annual Business Meeting.

Clemmys Conservation (Joint)

Whereas natural populations of the wood turtle, the spotted turtle, the western pond turtle, and the bog turtle *(Clemmys insculpta, Clemmys guttata, Clemmys marmorata,* and *Clemmys muhlenbergii)* are adversely affected by the loss and degradation of their habitats, and are heavily exploited by the commercial pet trade; and,

Whereas the above mentioned species are, by the nature of their habits and population structure, highly vulnerable to the effects of mass collection; and,

Whereas the above mentioned species reportedly are declining in numbers and already are legally protected from commercial exploitation in most states and provinces in which they occur;

Therefore, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles (SSAR) and the Herpetologists' League (HL), professional scientific societies devoted to the study of amphibians and reptiles, respectfully urge all states and provinces that have populations of the above mentioned species to increase efforts to protect their natural habitats and to move quickly to prohibit their commercial collection, as well as to limit and regulate private and scientific collection of these species; and, be it further

RESOLVED that the SSAR and HL urge the United States Fish and Wildlife Service and the Canadian Wildlife Service to initiate a review of these species and to coordinate enforcement efforts with the states and provinces, with the purpose of preserving existing populations of these species; and, be it further

RESOLVED that copies of this resolution be forwarded to the directors of the above mentioned agencies, and to wildlife agencies of all states and provinces in which turtles of the genus *Clemmys* occur.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, August 8, 1991 at their joint Annual Meeting.

Thanking The Local Committee (Joint)

Whereas over 500 herpetologists invaded the peaceful (except for deer season) woodlands of Pennsylvania; and,

Whereas Local Committee Chair Linda Maxson, ably assisted by Carla Hass, Blair Hedges, Thomas Lopez, Tammi Jo Cox, Marlene Adams, Peter Petokas, Noel Smith, Joane Stoneberg, Matt Bouchard, Ben Ruth, Joan Walsh, Jack Sinclair and the Conference Center Staff, and many others, performed a great service for the SSAR and the Herpetologists' League by agreeing to undertake the arduous task of hosting a meeting of this size; and,

Whereas the Local Committee has no doubt learned the true significance of volunteering to do so and shall never do so again; and,

Whereas the ageing and/or more conservative nature of the present membership of these esteemed societies has, believe us Linda, made their task less arduous than it might have been 15 years ago; and,

Whereas this meeting maintains a tradition whereby the joint SSAR and HL annual meeting provides an outstanding forum for the dissemination of ideas and information;

Therefore, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles and the Herpetologists' League offer their most sincere thanks to these persons who worked so hard to make this meeting a success.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, August 8, 1991 at their joint Annual Meeting. ●

KENNEDY STUDENT AWARD

The Kennedy Award Committee has completed its work for volume 24 of the *Journal of Herpetology*. The Committee has selected "Ecology and behavior of the Gila monster in southwestern Utah" by Daniel D. Beck. The paper is credited to the Department of Biology and Ecology Center, Utah State University and was part of Daniel's M.Sc. thesis. Daniel is currently at the Department of Ecology and Evolutionary Biology at the University of Arizona, Tucson. ●

THANKS TO REVIEWERS

The (past) editor would like to acknowledge the following individuals who reviewed manuscripts for *HR* during the past several years. Their service to the Society is greatly appreciated.

R. Anderson, W. Auffenberg, W. Bakhurst, S. Barnard, J. Behler, J. Berry, P. Brazaitis, D. Breininger, W. Brown, J. Burger, G. Burghardt, R. Burke, R. B. Bury, C. Carpenter, D. Chiszar, D. R. Clark, J. T. Collins, S. Corn, D. Crews, G. Dalrymple, B. Demeter, H. Dessauer, J. Dixon, C. K. Dodd, G. L. Dryden, H. Dundee, D. Duvall, H. Ellerbrock, Z. Ermi, G. Fellers, J. Ferner, L. Fitzgerald, L. Fleishman, D. Forester, R. Franz, F. L. Frye, A. Georges, P. Gregory, G. C. Grigg, J. Groves, G. Hammerson, M. Hayes, L. Hayes-Odum, J. Hendrickson, T. Henwood, J. M. Hero, R. Heyer, D. Hillis, G. Hoff, W. Horn, R. E. Honegger T. Hoshiko, L. Houck, R. Huey, G. R. Hughes, R. Inger, J. Iverson, D. Jackson, E. Jacobson, F. W. King, R. Klingenberg A. Kluge, J. Kushlan, J. Lazell, J. Legler, A. Lewis, L. Licht, M. Little, M. J. Littlejohn, R. Lohoefener, J. Losos, P. Maderson, R. Marquez, T. Matson, L. Maxson, F. Mazzotti, R. McDiarmid, B. Means, A. Meylen, S. Minton, J. Mitchell, P. Moler, D. Moll, S. Moody, P. Morin, J. Mortimer, J. B. Murphy, H. Mushinsky, R. Opferman, L. Orr, J. Pachmann, M. Packard, J. Palis, M. Paulissen, R. Pawley, R. Pfingsten, E. Pianka, G. Pisani, M. Plummer, L. Porras, P. C. H. Pritchard, H. Quinn, A. S. Rand, H. Reinert, A. Rhodin, J. Richardson, S. M. Roble, F. L. Rose, D. Rossman, R. Ruibal, T. Schoener, R. Seigel, W. Sherbrooke, J. Simmons, D. Smith, H. M. Smith, L. E. Taplin, R. Thomas, S. Tilley, C. Toft, N. Tulodziecki, P. Vanzolini, P. Verrell, L. Vitt, D. A. Warrell, S. Wassersug, G. J. W. Webb, R. Webb, K. Wells, D. Werner, R. Wilkinson, L. D. Wilson, J. Wright, E. Zalisko, G. Zug, R. Zweifel. ●

CATALOGUE OF AMERICAN AMPHIBIANS AND REPTILES

The Board of the Society for the Study of Amphibians and Reptiles and the editors of the *Catalogue of American Amphibians and Reptiles* wish to acknowledge and thank the following persons for reviewing *Catalogue* accounts:

Charles C. Cole, Ronald I. Crombie, Dave Darda, Robert W. Henderson, David M. Hillis, John B. Iverson, Julian C. Lee, Jeffrey E. Lovich, James R. McCranie, Roy W. McDiarmid, Don Moll, Gregory K. Pregill, Charles A. Ross, Albert Schwartz, Michael E. Seidel, John B. Thorbjarnarson, Jaime D. Villa, David B. Wake, Joseph P. Ward, George R. Zug.

Accounts on a number of American taxa and many U.S. forms remain unassigned. If you are interested in writing an account, please contact the pertinent section editor: **Marvalee H. Wake** (Gymnophiona), Department of Integrative Biology, University of California, Berkeley, California 94720, USA; **R. Wayne Van Devender** (Caudata), Department of Biology, Appalachian State University, Boone, North Carolina 28608, USA; **John D. Lynch** (Anura), School of Life Sciences, University of Nebraska, Lincoln, Nebraska 68508, USA; **Michael W. Klemens** (Testudines), American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024-5192, USA; **Andrew H. Price** (Sauria and Amphisbaenia), Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744, USA; **Larry David Wilson** (Serpentes), Department of Biology, Miami-Dade Community College, South Campus, 11011 S.W. 104th Street, Miami, Florida 33176, USA; **I. Lehr Brisbin** (Crocodylia), Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29801, USA. ●

CHELONIAN SYSTEMATICS, EVOLUTION, AND ZOOGEOGRAPHY SYMPOSIUM ANNOUNCEMENT

A symposium on the above subjects will be held in conjunction with the SSAR Meeting in El Paso, Texas (2-6 August 1992). Topics to be presented concern molecular, phylogenetic, and traditional investigations of chelonian relationships and distribution. To date, the following researchers are *tentative* presenters for the program: John Bickham, Brian Bowen, John Carr, Brian Hanks, Eugene Gaffney, John Iverson, John Legler, Trip Lamb, Peter Meylan, Pat Minx, Edward O. Moll, Anders Rhodin, and Roger Wood.

The program is open for additional participants. Others wishing to present a paper in the program are invited to submit a title and brief summary of their topic by January 15, 1992. Final selection of participants will be made by January 30. Those interested in being presenters should contact either of the following:

Edward O. Moll
Department of Zoology
Eastern Illinois University
Charleston, Illinois 61920, USA
Phone: (217) 581-5410
FAX: (217) 581-2722

John Carr
Conservation International
1015 18th St. N.W.
Suite 1000
Washington, D.C. 20036, USA
Phone: (202) 429-5660.

NEWSNOTES

REQUEST FOR PHOTOS AND REFERENCES OF GARTER SNAKES

The University of Oklahoma Press has contracted to publish "The Garter Snakes: Systematics and Life History" by D. A. Rossman, N. B. Ford, and R. A. Seigel. The authors wish to show examples of every subspecies of all species of this genus. Anyone willing to loan quality color slides of rarer subspecies for use in this publication should send a list of available photos to Douglas A. Rossman, Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana 70803, USA. Any slides used will receive proper acknowledgment in the book.

In addition, the authors wish to make the references as complete as possible. Any researchers with papers in press or who have access to unpublished Master's theses or status reports are encouraged to send reprints, manuscripts, or citations to any of the above authors. Papers should be sent no later than January, 1993. ●

PLETHODONTID SUMMER COURSE

The Biology of Plethodontid Salamanders will be offered 4–27 June 1992 at the Highlands Biological Sta-

tion in North Carolina. The instructor will be Stephen G. Tilley. The southern Appalachian region is renowned for the diversity of its salamander fauna. This course is designed to acquaint students with plethodontid salamanders and to show how studies of these animals have enhanced our understanding of a series of major evolutionary and ecological topics. Each of these topics will occupy one week of the course and will be treated by lectures, field and laboratory exercises, and discussions of original research papers. Numerous field trips to significant salamander localities are a highlight of the course. Advanced undergraduate or graduate credit is available through either The University of North Carolina at Chapel Hill or Western Carolina University. For information, contact:

Dr. Richard Bruce
Highlands Biological Station
P.O. Box 580
Highlands, North Carolina 28741, USA.

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ZOO RESEARCH GRANTS

The American Association of Zoo Keepers announces the availability of two $750 research grants in the field of zoo biology. Interested applicants should direct their inquiries to Sue Barnard, Chairperson, AAZK Research/Grants Committee, Zoo Atlanta, Department of Herpetology, 800 Cherokee Ave., SE, Atlanta, Georgia 30315, USA. ●

SOUTHWESTERN RESEARCH STATION STUDENT RESEARCH GRANTS

The American Museum of Natural History awards several grants each year of approximately $400-$800 to graduate students or post-doctoral students pursuing research at its Southwestern Research Station in the Chiricahua Mountains, Portal, Arizona. Information and application forms concerning this program and other Museum programs can be obtained by writing:

Office of Grants and Fellowships
American Museum of Natural History
Central Park West at 79th Street
New York, New York 10024-5192, USA.

Application due date is 15 February 1992. Address questions concerning the Research Station to:

Dr. Wade C. Sherbrooke, Director
Southwestern Research Station
Portal, Arizona 85632, USA
(602) 558-2396.

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SWRS VOLUNTEER OPPORTUNITIES

Approximately 20 volunteer positions are open in 1992 at the American Museum of Natural History's Southwestern Research Station in Portal, Arizona. The volunteer program is run annually and offers students in biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging are provided to volunteers in exchange for four hours per day of routine chores, with the remaining time available for research activities.

The program is open to both undergraduates and graduate students; the latter may pursue their own research projects. Faculty knowing of promising students should alert them to this opportunity for professional experience toward, development of, and evaluation of their career goals.

Volunteers are needed between March 15 and November. Appointments are for part of this period, with a minimum appointment of six weeks. Applicants for spring positions (March through May) should submit forms by 15 February, summer volunteers (June – August) by 1 April, and fall volunteers (September – November) may apply any time.

For application forms, contact:

Dr. Wade C. Sherbrooke, Director
Southwestern Research Station
Portal, Arizona 85632, USA
(602) 558-2396.

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HERPETOLOGY ON-LINE COMPUTER NETWORK

The Herpetology Online Computer Network (Herp-Net) invites all SSAR members to participate in its international communication system for those interested in the study or conservation of reptiles and amphibians. Herp-Net was created to facilitate the exchange of information and ideas among zoos, herpetologists, veterinarians, biologists, conservationists, and the interested public. Discussions include husbandry, field biology, medical aspects, captive requirements, reproduction, etc. Herp-Net is available 24 hours/day via ANY modem-equipped computer or terminal. The direct dial system has 10 incoming phone lines connected to **215-464-3563.**

Herp-Net currently contains the following sections:

A public message area that works like an electronic bulletin board. Questions may be posted for other callers to see and discussions and informal conversations take place here. New topics are created daily and range from field reports, to genetics, to UV lighting, to photography, to zoogeography, to student research requests, to specific captive requirements for a species, and so on.

A file archive area is available to transfer articles, programs, data, book reviews, and even electronic images to or from your computer. Thousands of pages of information are available. Book reviews are periodically added as new titles are received.

Several online databases for members' interests, regional societies, and veterinarians may be searched.

A free book search service for out-of-print to rare titles in zoology or natural history (requests may also be mailed).

A listing of "herp crimes"—thefts of animals, educational materials, specimens, and so forth.

A calendar of international meetings, conferences, and other events relating to reptiles/amphibians is constantly being compiled and updated. This list may be read on-line or downloaded to your printer.

New projects are added as interest dictates. Many organizations have a representative on-line with us and callers benefit from the experience of others with similar interests.

The Herp-Net project is supported by private contributions and an all-volunteer staff. For more information contact:

Mark F. Miller
System Administrator
Herp-Net
P.O.Box 52261
Philadelphia, Pennsylvania 19115,
USA

Voice or FAX messages are accepted on **215-464-3561** anytime. ●

INFORMATION REQUEST

All collections, public or private, holding living specimens of the black pine snake, *Pituophis melanoleucus lodingi* or Louisiana pine snake, *Pituophis melanoleucus ruthveni*, or collections having held these snakes in the past are encouraged to participate in the formation of the AAZPA North American Regional Studbook for these taxa, which is currently in preparation. Both reptiles may be threatened in the wild, and the studbook will aid in the genetic management of the captive population.

If you would like to contribute data and be included in the project please contact:

Steve Reichling
Memphis Zoo and Aquarium
2000 Galloway Ave.
Memphis, Tennessee 38112, USA
(901) 726-4787.

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ANNOUNCING A SYSTEMATICS PRIORITIES INITIATIVE

The American Society of Plant Taxonomists, the Society of Systematic Biologists, and the Willi Hennig Society have formed a steering committee to organize an initiative to document research trends and priorities within systematics, to be called SYSTEMATICS AGENDA 2000: INTEGRATING BIOLOGICAL DIVERSITY AND SOCIETAL NEEDS. SYSTEMATICS AGENDA 2000 will have as its major themes the role of systematics in the analysis of biodiversity, the integrative role of systematics in comparative biology, and the importance of systematics in human affairs. The initiative is charged with (1) identifying important research trends and questions and with establishing priorities among them, (2) assessing the status of current infrastructures supporting systematics research and evaluating future needs, (3) documenting the broad role that systematics plays in human affairs and evaluating its future contributions and needs in those endeavors. SYSTEMATICS AGENDA 2000 has established 28 committees to undertake this initiative.

A detailed description of SYSTEMATICS AGENDA 2000. including a list of the members of the Steering Committee and the co-chairs of all Standing Committees, can be found in the last issue (no. 4, 1991) of *Cladistics*, *Systematic Botany*, and *Systematic Zoology*. All systematists, and nonsystematists interested in the role that systematics plays in their discipline, are invited to contact the appropriate committee co-chairs to discuss how each might contribute to this effort. ●

MEETINGS

HIGHLANDS CONFERENCE ON PLETHODONTID SALAMANDERS

The Highlands Conference on Plethodontid Salamanders will be held from 31 May – 2 June 1992 in Highlands, North Carolina. This Conference is the third sponsored by the Highlands Biological Station, and will follow the tradition of the First (1972) and Second (1982) Conferences in exploring new directions in plethodontid research. The Conference features two contributed poster sessions, invited papers, and a symposium. All interested are welcome to attend; those who work on plethodontid salamanders are encouraged to participate.

The symposium, Recent Advances in Plethodontid Research, will focus on the following topics:

Life History Ecology
Social Behavior
The Nervous System of Plethodontid Salamanders
Development and Evolution
Molecular Approaches
Geographic Variation and Speciation
Phylogenetic Issues

To receive the Call for Papers or registration material, contact:

Dr. Robert Jaeger
Department of Biology
University of Southwestern Louisiana
Lafayette, Louisiana 70504-2451,
USA
Phone: (318) 231-5235
FAX: (318) 231-5834.

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III CONGRESSO LATINOAMERICANO DE HERPETOLOGIA

The Third Latin American Congress of Herpetology will be held December 12-18, 1993 in Campinas, São Paulo, Brasil. The Congress will include oral presentations, lectures, poster sessions, workshops, mini-courses, and excursions. For further information, please contact:

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INTERNATIONAL SYMPOSIUM— "BIODIVERSITY IN MANAGED LANDSCAPES: THEORY AND PRACTICE"

The symposium will be held at the Capitol Plaza Holiday Inn, Sacramento, California, 13-17 July 1992. This milestone symposium will be coordinated with The Biodiversity Conservation Strategy Programme organized by the International Union for the Conservation of Nature and Natural Resources (IUCN), the United Nations Environment Programme (UNEP), and the World Resources Institute (WRI), and is initially being co-sponsored by a variety of U.S. Agencies and environmental groups including the Forest Service, Fish and Wildlife Service, National Park Service, Bureau of Land Management, Environmental Protection Agency, Smithsonian Institution, Ecological Society of America, The Nature Conservancy, Wilderness Society, and The Wildlife Society. The program's objectives will be to provide the scientific basis for understanding biodiversity, document case examples of theory and concepts applied at differing scales, and examine policies that affect its conservation. The result

will be the publication of a reference text for managers, scientists, and students that focuses on actual accomplishments and strategies for conserving biodiversity. A distinguished group of invited speakers will address: genetic diversity; species diversity; community diversity; landscape diversity; setting objectives and priorities, inventory, monitoring, and assessment; management strategies; and policy and social considerations. For further information write to:

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LEGISLATIVE ALERT/ CONSERVATION

The following final and/or proposed listings, regulations, and general information have been announced by governmental regulatory agencies. Pertinent Federal Register (FR) citations are given for U.S. notices.

U.S.A.: *Thamnophis gigas* (giant garter snake); On September 21, 1990, the USFWS received a petition from the President of the California-Nevada Chapter of the American Fisheries Society to list the giant garter snake as an endangered species. This species has been classified by the Service as a category 2 candidate species since 1985 (FR Vol. 50:37958). The giant garter snake historically occurred from the Buena Vista Lake Basin near Bakersfield, Kern Co., California north to Chico, Butte Co. The petition stated that the snake has experienced significant losses of habitat and populations, and a reduction in its range. This is attributed to a 98% loss of wetland and riparian habitats within the range. The USFWS is soliciting additional data, comments, and suggestions concerning the status of this species.

U.S.A., Michigan: *Nerodia erythrogaster neglecta* (northern copperbelly watersnake); The Michigan Nature Association, 7981 Beard Road, P.O. Box 102, Avoca, Michigan 48006 (313) 324-2626 is launching a fund-raising drive to purchase land deemed critical to the survival of the largest and healthiest population in the post-glacial range of the northern copperbelly watersnake. Potential threats to the site include a proposal to re-open a currently closed road that traverses the snake's swamp-forest habitat. Further information can be obtained by writing the Michigan Nature Association.

FEATURES

RATTLESNAKES AND MEXICAN FOLK MEDICINE

Dried rattlesnake flesh and powdered rattlesnake bones (polvo de cascabel) are widely used folk medicines in parts of México. In rural sections of the state of Querétaro, they are considered to be a virtual panacea and are used particularly for skin and kidney diseases and for prevention and treatment of cancer. They are occasionally used by upper class urban Mexicans and North Americans residing in México. A survey of Hispanic patients in El Paso, Texas hospitals showed that about a third had used rattlesnake remedies themselves or their relatives had used them (Bhatt et al. 1988).

Vendors of fruits, candies, handicrafts, and other articles are ubiquitous along Mexican highways. For many years the Indians near Entronque Huizache (intersection of Mexican Federal highways 57 and 80) in semiarid northern San Luis Potosí have sold various animals to motorists. Until about 1986 these were mostly ground squirrels and other small mammals and birds such as hawks and parrots. However, on our 1987, 1988, 1989, and 1991 trips, we noted dried snake carcasses prominently displayed. Most were of animals about 70 to 100 cm long, but a few were considerably larger. They were stretched on crude wooden frames (Fig. 1). During our two trips in 1991, we estimated there were 20 frames over a distance of about 2 km and each held 8 to 14 carcasses. In 1987 particularly, we believe the number of frames was larger, perhaps as many as 30. An estimated 100 to 200 snakes were on display on each of our visits.

On the frames we have examined closely, most of the carcasses were clearly those of rattlesnakes (*Crotalus* sp.), but some seemed too slender and probably were colubrids such as *Pituophis*. Some of these had two or three rattles obviously sewed to the tail. We presume the Indians obtain these snakes locally. We have no idea of the daily or weekly sales volume or of the "shelf life" of a carcass, but this curious enterprise may significantly deplete local populations of rattlesnakes and other large to medium-sized species.

Use of these rattlesnake remedies has its dangers, the most significant being infection with salmonella bacteria which commonly infect snakes and have been isolated from rattlesnake capsules and a dried carcass (Babu et al. 1990). About two dozen cases of generalized *Salmonella arizona* infections have been reported from the Los Angeles, California area. Nearly all those infected gave a history of having taken capsules of powdered rattlesnake flesh for serious underlying conditions. There were six deaths, three in patients with AIDS (Riley et al. 1988; Waterman et al. 1990). Similar cases have been reported in other cities near the Mexican border.

We thank Brooks Minton de Cervantes for information regarding use of rattlesnake remedies in Querétaro.

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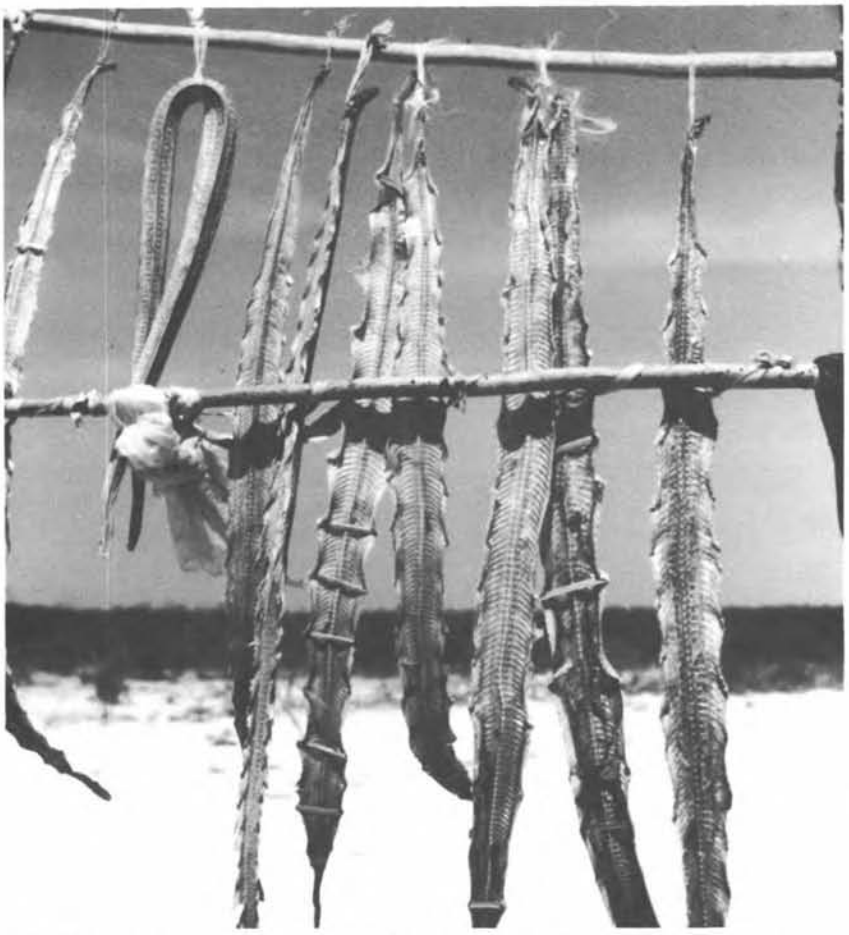


Figure 1. Dried snake carcasses hanging from a rack near Entronque Huizache, San Luis Potosí, México. Most are rattlesnakes, but the looped one at the left is probably a colubrid.

DISTRIBUTIONAL NOTES ON *Nerodia harteri harteri* IN PARKER AND PALO PINTO COUNTIES, TEXAS

The Brazos water snake, *Nerodia harteri harteri*, has a limited distribution, and knowledge of its ecology and occurrence within its range has accumulated slowly since its description (Trapido 1941). Literature specific to *N. h. harteri* is limited to several brief distributional reports (Mecham 1983; Smith 1983; Wade 1968). Scott et al. (1989) recently reviewed the status of *N. harteri* populations. Because of its limited distribution and specific habitat requirements, *N. harteri* has been the focal issue in controversial river development projects. *Nerodia h. harteri* is currently listed as Threatened by the Texas Parks and Wildlife Department.

Scott et al. (1989) reported a 100 km hiatus in the present distribution of *N. h. harteri* along the Brazos River. This hiatus encompasses a river section from Hittson Bend (Palo Pinto Co.) downstream to Lake Granbury (Hood Co.). Littlefield Bend lies primarily in the southwestern corner of Parker County, just east of the Palo Pinto/Parker County line and approximately in the center of the hiatus (Fig. 1). Scott et al. (1989) report six areas of suitable habitat within the hiatus where *N. h. harteri* were not found, including two in the Littlefield Bend area. They also report two historical records from Palo Pinto County within the hiatus. Here we document the continued occurrence of *N. h. harteri* within the hiatus and report new records from the Littlefield Bend area of Parker County. This constitutes a new county record for Parker County, Texas (Dixon 1987; Scott et al. 1989). All specimens were deposited in the University of Texas at Arlington Collection of Vertebrates (UTACV). The following represents the new distributional information for *N. harteri harteri* in Palo Pinto and Parker Counties, Texas (Fig.1).

A. Texas: Palo Pinto Co.: 9.6 km northeast of Palo Pinto on the Brazos River (Moffitt Bend). 28 July 1961. UTACV R-597. Previously unreported historical record.

B. Texas: Palo Pinto Co.: 100 m SE of U.S. Highway 281 bridge over Brazos River at mouth of Coffee Creek. 30 April 1988. Three juveniles observed by MED under flat rocks on south bank; cloudy; temperature ca. 19°C. Rediscovery of species at an historical locality (Scott et al. 1989).

C. Texas: Parker Co.: 3.8 air km NW of Interstate Highway 20 bridge over Brazos River. 1 June 1986. Adult observed by MED on rocky, east bank next to deep, slowly moving water. New locality record.

D. Texas: Parker Co.: 4.6 air km NNW of Interstate Highway 20 bridge over Brazos River. 1 April 1989. Three juveniles collected (UTACV R-27183-27185) under flat rocks on north gravel bank. One adult female collected (UTACV R-27186) ca. 100 m downstream on south bank at the edge of water ca. 1 meter deep, while trying to eat a juvenile channel catfish, *Ictalurus punctatus* (130 mm TL). New locality record.

E. Texas: Parker Co.: ca. 2.4 km N of Interstate Highway 20 bridge over Brazos River. 16 September 1989. UTACV R-27187. One adult female collected while basking on a limb overhanging swiftly moving water ca. 1.5 m deep. The river bank consisted of large boulders and trees; no riffles within 3 km up or downstream. New locality record.

The following areas of suitable "juvenile *N. harteri* habitat" (Scott et al. 1989) were also located in the Littlefield Bend region. Although no *N. harteri* were found at these sites, juvenile *N. erythrogaster* and *N. rhombifera* were found here under flat rocks.

F. Texas: Palo Pinto Co.: 3.2 air km NE of U.S. Highway 281 bridge over Brazos River.

G. Texas: Parker Co.: 5.3 air km NNW of Interstate Highway 20 bridge over Brazos River. The discovery of these *N. h. harteri* from Littlefield Bend indicates that present day populations are not as widely separated along the Brazos River as previously thought (Scott et al. 1989).

ACKNOWLEDGMENTS

We thank M. Harvey, K. Kittelson, and T. Dorcas for assistance in the field. J. A. Campbell provided helpful comments on the manuscript and logistical assistance. J. L. Darling curated the specimens expeditiously. This work was authorized by the Texas Parks and Wildlife Dept. (permit number: SPR-0590-072).

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PREDATION ON AVIAN EGGS BY THE BOID SNAKE, *Eunectes notaeus*

Besides the well-known, specialized egg-eater *Dasypeltis* (Gans 1974), several colubrid snakes (including *Boiga, Conophis, Elachistodon, Elaphe, Lampropeltis, Pseustes,* and *Spilotes*) include bird eggs in their diets (Cunha and Nascimento 1978, Greene 1989, Mushinsky 1987, Savitzky 1983, Scott 1983). To date, documented observations on avian egg-eating seem restricted to colubrid snakes.

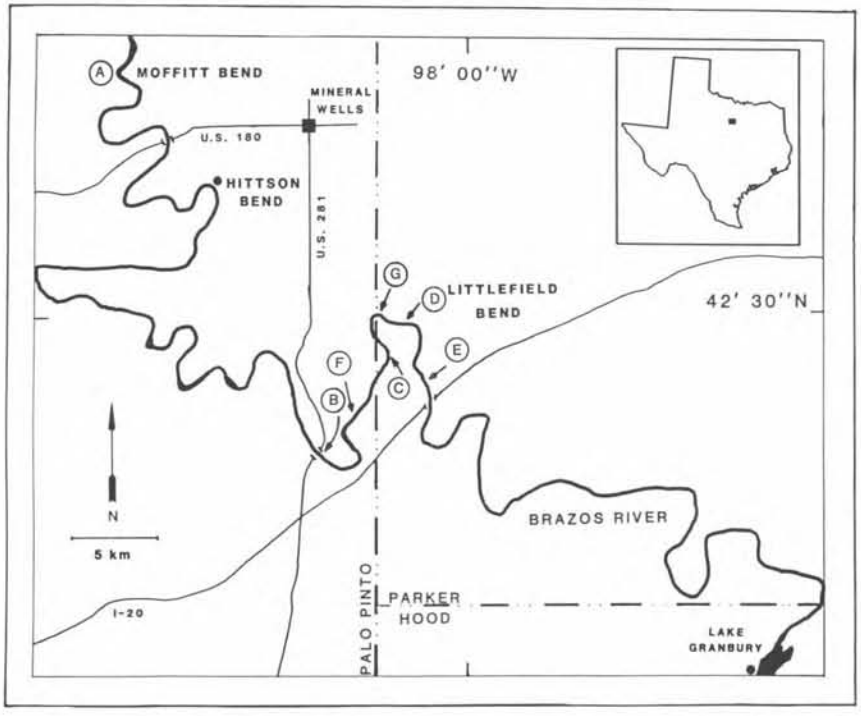


Figure 1. The 100 km hiatus in the distribution of *Nerodia h. harteri* along the Brazos River reported by Scott et al. (1989). Closed circles represent localities where snakes were found by Scott et al. (1989). Lettered localities are referred to in text.

Constricting anacondas, boid genus *Eunectes*, are known to mainly feed on avian and mammalian prey (Cunha and Nascimento 1978, Ditmars 1912, Wehekind 1955), and occasionally on crocodilians and turtles (Parker and Grandison 1977, Yamashita et al. 1985). In southwestern Brasil we observed the yellow anaconda, *E. notaeus*, feeding on prey as diverse as fishes, turtles, caimans, wading birds, and rodents; this snake even scavenges, a habit anticipated by Sazima and Strüssmann (1990). Here we report on an observation of avian egg-eating by *E. notaeus*.

Field work was done in the Pantanal wetlands at Poconé, Mato Grosso, southwestern Brasil. The Pantanal covers ca. 100,000 km^2 of almost flat, seasonally flooded terrain (additional information in Prance and Schaller 1982). As part of a study on the Pantanal herpetofauna, 33 anacondas were caught and palpated to determine whether their stomach contained food. Whenever a bolus was detected, the snake was forced to regurgitate its prey (Slip and Shine 1988), which was then examined.

A juvenile *E. notaeus* (165 cm SVL, 3.2 kg) was found on 11 July 1990, apparently basking on an emergent mat of aquatic vegetation at 1745 h, with an air temperature of 19.5°C. Upon manipulation the snake regurgitated two intact bird eggs; an additional egg was broken during palpation. The eggs were identified as those of limpkin (Harrison 1978), *Aramus guarauna*, a common wading bird in the Pantanal.

Head length and head width of the snake were 5.4 cm and 3.3 cm, respectively. The two intact eggs measured 6.2 x 4.3 cm and ca. 6.0 x 4.5 cm, and weighed about 60 g each, a prey/predator mass ratio (Pough and Groves 1983) of ca. 0.02. This is a very low mass food item for a boid snake (average of 0.36; see Greene 1983).

The eggs were all swallowed by their pointed end first, an orientation commonly found in other instances of egg-eating by snakes (see Gans 1974). Egg handling by *E. notaeus* may possibly be similar to that employed by the boid *Loxocemus bicolor* when feeding on reptile eggs—either pushing the egg against the body using its mouth, or enveloping the eggs with body loops (Mora 1987). A young yellow anaconda was observed to engulf small fishes using the first technique (A. S. Abe, pers. comm.).

Feeding on avian eggs is regarded as a kind of durophagy (Savitzky 1983), and anacondas also take turtles (Parker and Grandison 1977), another hard-shelled prey ingested intact. The snake-necked turtle, *Platemys macrocephala*, was reported from intestinal contents of *E. notaeus* in the Pantanal (Yamashita et al. 1985), and we observed the turtle *Phrynops vanderhaegei* in the contents of an *Eunectes* rotting carcass (probably *E. murinus*) at another locality in Mato Grosso.

Limpkin nests may be found on bushes up to 1 m above water level in flooded terrain, or near the water in low trees up to 2 m (pers. obs.). Anacondas are known to occasionally climb (Parker and Grandison 1977), and we observed *E. notaeus* foraging at night and taking birds perched on bushes and trees at heights of about 2.5 m. Large nesting colonies of herons and ibises are a common sight in the Pantanal (see Yamashita and Valle 1990), and at these places arboreality would be advantageous for the anaconda. Nestlings and eggs found by *E. notaeus* foraging in trees probably fall prey to this apparently generalized predator.

ACKNOWLEDGMENTS

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The Herpetologists' League recently embarked on a program to support the publication of books of interest to its members, and to provide members the opportunity to purchase these books for a limited time at specially discounted prices. The initial result of this program was the critically acclaimed "Venomous Reptiles of Latin America." Future projects in this series include the herpetofauna of Baja California, as well as continuing the world checklists project started by the Association of Systematics Collections. Volumes currently in progress include one on snakes and a revision of the 1985 amphibian checklist.

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THE IWAKUNI SHIROHEBIS, A GROUP OF ALBINO *Elaphe climacophora*

Albinism in wild populations of snakes is rare or uncommon (Bechtel and Bechtel 1981; Dyrkacz 1981; Hensley 1959; see Satoh and Miyamoto (1987) for records of albino snakes in Japan). The Iwakuni shirohebis are a group of albino *Elaphe climacophora* occurring in a limited area of the city of Iwakuni (34°10'N, 132°13'E), Japan. As far as we know, this is the only instance among snakes where albinism has become established in a wild population. Due to the rarity of this phenomenon, the habitat known to support albino snakes was designated as a natural monument by the Japanese government in 1924. In 1972, the subject of designation was changed to the snakes themselves. Although the Iwakuni shirohebi has been briefly mentioned in English-language literature (Goris and Naganuma 1979; Maki 1931), the accounts were brief and little information was provided concerning the status of the snakes. This paper summarizes the past and present status of this group of snakes.

Among several types of color abnormalities described (Bechtel 1978; Bechtel and Bechtel 1985), the Iwakuni shirohebi consists of amelanistic albinos. All adult snakes are white to yellow. They have golden irises, red pupils, and red tongues. Juveniles have orange blotches on the dorsal and lateral surfaces of the body. The pattern of the blotches is the same as that of wild type juveniles. As the crossing of the albino snakes always produces albino snakes, the gene for albinism is presumed to be allelic.

Little information on historical abundance and distribution exists. In 1924, the residents of Marifu village, one of the predecessors of Iwakuni city, were questioned as to the number of snakes in each block of the village (Yamaguchi Prefecture 1925). The number of snakes was estimated as "no fewer than 1000" and the estimated distribution was about 400 ha (Yamaguchi Prefecture 1925; Watasé 1926). Habitats occupied by snakes were reported to be houses, storehouses, river banks, and stone walls. Active snakes were observed in the streets, gardens, and fields (Watasé 1926). It was not rare to see the albino snakes in human residences (Yamaguchi Prefecture 1925).

Since the 1970s, the city of Iwakuni has appealed to its citizens to report occurrences of albino snakes. The number of snakes reported is declining; the average number per year (followed by SD and range) was 22.6 (12.3, 12-40), 8.8 (3.6, 4-12) and 4.8 (3.0, 0-8) for 1974-1978, 1981-1985, and 1986-1990, respectively.

The authorities and citizens of Iwakuni city are concerned about the decreasing number of albino snakes. The city of Iwakuni and the Society for the Conservation of the Iwakuni shirohebi, organized by volunteers, are making great efforts to conserve the shirohebi. To breed the snakes, they constructed an indoor breeding facility (total floor space of 240 m^2) and three outdoor pens (total space of 1560 m^2). Financial aid from the Japanese government was obtained for construction of one of the outdoor enclosures. In general, the adult snakes are allowed to breed at random in the pens, and emerging hatchlings are collected and raised in the indoor facility. Juveniles are released into the outdoor pens after three years. Approximately 400 snakes are maintained in these facilities.

The normal type of *E. climacophora* is abundant in the city. Studies are under way in an attempt to elucidate the circumstances surrounding the establishment and maintenance of high-frequency albinism in *E. climacophora*.

This study was sponsored by Iwakuni city and the Society for the Conservation of the Iwakuni shirohebi.

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Figure 1. The Iwakuni shirohebis, albino *Elaphe climacophora*, in an outdoor pen.

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POINTS OF VIEW

WHEN IS AN INTRODUCTION NOT AN INTRODUCTION?

Imagine my surprise when I saw a distributional spot for *Eleutherodactylus coqui*, a Puerto Rican frog, in the New Orleans, Louisiana area in the recently published *A Field Guide to Reptiles and Amphibians of Eastern and Central North America* (Conant and Collins 1991). As the coauthor responsible for the amphibian accounts in *The Amphibians and Reptiles of Louisiana* (Dundee and Rossman 1989), I felt embarrassed that I had missed such a record in the literature. I checked the text of Conant and Collins and found that it stated that the frog was introduced at New Orleans. Reference to the locality was given by Schwartz and Henderson (1988), with Frost (1985) given as the source. In Frost I found that the original report was credited to Rivero (1984). Neither Zoological Record or Biological Abstracts had the Rivero paper listed—neither abstracts from the Journal of the Bromeliad Society.

I felt vindicated for my oversight, but nevertheless I examined the Rivero article and found that he had said, "For more than four years, a few males have been calling from bromeliads in Jeanne Garman's garden in New Orleans." I contacted Mrs. Garman in July 1991 and the whole story emerged. Although she had never met Rivero nor been to Puerto Rico, she had corresponded with him regarding bromeliads. Rivero sent her five male *Eleutherodactylus coqui*; two arrived alive on 12 October 1979 and were released in her greenhouse where she kept bromeliads. The greenhouse was open to the outside in warm months, but closed in winter. After six to eight months, only one male survived and continued his singing for 3-4 yrs. He is gone now.

Rivero has confirmed in a letter to me (31 July 1991) that he avoided the possibility of an introduction by sending Mrs. Garman only males. Therefore, although the record was valid, the "population" did not constitute a viable introduction; it did not pose the possibility of reproductive success, nor did it prove that outdoor survival was possible. A true introduction should be one in which natural survival without the intervention and support of man has occurred. Otherwise we could justifiably say that species that survive outdoors in zoos or game farms constitute introductions.

Accidental introductions will occur; deliberate ones should be avoided in the interests of ecological integrity. The Miami, Florida area is one where many introductions have probably been deliberately made, and recent distributional records suggest that herpetologists, both amateur and professional, may have had a hand in the spread of exotic species. Having exotic species around one may be exciting, but it is bad policy, thus the herpetological community should practice proper restraint.

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TECHNIQUES

RELATIONSHIP BETWEEN GOPHER TORTOISE BODY SIZE AND BURROW WIDTH

Gopher tortoises (*Gopherus polyphemus*) occur in the coastal plain of six southeastern states (Auffenberg and Franz 1982). They dig long, deep burrows in habitats with well-drained, deep sandy soils. A high correlation exists between tortoise straight-line carapace length and burrow width (Alford 1980; Hansen 1963; Martin and Layne 1987). Because of this correlation, measurements of burrow widths are used to estimate the size class distribution of tortoises in a population (Alford 1980; Cox et al. 1987). No studies, as far as we know, offer an explanation for this correlation, however. A probable misconception is that the correlation derives from a causal relationship; specifically, burrow width is maintained so that a resident tortoise can turn around anywhere in its burrow. This assumption lacks verification. As no good alternate explanation seems to exist, we sought data to provide a functional explanation for the relationship between carapace length and burrow width.

During the spring of 1991, we watched tortoises digging burrows in a central Florida sandhill (see Myers 1990 for a habitat description). We noted that only the forearms of a tortoise extend beyond the margin of the shell during burrow excavation. We noted also that tortoises do not use both forearms simultaneously as they excavate their burrows, but pivot from side-to-side as they alternate the power stroke. Based upon our observations of tortoise digging behavior, we hypothesized that some measure of "burrowing diameter" of a tortoise is related to its carapace length, and that carapace length, therefore, is merely a useful index of a tortoise's burrowing diameter.

To test our hypothesis, we captured 75 tortoises inhabiting the University of South Florida Ecological Research Area in Tampa. Tortoises were captured by placing concealed buckets at the burrow mouths. By examining tortoise footprints, we were able to determine that individuals were captured as they exited their burrow. We used a relatively large sample of tortoises to accommodate the possibility that some tortoises may have been paired with burrows that they had not constructed.

The width of the burrow occupied by each tortoise was measured at a depth of 50 cm with calipers constructed from two meter sticks hinged together with a bolt 50 cm from the end. We inserted the calipers into each burrow, and measured the width across the open arms (Martin and Layne 1987). For each tortoise, we measured its greatest straight line carapace length, greatest carapace

width, body width (at the level of the pectoral girdle, across the plastron at the distal union of the humeral and pectoral scutes), and forearm length (from the distal end of the humerus to the tip of the longest claw) (Fig. 1).

We calculated the burrowing diameter of a tortoise in two ways. First, we doubled its forearm length and added the result to its body width (called the "shoulder-feet" method). Use of this measure of burrowing diameter assumes that a tortoise maintains a relatively central position as it digs its burrow, regardless of whether it uses its arms singly or in tandem. Second, we subtracted body width from carapace width, divided the result by 2, and then added the quotient to the sum of body width plus forearm length (called the "carapace-foot" method). Use of this measure of burrowing diameter assumes that a tortoise pushes itself against the right side of the burrow as it digs with its left forearm and vice-versa.

In almost all cases, carapace length was smaller than corresponding burrow width. Likewise, both methods of calculating burrowing diameter generally yielded a smaller value than corresponding burrow width. For example, one of our tortoises that was captured from a burrow measuring 150 mm, had a carapace length of 131 mm, a shoulder-feet burrowing diameter of 149 mm, and a carapace-foot burrowing diameter of 124.5 mm. The carapace-foot method used to calculate burrowing diameter produced values that were 15-20% smaller than those produced by the shoulder-feet method, and 20-25% smaller than the burrow widths. These findings, coupled with our observations of digging behavior, suggested to us that the shoulder-feet method is the more accurate way of matching dimensions of the tortoise that are relevant to the mechanics of digging with the resulting burrow. We focus our attention, therefore, on the shoulder-feet method, and all subsequent references to burrowing diameter refer to this method. We suggest, however, that direct observation is necessary to confirm the precise measurements of tortoises that reflect their burrowing behavior.

Burrow width and burrowing diameter were correlated positively ($r = 0.93$, $p < 0.001$, $n = 75$). We related burrowing diameter to carapace length for the 75 tortoises with geometric mean regression (GMR). Standard regression theory assumes that the X variable (burrowing diameter in this case) is measured without error; only the Y variable (carapace length in this case) has associated measurement error. Geometric mean regression (Ricker 1984) relaxes this assumption and allows calculation of a regression line when measurement error is present in both the X and Y variables. The GMR equation relating carapace length (CL) to burrowing diameter (BD) is: $CL = -2.46 + 0.915BD$ ($r = 0.987$, $p < 0.001$, $n = 75$). These findings indicate that carapace length and burrowing diameter are highly correlated and, although the slope of the relationship is not 1.0 ($t = 7.13$, $p < 0.001$, $df = 73$), burrowing diameter and carapace length are quite similar for tortoises of any size.

We conclude that burrow width is a reliable indicator of tortoise carapace length because of the correlation between carapace length and the morphological components involved in burrow construction (burrowing diameter). The presumed causal relationship between carapace length and burrow width may not exist, and therefore, one need not take an adaptationist position to explain their correlation. The ability of a gopher tortoise to turn around in any portion of its burrow may only be a fortuitous byproduct of its morphology (i.e., burrowing diameter) and not a primary force in determining the width of its burrow.

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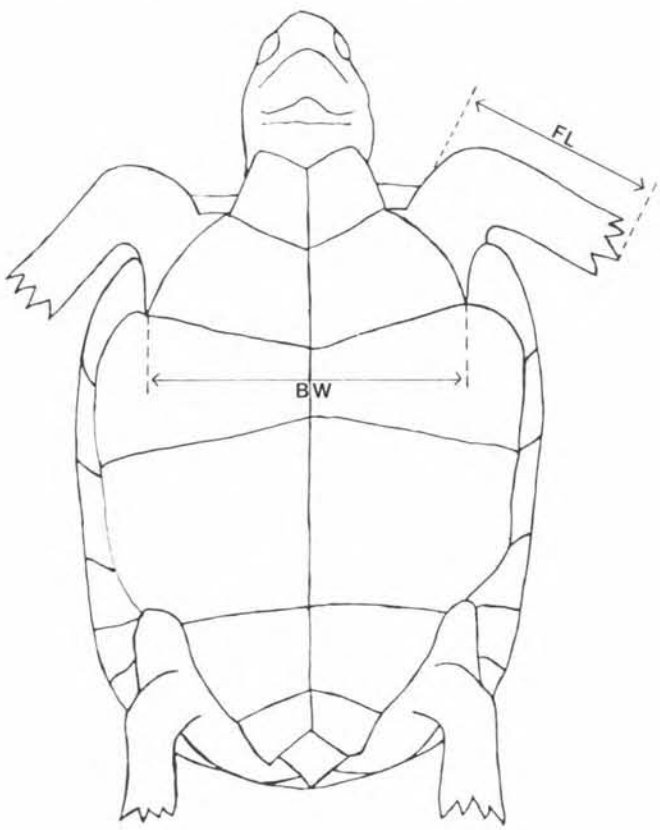


Figure 1. Two measurements used to calculate "burrowing diameter" of a gopher tortoise. FL = forearm length, BW = body width.

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HERPETOLOGICAL HUSBANDRY

AD-LIBITUM FEEDING RATES, GROWTH, AND SURVIVAL OF CAPTIVE-HATCHED CHAMELEONS (*Chamaeleo pardalis*) FROM NOSÉ BE ISLAND, MADAGASCAR

Wild-caught Old World chameleons are relatively hardy in captivity, if one obtains healthy young animals, treats them for parasites, and utilizes proper species-specific husbandry techniques (see Bustard 1989, DeVosjoli 1990, Ferguson and Blades 1991, for description of these techniques). Several species have bred in captivity. Raising captive-hatched or -born juveniles to maturity and obtaining successful reproduction from them is quite another matter. Successful second-generation captive breeding has been reported (McKeown 1991, Obst et al. 1988, Van Mater 1971) but high mortality followed by poor reproduction of captive-raised adults is the general rule. Little is known of the energy, nutritional, and light requirements of juvenile chameleons, and given the diversity of this group these requirements are likely to differ significantly among species.

The Malagasy panther chameleon (*Chamaeleo pardalis*), and especially the population from Nosé Be Island off the northwest tip of Madagascar, seems to be one of the most hardy chameleons in captivity. Some keepers have reported males that live up to 8 yrs in captivity (De Vosjoli 1990). I have maintained several wild-caught adult males for over three years with no mortality. Females cycle continuously, producing a clutch of 15-35 eggs every 6 to 8 weeks. In this report, I provide information on just how much a panther chameleon will eat under ad-libitum food conditions throughout its growth cycle. Although I have not conducted experiments, I, like others (De Vosjoli 1990), have the distinct impression that underfed small juvenile chameleons are highly susceptible to sudden mortality even though they do not appear emaciated. Simply providing sufficient food may prevent the high juvenile mortality that keepers frequently observe.

I conducted a growth study of a cohort of 16 hatchling *C. pardalis* in my laboratory at TCU from January 1990 through March 1991. Chameleons were housed individually in 1.3 l plastic fish bowls from hatchling size until about one-quarter grown (10 cm TL). They were then transferred to 7.9 l plastic terraria (Pet Habitats, Fritz Co.) until maturity (20-25 cm TL). Males were then transferred to 13.2 l terraria until they approached full size (35-40 cm TL), at which time they were moved to larger enclosures (50 l aquaria or larger). Throughout the study, cage furniture consisted only of dead twigs for perching and plastic vials or cups containing insect food and vitamin/mineral powder taped to the cage floor. Cage walls were sprayed daily, and cages were thoroughly cleaned every 10-14 days. Food containers were cleaned daily as necessary. Cage temperatures were maintained from a nighttime low of 19-23°C to a daytime high of 30-33°C. There were minor, seasonal variations of temperature (especially lows) but there was little variation from cage to cage. However, cage positions were rotated daily along the 2.5 m desk top where the cages were kept to equalize minor "position effects." Fluorescent lighting on a 12 h photoperiod (Vitalites, Durotest Corp.) was positioned 15 cm above the open cage tops. This was far enough from the animals to prevent utilization of the lamps as a heat source. Thus, their body temperatures (periodically monitored) closely matched that of the general area, which was monitored daily with minimum-maximum thermometers. Appropriate-sized crickets (*Achaeta*), mealworms (*Tenebrio molitor*), or super worms (*Zophobas morio*) were introduced daily in weighed quantities to ensure uneaten excess at feeding time the next day. Vitamin-mineral supplement was continually available in the bottom of the vial or cup and was changed with each feeding. The supplement was a mixture of 1/2 Reptivite (Zoo Med, Santa Ana, California) and 1/2 calcium carbonate. The mixture was stored in a freezer at -10°C. Residual insects were weighed each day and discarded before introducing new food. Insects lost weight in the vials due to dehydration and tissue metabolism. A control feeding dish (containing insects and vitamin/mineral powder, but not exposed to chameleons) indicated this weight loss to average 10-15% per day. When determining mass of food eaten (mass of food on day 1 minus residual mass of food on day 2), residual mass was corrected for weight loss.

Table 1 indicates the mass of insect food eaten by juveniles at different ages under these conditions. Juveniles ate 4 to 6 times their body mass per month, or about the equivalent of the body mass per week during the first four months. The amount of food eaten increased dramatically during the first five months, then leveled off as the animals reached maturity. Table 2 converts insect mass into numbers of insects of each size fed to the chameleons. Note that for the first two months of life large numbers of small crickets were consumed daily (up to ca. 3 dozen per day).

All 16 of these animals showed no developmental abnormalities. All reproduced beginning at five months of age and continued to reproduce throughout the experiment. After 18 months, all but two of the ten females had died after producing from one to five fertile clutches of eggs. Death of each occurred while gravid or shortly after laying a clutch of eggs. A pathology report on one female indicated some problems with calcium imbalance (metastatic calcification of soft tissues). All of the fertile eggs produced by these animals developed to full-term embryos, but to date less than 10% have hatched; most died at full term. Clearly these laboratory conditions are not perfect for *C. pardalis*. Some fine-tuning of nutrition, lighting, and other environmental factors is needed. Results thus far strongly indicate that large amounts of food must be provided to

Table 1. Mean mass of insects eaten by captive-hatched *Chamaeleo pardalis* at each of their first 9 months of life. Mean mass of chameleons at the beginning of the month is give. Male and female chameleons diverged significantly in size by age 7 months (repeated measures ANOVA, probability of a significant interaction between sexes of mass vs. time <0.001). Amount of food eaten was not significantly different for the sexes but gravid females tended to eat less than males or non-gravid females. Double values separated by a "/" indicate male/female.

Chameleon Age (Months)	1	2	3	4	5	6	7	8	9
Sample Size (# chameleons)	12	16	10	16	10	11	13	9	7
A. Food eaten (g/mo)	2.4	5.1	13.8	29.7	46.1	30.1	32.1	39.4	25.1
B. Chameleon mass at beginning of month (g)	0.5	1.1	2.4	6.7	18.3	35.1	53/39	69/44	79/44
A/B	4.4	4.7	5.7	4.5	2.5	0.9	0.9/0.6	0.6/0.8	0.4/0.4

produce maximum growth and survival. Twenty-two juveniles maintained as above but provided only 10-15 crickets 3 time per week all failed to grow significantly and died during their second month of life.

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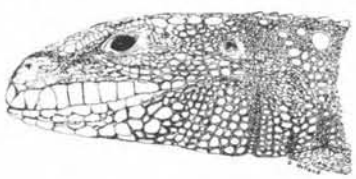
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RECENT POPULATION CHANGES

POPULATION CHANGES IN *Atelopus* SPECIES OF THE CORDILLERA DE MÉRIDA, VENEZUELA

The Venezuelan Andes, with its complex arrangement of diverse high montane ecosystems, support a group of closely related, brightly colored bufonids in the genus *Atelopus*. Six such species have been described from these mountains, and five of them (*A. carbonerensis, A. mucubajiensis, A. oxyrhynchus, A. pinangoi, A. sorianoi)* are reported from páramos and cloud forest in the Venezuelan Cordillera de Mérida. Reports on their abundance dating as early as 1922 indicate that these anurans were historically among the most prominent and ubiquitous species in their respec-

Table 2. Mean number of insects eaten by captive-hatched *Chamaeleo pardalis* at each of their first 9 months of life. Values were obtained by dividing values from Table 1 by mean mass of 5 samples of 10 insects each (see values of mean mass in column 1). SC = small-sized crickets, MC = medium-sized crickets, MMW = medium-sized mealworms, SW = superworms.

Chameleon Age (months)	1	2	3	4	5	6	7	8	9
Chameleon Size (♂ SVL in mm) at beginning of month	27	34	47	68	92	114	135/119	147/123	156/128
No. Insects/Day									
SC (4 mg)	19	40							
MC (0.25 g)			2	4	6	4	4	5	3
MWW (0.04 g)		or	11	25	38	26	27	33	21
SW (0.8 g)					or	1.3	1.3	1.6	1.1

tive environments. The field notes of M. A. Carriker archived at the University of Michigan Museum of Zoology (UMMZ) indicate that he observed at least 27 *A. oxyrhynchus* (= *A. carbonerensis*, sensu La Marca 1983), 25 of which were collected in a "very small" area. The reports of other investigators also emphasized the historical abundance of this toad. Rivero (1972) stated that "a hundred can be collected in less than an hour." Durant and Dole (1974a), in an ecological study performed at the type locality, captured, marked, and released 750 *A. carbonerensis*. Censuses had been conducted in 12 out of 13 continuous months with a range of from 5 to 69 individuals per census. The abundance of *A. carbonerensis* also seems to have characterized the other species of Venezuelan Andean *Atelopus*. We observed large numbers of individuals (roughly 50 and 100, respectively) of *A. oxyrhynchus* in June of 1978 at Monte Zerpa (in ca. 10 min collecting effort), near the city of Mérida, and of *A. sorianoi* in June of 1988, at its type locality (in ca. 30 min of observation).

We are concerned that these once seemingly abundant anurans now appear to have their numbers drastically diminished. From March to November 1990, we made 34 field excursions, totaling 40 days (for a total of ca. 320 man h of search effort), to places where formerly we had observed large numbers (usually ten or more individuals) of five Venezuelan Andean *Atelopus*. Our trips were discouraging, for even with this significant search effort, we only found one specimen of *A. mucubajiensis*, and two of *A. sorianoi*.

Declines in populations of Venezuelan Andean *Atelopus* appear not to be an isolated problem. The decline of amphibian populations appears to be a worldwide phenomenon, and various hypotheses have been offered to account for the declines (Blaustein and Wake 1990, Phillips 1990, Wyman 1990). Habitat destruction accounts for reductions in frog populations in disturbed habitats. However, for those places that have not experienced obvious environmental degradation, the following factors have been proposed as causative agents: global climatic change, pollution, ultraviolet radiation, and habitat fragmentation (Wyman 1990). Below, we briefly discuss several factors that may account, singly or collectively, for the observed declines in populations of Venezuelan Andean *Atelopus*.:

1) Destruction of natural habitats.—Several *Atelopus* species are endemic to the Venezuelan Andes and in such montane environments even slight habitat disturbances may cause severe changes. Habitat destruction may be having a considerable impact on populations of *A. carbonerensis*, *A. oxyrhynchus*, *A.pinangoi*, and *A. sorianoi*. Increases in agrofarming acreage have reduced historic forests to small isolated patches, one of which holds the only known population of *A. sorianoi*. The very small geographic ranges of these highly restricted endemics places them at considerable risk if further reduction of this forested area occurs. At present, the areas where some of these species occur are not protected by Venezuelan law. In the Rio Mucujún Basin, where *A. oxyrhynchus* was frequently seen by us in the early 1980s, agriculture and cattle farming have increased steadily over the past two decades. Likewise, the places where *A. carbonerensis* and *A. pinangoi* occur have been subjected to extensive human modification.

2) Floods.—Floods may adversely impact Venezuelan *Atelopus*; most of these frogs occur and breed in places of high precipitation (e.g., montane cloud forests). Duellman and Trueb (1986) reported a flood affecting *Atelopus mindoensis*. In a mountain stream in Ecuador, they observed 77 individuals of *A. mindoensis*; "after a flash flood had scoured away nearly all streamside vegetation," they were able to find only two specimens. At least one population of an undescribed *Atelopus* from a cloud forest in the Venezuelan Andes may have been similarly affected by flash floods. According to Alberto Juárez and Isaac Goldstein, frogs were common in October 1989 (10 individuals collected, ca. 10 others seen). We were unable to find a single frog when we visited the locality in July 1990. However, we noticed that local flooding in April 1990 had scoured away the vegetation alongside the "quebradas" (cascading mountain streams).

3) Road kills.—Reports of road kills are rare among Neotropical amphibians. Among Venezuelan *Atelopus*, Rivero (1972) reported on "dozens of dried, squashed" *A. carbonerensis* "along the road from Mérida to La Azulita," and "numerous squashed specimens [of *A. mucubajiensis*] along the roads" (both reports probably are from near their respective type localities). Further, in June 1988, the junior author observed 42 road-killed *A. sorianoi* near its type locality. This number represents about 44% of the total observed in one day at that locality; 53 living individuals were encountered. The high percentage of road kills for an anuran with such a restricted distribution is of concern.

4) Overcollection.—Overcollection has not been addressed in available literature on *Atelopus*, but this activity may account for a decrease of certain vulnerable endemic species. A cursory review of Venezuelan *Atelopus* in museums in the United States and Venezuela was enlightening. The taxa most collected have been *A. carbonerensis* (nearly 400 specimens, of which 154 are "paratypes"), *A. oxyrhynchus* (nearly 160), and *A. mucubajiensis* (nearly 140). We believe these data are not representative of the total number of individuals collected for scientific purposes. In the available literature, evidence exists that many individuals of these taxa were collected but never deposited in any collection. Piñero (1985) collected 28 *A. oxyrhynchus* in Monte Zerpa, near the city of Mérida; Durant and Dole (1974b) collected 63 *A. carbonerensis*; and Durant (1976) collected 104 *Atelopus*, 33 from "La Carbonera" (*A. carbonerensis*), 51 from "La Culata" (*A. oxyrhynchus*) and 20 from "Mucubají" (*A. mucubajiensis*). Piñero (pers. comm.) never deposited her frogs in collections; they probably are lost now. Perusal of lists from museums in the United States and Venezuela, and herpetological collections and catalogs at the Universidad de Los Andes in Mérida, reveal the following total numbers of *Atelopus* deposited either by Durant or both Durant and Dole: 4 *A. carbonerensis*, 14 *A. mucubajiensis*, and 33 *A. oxyrhynchus*.

Casual collectors attracted by these colorful frogs, and some commercial dealers, are probably also responsible for taking some *Atelopus* species. We are aware of at least three private dealers who offered Venezuelan *Atelopus* for sale in Germany and the United States in 1982 and 1989.

Three other factors, albeit less well supported than those mentioned above, may also play significant roles in the observed population declines:

5) Climatic changes.—We lack precise information on such changes in the Venezuelan Andes, but reduction in forest cover may contribute to increasing drought susceptibility in the entire region. This may not be the only effect of

deforestation. Increased run-off with high erosion potential can produce stronger floods that increase the probability that susceptible environments along the water courses where *Atelopus* occur will experience scouring. Other climatic factors may also be important. Blaustein and Wake (1990) noted that there "is little evidence for declines of amphibians inhabiting low-equatorial (within 10° north or south of the equator), low altitude regions." Hobart M. Smith (in litt.) suspects that radiation (which is directly correlated with altitude) may be a significant factor explaining population declines at altitudes above 1000 m. Ultraviolet radiation has been implicated in some declines (Wyman 1990).

6) Pollution.—We lack information on the effect of pollution on the Venezuelan Andean frog fauna, but biocides washed from agricultural fields into streams probably affect species living along those environments. *Atelopus* species may be affected by such pollutants. DDT, parathion, and other chemicals whose use is illegal in developed countries but still sold to third world countries are but a few examples of biocides employed in the Venezuelan Andes. The notion that contamination by heavy metals and pesticides may play a role in the decline of some species has been noted previously (Phillips 1990).

7) Introduced species.—At least two introduced taxa may contribute to declines among Venezuelan *Atelopus*. Conifers, especially members of the genus *Pinus,* have been introduced in some páramo (Ohep and Herrera 1985) and cloud forest (Mendoza 1969) environments where, respectively, *A. mucubajiensis* and *A. carbonerensis* occur. Larcher (1983) provided evapotranspiration rates (as percentages of precipitation) for some coniferous forests of flatlands in northeastern Europe (with rates ranging from 60 to 65%) and in some mountain forests in Europe and North America (ranging from 25 to 52%). Larcher's data suggest that coniferous forests have higher evapotranspiration rates compared to native montane cloud forests. Research is needed to ascertain whether Venezuelan Andean introduced conifers, mostly *Pinus* from Central America (CONARE 1977; Lamprecht 1961) contribute to a humidity deficit in Andean forests. These conifers may also depress pH of local ground water through acidic runoff from nearby pine plantations. Levels of pH in conifer forests are typically quite low, and the distribution and abundance of frogs elsewhere has been shown to be correlated with soil pH (Wyman 1988, 1990).

Introduced trout (*Salmo* and *Onchorhynchus*) may also pose a potential threat to *Atelopus* populations. We have observed trout at both *A. mucubajiensis* and *A. pinangoi* localities, where they may prey on *Atelopus* larvae. Hayes and Jennings (1986) discuss the relationship between predation by fish and decline of anuran populations.

Atelopus endemic to the Venezuelan Andes, historically common, are declining in an alarming manner. Because of this, we urge the Venezuelan government and appropriate international organizations to confer protected status and encourage their study.

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We are indebted to Hobart M. Smith (University of Colorado) for kindly sharing his personal comments on this topic. Arnold G. Kluge (UMMZ) generously provided the senior author with Carriker's field notes. Grants S1-2053 from CONICIT (Consejo Nacional de Investigaciones Científicas y Tecnológicas de Venezuela) and Fo. 223-89 from CDCHT (Consejo de Desarrollo Científico, Humanístico y Tecnológico de la Universidad de Los Andes), both to the senior author, provided funds for field studies. The Ministerium für Wissenschaft und Forschung of Austria provided financial support to the junior author. Data for the undescribed *Atelopus*, gathered under a grant from the Wildlife International Conservation [Fund] of the New York Zoological Society to Isaac Goldstein, were graciously supplied by Goldstein and Alberto Juárez. The manuscript has been greatly improved by the comments of three anonymous reviewers.

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LIFE HISTORY NOTES

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). **PREDATION.** Overland migration exposes ambystomatid salamanders to risks not encountered in the underground habitat, e.g., desiccation (Holland et al. 1990. Southwest. Nat. 35:217-220). On 14 March 1988 at ca. 1500 h, I found 21 dead *Ambystoma maculatum* scattered around the periphery of a small, rain-filled pool. The pool (2 X 2.5 m, maximum depth = 1.0 m) was located in Blue Valley, on the southern escarpment of the Blue Ridge Mountains in the Nantahala National Forest, North Carolina at an altitude of 780 m. *Rana sylvatica* also breeds in this pool.

All carcasses consisted of only the pelvic girdle (including the hindlegs) and tail. Cloacal inspection allowed 18 of the carcasses to be sexed, of which 16 were female. Males of *Ambystoma* typically arrive at breeding ponds before females (Bishop 1941. Bull. New York State Mus. 324:1-365; Pfingsten and Downs 1989. Bull. Ohio Biol. Survey, New Ser. 7(2):1-315). I searched the pool using a dipnet, however, and found one female. The preponderance of females among the carcasses and the absence of males in the pool suggests that the females arrived first at this pool.

No sign of a predator was found in the vicinity of the pool. Short-tailed shrews are present locally and can prey upon salamanders. However, the large number of salamanders killed suggests that the predator may have been a larger mammal. Raccoons, opossums, weasels, and minks are present in the area and represent likely predators.

This manuscript benefited from comments from R. C. Bruce and was written while the author was supported by Louisiana Board of Regents Doctoral Fellowship LEQSF (1988-1994) - GF-15.

Submitted by **CHRISTOPHER KING BEACHY**, Department of Biology, Western Carolina University, Cullowhee, North Carolina 28723, USA. Present address: Department of Biology, P.O. Box 42451, The University of Southwestern Louisiana, Lafayette, Louisiana 70504-2451, USA.

AMBYSTOMA TEXANUM (Smallmouth Salamander). **ALBINISM.** Two albino *Ambystoma texanum* (Fig. 1) were collected on 19 and 20 April 1984 by Ricky G. Jones and Bill Arntz. Both individuals possessed pink eyes characteristic of total albinism (sensu Nero 1954. Auk 71:137-155). To our knowledge, this is the first reported instance of total albinism in *A. texanum* (Dyrcacz 1981. SSAR Herp. Circ. 11. 31 pp.). The specimens were collected from an abandoned swimming pool in the Britton area of Oklahoma County, Oklahoma that was partially filled (1 m depth) with turbid rainwater. The pool has since been destroyed and removed. Snout-vent lengths of the specimens after preservation in 10% formalin were 71 and 70 mm. The two albinos were found together with two normally pigmented conspecifics.

I thank Marvin L. Mays and Victor

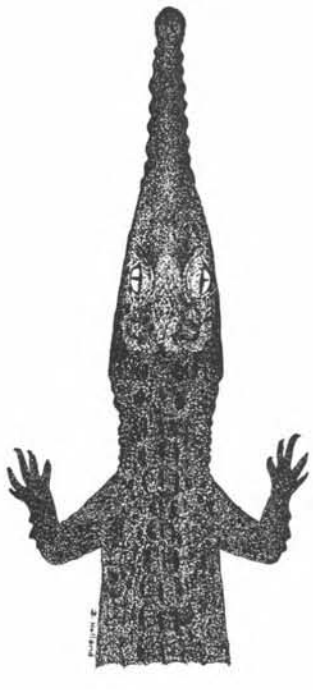




Figure 1. Albino *Ambystoma texanum* from Oklahoma County, Oklahoma.

Hutchison for identifying the specimens, and Troy A. Baird for helpful suggestions on the manuscript. The specimens have been deposited in the Oklahoma Museum of Natural History herpetology collection.

Submitted by **RICKY G. JONES,** Department of Biology, University of Central Oklahoma. Present address: 15205 N. May Ave., Edmond, Oklahoma 73013, USA.

ANURA

OSTEOPILUS DOMINICENSIS (NCN). **BEHAVIOR.** On 31 May 1991 at the Acuario Nacional, Santo Domingo, Distrito Nacional, and again on 3 June 1991 near the Hotel Guarocuya, Barahona, Barahona Province, República Dominicana, we observed one and two instances, respectively, of *Osteopilus dominicensis* making use of trunk cavities in a manner similar to *Hyla chrysoscelis* in Tennessee (Ritke and Babb. 1991. Herpetol. Rev. 22(1):5-8).

The frog from the aquarium grounds (SVL ca. 60 mm) was in a trunk cavity of a coconut palm (DBH = 32 cm), 168 cm above the ground, dimensions (w x h) of the opening were 7.5 x 2.5 cm, dimensions (w x h x d) of the cavity were 5 x 7 x 10 cm. A. Schwartz (field notes) described finding a large female (SVL = 77 mm) in a "H_2O filled cavity of 4" diameter palm" (Haiti, Dept. l'Ouest, beach just w. Grand Goôve, 30 July 1971). Both of the Barahona specimens were females (SVL = 59 mm, 63 mm) and were found in knotholes of almond trees (DBH = 110 and 85 cm). Heights and dimensions of the cavities were 100 cm, 8 x 5 cm, 9 x 6 x 22 cm, and 125 cm, 9 x 5 cm, 9 x 5 x 20 cm, respectively. In each instance the cavity used by these frogs held water or was very moist. Similar holes (N = 4) in Barahona, but with drainage and therefore drier, were not occupied by *Osteopilus* during the two-week period of observation. The two frogs from Barahona were collected on 10 June. The vacated holes had not been reinhabited by 16 June, despite conditions (almost nightly periods of showers) presumably conducive to anuran movements.

The frog from the aquarium grounds was not collected, but the two specimens from Barahona were deposited in the Bobby Witcher Memorial Collection (BWMC 04592-3), Avila College. The Schwartz specimen (Albert Schwartz Field Series, ASFS V36674) is in the Museum of Natural History, University of Kansas.

We wish to thank Sixto and Ivonne Incháustegui, who provided assistance in the Dominican Republic. José A. Ottenwalder of the Parque Zoológico Nacional facilitated opportunities for field work. Permits were graciously provided by Emílio A. Bautista M., Director, Departamento de Vida Silvestre, República Dominicana.

Submitted by **DONALD D. SMITH,** Division of Allergy & Rheumatism, University of Kansas Medical Center, Kansas City, Kansas 66103, USA, **ROBERT POWELL,** Department of Natural Sciences, Avila College, Kansas City, Missouri 64145, USA, **PETER A. ZANI,** Department of Zoology, Miami University, Oxford, Ohio 45056, USA, and **AMY LATHROP,** Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA.

PTERNOHYLA DENTATA (Upland Burrowing Treefrog). **MATING CALL.** The call of *Pternohyla dentata* was recorded at the edge of a small pond in farmland at Potrero del Campo Santo, 1 km NW of Villa Hidalgo, Jalisco, México. The specimen is deposited at Museo de Zoología, Fac. de Ciencias, UNAM (No. MZFC 04874). A copy of the tape is on file at the National Museum of Natural History, Smithsonian Institution. Air temperature was not recorded; the call was recorded early at dusk.

The call consists of a series of notes given at a rate of 150/min (Fig. 1). The average note duration is 0.20 s and the average internote duration is 0.21 s. The energy is broadcast in three frequency bands, two strong bands at 400-475 Hz (fundamental?) and 1900-2200 Hz (5th harmonic?) and a weak band at 3200-3500 Hz (9th harmonic?). The level of background noise precludes wave form analysis to determine whether the call is pulsatile.

Pternohyla dentata has a faster call rate and lower fundamental frequency than *P. fodiens* as described by Trueb (1969. Cat. Amer. Amphib. Rept. 77:1-4), although both have broadcast energy around 2000 Hz.

W. Ronald Heyer helped with the analysis of the call. JVD wishes to thank Gustavo E. Quintero Díaz and Vicente Esparza Soto for field assistance. Participation of OFV was possible due to DGAPA UNAM No. IN201789.

Submitted by **JOEL VÁSQUEZ-DIAL** and **OSCAR FLORES-VILLELA,** Museo de Zoología, Fac. de Ciencias, UNAM, A.P. 70-399, México, D.F. 04510, México

UPEROLEIA LAEVIGATA (NCN). **BEHAVIOR.** The behavior of Australian frogs is relatively unstudied. While photographing a specimen of the myobatrachid *Uperoleia laevigata* caught in Terrey Hills near Ku-ring-gai Chase National Park, N.S.W., I observed a previously undescribed defensive behavior pattern.

As I approached from the side to reposition the frog for a photograph, it inflated its body slightly and tilted toward me. This tilting action caused the bright orange patch present on the front of the hind limb on the opposite side from me to be exposed. Subsequent prodding of the frog with a stick failed to cause it to jump; instead, it continued the "tilting" behavior.

Puffing up the body by inflating the lungs is a common defensive behavior among heavy-bodied anurans such as species of *Bufo* (Duellman and Trueb

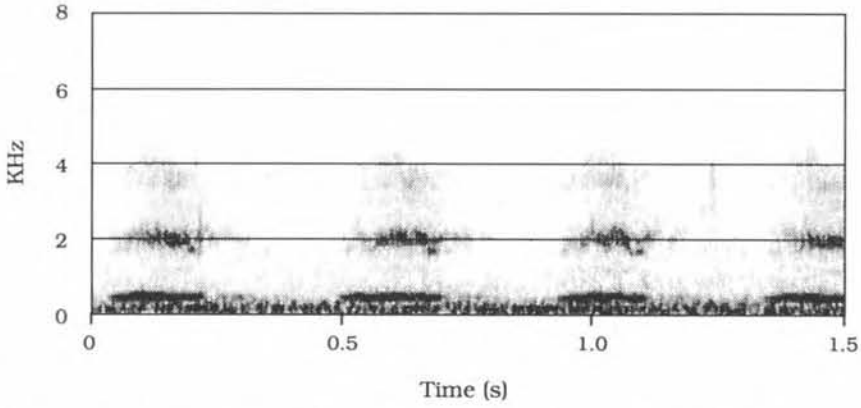


Figure 1. Audiospectrogram of the call of *Pternohyla dentata* from Jalisco, México.

1986. Biology of Amphibians, McGraw-Hill, New York, 670 pp.). In some *Bufo* species this is accompanied by a lateral tilting of the body towards the predator (Hanson and Vial 1956. Herpetologica 12:141-149). P. Harlow (pers. comm.) suggests that *U. laevigata* is toxic and the presence of enlarged parotoid glands (Tyler et al. 1981. Aust. J. Zool. Suppl. Ser. 79:1-64) supports this suggestion. The orange patches on the front of the thigh in *U. laevigata* may represent hidden aposematic coloration similar to that seen in *Bombina variegata* (Duellman and Trueb, op. cit.). There is, however, no evidence at present to support this speculation. Further work on defensive behavior and toxicity of Australian frogs appears warranted.

I thank R. Shine, P. Harlow, L. Schwartzkopf, and F. Lemckert for comments on the manuscript.

Submitted by **GEORDIE A. TORR**, Zoology A08, University of Sydney, NSW 2006, Australia.

CROCODYLIA

CROCODYLUS ACUTUS (American Crocodile). **SOCIAL BEHAVIOR.** Crocodilians have some of the most highly developed social behaviors of any reptile. Many of the advertisement displays used by crocodilians involve stereotyped body posturing, headslapping, and loud vocalizations referred to as roars or bellows. Nevertheless, the one published study of *C. acutus* social behavior (Garrick and Lang 1977. Am. Zool. 17:225-239) did not verify the presence of a vocal component to the advertisement display.

While maintaining a pair of *C. acutus* in Venezuela (Funa Pecuario Masaguaral; 8°34'N, 67°35'W) for captive breeding purposes, I had the opportunity to observe male advertisement displays on six occasions (7 April, 28 September, 5 December 1988, 13 February, 21 March, and 18 April 1989). The timing of these displays largely coincided with the species' courtship (November–January) and nesting (February–March) seasons on Masaguaral. The male (3.3 m TL) entered a head-elevated, tail-arched posture in shallow water, similar to the posture described in Garrick and Lang (op. cit., Fig. 2f) for *C. acutus* subaudible vibrations. From this posture, the male proceeded to headslap 2 to 3 times, then produced 1 to 5 loud roars (mean = 2.5 roars per advertisement display). All displays occurred in the morning (0656 to 0857 h) and were very similar to the adverisement display of male Orinoco crocodiles (*C. intermedius*) that were housed at the same crocodile breeding facility (pers. obs.). The female (2.8 m TL) never produced headslaps or roars.

Submitted by **JOHN B. THORBJARNARSON**, Wildlife Conservation International, c/o Fundo Pecuario Masaguaral, Apartado 39, Calabozo 2312-A, Guárico, Venezuela.

LACERTILIA

ANOLIS CHLOROCYANUS (Hispaniolan Green Anole). **BEHAVIOR.** On 18 June 1991, on natural vegetation at the Casa de Campo resort complex near La Romana, La Romana Province, República Dominicana, we observed two instances of aggressive behavior in *Anolis chlorocyanus*. On the first occasion at 1410 h, ca. 1.5 m above the ground on a small tree (DBH = 10 cm), a large male (SVL estimated by eye at ca. 65 mm) was observed with the entire head of a female *Anolis cristatellus* (SVL ca. 40 mm) in its mouth. During the 2-3 min span of observation, the *A. chlorocyanus* made concerted efforts to reposition the *A. cristatellus* in an apparent effort to facilitate swallowing. The latter was struggling frantically, thrashing its entire body. Finally, during one attempt at realignment, the *A. cristatellus* managed to escape, fell to the ground, and rapidly disappeared into the undergrowth. We did not observe initiation of the encounter, and the *A. cristatellus* appeared to be too large for consideration as food, but we assume that the *A. chorocyanus* was treating the *A. cristatellus* as prey. Aggression or territorial defense, however, cannot be ruled out.

The second observation of aggressive behavior was between two large (ca. 65 mm SVL) male *A. chlorocyanus*. At 1430 hrs, at a height of ca. 3 m on a small tree (DBH = 18 cm), one male was observed with its mouth completely encompassing the head of the other. Again, initiation of the encounter was not observed, and we assumed it to be a territorial dispute gone awry (interlocking jaws being a much more common situation). After less than two minutes, the latter individual managed to escape and fell to the ground. This lizard immediately climbed an adjacent tree to the same height as that still occupied by the first animal, then dewlapped repeatedly before further ascending the tree, precluding additional observation. Interestingly, the male in the grasp of the other had assumed a bright blue color, in vivid contrast to the bright green of the second individual and that normally associated with active males. It retained this color throughout the period of observation.

Submitted by **ROBERT POWELL** and **JOHN S. PARMERLEE, JR.**, Department of Natural Sciences, Avila College, Kansas City, Missouri 64145, USA.

SERPENTES

AGKISTRODON PISCIVORUS PISCIVORUS (Eastern Cottonmouth). **DIET.** On 4 May 1991 at ca. 1600 h, while on a herpetology class field trip, we discovered a dead red-bellied water snake (*Nerodia erythrogaster erythrogaster*, ca. 1.3 m TL) lying near the shore at Steel Creek Bay, a wetland on the Savannah River Site in Barnwell County, South Carolina. The snake was on land, ca. 1 m from the water's edge and 1 m from the edge of a dirt road bordering the wetland. No visible cause of death was apparent, but the snake obviously had been dead for several hours based on the odor. The snake was placed alongside the road for the class to examine and left in this spot.

After dark, at 2100 h, we stopped at the same location to show a new member of the field trip the dead water snake. To our surprise the water snake was found in the water being consumed by an *Agkistrodon p. piscivorus* (also ca. 1.3 m TL) which had swallowed the first several centimeters of the dead snake.

When several students got out of the vehicle, the cottonmouth quickly released its grip and swam away. We again put the dead snake back on land when we left the area. Upon returning to the site at 2130 h we found the *A. piscivorus* now on land with ca. 30 cm of the water snake in its mouth. During the next 20 min the *A. piscivorus* released its hold and backed off of the water snake completely two times. On both occasions the cottonmouth returned to the water snake and continued trying to swallow it. When the cottonmouth released the water snake for the third time, it retreated to the water. However, as we left the area, the cottonmouth was swim-

ming back toward the water snake, presumably to try again.

Cottonmouths will eat dead fish and birds in the wild (Gloyd and Conant 1990. Snakes of the *Agkistrodon* Complex. SSAR, Oxford, Ohio; Wharton 1966. Copeia 1966:149-161), but this is the first record we know of in which one attempted to consume a dead reptile in a natural situation.

We thank D. E. Scott, R. U. Fischer, and M. S. Mills for comments on the manuscript. Research related to this observation was supported by Contract DE-AC09-76SR00-819 between the University of Georgia and the U.S. Department of Energy.

Submitted by **HOWARD J. BERNA** and **J. WHITFIELD GIBBONS,** Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29802, USA.

BOTHRIECHIS NIGROVIRIDIS (Speckled Palm Viper). **MAXIMUM SIZE.** On 27 April 1988 two female *Bothriechis nigroviridis* arrived at the Dallas Zoo on breeding loan from the Central Florida Zoological Park. Both animals were acquired on 13 November 1983 from a local collector from Alto La Palma, San Jose Province, Costa Rica. Both were exceptionally large. In-house identification numbers were assigned to these animals. Female #2 was 721 mm SVL and 892 mm TL while female #3 was 783 mm SVL and 937 mm TL. Referring to this species, Campbell and Lamar (1989. The Venomous Reptiles of Latin America, Comstock Publ. Assoc., Ithaca, New York, 425 pp.) stated: "Although it may exceed 800 mm in total length, it is more commonly less than than 600 mm." Female #3 died on 18 February 1991 and was deposited in the vertebrate collection of the Florida Museum of Natural History (#UF80252).

Submitted by **STEPHEN H. HAMMACK**, Department of Herpetology, Forth Worth Zoological Park, 2727 Zoological Park Drive, Fort Worth, Texas 76110, USA, and **FRED ANTONIO**, Department of Herpetology, Central Florida Zoological Park, P.O. Box 309, Lake Monroe, Florida 32747, USA.

CLELIA CLELIA (Mussurana). **FEEDING BEHAVIOR.** *Clelia clelia* is a large colubrid (TL = 2 m) widely distributed in South America. This species is primarily ophiophagus, but it also captures lizards and small rodents (Cunha and Nascimento 1978. Publ. Avuls. Mus. Paraense E. Goeldi 10:1-218). On 25 May 1989, at Engenho Agua Azul, Timbaúba, Pernambuco, northeastern Brazil (07° 31'S, 35° 19'W), we observed an adult *C. clelia* attacking a nest of the brown four-eyed opossum (*Metachirus nudicaudatus*) during the day. The nest was located 1 m above the ground in a small bush, and housed two juvenile opossums (228 mm TL, 35 g). One juvenile had been swallowed by the snake, and the other was being killed by constriction. We recorded no aggressive reaction by the adult female opossum, but we did observe it walking around the snake chattering its teeth. Predation of marsupials by South American snakes may be more common than believed. Opossums of the genus *Marmosa* have been recorded as prey of boids, probably *Epicrates cenchria* (Ribeiro 1936. Rev. Mus. Paul. 20:245-427), and we have previously observed predation on the woolly mouse opossum (*Marmosa cinerea*) by *Spilotes pullatus*.

Submitted by **DANTE MARTINS**

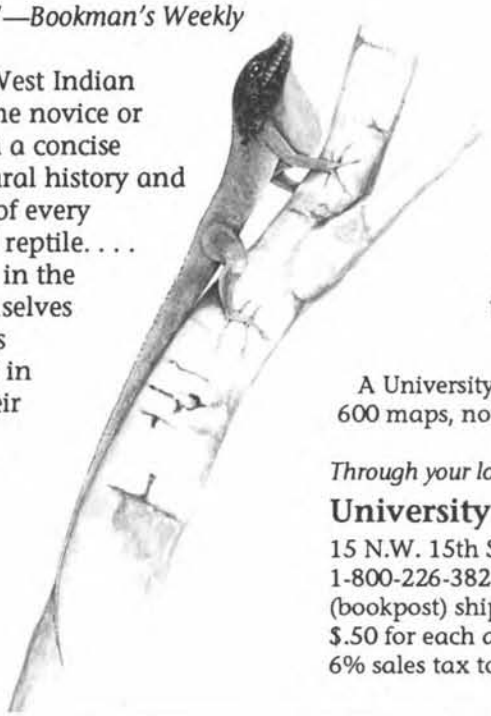
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TEIXEIRA, MARIA LUCI LORINI, VANESSA G. PERSSON, and **MARCOVAN PORTO**, Departamento de Vertebrados, Museu Nacional/UFRJ, Rio de Janeiro 20.942 Brazil.

HETERODON NASICUS KENNERLYI (Mexican Hognose Snake). **OOPHAGY.** In August 1986 I received an amelanistic female *Heterodon nasicus kennerlyi* from David Lazcano, Jr. of the Museo de Historia Natural, Universidad Autonoma de Nuevo Leon. The coloration of this specimen had been reported previously by Lazcano (1988. Herpetol. Rev. 19(2):36). The animal has been bred four times. In 1987, seven offspring were produced and in 1988, four offspring were produced. In both of these breeding seasons the amelanistic female was bred to a normal-colored, homozygous male. During the breeding seasons of 1989 and 1990, the amelanistic female was bred to heterozygous males that were her own progeny from the 1987 breeding season. On 15 July 1989 a nest box was placed in with the female, after it was apparent that she was gravid. On 16 July 1989 she shed and nine eggs could be felt be gentle palpation. On 25 July 1989 at 0630 h, three eggs were deposited in the nest box. The female was left alone until 2100 h, when only one egg was found remaining in the next box. Based upon a mid-body enlargement, it was apparent that the female had consumed two eggs. On 30 July she passed a very yolky stool containing remnants of eggshells.

A similar incident occurred in 1990. On 12 July 1990 the female shed and a nest box was placed in her cage. On 14 July 1990, six eggs could again be felt by gentle palpation. On 30 July 1990 at ca. 0700 h, one egg was found in the nest box. The female was again left alone until later that night. At ca. 1900 h, only two eggs could be found and once again the female was large at mid-body. On 4 August 1990 the female passed a yolky stool with remnants of eggshells. Egg-eating behavior was not observed during the 1987 or 1988 breeding seasons.

Submitted by **STEPHEN H. HAMMACK**, Department of Herpetology, Forth Worth Zoological Park, 2727 Zoological Park Drive, Fort Worth, Texas 76110, USA.

LEPTOPHIS AHAETULLA (Parrot Snake). **FEEDING BEHAVIOR.** The diet of *Leptophis ahaetulla* typically is composed of small frogs and geckos captured on the ground or in low vegetation (Cunha and Nascimento 1978. Publ. Avuls. Mus. Paraense E. Goeldi 10:1-218; Vanzolini et al. 1980. Répteis das Caatingas, Rio de Janeiro, 161 pp.). In the highland forests of Pedra Branca, Murici, Alagoas, northeastern Brazil (09° 15'S, 35° 50'W), this species forages in the canopy 20 m above the ground. We observed an adult *L. ahaetulla* swallowing a feathered chick of the flame-crested tanager (*Tachyphonus cristatus*) during the day. *L. ahaetulla* is recognized by birds as a potential predator, and is pursued by mixed flocks of passerines. Specimens were deposited in the collection of Museu Nacional/UFRJ.

Submitted by **DANTE MARTINS TEIXEIRA** and **MARCOVAN PORTO,** Departamento de Vertebrados, Museu Nacional/UFRJ, Rio de Janeiro 20.942 Brazil.

TROPIDOPHIS HAETIANUS (NCN). **LOCOMOTION.** On 7 June 1991 two adult *Tropidophis haetianus* were collected at the edge of a stream near Canoa at the junction of HW 44 and the road to Pto. Alejandro, and on 12 and 14 June 1991 two juvenile *T. haetianus* were collected 5.6 km W of HW 44 on the Sta. Helena road, this junction is 4.1 km south of the Hotel Guarocuya in Barahona; both sites are in the Provincia de Barahona, República Dominicana. During a photography session involving the first-captured juvenile (SVL = 163 mm), an effort was made by the snake to escape by sidewinding. When given the opportunity, the second juvenile (SVL = 241 mm) behaved similarly, as did the adult male (SVL = 520 mm) captured earlier. All three animals used the same pattern of locomotion on a variety of substrates, including a tile floor, carpet, a tightly stretched sheet, poured concrete, grass, and sand. The adult female was gravid and resisted all attempts to induce movement by refusing to uncoil from a defensive ball. The sidewinding pattern (Fig. 1) resembled that of *Crotalus cerastes* and left a similar track in sand. It differed, however, in that the direction of movement was more parallel to the long body axis than in sidewinding rattlesnakes. Individuals "looped" their bodies to either the left or right as they moved in a forward direction.

Specimens were deposited in the Bobby Witcher Memorial Collection (BWMC 04481, 04587, 04606), Avila College. The adult female is being held alive at Avila College.

Michael C. Schreiber made the videotape from which the illustration was produced. We also wish to thank Sixto Incháustegui, who provided assistance in the Dominican Republic. José A. Ottenwalder of the Parque Zoológico Nacional facilitated opportunities for field work. Permits were provided by Emílio A. Bautista M., Director, Departamento de Vida Silvestre, República Dominicana.

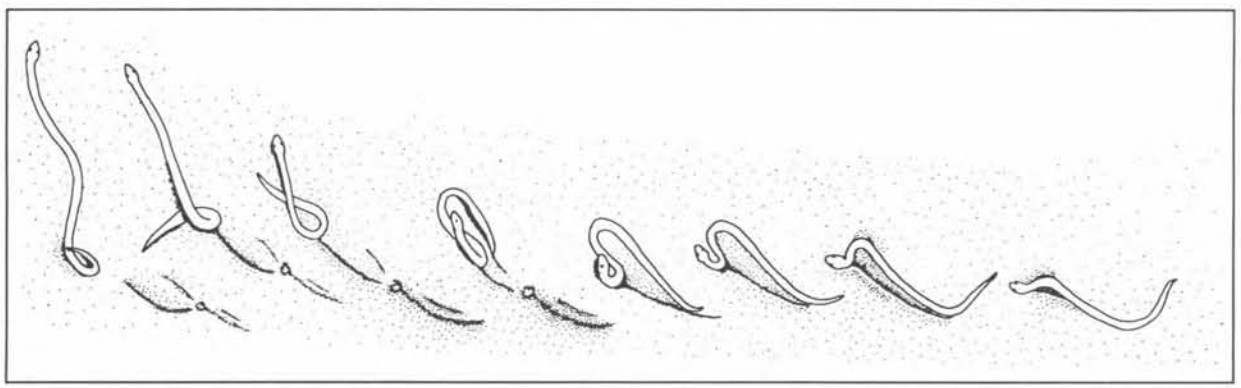


Figure 1. Sidewinding pattern of *Tropidophis haetianus*, drawn by Amy Lathrop from videotapes.

Submitted by **DONALD D. SMITH,** Division of Allergy and Rheumatism, University of Kansas Medical Center, Kansas City, Kansas 66103, USA, **JOHN S. PARMERLEE, JR., ROBERT POWELL**, Department of Natural Sciences, Avila College, Kansas City, Missouri 64145, USA, **LISA R. WHITE**, Department of Biology, Miami-Dade Community College, South Campus, Miami, Florida 33176, USA, and **AMY LATHROP**, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA. ●

GEOGRAPHIC DISTRIBUTION

CAUDATA

AMBYSTOMA ANNULATUM (Ringed Salamander). USA: ARKANSAS: Logan Co: NW 1/4, SE 1/4, NE 1/4, Sec. 14, T6N, R25W. 16 January 1990. Glyn Turnipseed & Matt Gallagher. Verified by Joseph T. Collins. KU 216103. County record.

Submitted by **GLYN TURNIPSEED**, Department of Biology, Arkansas Tech University, Russellville, Arkansas 72801, USA, and **MATT GALLAGHER**, Arkansas Herpetological Society, Russellville, Arkansas 72801, USA. ●

AMBYSTOMA JEFFERSONIANUM (Jefferson Salamander). USA: ILLINOIS: Clark Co: Lincoln Trail State Recreation Area. 2 March 1991. C. A. Phillips. Verified by Thomas Uzzell. UIMNH 95674. One juvenile raised from a larva dipnetted from a small pond. First record for species in Illinois (Smith 1961. Nat. His. Surv. Bull. 28(1):1–298) and range extension ca. 15 km west of record for Vigo County, Indiana (Hay, 1887. Annu. Rep. Indiana St. Board Agr.: 201–227).

Submitted by **CHRISTOPHER A. PHILLIPS**, Department of Ecology, Ethology and Evolution, University of Illinois, Urbana, Illinois 61801, USA. ●

AMBYSTOMA MACULATUM (Spotted Salamander) USA: ILLINOIS: Clark Co: Lincoln Trail State Recreation Area. 2 March 1991. C. A. Phillips. Verified by Thomas Uzzell. UIMNH 95666. New county record (Smith 1961. Nat. Hist. Surv. Bull. 28(1):1–298).

Submitted by **CHRISTOPHER A. PHILLIPS**, Department of Ecology, Ethology and Evolution, University of Illinois, Urbana, Illinois 61801, USA. ●

AMBYSTOMA MACULATUM (Spotted Salamander). USA: NORTH CAROLINA: Hyde Co: 4.5 km SSE Sladesville. 29 January 1990. NCSM 30435 (DOR adult); 3.5, 3.9, & 4.0 km NNE Scranton. 9 January 1991. NCSM 31197–99 (DOR adults). All collected by R. W. Gaul, Jr. Verified by W. M. Palmer. New county records; only one previous record from the lower coastal plain of North Carolina; extends range ca. 17 km SSE & 9 km ESE of nearest record in Beaufort County (NCSM files).

Submitted by **JEFFERY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 27647, Raleigh North Carolina 27611, USA, and **R. W. GAUL, JR.**, Route 1, Bath, North Carolina 27808, USA. ●

DESMOGNATHUS OCHROPHAEUS (Mountain Dusky Salamander). USA: TENNESSEE: Coffee Co: Small spring-fed creek off Lyndell Bell Road, 2.9 km S Blantons Chapel Road. 20 March 1991. B. T. Miller. Verified by Wayne Van Devender. Middle Tennessee State University (MTSU 35C, 36C). New county record; extends the distribution into the Eastern Highland Rim of middle Tennessee, ca. 45 km W of populations in the Cumberland Plateau and 55 km north of the presumably disjunct populations in the Cumberland of northern Alabama (Redmond, MS. A biogeographic study of amphibians in Tennessee, Unpubl. Doctoral Diss. subm. 1985, Univ. Tennessee, Knoxville. 290 pp.; Tilley 1973. *Desmognathus ochrophaeus*. Cat. American Amph. Rept. 129.1–129.4).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA. ●

HEMIDACTYLIUM SCUTATUM (Four-toed Salamander). USA: ILLINOIS: Vermillion Co: Middle Fork State Fish and Wildlife Area. 29 April 1991. C. A. Phillips. Verified by Thomas Uzzell UIM 95645. One adult. New county record (Smith 1961. Nat. Hist. Surv. Bull. 28(1):1–298) and sixth isolated population reported for state since 1961 (Michael Morris, unpubl. data).

Submitted by **CHRISTOPHER A. PHILLIPS**, Department of Ecology, Ethology and Evolution, University of Illinois, Urbana, Illinois 61801, USA. ●

ANURA

BUFO AMERICANUS (American Toad). USA: LOUISIANA: East Baton Rouge Parish: ca. 5 km N Greenwell Springs. 11 May 1990. J. Wilkinson. Verified by David A. Good. LSUMZ 49497. Second parish record, extends range about 30 km southwest of nearest record.

Submitted by **J. SEAN DOODY** and **JEFFERY A. WILKERSON**, Museum of Natural Science, 119 Foster Hall, Louisiana State University, Baton Rouge, Louisiana 70803, USA. ●

GASTROPHRYNE OLIVACEA (Great Plains Narrowmouth Toad). USA: ARKANSAS: Pope Co: NE 1/4, NE 1/4, SW 1/4 Sec. 14, T7N, R20W. 6 June 1990. Jim Price & Don Price. Verified by Glyn Turnipseed. KU 216104. County record.

Submitted by **JIM PRICE** and **DON PRICE**, Department of Biology, Arkansas Tech University, Russellville, Arkansas 72801, USA. ●

HYLA ANGUSTILINEATA (NCN). PANAMA: PROVINCIA DE CHIRIQUI: Distrito de Boquete: Parque Internacional La Amistad, Cerro Horqueta, 8°50'N, 82°28'W, & 8°51'N, 82°27'W, elev. 1800 & 2300 m. 23 July 1990. F. A. Arosemena. Verified by Jay M. Savage. Museo de Vertebrados de la Universidad de Panamá, MVUP 961–962. New country record. Known to occur only in Costa Rica, previously reported from three localities in the Cordilleras Central and Tilarán (Savage and Heyer 1969. Rev. Biol. Trop. 16:1–753); also found in the Cordillera de Talamanca (Savage and Villa, 1986. SSAR Contrib. Herpetol. 3:1–207). This new record is located ca. 215 km (airline) SE of La Palma, Provincia de San José, Costa Rica.

Submitted by **FERNANDO A. AROSEMENA**, Asociación Nacional para la Conservación de la Naturaleza (ANCON), Apdo. 1387, Panamá 1, Republica de Panamá, and **ROBERTO IBANEZ D.**, Smithsonian Tropical Research Institute, Apdo. 2072, Balboa, Republica de Panamá. ●

HYLA FIMBRIMEMBRA (Fringe-limbed Treefrog). PANAMA : PROVINCIA DE CHIRIQUI: Distrito de Boquete: Cerro Horqueta, 8°49'N, 82°27'W elev. 1600–1700 m. 22 April 1982 . L. Bruña, F. Crastz, C. A. Jaramillo, F. E. Jaramillo & R. Ibáñez. Verified by Jay M. Savage. Círculo Herpetológico de Panamá (CH

1036). New record for Panama; previously known only from the cordilleras Central and Tilarán of Costa Rica (Hayes et al. 1986. Florida Sci. 49:193–198; Savage and Villa 1986. SSAR Contrib. Herpetol. 3:1–207). This record extends the range ca. 220 km (airline) SE Cerro Turú, Provincia de Heredia, Costa Rica.

Submitted by **ROBERTO IBAÑEZ D.**, Smithsonian Tropical Research Institute, Apdo. 2072, Balboa, Republica de Panamá, **CESAR A. JARAMILLO**, **FRANK A. SOLIS** and **FIDEL E. JARAMILLO**, Circulo Herpetológico de Panamá, Apdo. 10762, Estafeta Universitaria, Panamá, Republica de Panamá. ●

PSEUDACRIS TRISERIATA (Western Chorus Frog) USA: COLORADO: Elbert Co: 1.2 km E & 6.5 km N Agate. 31 August 1991. David Chiszar & David Drew. Verified by Hobart Smith. UCM 56488–94. New county record and the southernmost in the South Platte River drainage of eastern Colorado (Hammerson 1982. Amphibians and Reptiles in Colorado. Colorado Division of Wildlife Department of Natural Resources, Denver. 131 pp.).

Submitted by **DAVID CHISZAR**, Department of Psychology, University of Colorado, Boulder, Colorado 80309, USA, and **J. DAVID DREW**, Campion Academy, SW 42nd & Academy Drive, Loveland, Colorado 80537, USA. ●

SCAPHIOPUS HOLBROOKII HURTERII (Hurter's Spadefoot). USA: ARKANSAS: Logan Co: NE 1/4, SE 1/4, SE 1/4, SE 1/4 Sec. 3, T6N, R25W. 15 March 1990. Noel Tugwell & Kimberly Schwartz. Verified by Glyn Turnipseed. KU 216105. County record.

Submitted by **NOEL TUGWELL** and **KIMBERLY SCHWARTZ**, Department of Biology, Arkansas Tech University, Russellville, Arkansas 72801, USA. ●

TESTUDINES

CHELYDRA SERPENTINA SERPENTINA (Common Snapping Turtle). USA: NEW MEXICO: Sandoval Co: Jemez River, 4.5 river km upstream of the Rio Grande confluence, Jemez Canyon Dam (inside of outflow conduit), SW 1/4 Sec. 32, T14N, R4E. 13 July 1991. C. S. Clark & J. N. Stuart. Verified by W. G. Degenhardt. MSB 52338. New county record and third specimen preserved from the Rio Grande drainage basin of New Mexico (Stuart and Painter 1988. Herpetol. Rev. 19(1):21). Previous northernmost report for the basin was an adult from the Rio Grande in NW Albuquerque, Bernalillo County (not preserved; photograph in the Albuquerque Journal, 23 July 1981, p. B2). The species' status in this basin is unknown due to the paucity of verified records.

Submitted by **JAMES N. STUART**, National Ecology Research Center, U.S. Fish and Wildlife Service, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA, and **CRAIG S. CLARK**, Environmental Section, U. S. Army Corps of Engineers, P. O. Box 1580, Albuquerque, New Mexico 87103, USA. ●

CLEMMYS MUHLENBERGII (Bog Turtle) USA: SOUTH CAROLINA: Pickens Co: 16 km NE Easely. 18 June 1991. J. E. Batson & G. R. Engle. Verified by R. R. Montanucci. Photographs and negatives deposited in Clemson University collection (CUSC Accession No. 720). New county record (Putnam and Herman 1980. Herpetol. Rev. 13:2).

Submitted by **JANICE E. BASTON**, Department of Chemistry, Furman University, Greenville, South Carolina 29613, USA. ●

GRAPTEMYS PSEUDOGEOGRAPHICA OUACHITENSIS (Ouachita Map Turtle). USA: KANSAS: Pawnee County: Pawnee River at south edge of Larned, just downstream from KS. Rt. 19 bridge (Sec. 5, T22S, R16W). 9 August 1991. P. A. Shipman and L. E. Shipman. Verified by Joseph T. Collins. Museum of Natural History, University of Kansas (KU 218577). New county record; extends range ca. 140 km NW of nearest recorded locality in Harper County (Collins 1982. Amphibians and Reptiles in Kansas. Second Edition. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356) and as shown in Conant and Collins (1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston, Massachusetts. 450 pp.).

Submitted by **DAVID R. EDDS, PAUL A. SHIPMAN** and **LENN E. SHIPMAN,** Division of Biological Sciences, Emporia State University, Emporia, Kansas 66801, USA. ●

LACERTILIA

ANOLIS BISCUTIGER (Anole). PANAMÁ: CHIRIQUÍ PROVINCE: Finca Higuerón: Chiriquí Land Company, Distrito de Barú. 2 January 1989. MVUP 1090. Macano: Distrito de Boquerón. 24 July 1990. Fernando A. Arosemena. MVUP 1095. Verified by Robin M. Andrews. New records for Panama and a southern range extension of ca. 100 km SE from Golfito, Puntarenas Province Costa Rica (Taylor 1956. Univ. Kansas Sci. Bull. 38:3–322).

Submitted by **FERNANDO A. AROSEMENA**, Asociación Nacional para la Conservación de la Naturaleza (ANCON), Box 1387, Panamá 1, Republic of Panamá. ●

ANOLIS CAROLINENSIS (Green Anole). USA: TEXAS: Goliad Co: grounds of Goliad County Courthouse. 28 April 1991. Michael B. Keck & Fred L. Rainwater. Verified by J. R. Mendelson. UTACV R 30069–70. County record (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M University Press. College Station, Texas. 434 pp.)

Submitted by **MICHAEL B. KECK**, Department of Biology, University of Texas at Arlington, Texas 76091, USA, and **PAUL D. KLAWINSKI**, Department of Biology, Stephen F. Austin State University, Nacogdoches, Texas 75962, USA. ●

ANOLIS CHLOROCYANUS (Hispaniolan Green Anole). DOMINICAN REPUBLIC: BARAHONA: Barahona Central. 8 March 1988. Bobby Witcher Memorial Collection (BWMC) 3733, Avila College, Kansas City, Missouri; Barahona, Hotel Guarocuya. 22 May 1989. BWMC 4022; 9.5 km N Barahona, cane fields. 4 March 1990. BWMC 04206–04211; Barahona Central. 15 June 1991. BWMC 4659. R. Powell, J. S. Parmerlee, Jr., D. D. Smith, A. J. Lathrop, and others. Verified by Adrian Nieto. These specimens extend the known range along mesic coastal lowlands south through Barahona, and represent the southeasternmost records of this species, which is widely distributed throughout the "north" island of Hispaniola (Schwartz and Henderson 1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. Univ. Florida Press, Gainesville). The Hotel Guarocuya, on the southern edge of the city of Barahona, apparently represents the current limit of the species' distribution.

Submitted by **ROBERT POWELL, JOHN S. PARMERLEE, JR.**, Department of Natural Sciences, Avila Col-

lege, Kansas City, Missouri 64145, USA, **DONALD D. SMITH**, Division of Allergy & Rheumatism, University of Kansas Medical Center, Kansas City, Kansas 66103, USA, & **AMY J. LATHROP**, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, USA. ●

CROTAPHYTUS INSULARIS VESTIGIUM (Baja Black-collared Lizard). MÉXICO: BAJA CALIFORNIA DEL SUR: 27.7 km (by road) SE San José de Comondú. 9 July 1991. J. A. McGuire & L. L. Grismer. Verified by Richard Etheridge. Los Angeles County Natural History Museum Photograph Collection (LACM PC 1207). Extends known distribution ca. 29 km to southeast. This locality represents the southernmost volcanic mesa of the Magdalena region accessible by road. Previously, it was thought that the distribution of this subspecies terminated ca. 4.1 km (by road) north of San José de Comondú (Smith and Holland 1971. J. Herpetol. 5(1–2):56–59), despite the continuation of suitable habitat to the south. It is likely that *C. i. vestigium* does not inhabit the southern Sierra de la Giganta in the vicinity of San Javier, and that its southernmost distribution is bounded by the volcanic mesas that terminate south of San José de Comondú. Contrary to Stebbins (1985. A Field Guide to Western Reptiles and Amphibians, Houghton Mifflin Co., Boston, Massachusetts. 336 pp.), *C. i. vestigium* is not known from the vicinity of Loreto, which is located on the east side of the Sierra de la Giganta, and has not been collected south of the turnoff to La Purisima (ca. 65 km north of Loreto) on the east side of the peninsular ranges.

Submitted by **JIMMY A. MCGUIRE**, Department of Biology, San Diego State University, San Diego, California 92182–0057, USA. ●

EUMECES OBSOLETUS (Great Plains Skink). USA: MISSOURI: Barry Co: 1.8 mi E Rt. M on Rt. E. 16 August 1991. Kevin R. Toal & Randy Reiserer. KU 218527. Verified by Joseph T. Collins. New county record that extends the distribution southeast from the nearest previously reported Missouri record south of Joplin, Newton County (Powell et al. 1990. Missouri Herp. Assn. Newsl. 3:4–8), and a slight eastern extension of the known range of the species in southwestern Missouri as shown by Conant and Collins (1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston, Massachusetts. 450 pp.).

Submitted by **KEVIN R. TOAL**, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045–2454, USA. ●

SERPENTES

AGKISTRODON PISCIVORUS LEUCOSTOMA (Western Cottonmouth). USA: Kansas: Cherokee Co: ca. 1 mi W Missouri border on Ks. Rt. 96 at Spring River, NW 1/4 of Sec.14, T33S, R25E. 14 September 1991. Shane Eckhardt (KU 218677). Verified by Joseph T. Collins. County record and second record of a native specimen for the state, confirming an earlier record from southeastern Kansas in adjoining Labette County, collected in 1937 (Collins 1982. Amphibians and Reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8:1–356).

Submitted by **JAMES R. TRIPLETT**, Department of Biological Sciences, Pittsburg State University, Pittsburg, Kansas 66762, USA. ●

CLELIA SCYTALINA (NCN). PANAMÁ: PROVINCIA DE CHIRIQUI: Distrito de Gualaca: Cerro Hornito, 8°38'N, 83°49'W. 22 September 1976. F. Crastz. Verified by Jay M. Savage. Museo de Vertebrados de la Universidad de Panamá, MVUP 144. New country record, it partially fills a gap in the distribution of this species. Previously known from México to Colombia (Bailey 1970. pp. 62–64. *In*: Catalogue of the Neotropical Squamata. Part I. Snakes; Pérez-Santos and Moreno 1988. Monogr. Mus. Reg. Sci. Nat. Torino 6:1–517), but no specimens from Panamá were reported. This species occurs in the central and southeastern regions of Costa Rica (Savage and Villa 1986. SSAR Contrib. Herpetol. 3:1–207) and extreme southern Pacific lowland of Colombia (Pérez-Santos and Moreno 1988. op. cit.).

Submitted by **FRANK A. SOLIS**, Círculo Herpetológico de Panamá, Apdo. 10762, Estafeta Universitaria, Panamá, Republica de Panamá, **ROBERTO IBANEZ D.**, Smithsonian Tropical Research Institute, Apdo. 2072, Balboa, Republica de Panamá, and **VICTOR H. TEJERA**, Museo de Vertebrados, Escuela de Biologia, Universidad de Panamá, Republica de Panamá. ●

LAMPROPELTIS CALLIGASTER CALLIGASTER (Prairie Kingsnake). USA: TEXAS: Starr Co: Jct. FM 2089 & Park Road 46 (road to Falcon State Park). 27 April 1991. Michael B. Keck & Paul D. Klawinski. Verified by J. R. Mendelson. UTACV R-30068. Dixon (1987. Amphibians and Reptiles of Texas. Texas A&M University Press. College Station, Texas. 434 pp.) based his Willacy County record on a specimen from the Strecker Museum (SM 8794) collected at Delta Lake on 3 April 1969 (David Lintz, pers. comm.) Delta Lake is in Hidalgo County, and the record for Willacy County should be changed to reflect this. The specimen reported herein is a county record and extends the known range of this species 87 km west of the Delta Lake locality (Dixon 1987. op. cit.)

Submitted by **PAUL D. KLAWINSKI**, Department of Biology, Stephen F. Austin State University, Nacogdoches, Texas 75962, USA, and **MICHAEL B. KECK**, Department of Biology, University of Texas at Arlington, Arlington, Texas 76019, USA. ●

LEPTOTYPHLOPS DULCIS DULCIS (Plains Blind Snake). USA: TEXAS: Goliad Co: Grounds of Goliad County Courthouse. 28 April 1991. Paul D. Klawinski & Michael B. Keck. Verified by J. R. Mendelson. UTACV R-30067. County record (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M University Press. College Station, Texas. 434 pp.)

Submitted by **PAUL D. KLAWINSKI**, Department of Biology, Stephen F. Austin State University, Nacogdoches, Texas 75962, USA, and **MICHAEL B. KECK**, Department of Biology, University of Texas at Arlington, Arlington, Texas 76019, USA. ●

UROMACER FRENATUS (NCN). DOMINICAN REPUBLIC: BARAHONA: 4 km WNW Puerto Alejandro. 9 June 1991. D. D. Smith & R. Powell. Verified by J. S. Parmerlee, Jr. Bobby Witcher Memorial Collection (BWMC) 4495, Avila College, Kansas City, Missouri. This specimen extends the known range north of the Bahía de Neiba and represents the northeasternmost record of the species (Schwartz and Henderson 1991. Amphibians and Reptiles of the West Indies: Descriptions, Distributions, and Natural History. Univ. Florida Press, Gainesville).

Submitted by **DONALD D. SMITH**, Division of Allergy & Rheumatism, Uni-

versity of Kansas Medical Center, Kansas City, Kansas 66103, USA, and **ROBERT POWELL**, Department of Natural Sciences, Avila College, Kansas City, Missouri 64145, USA. ●

VIRGINIA VALERIAE (Smooth Earth Snake) USA: ILLINOIS: Vermilion Co: Kickapoo State Park. 3 May 1991. C. A. Phillips. Verified by Michael Morris. Color slide INHS 1991–1. New county record (Smith 1961. Nat. Hist. Surv. Bull. 28(1):1–298) and range extension ca. 55 km north of record from Parke County, Indiana (Minton 1972. Indiana Acad. Sci. Monog. 3: 1–346).

Submitted by **CHRISTOPHER A. PHILLIPS**, Department of Ecology, Ethology and Evolution, University of Illinois, Urbana, Illinois 61801, USA. ●

CORRECTION

In a previous range extension of *Epipedobates trivittatus* to Venezuela (Gorzula and Balbas 1991. Herpetol. Rev. 22(3):102), the inclusion of Maria Jose Praderio as the identification verifier is in error. The identification of these specimens has not been verified. ●

BOOK REVIEWS

Snakes of Iran, by Mahmoud Latifi. Translated by Sepideh Sajadian and edited by Alan Leviton and George Zug. 1991. Society for the Study of Amphibians and Reptiles, viii + 159 pp. Hardcover. $22 U.S.

The interesting snake fauna of the region west of the Indian subcontinent and south of the USSR is poorly known apart from local studies by Gasparetti in the Arabian peninsula and Mendelssohn and others in Israel. As Director of the Department of Herpetology and Antivenom Studies of Razi Institute, Iran's principal laboratory for serum and vaccine production, Dr. Latifi has had a unique opportunity to study the Iranian snake fauna. In 1985 this led to his publication of "Snakes of Iran," written in Farsi and intended primarily for distribution in Iran. The book is written for the non-specialist Iranian reader and must be judged accordingly, although the editors and translator have modified it for a broader English-speaking audience.

The book is divided into two major sections. The first deals in a general manner with the anatomy and biology of snakes, their distribution and ecology in Iran, venomous snakes, and the symptoms and treatment of snakebite. Most of this is material well known to the average herpetologist, although some has a distinctly local flavor. Recommendations for management of snakebite are generally sound although differing in some details from the protocol usually advocated in the U.S. Throughout this section, the snakes usually are referred to by their colloquial names, so the reader must remember that the Gafari snake is *Echis carinatus* and the ladle snake *Naja n. oxiana*. Literal translation of some Farsi snake names is unfortunate. "Blind snake" to most American herpetologists means a *Leptotyphlops* or *Typhlops* but in Iran it refers to the sand boas, *Eryx*; "wolf snake" is applied to *Lycodon striatus* and *Coronella austriaca*, two quite different serpents.

The second section of the book contains a list of the snakes of Iran, their general distribution, and Iranian distribution by provinces. This is followed by a key to the Iranian snakes. Most of this section consists of species accounts which include description, size, diet, reproduction, and habitat. There is a good general bibliography and a list of some Iranian references not widely available. The list of Iranian snakes reflects best current knowledge, although additional sea snakes such as *Astrotia* and *Praescutata* almost certainly occur along the Iranian coast. The distributional information is valuable; there are topographic and political maps of Iran as well as a small distribution map for each species. The latter often indicate species needing study; for example, *Coluber r. rhodorachis* and *C. r. ladacensis* both are shown as having nation-wide distributions.

I had trouble with the key, for early on I had to decide whether head scales of *Eryx* are smaller than those of most viperids. The species accounts of habits and habitat often are brief, overly generalized, or incomplete, but it must be remembered that many of these snakes are poorly known, and this book provides the only available information about them. The book closes with a supplementary bibliography compiled by the editors and an update of taxonomic nomenclature since the original publication in 1985.

Each species is illustrated by a color drawing, sometimes of the entire animal, in other cases only of the head and forebody. The body conformation depicted sometimes is misleading. *Vipera lebetina* seems a bit too slender for the species as I know it, while *Boiga trigonata* is too stout. The configuration of *Hydrophis cyanocinctus* is poor unless modeled on a very young animal; the head of the adult is smaller and the neck much more slender and elongate. Pattern is well depicted, but the colors are poorly reproduced and appear mostly as shades of gray or brown. I know the colors of many of these snakes as much richer than shown here.

Any herpetologist interested in snakes of the Middle East or in the world snake fauna should have this book, and I recommend it to those interested in the zoogeography of Eurasian reptiles. Physicians or other medical personnel anticipating a tour of duty, military or otherwise, in the Middle East will find useful information on snakes and snakebite. Dr. Latifi has written an authoritative book for a wide audience; one hopes it will be followed by others.

SHERMAN A. MINTON
Department of Microbiology & Immunology
Indiana University School of Medicine
Indianapolis, Indiana 46202-5120, USA. ●

The Frogs of Zimbabwe, by Angelo J. L. Lambiris. Monografia X, Museo Regionale di Scienze Naturali, Torino, Italy, 1989. 247 pp., 24 color plates.70,000 lira, approx. US $58.

Although the frog fauna of Africa pales beside that of South America, students of African frogs have a considerable advantage, a tradition of making these animals and their habits more accessible to specialists and the general public alike. South Africa had its fauna treated technically by Poynton (1964) and subsequently by less technical but more information dense accounts by Wager (1965, 1986) and Passmore and Carruthers (1979). Poynton and Broadley extended Poynton's treatment to cover Zimbabwe and adjacent countries in a series of four technical accounts (1985a, b, 1987, 1988) and laid the groundwork for Lambiris' account of Zimbabwe frogs.

This is neither a technical monograph nor a field guide but somewhere in between. All illustrations are documented

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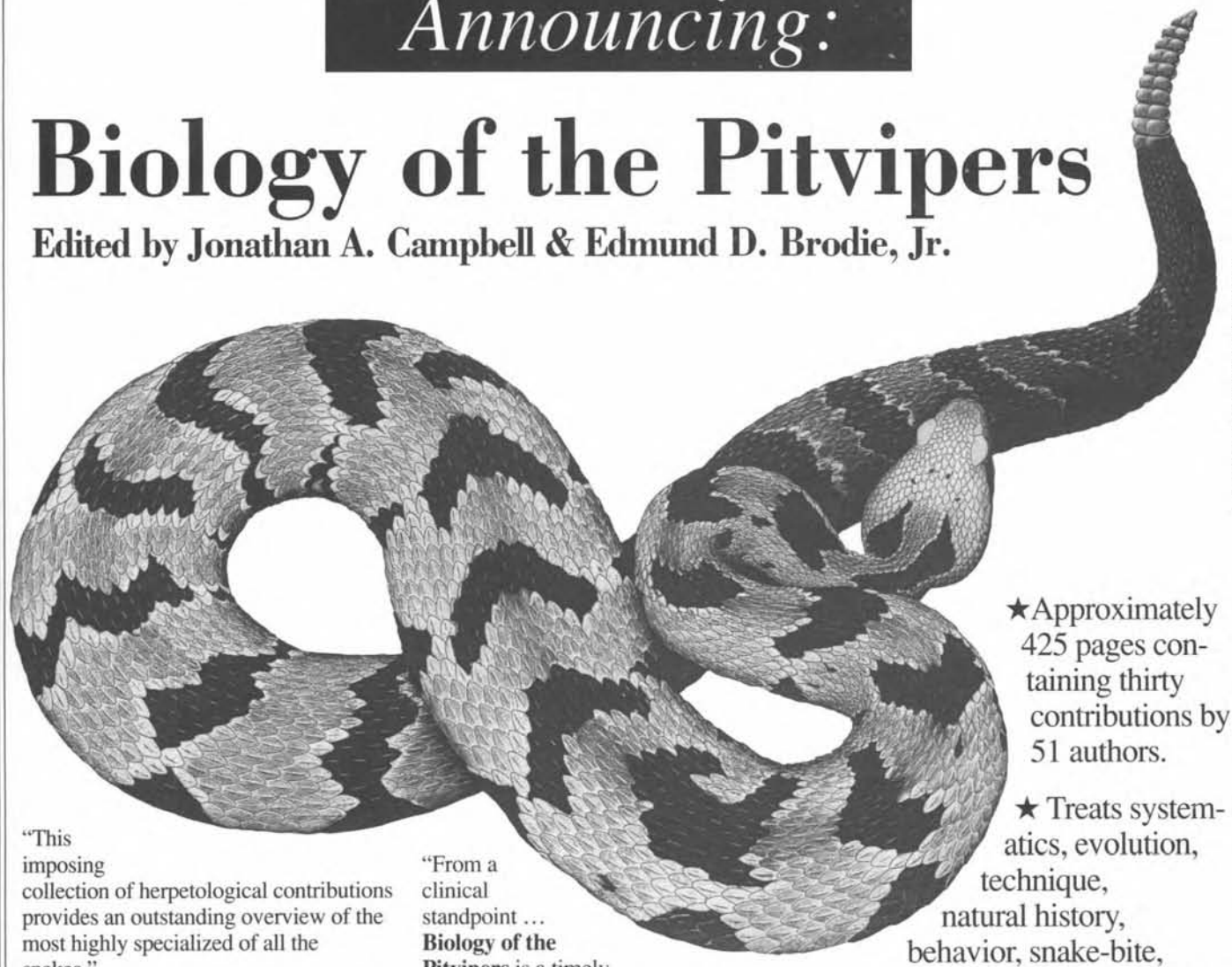


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The cover illustration of a Canebrake Rattlesnake, *Crotulus horridus*, by artist William B. Montgomery, was commissioned especially for **Biology of the Pitvipers**. It is a limited edition etching, hand printed on acid-free archival paper, signed and numbered by the artist. Each impression is individually hand colored by the artist using light-fast watercolors.The 16" x 22" prints will be sold for $100.00 (includes shipping). A special discount of 25% off will be available for a limited time. For more information contact SELVA.

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(of particular specimens whose catalogue numbers and locality data are provided in the legends). The distribution maps do not include dots but rather report distributions by shaded-in areas on the maps. No locality data are provided aside from data in legends and the occasional taxon known from single localities. Call information is reported using everyday language/description rather than using sonograms or quantitative descriptions.

Following introductory materials (in which many drawings are provided showing structures mentioned in the keys and descriptions), mostly about frogs, we are provided the systematic accounts arranged in a traditional "phylogenetic order."

The Zimbabwe fauna consists of pipids (3 taxa), bufonids (9 taxa), microhylids (4 taxa), hemisotids (2 taxa), hyperoliids (19 taxa), rhacophorids (1 taxon), and 29 taxa assigned to the Ranidae (subfamilies Arthroleptinae, Phrynobatrachinae, and Raninae). The familial arrangement and some generic assignments differ from those used by Frost (1985). Each taxon is provided with a brief diagnosis (distinguishing it from other Zimbabwean frogs), description, habitat and behavior, call and call sites, breeding and development, a statement of the distribution of the species or subspecies, and a note regarding similar species (those with which it might be confused). For every taxon, outline drawings of the hand and foot, tadpole (in lateral view), and tadpole mouthparts (when known) are provided. With the limited materials available to me, I found Lambiris' keys and descriptions easy to use and accurate.

Paintings (in color) are provided for 64 of the 67 taxa, using a style which reminds me of many ornithological field guides (the animals are in three quarter view and duplicate outlines are provided to report variation in coloration or color pattern). Only four species are shown in as few as two paintings (ventral view and three quarter view) and *Hyperolius marmoratus broadleyi* is shown in 13 views. Most species are shown in three views (two three quarter and one ventral). Colors compare favorably with published color photographs. All illustrations in the text are the work of the author.

Lambiris' book invites comparison with those of Passmore and Carruthers (1979) and Stewart (1967). All three works deal with comparable faunas except that South Africa has heleophrynids (3), a few more bufonids (13), and several more breviciptine microhylids (11) than do the other regions. Passmore and Carruthers (1979) is more an identification guide than are the other two volumes and it has superb color photographs and many black and white photographs focused on structural features of the organisms. By way of contrast, Stewart's (1967) book has few color photographs and many ink drawings of frogs. Stewart's book provides a great deal of descriptive detail about the frogs. Lambiris' book has a tadpole focus, recalling Wager (1965) for South Africa. The three books treat many of the same taxa but each addresses some endemic taxa. Because they treat the faunas in different ways, each provides an important window to the African fauna.

Lambiris' treatments will be most useful to those with firsthand experience in that part of the world. Reproductive seasons are expressed relative to the onset of rainy seasons without a calender reference. I was frustrated by his expressing the size of animals in terms of the largest individual found (or measured). Frogs reach sexual maturity at some smaller size but fortunately, Stewart (1967) provides these data for Malawi taxa. Although size is indicated in all line drawings, I would have appreciated information on the sizes of tadpoles as well as the size at which various species transform.

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Management of Amphibians, Reptiles, and Small Mammals in North America. R. C. Szaro, K. E. Severson, and D. R. Patton, Technical Coordinators. 1988. Proceedings of a Symposium. USDA Forest Service, Gen. Tech. Rep. RM-166. Formerly out of print, this publication is available again. This volume contains 28 papers dealing with herps. Copies may be obtained at no charge by writing or calling: Publications Section, Rocky Mountain Forest and Range Experiment Station, 240 West Prospect Road, Fort Collins, Colorado 80526, USA, (303) 498-1719, FTS 323-1719.

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"*Herpetological Review* incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of individuals, institutions, literature and other components of the field. Perhaps equally important, the *Review* will provide a means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology, and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. ***HR*** publishes, in English, articles and notes of a semi-technical or non-technical nature, as well as book reviews, institutional features, commentaries, regional and international herpetological society news, research requests of SSAR members, and letters from readers directed to the field of herpetology. Articles reporting the results of experimental research, description of new taxa, or taxonomic revisions are not published in ***HR***; such material should be submitted to the ***Journal of Herpetology*** (see inside front cover for address).

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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (4 issues annually), **Herpetological Review** (4 issues annually), and occasional issues of **Facsimile Reprints in Herpetology**. Members may purchase other Society publications at reduced rates.

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HERPETOLOGICAL REVIEW

Volume 22 September 1991 Number 3

SSAR BUSINESS

SSAR IS LOOKING FOR A FEW GOOD SITES

The SSAR Board and the Joint Local Meetings Committee (shared with the Herpetologists' League) are looking for persons and institutions who are interested in hosting an SSAR Annual Meeting. Although the committee is currently involved in discussions with several institutions, we do not now have any commitments beyond the 1992 meeting in El Paso, Texas.

Although SSAR meetings are no longer small (New Orleans drew 500 in 1990), the reward to host individuals and institutions goes beyond service to the society. A meeting is a good way to gain visibility for a program, and thus to attract future students (many attending herpetologists to take note of facilities, programs, and projects). Whereas ultimate responsibility falls on one or two persons, assistance in planning is available from the society and most institutions, and resources outside the institution include local zoos and regional societies.

Anyone interested in hosting such a meeting should contact the Secretary, J. Eric Juterbock (address on inside back cover). ●

SSAR GRANTS-IN-HERPETOLOGY

Proposals are now being accepted for the 1992 SSAR Grants-in-Herpetology Program. This program is intended to provide financial support for deserving individuals or organizations involved in herpetological research, education, or conservation. In keeping with the Society's goal of encouraging participation by the broadest possible community, preference may be given to individuals who might not have access to other funding sources. All applicants must be members of the SSAR, with the exception of those applying in the REGIONAL HERPETOLOGICAL SOCIETY category. Applicants are limited to submission of one proposal in one category per year. If proposals in any of the categories are not forthcoming, or judged not to be of sufficient quality, the funds in those categories may be transferred to other categories. Grant proposals will be considered in the following categories:

1. REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS. Proposals may address educational projects, speakers' fees, regional research, defrayment of one-time-only costs, or other purposes that would strengthen regional societies. Proposals may be submitted by regional herpetological societies or by individual members and must be accompanied by a letter of support from the current president of the regional society.

2. HERPETOLOGICAL RESEARCH OR EDUCATION IN ZOOS. Proposals may address any herpetological endeavor conducted in zoos, such as improvement of displays, interpretive graphics, husbandry, or behavioral research. A letter of support from the herpetological curator or the director of the sponsoring zoo must accompany the proposal.

3. CONSERVATION OF AMPHIBIANS AND/OR REPTILES. Proposals should address research on species endangered or threatened at the state, national, or international level, or address research on potentially threatened habitats or species. Proposals must be from individuals only and must be accompanied by a letter of support from another member of the SSAR.

4. FIELD WORK. Proposals may address support for travel to ecological study sites or for survey collections. Proposals normally submitted in the CONSERVATION or GRADUATE STUDENT RESEARCH categories should be submitted here if travel or field station support is sought. Proposals must be from individuals only and accompanied by a letter of support from another member of the SSAR.

5. GRADUATE STUDENT RESEARCH IN HERPETOLOGY. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only. Applications must be accompanied by a letter of support from the student's major advisor or committee chairperson.

Each proposal must include the following: (A) BACKGROUND AND OBJECTIVES of the proposed project. (B) METHODS of carrying out the project. (C) COMPLETE PROJECT BUDGET (regardless of whether the SSAR grant will entirely cover expenses). (D) BRIEF RESUMÉ of the applicant or project coordinator. (E) LETTER OF SUPPORT. The proposal must be typed, double spaced, and must not exceed five pages, excluding resumé and budget.

Applicants must designate to which of the five categories their proposal is submitted (although the committee reserves the right to reassign categories). All proposals must be submitted (postmarked) no later than 31 December 1991. Failure to meet the guidelines may result in elimination of a proposal from consideration. The awards will be announced by 1 April 1992. Successful applicants will be expected to submit a written report of the results of this support within a reasonable amount of time after the project year is completed. They are also encouraged to submit the results of research projects for publication in the *Journal of Herpetology* or *Herpetological Review* or to present their findings at the annual meeting of the SSAR. Submit proposals or questions regarding application procedures to:

A. Dale Belcher, Chair (505) 843-7413
SSAR Grants-in-Herpetology
Rio Grande Zoo
903 Tenth St. SW
Albuquerque, New Mexico 87102-4098,
USA

Financial contributions by SSAR members, institutions, and other benefactors support this program significantly and can increase the number and/or size of awards. Your tax-deductible contribution to this program will directly benefit meritorious research and education in herpetology. Contact the Treasurer of SSAR for additional information on contributing to the Grants-in-Herpetology Program. If you are employed by an organization that will match donations made to nonprofit organizations, please notify your employer that you have made a donation to the Grants-in-Herpetology Program. ●

PUBLICATION DELAY

MIDDLE EAST BOOK

The SSAR book, "Herpetofauna of Iraq, Kuwait, and the Arabian (Persian) Gulf," due for publication this summer, will be delayed until late in 1991. Despite our high hopes to produce this book in less than one year after the invasion of Kuwait, the work has been more time-consuming than expected. Nevertheless, as one positive result of the delay, the number of color plates has been doubled, from 16 to 32, and about 80% of the species will now be in full color (210 photos).

Copies of the book can be ordered for $28 clothbound and postpaid in USA. Send orders to Dr. Robert Aldridge, SSAR Publications Secretary, Department of Biology, St. Louis University, St. Louis, Missouri 63103, USA. Further details in Herpetological Review, 21(4): 72, December 1990.

We regret this delay and appreciate the continued patience of the subscribers. — The Editor.

ANNUAL REPORT (1991) OF THE GRANTS-IN-HERPETOLOGY COMMITTEE

Committee: Dale Belcher, Rio Grande Zoo; Maureen Donnelly, AMNH; Tom Fritts, USNM; D. Frost (Chair), AMNH; Jerry Johnson, El Paso Community College; Michael Plummer, Harding University; Dawn Wilson, University of South Florida.

Five awards were made this year of $300 each. These are:

1. Zoo Research or Education (Cecelia Chang Award)—John Steven Conners, Birmingham Zoo, 2630 Cahaba Road, Birmingham, Alabama 35223, USA. Title: An interactive exhibit to interpret reptile thermoregulation at the Birmingham Zoo.

2. Regional Society Programs or Projects—Tucson Herpetological Society, Speaker's Bureau (Travis La Duc and Roger Repp). THS Speaker's Bureau, PO Box 31531, Tucson, Arizona 85751-1531, USA. Project proposal: Request for funds to develop a slide library.

3. Conservation—Glenn Johnson, 224 Illick Hall, SUNY Coll. Environ. Sci. & For., Syracuse, New York 13210, USA. Title of proposal: Conservation biology and spatiotemporal ecology of the eastern massasauga *(Sistrurus catenatus catenatus)*.

4. Field Work—Dwight P. Lawson, Department of Biology, UTA Box 19498, University of Texas at Arlington, Arlington, Texas 76019, USA. Title of proposal: Systematic revision of the *Porthidium nummifer* complex.

5. Graduate Student Research—Karen R. Lips, Department of Biology, University of Miami, PO Box 249118, Coral Gables, Florida 33124-9118, USA. Title of proposal: Metamorphic strategies in a tropical stream-breeding frog *(Hyla lancasteri)*. ●

NEWSNOTES

IUCN SPECIES SURVIVAL COMMISSION ESTABLISHES DECLINING AMPHIBIAN POPULATIONS PROGRAM

During the past several years there has been increasing public concern for the habitat destruction and species extinctions being measured on a global scale. One facet of these universal phenomena is exemplified by reports from biologists of a widespread decline in amphibian populations. Although the amphibian declines are not consistently noted at all locations, nor among all species, their magnitude is undeniable. The significance of these reports is accentuated by certain characteristics of amphibians (e.g. biphasic life cycle, permeable skin, etc.) that provoke a sensitivity of response to varying environmental conditions. Consequently, many species are considered to be early indicators of potentially drastic changes in ecosystems.

Following an international symposium convened by Dr. John W. Wright (Los Angeles County Museum of Natural History) at the annual joint meetings of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, a clear consensus emerged as to the world-wide character of the problem and the need for immediate action. In response to this demand the World Conservation Union (IUCN), Species Survival Commission, activated the Declining Amphibian Populations Task Force with David B. Wake (University of California, Berkeley) as Chair. The focus of this program is to provide a global coordinating center for investigators and agencies concerned with documentation and determination of causes of these declines. It will also identify priorities for research on indicator species in critical habitats. An inherent component of these objectives will be the prescription of uniform protocols by which studies of different species and habitats can be compared.

Overseeing the activities of the Task Force will be a Board of Directors, having international representation, that will act within the fabric of the IUCN/SSC. This directorate is responsible for establishing policies, determining priorities and raising funds necessary for the Task Force endeavors. A Coordinating Council will serve as the operational unit for the program. Participants on the Coordinating Council will include researchers, liaison officers of societies and agencies, and others, all of whom serve as communicators for the Task Force. Among its functions will be the collating of all available information, establishing a computerized data base, and setting up a global monitoring program with electronic input and access (these collectively representing what is popularly referred to as the "FROGLOG"). A newsletter will be issued at frequent intervals and distributed to all interested parties.

Managed by a Coordinator with staff support, it is anticipated the Council will be situated in its new headquarters at the Center for Analysis of Environmental change in Corvallis, Oregon by September. James L. Vial, who will be departing from the University of Tulsa, has been appointed as Coordinator.

The Coordinator will also work with the directorate to establish regional Working Groups of independent scientists and technical personnel. The Working Group for Costa Rica/Panama, recently convened

by Jay M. Savage (University of Miami), has been organized with a scientific advisory committee composed of consultants for the project and chaired by the principal investigator.

A project coordinator will oversee the gathering, standardization, and management of all data and is responsible for logistical operations among the several included study sites, each of which is in the charge of a site coordinator. This suggested model should, of course, be modified as suited to the needs of a particular group or project. In addition to field activities, other Working Groups will formulate protocols and facilitate symposia or workshops.

The IUCN/SSC invites persons and organizations interested in the DAP program to correspond with the Task Force Coordinator. In the near future we hope to provide a full-time, full-service operation to all those involved with species conservation and biodiversity. We are immediately concerned with the establishment of a universal communications network and would appreciate any expression of interest on the part of persons who might volunteer service as a communicator. The address, effective September 1, 1991, is:

James L. Vial, Coordinator
DAP Task Force
Species Survival Commission, IUCN
c/o Environmental Research Laboratory
Center for Analysis of Environmental Change
200 SW 35th St.
Corvallis, Oregon 97333, USA ●

JOB ANNOUNCEMENT

Six seasonal technician positions with the Missouri Department of Conservation will be available from 1 February to 15 October 1992. Technicians will construct herp arrays and collect Ozark forest herpetofauna caught in arrays. Work will include marking herpetofauna for possible recapture. This research is part of a larger project to examine the effects of even- and uneven-aged forest management on Ozark forest plant and animal communities. The pay is $4.69/hour for 40 hours per week. Housing, utilities, and vehicles in Ellington, Missouri will be provided. To receive an official application, please send cover letter and resumé to Dr. Rochelle B. Renken, Missouri Department of Conservation, Wildlife Research Center, 1110 South College Avenue, Columbia, Missouri 65201, USA or call (314) 882-9880. Interviews will be conducted by phone or in person. Applications must be received by 1 November 1991. ●

ATTENTION OVERSEAS MEMBERS

Announcements for the 1992 SSAR Meeting in El Paso, Texas will not automatically be mailed to overseas addresses. Overseas members wishing to receive an announcement (including the call for papers) must contact either of the meeting co-chairmen:

Carl S. Lieb
Department of Biological Sciences
The University of Texas at El Paso
El Paso, Texas 79968-0512, USA
(915) 747-5844
or
Jerry D. Johnson
Biology Department
El Paso Community College
P.O. Box 20500
El Paso, Texas 79998-0500, USA
(915) 594-2214

●

INFORMATION REQUEST

The Milwaukee County Zoo is trying to locate living specimens of yellowfoot tortoise *(Geochelone denticulata)* with a carapace length of over 45 cm. Please send any information to:

Richard A. Sajdak
Aquarium/Reptile Curator
Milwaukee County Zoo
10001 W. Bluemound Rd.
Milwaukee, Wisconsin 53226, USA
(414) 771-3040 ●

MEETINGS

CHINA HOSTS ASIAN HERPETOLOGICAL MEETING 1992

The Asiatic Herpetological Society, the Chinese Society for the Study of Amphibians and Reptiles (CSSAR), the China Amphibian, Reptile Specialist Group of Species Survival Committee of I.U.C.N., and the 3rd Sino-Japanese Herpetological Symposium co-sponsored by the Japanese Herpetological Society and CSSAR will hold a joint meeting in Anhui Province, China during July 1992.

This announcement invites members of these societies and other interested individuals to attend the meeting and present papers or posters dealing with the following general topics:

1. The biology and conservation of Asian turtles and tortoises.
2. The biology and conservation of giant salamanders of the genus *Andrias*.
3. The biology and conservation of the Chinese alligator.
4. Herpetological studies of the Himalayas and adjacent regions.
5. Herpetological studies of arid central Asia.
6. Herpetological studies of Asian islands.
7. Tropical Asian herpetological studies.
8. The biology and conservation of Asian amphibians and reptiles in general.
9. Venomous snakes and snake bite treatment in Asia.
10. The captive reproduction of Asian amphibians and reptiles.

The meetings will be held in Huangshan City (formerly Tunxi), Anhui Province, China from 15 July to 20 July 1992. The name of the city, Huangshan, means Mount Yellow, named after the famous mountain near the city. Huangshan Mountain is a United Nations human cultural estate. Anhui Province, located in eastern China, is of great herpetological interest. About 100 species of amphibians and reptiles, including the Chinese alligator and the Chinese giant salamander, occur in the Province. Excursions will be arranged to observe and photograph the Chinese Alligator Research and Reproduction Center. This is the only center in China for conserving this endangered species. There are more than 3000 Chinese alligators at the center, among which over 200 are second generation. Additional excursions will be arranged to visit natural habitats and cultural sites in the Province.

Individuals interested in attending the meeting should write to the following addresses for additional information and to register and submit abstracts:

In China
Dr. Huang Jie-tang
Qimen Institute of Snake Bites
Qimen, Anhui Province, China

In Japan
Dr. Richard Goris
Yokohama City University
School of Medicine
Fukuura 3-9, Kanazawa-ku
Yokohama, 236, Japan

In USSR

Dr. Ilya Darevsky
Zoological Institute
Leningrad, USSR

In USA and all other countries

Dr. Theodore J. Papenfuss
Museum of Vertebrate Zoology
University of California
Berkeley, California 94720, USA

TIMBER RATTLESNAKE SYMPOSIUM: CONSERVATION AND MANAGEMENT

The Massachusetts Audubon Society is sponsoring a one-day symposium on the conservation of the Timber Rattlesnake *(Crotalus horridus)* in the northeast. A petition to the U. S. Fish and Wildlife Service to list the New England, New York, and New Jersey populations as federally endangered will be included in the discussion. The meeting is set for Saturday, December 7 from 9 a.m. to 4 p.m. and will be held at Smith College in Northampton, Massachusetts, USA. Registration is $15 per person. For details, send a SASE to: Rattlesnake Symposium, Massachusetts Audubon Society, South Great Road, Lincoln, Massachusetts 01773 USA.

REGIONAL SOCIETIES

USSR HERPETOLOGICAL SOCIETY

In January 1991, Soviet herpetologists established their first official national herpetological organization, at a meeting held in Pushchino (Moscow region). The society encompasses both professional and amateur herpetologists and is intended to encourage progress in research and conservation. It will also serve as a formal means of communication between Soviet herpetologists and other national groups. Membership is open to all herpetologists. Address the Council Secretary, USSR Herpetological Society: Dr. Tatyana M. Sokolova, Zoological Institute, Academy of Sciences, 199034 Leningrad, USSR.

NEW VETERINARY ORGANIZATION

Veterinarians, veterinary technicians, and veterinary students with an interest in herpetological medicine are invited to join the Association of Amphibian and Reptile Veterinarians (AARV). The AARV is a new organization devoted to improving husbandry and medical care for amphibians and reptiles through education and exchange of ideas among veterinarians and herpetologists. The founders of the AARV are Thomas H. Boyer, D.V.M., of Deer Creek Animal Hospital in Littleton, Colorado and Michelle W. Frahm, D.V.M., of the Gladys Porter Zoo in Brownsville, Texas.

Membership includes subscription to the Association's official publication, *Association of Amphibian and Reptile Veterinarians Newsletter,* the first issue of which is planned for the summer of 1991. The Newsletter will include a forum for exchange of clinical experiences, reviews of current herpetological literature, and original articles on herpetological medicine and captive husbandry.

Membership in the association is limited to veterinarians, veterinary technicians, and veterinary students. Non-veterinarians are welcome to subscribe and participate in the newsletter but are not eligible for membership.

An organizational meeting of the AARV will take place during the annual conference of the Association of Avian Veterinarians in Chicago, Illinois, September 23-28, 1991.

To apply for membership or to subscribe to the newsletter send a letter with your name, address, telephone number, educational degrees, occupation, and primary interests along with a check payable to AARV for $20.00, to: AARV, c/o Michelle Frahm, D.V.M., Gladys Porter Zoo, 500 Ringgold Street, Brownsville, Texas 78520, USA.

ADDRESS CHANGE

The Pro Iguana Verde Foundation has changed its mailing address to:

Apartado 692-1007
San Jose, Costa Rica

Telephone and fax numbers remain the same:

Tel.: (506)31-6756
Fax: (506)32-1950

LEGISLATIVE ALERT

This column is produced by the SSAR Conservation Committee to alert members of the herpetological community to recent and proposed regulatory changes involving amphibians and reptiles. We encourage SSAR members to notify us of any significant changes in state, national, or international conservation laws as they relate to these animals. For further details about any of the following, or to report additional changes, please contact Kurt A. Buhlmann (see inside front cover for address).

The following final and/or proposed listings, regulations, and general information have been announced by governmental regulatory agencies. Pertinent Federal Register (FR) citations are given for U.S. notices.

U.S.A.: *Bufo hemiophrys baxteri* (Wyoming Toad). The federally Endangered Wyoming Toad historically inhabited a 78 km^2 area around Laramie, Wyoming, but now occupies only about 5 km^2. The Nature Conservancy acquired habitat containing the only known population in January 1991. The U.S. Fish and Wildlife Service is preparing a draft environmental assessment for a proposed 1,000 ha national wildlife refuge that would encompass all the toad's known habitat (Endangered Species Tech. Bull. 16(4), 1991).

Massachusetts: On 17 December 1990, the Massachusetts Legislature enacted a strong endangered species protection law. This law will be implemented in January 1992. The most significant component of the new law is the protection provided to habitat for endangered species. For more information contact Henry Woolsey, Coordinator, Massachusetts Division of Natural Heritage and Endangered Species Program.

Florida: As of 1 July 1990, Florida requires all persons who buy or sell live native (Florida) herptiles, to report their transactions four times per year. In addition, persons who buy for resale the carcass, skin, meat, or other body parts of Florida herptiles, except alligators, must obtain a no-cost Amphibian and Reptile Product Dealer's (ARD) Permit and report their transactions. For information and forms contact Florida Game and Freshwater Fish Commission.

Mississippi: New regulations (Public Notice 3071, effective 7 October 1990) regarding commercialization of reptiles and

amphibians. All native reptiles and amphibians in Mississippi are now covered by regulations regarding take. Take for personal use (for species not listed Endangered) requires a small game hunting and fishing license for Mississippi residents ($9) and an all game hunting license for non-residents ($150). Limits on possession are no more than 4 individuals of any one species, and a maximum of 20 reptiles and 40 amphibians. Wild-caught specimens cannot be bought or sold; this includes species which occur in Mississippi but were captured in another state. Captive propagators must be permitted by the state and are subject to inspection at any time. Captive propagators are allowed to take no more than 8 individuals of a reptile species and 16 individuals of an amphibian species from wild populations for breeding stock. For further information contact Robert L. Jones, Nongame Research Section, Mississippi Dept. of Wildlife, Fisheries, and Parks.

KURT A. BUHLMANN
SSAR Conservation Committee

FEATURES

FEEDING ECOLOGY OF SPADEFOOTED TOADS (*Scaphiopus couchi* and *Spea multiplicata)* IN WESTERN TEXAS

Although information is available on the feeding ecology and dietary preferences of many species of North American anurans (Inger and Marx 1961), similar information for spadefooted toads is conspicuously lacking (Ruibal et al. 1969; Toft 1985). Bragg (1965) provided some qualitative information on the feeding habits of this group which indicated that they fed largely on ground-dwelling arthropods. In view of the recent interest concerning competition and resource partitioning in reptiles and amphibians (see review by Toft 1985), the present study was conducted in order to provide information on the dietary preferences of the spadefooted toads, *Scaphiopus couchi* and *Spea multiplicata,* from western Texas. No quantitative information is currently available concerning the feeding ecology of these sympatric species.

All animals were collected April through September, 1988. The study area was located within a 20-km radius south to southwest of Marathon, Brewster Co., Texas (the center of the radius was located at 103°13'30"W, 30°11'21"N). The area was bordered by the Pena Colorado Creek to the west and State Highway 385 to the east. Several springs and numerous artificial impoundments provide permanent water. Temporary shallow ponds were found at various locations throughout the area following intermittent rains in April and July. This area is within the Marathon - Alpine Grassland habitat zone (elevation 1333 - 1667 m) as described by Sperry and Warnock (1941). Dominant vegetation consists of grama and chino grass (*Bouteloua* spp.), awn grass (*Aristida*), muhly grass *(Muhlenbergia),* javelina bush (*Condalia ericoides*), squaw bush (*C. spathulata*), and juniper (*Juniperus monosperma*). The soils of this region range from sandy to rocky.

Toads were located and collected at night using a variety of techniques including: (1) pitfall traps, as described by Punzo (1990); (2) road cruising along State Highway 385 as well as several dirt roads throughout the area; (3) on foot, through the use of head lamps; (4) drift fences as described by Huey and Pianka (1983). Time, place of capture, SVL and sex were recorded for each animal and individuals were marked by toe-clipping as reported by Martof (1953) and released for future demographic studies. Pitfall traps were checked at hourly intervals.

Stomach contents were obtained from anaesthetized toads within 8 h of capture using the stomach-flushing technique described in detail by Legler and Sullivan (1979). The stomach contents for each toad were placed in individual glass vials containing 80% ethanol for later identification. Prey items were identified to order and family, depending on the stage of digestion. The information obtained for stomach contents reported in this study represents data from different individuals (no recaptures). For each prey item, length (a) and width (b) were measured to the nearest 0.01 mm (excluding legs and antennae) and volume was determined according to the formula for the volume (V) of a prolate spheroid (Dunham 1983): $V = 4/3\ (a/2)(b/2)^2$. Dietary niche overlap (D) was calculated according to the method of Floyd and Jenssen (1983).

The results for the stomach content analyses are listed in Table 1. An ANOVA (Sokal and Rohlf 1981) showed no overall significant differences as a function of sex ($p > 0.45$) or season ($p > 0.37$). The major prey types during spring and summer months for both species, as indicated by % volume, were beetles (Coleoptera, 33.6 - 34.2%), ants (Formicidae, 16.4 - 21.3%), orthopterans (9.8 - 12.8%), unidentified insects (8.1 - 13.9%) and spiders (8.8 - 13.4%). Termites (Isoptera) comprised a significant proportion of the diet (12.1 - 13.5%) during the spring but decreased markedly (3.4 - 4.2%) during summer months ($p < 0.01$, Two Sample Means Test, assuming unequal variance, Sokal and Rohlf 1981), reflecting differences in the seasonal activities and abundance characteristic of desert termites (Punzo 1974). Nocturnal representatives of arthropods with well known chemical defenses that were commonly found in the study area, such as blister beetles (Meloidae), velvet ants (Mutillidae), stink bugs (Pentatomidae), and millipedes, were not found in any of the stomachs examined. A few centipedes and scorpions were found in the stomachs of *S. multiplicata.* This may be related to the observation that *S. multiplicata* appeared to be more common on rocky substrates which provide more suitable microhabitats for scorpions and centipedes. The data in Table 1 indicate that *S. couchi* and *S. multiplicata* have very similar diets. This is supported by the results found for niche overlap (D = 0.82) which indicate a high degree of dietary overlap between these two species.

The results of this study indicate that although *S. couchi* and *S. multiplicata* are generalized arthropod predators, beetles, orthopterans, ants, spiders, and termites (spring) collectively comprise 82.1 - 93.8% of their total diet. It is well known that the mutual use of similar resources by sympatric species may indicate a potential for competition (Jones 1982). Although overlap is not necessarily proportional to the intensity of competition (Dunham 1983), the high degree of dietary overlap between these two species suggests the potential for interspecific competition. Most amphibians and reptiles exhibit some degree of food partitioning (Schoener 1968) and yet there was little evidence of this in these spadefooted toads. This suggests that competition for food was relatively unimportant in this area over this period of time. The prey of most frogs can be divided into two main categories (Toft 1985): (1) ants and other slow-moving, chitinous arthropods, and (2) all other types. It has also been shown that ants constitute a significant if not dominant component of the diet in many species of bufonids, dendrobatids, and other anurans (Inger and Marx 1961; Toft 1980). This is not true for *S. couchi* and *S. multiplicata,* although

Table 1. Stomach content analyses for *Scaphiopus couchi* (N = 367) and *Spea multiplicata* (N = 293). Data represent different individuals (no recaptures). The results are expressed as number of prey (N), frequency (F, percent of toad stomachs containing a particular prey item), and percent volume (V). There were no significant differences in dietary composition between sexes for both species.

	S. couchi (N = 367)[2]						S. multiplicata (N = 293)[3]					
	Spring[4]			Summer			Spring			Summer		
Prey Taxon[1]	N	F	V	N	F	V	N	F	V	N	F	V
Coleoptera												
Carabidae (A)	492	92.4	14.2	157	87.6	12.4	332	90.8	13.7	194	83.1	13.3
Cicindelidae (A)	41	17.4	2.4	23	16.1	2.1	34	19.4	1.9	23	18.6	2.2
Elateridae (A)	8	3.5	0.6	6	4.1	0.5	7	3.4	0.5	5	4.2	0.3
Lampyridae (A)	7	3.1	0.2	4	2.7	0.3	2	1.1	0.1	0	0	0
Scarabaeidae (A)	51	22.7	7.4	25	17.4	8.1	40	21.1	8.7	24	17.7	9.2
Silphidae (A)	10	4.4	0.2	7	4.8	0.3	6	3.4	0.3	7	5.9	0.2
Tenebrionidae (A)	17	7.1	2.2	7	4.9	2.4	5	2.8	2.4	6	5.1	1.9
Unidentified (A, L)	32	9.8	6.9	13	9.1	8.1	11	5.1	6.0	16	11.8	4.0
Diptera (A)	7	3.1	0.7	4	2.7	0.5	4	2.3	0.4	3	2.5	0.3
Hemiptera												
Coreidae (A, N)	8	3.5	0.6	5	3.4	0.4	5	2.8	0.4	6	5.1	0.3
Miridae (A, N)	2	0.8	0.1	0	0	0	0	0	0	1	0.8	0.1
Reduviidae (A, N)	11	4.5	0.3	7	4.8	0.2	7	4.0	0.2	8	6.7	0.2
Unidentified (A, N)	6	2.6	0.2	4	2.7	0.1	4	2.2	0.2	2	1.6	0.2
Homoptera (A , N)	3	1.3	0.5	2	1.3	0.7	0	0	0	2	1.6	0.1
Hymenoptera												
Formicidae (A)	806	99.1	16.4	486	99.3	21.3	595	97.7	20.3	342	99.1	20.7
Isoptera (A)	1164	88.3	12.1	419	21.6	4.2	787	82.2	13.5	27	20.3	3.4
Lepidoptera (A)	53	17.4	2.7	27	16.7	2.6	15	8.5	1.3	4	3.3	3.4
(L)	11	4.4	1.8	4	2.7	1.1	6	3.4	2.1	3	2.5	1.7
Orthoptera												
Acrididae (A, N)	33	14.7	6.1	24	15.3	5.7	27	13.7	4.4	18	15.2	7.1
Gryllidae (A, N)	43	17.8	3.5	25	14.6	4.2	31	13.7	4.1	17	12.7	3.7
Polyphagidae (A)	31	12.9	1.7	17	11.1	2.1	20	10.2	1.3	14	11.8	1.9
Tettigoniidae (A)	3	1.3	0.4	0	0	0	0	0	0	1	0.8	0.1
Unidentified Insecta	81	35.2	9.5	54	37.7	13.9	61	31.4	8.1	47	33.8	12.0
Chilopoda	0	0	0	0	0	0	5	2.8	0.2	4	3.3	0.2
Arachnida												
Scorpionida	0	0	0	0	0	0	0	0	0	2	1.6	0.1
Araneae	81	31.6	9.3	60	37.7	8.8	61	29.1	9.9	37	27.9	13.4

[1] Prey categories : A (adults) , N (nymphs) , L (larvae) .
[2] Number collected during spring months = 224 ; summer = 143 .
[3] Number collected during spring months = 175 ; summer = 118 .
[4] Spring (April 2 - June 20) ; Summer (June 21 - Sept. 15)

ants are consumed in moderate proportions.

Future studies should investigate possible differences in microhabitat preferences and seasonal activity patterns. In addition, it would be valuable to study dietary preferences and diel activity patterns in allopatric populations and then extend these studies to other pelobatid species.

ACKNOWLEDGMENTS

I wish to thank T. Punzo and J. Bottrell for their assistance in the field, and T. Snell and anonymous reviewers for helpful comments on the manuscript. I am grateful to D. McCarty for access to private property and B. Garman who provided assistance on statistical analyses. A Faculty Development Grant and sabbatical leave from the University of Tampa made much of this work possible.

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IDENTITY OF THE GARTER SNAKE *Thamnophis sumichrasti cerebrosus* SMITH

Among the garter snake names that have defied easy allocation is *Thamnophis sumichrasti cerebrosus*, which was described originally by Smith (1942) on the basis of three specimens from Guatemala. The female holotype (USNM 12734) and male paratopotype (USNM 12753) were collected at Esquintla by H. J. Stuart; a male paratype (FMNH 410) bears no locality data more precise than "Guatemala." No additional specimens have come

to light since the description, and *T. s. cerebrosus* has been treated variously as a synonym of *T. fulvus* (Stuart 1963; Rossman 1970 — both by implication), as a subspecies of *T. cyrtopsis* (Rossman 1971), or as a synonym of *T. marcianus* (Webb 1982). Clearly, the identity of this nominal taxon is far from settled.

Unlike his predecessors, Webb (1982) gave a detailed redescription of the type series of *cerebrosus*, and he provided the first photographs of the holotype and paratopotype. Rather than repeat his descriptions here, I will merely point out a few differences I observed, and will provide data on several pertinent features that Webb did not discuss. For the holotype, I recorded 66 (rather than 67) subcaudals and 23 (vs. 22) maxillary teeth; I clearly saw the lateral stripe on dorsal scale rows 2 and 3 (vs. not recognizable), and observed short and narrow black bars preceding the posterior margin of supralabials 2-5 (vs. 4 and 5). The male paratopotype appears to have 146 (vs. 149) ventrals and unmarked supralabials (vs. faint bars on 4 and 5). Although not reported by Webb (1982), this specimen, like the holotype, has 23 maxillary teeth. The other male paratype (FMNH 410) appears to have 78 (rather than 79) subcaudals and, to my eyes, lacks distinct supralabial markings save for a very narrow black bar lying along the posterior margin of supralabial 5 (the epidermal scales are missing and the animal is too discolored by preservative to state with any degree of certainty that 6 and 7 were the same color in life as the temporals). This animal possesses 22 maxillary teeth.

Webb (1982) concluded that the holotype was assignable to *Thamnophis marcianus praeocularis* (on the basis of vertebral stripe width and ventral pattern) with a tendency in ventral pattern toward *T. m. bovalli*. He opined that the two male paratypes differed too much from the female holotype and from each other (and, presumably, from *T. marcianus*), to permit allocation without further study.

The width of the vertebral stripe in the holotype of *cerebrosus* may be similar to that of *T. m. praeocularis*, but the holotype has too few maxillary teeth (23 vs. 27-31), too many ventrals (142 vs. 134-138), and too short a tail (21.6% of total length vs. 24.8-26.8%) to belong to that taxon. In these three specific features, the holotype more closely resembles members of the Tehuantepec population of *T. m. marcianus*. Such an association would also make more sense zoogeographically (*praeocularis* being confined to the Caribbean versant), except that I am not convinced this specimen (any more than the male paratypes) is a *Thamnophis marcianus* of any kind. All three lack any trace of the unique head pattern characteristic of all *T. marcianus* (see Rossman 1971, fig. 2) — including USNM 108598-599 from Aquacate, Chiapas. Moreover, the holotype of *cerebrosus* has a broad muzzle tip (internasorostral contact/nasorostral contact = 137.5%), whereas the muzzle tip is relatively narrow in female *T. marcianus* throughout the range of that species (pers. obs.).

If not a *T. marcianus*, what is *cerebrosus?* Assuming the locality data to be accurate, the only *Thamnophis* species known to occur in the Pacific versant of Guatemala are *T. fulvus* (Webb 1982) and *T. proximus* (UTACV R24817, R26339; unpublished records, courtesy of J. A. Campbell). Another garter snake, *T. cyrtopsis collaris*, which ranges into the interior valleys of Guatemala from Chiapas, México (Webb 1982), must also be considered. All three taxa can be eliminated easily. The lateral stripe is on rows 3 and 4 in *T. proximus*, which also has far more subcaudals (82-98 in females from southern México and Central America; Rossman 1963) and more maxillary teeth (27-34; Rossman 1963). Specimens of *T. cyrtopsis collaris* from southern México and Guatemala also have far more subcaudals (86-92; Webb 1982) and more maxillary teeth (25-28; unpublished data). Finally, *T. fulvus* has an indistinct vertebral stripe and more maxillary teeth (27-30; unpublished data). Moreover, all three of these species usually have eight supralabials, whereas *cerebrosus* has but seven (the six in the male paratopotype appears to represent a fusion of supralabials 4 and 5).

What then can we conclude? Either *cerebrosus* represents a valid taxon, presumably isolated in the foothills on the Pacific versant of Guatemala, or the locality data for all three specimens are inaccurate. At this point, I cannot conclude which alternative is correct, but I feel it is important that the uncertain status of *cerebrosus* be brought to the attention of the herpetological community. Our classification might be more "tidy" if *cerebrosus* were left buried in the synonymy of *T. marcianus*, but to do so would only perpetuate this case of mistaken identity. Perhaps by focusing light on this enigma, someone will be encouraged to conduct fieldwork that might finally resolve the matter.

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BEHAVIOR OF HATCHLING DIAMONDBACK TERRAPINS *(Malaclemys terrapin)* RELEASED IN A SOUTH CAROLINA SALT MARSH

Aspects of the ecology and demography of diamondback terrapins *(Malaclemys terrapin)* have been published for populations in Delaware (Hurd et al. 1979), New Jersey (Montevecchi and Burger 1975), Florida (Seigel 1984), South Carolina (Lovich and Gibbons 1990), and Louisiana (Cagle 1952). However, as in most turtle species, very little is known regarding the behavior and ecology of juveniles. Studies of reproductive ecology (Burger 1976, 1977; Burger and Montevecchi 1975; Montevecchi and Burger 1975; Seigel 1980) and hatchling emergence behavior (Burger 1976) have documented the first few weeks of a terrapin's life, but from the time that a hatchling enters the water to approximately the time of sexual maturity, little is known about wild *M. terrapin*.

We have studied a population of *M. terrapin* in Charleston Co., South Carolina since 1983 (Lovich and Gibbons 1990). Like previous investigators (Coker 1906; Hurd et al. 1979) we were intrigued by the

absence of hatchling and juvenile terrapins (0-3 yrs of age) in our sample of over 670 marked individuals, despite repeated efforts to locate them using a variety of collecting techniques.

The objective in this study was to observe the behavior of artificially incubated *M. terrapin* following release into the wild. It was hoped that their behavior would provide clues as to where these animals spend their first few months of life after leaving the nest.

MATERIALS AND METHODS

Nineteen eggs were removed from three *Malaclemys terrapin* nests on Kiawah Island, South Carolina on 21 May 1990. The nests were located on exposed sand dunes with sparse vegetative cover *(Uniola paniculata)* along the Kiawah River. The eggs were returned to the Savannah River Ecology Laboratory (SREL) for incubation at either 27° or 30°C as part of a larger study of terrapin ecology (see Lovich and Gibbons 1990). Eight eggs hatched in late July, 1990. The hatchlings were maintained in an aquarium at SREL, unfed due to the presence of large yolk sacs, for one week prior to being released on Kiawah Island. The mean straightline carapace length (CL) of the hatchlings was 33.4 mm (SD = 1.5 mm, range 32-36 mm). A single individual (36 mm CL) from a clutch hatched in October of the previous year was included in the experiment.

The nine hatchlings were released on 22 August in the salt marsh across the Kiawah River from the nest sites. The release points were located along the shoreline of a small (600 m^2) island in the marsh known to have concentrated nesting activity. The island sustains a few pines *(Pinus taeda)*, live oaks *(Quercus virginiana)* and palmettos *(Sabal palmetto)*, but a dense cover of *Spartina patens* predominates. The marsh around the island is composed of dense to sparse stands of *Spartina alterniflora* that are exposed at low tide. The habitat around the immediate perimeter of the island where the hatchlings were released is the "short *Spartina* high marsh/*Salicornia—Distichlis* marsh" described by Teal (1958). The behavior of each hatchling was monitored by a pair of observers for one hour after being released in the water within 1-2 m of the shoreline or on the island. Releases occurred at 1200 h.

RESULTS

All hatchlings displayed a general avoidance reaction to open water and swam toward shoreline vegetation even when observers were standing on the shoreline in direct view of the animals. The orientation of release, relative to the sun, did not appear to influence this behavior; hatchlings swam toward shore when released on both north and south sides of the island. In addition, upon encountering beached mats of tidal wrack (*Spartina* stems) terrapins immediately burrowed into the mat by pushing the stems apart with their forelimbs. This behavior was remarkably consistent and was repeated by the same animal even when it was pulled out of the mat and allowed to choose again between burrowing and some alternative behavior. Hatchlings released facing away from the island also turned and swam directly toward the shoreline. Hatchlings released on the island within one meter of the line of tidal wrack moved in the direction of the wrack and burrowed. Burrowing behavior always occurred in the tidal wrack at the high tide line. No terrapins were observed to venture beyond this microhabitat into the dry interior of the island.

DISCUSSION

Most hatchling *Malaclemys terrapin* emerge from the nest during the daytime, 1-9 days after hatching (Burger 1977) and move toward the closest terrestrial vegetation. This behavior is consistent regardless of the direction of incline in the terrain (Burger 1976). The apparent negative phototaxis exhibited by this species following emergence may be selected for because of high diurnal predation by shore birds (Burger 1976). In contrast, several other turtle species exhibit positive phototaxis (Anderson 1958), heading straight for the water following emergence from the nest. After entering the water terrapins are rarely seen until they attain sexual maturity some 3-6 yrs later (Lovich and Gibbons 1990).

The only published information on the microhabitat of juvenile *M. terrapin* during the active season is given by Pitler (1985). He observed juveniles with shell lengths ranging from 25-75 mm hiding under "accumulated surface debris and matted *Spartina* grass" in a New Jersey "tidal mud flat." He made 12 observations between 30 May 1979 and October, 1981. Several observations were made of terrapins hiding under rocks, boards, and a low growing *Vaccinium* bush. Lawler and Musick (1972) discovered a 54 mm CL terrapin hibernating in moist sand eight meters from the high tide mark at a depth of about 0.3 m on 7 November 1967 in Virginia. The same individual was periodically uncovered until 23 April the following year to determine depth of hibernation. Vertical and horizontal movements of 2-8 cm were observed.

Our preliminary observations and those of Pitler (1985) both suggest that young *M. terrapin* seek the underside of dense mats of vegetation. We suspect that small terrapins do this for several reasons. First, the tidal wrack and flotsam provide an abundant source of cover to terrapins at sizes when they are highly susceptible to predation by aquatic and terrestrial predators. Second, since the cover accumulates at the high tide line it is the nearest source of periodically flooded microhabitat to the nest site. Third, in addition to providing moist conditions, the summer temperatures under the debris are well below those of the surface outside the mat (pers. obs.). Fourth, numerous small invertebrates are found beneath the mats, providing a potential source of food for young terrapins. Allen and Littleford (1955) noted that newly hatched terrapins were rather indiscriminate in their initial food habits but preferred shellfish and snails *(Littorina irrorata)*. Our observations have revealed high concentrations of small fiddler crabs (*Uca* spp.), square-backed crabs (*Sesarma* spp.), marsh periwinkles *(Littorina irrorata)* and miscellaneous small insects and amphipods under the *Spartina* mats, all potential food items for young terrapins.

Although it seems logical that hatchling and juvenile terrapins might spend their early years under mats of debris in the marsh, we have been unable to locate these smaller individuals despite intensive searches. It is possible that smaller size classes exist at very low numbers due to heavy predation. Although juvenile habitat preferences can only be identified by more thorough behavioral studies, these limited observations do provide evidence that hatchling *M. terrapin* are not averse to temporarily utilizing the microhabitat beneath tidal wrack.

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OBSERVATIONS OF FORAGING BEHAVIOR IN CAPTIVE JUVENILE *Alligator mississippiensis*

Due to largely nocturnal activity in an aquatic environment, few published observations of foraging behavior among juvenile American alligators (*Alligator mississippiensis*) exist. In a detailed account based on years of field observations, McIlhenny (1935) suggested that juvenile alligators are opportunistic sit-and-wait predators taking any prey which happens to swim past "with a swift side motion of the head". Palis (1989) observed a juvenile alligator apparently attempting to flush prey in emergent vegetation. In conjunction with a food habits investigation of juvenile and sub-adult American alligators (Platt et al. 1990), observations were made of foraging behavior among captive animals.

Four juvenile alligators ($\bar{x}$ TL = 60.1 cm) were collected in July 1988 from the Manchac Wildlife Management Area (MWMA) in St. John the Baptist Parish, Louisiana, USA. They were maintained indoors in a 137 cm diam plastic-bottomed wading pool at 25°C and a water depth of ca. 16.5 cm. Concrete blocks were placed in the pool to provide a basking surface. An acclimation period of two weeks allowed the alligators to become accustomed to, and feed in the presence of, observers. The animals were fed a diet of chopped nutria (*Myocastor coypus*) meat. At the conclusion of the acclimation period, living prey items were introduced and foraging behavior was observed. Prey species offered included crayfish (Cambaridae), mosquitofish (*Gambusia affinis*), sailfin mollies (*Poecilia latipinna*), sunfish (*Lepomis* sp.), and crickets (*Gryllus* sp.). Observations on foraging behavior were made over the next four weeks, under the same conditions as described for the acclimation period.

In taking crayfish, alligators were observed to crawl along the bottom of the pool, moving the head from side to side in a slow horizontal sweeping motion with jaws slightly agape. When contact was made with a crayfish an instant attempt was made to seize it. If successful the alligator immediately surfaced, holding the crayfish in its jaws. Small (ca. < 4.5 cm TL) crayfish were swallowed with no further manipulation. Larger crayfish (maximum = 13 cm TL) were aligned between the jaws on an axis perpendicular to the head and then crushed repeatedly until the exoskeleton was reduced to a pulverized mass. The crayfish were then repositioned and swallowed tail first. We suggest that visual cues were unimportant in this foraging behavior as the nictitating membrane was observed to cover the eyes while the alligator was submerged. This corresponds to the observations of Fleishman and Rand (1989).

Our observations of underwater prey capture by American alligators indicate the necessary tactile stimulation was provided through direct contact with the prey. Crayfish often were captured while motionless and pieces of nutria meat placed on the bottom of the pool also were readily located. Additionally, juvenile alligators in Florida were reported by Fogarty and Albury (1968) to consume large numbers of aquatic snails (*Pomacea paludosa*), a relatively immobile prey species unlikely to be located by water movements. It also is possible that olfactory cues are important in underwater prey capture (Fleishman and Rand 1989).

A sit-and-wait behavior similar to that described by McIlhenny (1935) was used to capture mosquitofish, sailfin mollies, and swimming crickets. In addition, a large moth (Lepidoptera) and several cockroaches (Blattidae) that inadvertently fell into the pool also were taken using this

behavior. The alligators remained motionless and partially submerged with only the dorsal surface of the head exposed. To capture prey, alligators lunged forward, simultaneously twisting the head to one side while biting at the intended prey. The rear feet often were used to push off the bottom and the tail was thrust downward, providing additional leverage and making lunges up to 25 cm possible. It appeared that surface water movement generated by the prey was important in eliciting feeding behavior. These observations support the experimental evidence of Fleishman and Rand (1989).

Sunfish were not taken by the alligators in this study despite being present in the pool for a period of several weeks. We suggest that sunfish, which do not swim continuously near the surface in the manner of cyprinodontid and poeciliid killifishes, fail to provide the water movements that appear necessary to trigger the feeding response by alligators. Werner (1977) noted that sunfish generally occupy a niche in the deeper areas of the littoral zone, an area where alligators do not seem to forage. This observation is supported by Platt et al. (1990) who failed to find any evidence of sunfish in the stomach contents of 101 juvenile alligators from MWMA, despite their relative abundance (Hastings 1987). Tail wagging (Jones and Hayes-Odum 1990) was not observed in this study.

Alligators were observed to leave the water readily and capture crickets placed on the basking platform. This capture often involved a short chase. Similar observations have been made of captive *Caiman crocodilus* by Jackson et al. (1974). These observations and the large number of terrestrial insects found in the stomach contents of wild juvenile alligators by Platt et al. (1990) strongly suggest that alligators readily forage along the land/water interface and insect remains found in the stomach contents are not simply due to secondary ingestion from anurans as suggested by Neill (1971).

In summary, these observations further support the contention of Magnusson et al. (1987) that unlike most reptiles which have fairly stereotyped foraging behavior, crocodilians have highly specialized foraging modes which they can readily change as the situation warrants.

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FOOD HABITS OF WESTERN TOADS (*Bufo boreas halophilus*) FORAGING FROM A RESIDENTIAL LAWN

Toads (*Bufo boreas halophilus*) occur in suburban areas of central and southern California where residential landscaping and irrigation practices provide adequate food and shelter for survival. This study describes the food habits of toads foraging from a residential lawn in Bakersfield, California, a disturbed habitat. Previous studies have reported the food habits of western toads from various native localities (Campbell 1970; Cunningham 1954; Livezey 1961; Schonberger 1945; and Schuierer 1961).

MATERIALS AND METHODS

Fecal pellets egested by six adult toads (*B. b. halophilus*) were collected from a 0.06 ha residential lawn (hybrid bermuda grass, a cultivar of *Cynodon dactylon* x *C. transvaalensis*) in Bakersfield, California (Kern County, 35°21'15"N, 119°09'00"W). Pellets were collected daily between 0500-0800 h from mid-May through mid-July of 1989 and 1990. These were rinsed with water and chitinous arthropod fragments were collected on a 1 mm mesh screen. Fragments from individual pellets were transferred to filter paper, dried for 24 h at 68°C and sorted by taxa. Identification was aided by using intact reference specimens obtained locally.

The frequency of arthropod taxa was determined by direct inspection of egested chitinous fragments. The biomass and caloric content of arthropods was determined using fresh (nonegested) specimens. Live specimens were obtained from the turfgrass, weighed to the nearest 0.1 mg, and dried at 68° C to constant weight. Caloric values (kcal/g) were determined with a Parr oxygen bomb calorimeter (Dimmitt and Ruibal 1980).

RESULTS AND DISCUSSION

A total of 6,946 arthropods were collected from 320 fecal pellets (Table 1). Principal taxa included Crustacea, Coleoptera, Hymenoptera, Dermaptera, Arachnida, and adult Lepidoptera. Coleoptera and Crustacea were found in over 50% of the pellets examined. The mean number of arthropods per pellet was 21.71 ± 11.93 ($\bar{X} \pm$ S.D.).

Table 1. Arthropod remains in fecal pellets of *Bufo boreas halophilus.*

Taxa	Food Items No.	Food Items Percent	Food Items/Pellet $\bar{X} \pm$ S.D.	Pellets with Food Items No.	Pellets with Food Items Percent
CRUSTACEA					
O. Isopoda	2,169	31.23	11.42 ± 12.23	190	59.38
DIPLOPODA					
O. Spirostreptida	46	0.66	1.39 ± 0.78	33	10.31
ARACHNIDA					
O. Solpugida	8	0.12	1.00	8	2.50
O. Araneida	140	2.02	1.31 ± 0.63	107	33.44
INSECTA					
O. Orthoptera					
Acrididae	1	0.01	1.00	1	0.31
Gryllidae	5	0.07	1.00	5	1.56
Blattidae	19	0.27	1.00	19	5.94
O. Dermaptera					
Labiduridae	184	2.65	1.59 ± 1.06	116	36.25
O. Coleoptera					
Carabidae	245	3.53	1.70 ± 1.17	144	45.00
Staphylinidae	9	0.13	1.00	9	2.81
Elateridae	691	9.95	3.32 ± 3.20	208	65.00
Coccinellidae	7	0.10	1.00	7	2.19
Tenebrionidae	636	9.16	2.89 ± 3.37	220	68.75
Scarabaeidae	1,814	26.12	7.15 ± 5.63	257	80.31
Curculionidae	352	5.07	3.71 ± 4.05	172	53.75
O. Lepidoptera					
Unidentified Adults	138	1.99	1.61 ± 1.02	86	26.88
Unidentified Larvae	47	0.68	1.04 ± 0.21	45	14.06
O. Diptera					
Unidentified	3	0.04	1.00	3	0.94
O. Hymenoptera					
Formicidae	382	5.50	3.54 ± 4.16	108	33.75
Vespidae	29	0.42	1.07 ± 0.26	27	8.44
Unknown Insects	21	0.30	1.05 ± 0.22	20	6.25
TOTAL	6,946	100.00*	21.71±11.93	320	

* corrected for rounding error.

Table 2. Number, calculated biomass (g, wet) and calculated caloric intake (kcal, wet) of principal arthropods in the diet of *Bufo boreas halophilus.*

Taxa	Principal Arthropods No.	Principal Arthropods Percent	Est. No. Arthropods/g (Wet Wt)	Est. Wet Biomass g	Est. Wet Biomass Percent	Kcal/g (Wet Wt)	Est. Caloric Intake Kcal	Est. Caloric Intake Percent
Isopoda	2,169	31.23	29.2	74.3	23.2	0.88	65.4	10.4
Scarabaeidae								
(>25 mm)	6	0.09	1.3	4.6	1.4	2.22	10.2	1.6
(14-16 mm)	5	0.07	3.9	1.3	0.4	1.84	2.4	0.4
(12-14 mm)	1,710	24.62	9.4	181.9	56.7	2.33	423.8	67.4
(3-5 mm)	93	1.34	154.3	0.6	0.2	2.30	1.4	0.2
Elateridae								
(6-13 mm)	558	8.03	78.7	7.1	2.2	2.49	17.7	2.8
(3-5 mm)	133	1.91	579.2	0.2	0.1	2.43	0.5	0.1
Tenebrionidae	636	9.16	56.6	11.2	3.5	1.90	21.3	3.4
Formicidae	382	5.50	1,407.3	0.3	0.1	2.44	0.7	0.1
Curculionidae								
(8-10 mm)	65	0.94	28.4	2.3	0.7	2.48	5.7	0.9
(6-8 mm)	287	4.13	55.9	5.1	1.6	2.53	13.0	2.1
Carabidae								
(7-8 mm)	186	2.68	45.2	4.1	1.3	2.41	9.9	1.6
(6-7 mm)	59	0.85	84.4	0.7	0.2	2.32	1.6	0.3
Labiduridae	184	2.65	20.6	8.9	2.8	1.97	17.5	2.8
Araneida	140	2.02	81.2	1.7	0.5	(est)2.40	4.1	0.7
Lepidoptera (Adults)	138	1.99	8.4	16.4	5.1	2.03	33.4	5.3
TOTAL	6,751	97.19*		320.7	100.0		628.6	100.0**

* Analysis includes 6,751/6,946 or 97.19% of total arthropods in present study.
** corrected for rounding error

Table 3. Caloric values and ash contents ($\bar{X} \pm$ S.D.) of arthropods.

Taxa	Size (mm)	No. Samples	No. Individuals	Kcal/g Dry Wt	Kcal/g Ash-free Dry Wt	Percent Ash	Kcal/g Wet Wt	Est. No. Individuals/g Wet Wt
CRUSTACEA								
O. Isopoda	(5-8)	3	150	2.47 ± 0.01	3.78 ± 0.05	34.65 ± 0.72	0.88 ± 0.03	29.2
DIPLOPODA								
O. Spirostreptida	(14-17)	1	45	2.32	3.79	38.80	1.19	24.5
INSECTA								
O. Dermaptera								
Labiduridae	(12-16)	1	28	5.68	5.81	2.36	1.97	20.6
O. Coleoptera								
Carabidae	(7-8)	3	119	5.89 ± 0.04	5.93 ± 0.04	0.62 ± 0.28	2.41 ± 0.04	45.2
	(6-7)	1	44	5.69	5.71	0.42	2.32	84.4
Staphlinidae	(4-6)	1	79	5.69	5.80	1.79	2.51	389.4
Elateridae	(6-13)	2	71	5.43 ± 0.08	5.46 ± 0.10	0.49 ± 0.37	2.49 ± 0.26	78.7
	(3-5)	1	75	5.33	5.28	0.51	2.43	579.2
Tenebrionidae	(5-8)	1	29	5.51	5.62	2.32	1.90	56.6
Scarabaeidae	(>25)	3	3	5.84 ± 0.35	5.86 ± 0.33	0.40 ± 0.26	2.22 ± 0.33	1.3
	(14-16)	2	7	5.14 ± 0.05	5.15 ± 0.06	0.22 ± 0.26	1.84 ± 0.03	3.9
	(12-14)	2	10	5.75 ± 0.14	5.76 ± 0.15	0.21 ± 0.11	2.33 ± 0.03	9.4
	(4-5)	2	199	5.27 ± 0.04	5.34 ± 0.06	1.27 ± 0.36	2.30 ± 0.09	154.3
Curculionidae	(6-8)	4	296	5.04 ± 0.04	5.04 ± 0.07	0.35 ± 0.07	2.53 ± 0.04	55.9
	(8-10)	1	55	5.01	5.02	0.17	2.48	28.4
O. Lepidoptera								
Noctuidae	(15-22)	1	6	5.63	5.65	0.39	2.03	8.4
Pyralidae	(9-13)	1	19	5.83	5.86	0.45	2.33	114.0
O. Hymenoptera								
Formicidae	(2-4)	3	(est)4,772	6.03 ± 0.07	6.13 ± 0.09	1.72 ± 0.49	2.44 ± 0.09	1407.3

Studies of *B. boreas* in native habitats indicate that Coleoptera, Hymenoptera, and Diptera comprise the principal arthropod taxa ingested. In Oregon and Washington, Coleoptera and Hymenoptera (Formicidae) comprised 51.3% and 43.5% of the diet for *B. b. boreas* (Schonberger 1945). In Boulder County, Colorado the *B. b. boreas* diet included 71.0% Hymenoptera (Formicidae) and 14.6% Coleoptera (Campbell 1970). In Inyo County, California Hymenoptera and Diptera comprised 82.4% and 10.6% of the diet for *B. b. exsul* (Schuierer 1961). Adult *B. b. exsul* averaged 21.0 food items per stomach (Livezey 1961).

Calorimetric analyses revealed differences in the food value of selected arthropod taxa. Although isopods (*Armadillidium* sp.) and scarabaeid beetles (*Phyllophaga* sp.) were dominant in fecal pellets (31.2% and 26.1%, respectively), they were not of comparable caloric value (Table 2). Isopods and scarabaeids were calculated to represent 10.4% and 69.6% of the caloric intake, respectively. Differences in caloric value are attributed, in part, to the mineral (ash) content of exoskeletons (Table 3). Isopods have a much higher ash content than other food items (e.g., insects), hence they have a much lower caloric value.

The assimilation efficiency (calories ingested not recovered in feces) is known to vary between arthropod taxa, decreasing as the proportion of chitin in arthropod exoskeletons increases (Dimmitt and Ruibal 1980). Assimilation efficiencies were not quantified in the present study, but it is suspected that the assimilation efficiency for isopods may be much lower than that reported for other arthropods.

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NOTES ON AGGRESSIVE BEHAVIOR OF THE GOPHER TORTOISE

Male tortoises of the genus *Gopherus* are frequently cited as attempting to overturn other males by prying them up with the gular extension of the plastron. Review of the literature, however, reveals that interpretations are based on hearsay, personal communications, or observations of captives. No firsthand accounts of overturnings in the wild have been published for any of the four *Gopherus* species, with the possible exception of Grant (1936), who may have been watching captives. Here we report observations of fighting in wild and freshly caught male gopher tortoises (*G. polyphemus*), briefly review the literature, and discuss the consequences of overturning.

On 8 January 1989 JPH and RK watched two male gopher tortoises fighting in a sand firelane of Archbold Biological Station, Highlands County, Florida. The encounter was already underway at 1147 h EST when we found the animals and it concluded at 1218 h when the pursuing animal abandoned the chase. The tortoises did not, however, fight continuously during these 31 min, but rather stopped frequently.

Three principal action patterns were used. (1) In the "push" the tortoises faced one another with heads retracted but not entirely within the shells. Each animal thrusted with its hindlimbs, resulting in both tortoises rising off the substrate anteriorly with the gular extension of the plastron pressing firmly against some anterior part of the opponent. Because the forelegs were often dangling in the air, we concluded that the major thrust probably came from the hindlimbs. While the foreparts of their bodies were thus off the ground, the opponents actively moved the forefeet toward each other, but these motions rarely made contact. (2) "Jerk up" consisted of hooking the gular extension under the other animal (several times under the anterior edge of its carapace) and jerking up suddenly. We could not determine exactly how the thrust of this upward jerk was effected, but it had to come almost entirely from the hindlimbs. If the opponent is anchored by its hindfeet and the thrust is obliquely upward (as opposed to being truly horizontal), then there will be a vertical vector component to the thrust. One tortoise succeeded in upturning its opponent in this way, but the opponent managed to stop the motion as it was on its side and about to roll on its back, and then eventually righted itself. (3) "Kick sand" occurred when the animals were head-to-tail, with the lead tortoise throwing sand toward the face of the following animal. Kicking sand occurred when the tortoises were stationary, and also when one animal was retreating from its opponent during the final chase that ended the encounter. We were unable to see with certainty which limbs were used for kicking sand because the kicking was done on the side away from us. However, the kicking animal did end up with sand on its carapace (confirmed in our photographs), which suggests that the forelegs were used.

Observations on gopher tortoises temporarily held for marking and measuring at the Station by JNL further support the foregoing descriptions. On two occasions (23 July 1981 and 3 April 1982) one male was seen to overturn another during fighting. On 26 March 1973 two captive males loose in a large laboratory room fought off and on all day. The tortoises engaged in pushing head-on with each animal rising anteriorly and appearing to try to get its gular process under the other's shell. Similar pushing and hooking with the gular extension was also directed toward the side of the opponent. Futhermore, the attacking tortoise often rose up on the hind quarters, with front quarters low, to better pry up on the other with the gular process. Fighting bouts lasted minutes, then stopped for a while, only to continue again.

The earliest report of male fighting in *Gopherus* may be by Fletcher (1899), who described pushing and overturning in male gopher tortoises, but then added that the only fight he actually witnessed was between two (captive?) females, one of which killed the other. Carr (1952) found this and other claims of Fletcher to be preposterous. Camp (1916) stated that captive desert tortoises (*G. agassizii*) ram one another with the gular projection, which does the opponent "no damage except sometimes to turn him upon his back." Miller (1932) reported similar findings in this species, also apparently in captives, and added that "the inverted foe is seldom left helpless...possibly his [the victor's] sportsmanship induces him to help his rival up so that they can enjoy another bout." Grant (1936) also reported pushing with the gular extension in desert tortoises, in which the male "lifts and twists, often upsetting his antagonist," which may die in the sunlight if unable to right itself; this description suggests that the observations may have been made by the author himself, possibly on captive animals. In a popular article Cassell (1945) provided a similar description, later repeated by Pepper (1963) in the same magazine, the latter clearly based on captive animals. Legler and Webb (1961) reported ramming in captive Bolson tortoises (*G. flavomarginatus*). Rose (1970) conducted experiments with Texas tortoises (*G. berlandieri*), presenting them with a plaster model having chin-gland secretion (a mixture of fatty acids) smeared on it; 23 of 37 captive males rammed the model and six turned it over. Not one of the foregoing reports is clearly based on first-hand observations in the wild, and several seem to be based on hearsay.

Weaver (1970) reported seeing one *G. berlandieri* "attempting" to overturn another (no details), but apparently did not witness an actual overturning. The only overturning documented was in a personal communication from K. G. Metocha, where the observer himself interrupted the fight and turned one tortoise over, which was then overturned again by the opponent as the tortoise was righting itself.

The only unambiguous reports we have found of overturning in the wild are personal communications cited by Douglass (1976, 1986) for the gopher tortoise. He recounted some of JNL's observations (above) and added briefer reports by J. W. Lang, A. R. DeGange, and T. Allen and D. Austin. Each of these observers apparently witnessed a wild tortoise overturn its opponent at least once. If the early reports can be believed, males of all four species of *Gopherus* ram the opponent with the gular extension and use it as a lever to overturn the opponent.

Overturning of a tortoise can place it in serious thermoregulatory stress (Douglass and Layne 1978). If the animal cannot right itself it risks death, especially in direct sunlight where the radiation load is high. Although the gopher tortoise is active at the hottest times of day, two individuals died from thermal stress on summer afternoons, one within 5 h (Douglass and Layne, 1978). JNL has found that this species can sometimes right itself on a grassy substrate but not in the loose sand of its natural habitat. Death resulting from exposure to sunlight was also reported for *G. berlandieri* (Grant 1960), where an individual died in 10 min at an air temperature of 39.4°C. Similarly, Ortenburger and

Ortenburger (1927) reported that all (number unspecified) *G. agassizii* in a cage completely exposed to the sunlight died within a day, and a tethered animal that got tangled and was unable to reach shade died before noon.

Kicking sand appears never to have been reported before in fighting male *Gopherus*. Our observations of this act show it is not merely a consequence of rapid locomotion away from the opponent but is also done by stationary gopher tortoises. One of us (JNL) has observed sand kicking as a regular feature of burrow maintenance by the entering gopher tortoise. This behavior was associated with tortoises being chased into their burrows when he (JNL) attempted to capture them for marking. He has the impression that the forefeet are always used for this purpose. Thus, one action pattern (sand kicking) is used in three contexts: burrow maintenance, predator repulsion, and intraspecific aggression.

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NOTES ON EARLY SPRING PARASITES AND PATHOLOGIES OF OKLAHOMA *Crotalus atrox*

A study of western diamondback rattlesnakes, *Crotalus atrox*, collected in the spring of 1987 and 1988 during Oklahoma's rattlesnake round-ups presented an opportunity to examine parasites and pathologies of this species from three localities: Waurika (Jefferson Co.), Waynoka (Major Co.), and Okeene (Blaine Co.).

METHODS

Snakes sampled were collected within a 30-mile radius of each locality by area residents two weeks prior to the public event (at which time snakes may be brought from various localities). In 1988, viscera from 296 snakes (128 male:168 female) were collected immediately as snakes were killed by decapitation, and were preserved at once by submerging in 10% formalin. After formalin-fixation for several days, viscera were soaked for 24 h in water, then transferred to 70% ethanol for storage. Viscera were referenced to previously weighed and measured (several parameters) snakes by recovery of a numbered plastic tag inserted deeply into the esophagus of each live snake examined. In 1987, viscera from 60 (22:38) representative Waynoka snakes were similarly collected, but were not tag-referenced to individual living snakes.

Viscera were examined during the summers of 1987 and 1988. G-I tracts were slit lengthwise from the esophagus to the rectum, and macroscopically examined for parasites, pathologies, food, and fangs. Samples of tissue and gut contents for microscopic examination were removed and transferred to vials of ethanol. Gut contents samples were examined and photographed at 160x or 1000x magnification using Kodacolor-200 film and a Zeiss "Standard-17" microscope with Contax RTS camera. Photos were printed to 86 X 125 mm size. Representative tissue samples were sectioned, stained, and examined at the Research Animal Diagnostic and Investigative Laboratory, College of Veterinary Medicine, Univ. of Missouri (Columbia) (Accession number 003155-88). Parasite indications were observed in 41 snakes (11.5%), though as will be elaborated below not all of these can be unequivocally designated as parasites of *C. atrox*. All material is presently maintained in the University of Kansas Biology Teaching Collection.

RESULTS

Waurika. Results are summarized in Table 1. Pulmonary aspergillosis was evident as severe, diffuse interstitial and alveolar granuloma with numerous hyphae and terminal conidia. The multiple intraserosal trematode cysts recorded from a single male were clustered around the small intestine. A male (1220 mm SVL, 1520 g) contained numerous pentastomid eggs, and 14 adults *(Porocephalus crotali)* were observed in the lung (see Self and Kuntz 1967).

Okeene. Results are summarized in Table 2. The intraserosal trematode cysts recorded were clustered primarily around the animals' small intestines and kidneys, but occasionally were found in the adjacent mesentery and the serosal surface of a fat body (one animal). The two males containing pentastomids [*Porocephalus*

crotali (see Self and Kuntz 1967)] were not equivalently infected. One (1168 mm SVL) contained 36 adult and subadult pentastomids in the lung; additional subadults (ca. 20 mm) were also seen in the coelom and under the mesentery adjacent to the large intestine. Total weight of all pentastomids in this animal was 8.3 g. The other male (SVL not recorded) contained one adult pentastomid (wt. 0.2 g) in its lung.

Waynoka. Results are summarized in Table 3. Pentastomids [*Porocephalus crotali* (see Self and Kuntz 1967)] were recorded from two females. One of these (921 mm SVL) contained 26 pentastomids (adults and subadults—21 within the lung, 4 attached to its serosal surface, and 1 attached to a kidney). Weight of the 21 from within the lung was 4.6 g. The other female (930 mm SVL) contained 25 pentastomids (wt. 5.0 g) in the lung.

Again, the multiple intraserosal trematode cysts were found clustered mainly around the small intestine and adjacent coelom wall. Additionally (in one male) cysts were adherent to the gall bladder. The female containing trematode cysts was non-reproductive. An unidentified tapeworm was found in one snake. No pentastomid eggs were noted.

Table 1. Waurika Summary.

Viscera examined (m:f)	137 (78:59)
Coccidians found in	12
Pulmonary aspergillosis in	7
Trematode	
ova (m:f)	2 (1:1)
cysts (m:f)	1 (1:0)
Pentastomid	
ova and/or	
adults/subadults (m:f)	1 (1:0)
Pinworm eggs	1

Table 2. Okeene Summary.

Viscera examined (m:f)	105 (63:42)
Coccidians found in	11
Trematode	
ova (m:f)	2 (2:0)
cysts (m:f)	10 (9:1)
Pentastomid	
ova and/or	
adults/subadults (m:f)	2 (2:0)

Table 3. Waynoka Summary.

Viscera examined (m:f)	60[1987] (38:[illegible]) 92[1988] (52:[illegible])
Coccidians found in	9 (1988)
Pulmonaryaspergillosis in (m:f)	2 (2:0) (1987)
Trematode	
ova (m:f)	2 (1:1)
cysts (m:f)	5 (4:1)
Pentastomid	
ova and/or	
adults/subadults (m:f)	2 (0:2)
Unidentified tapeworm segments	1

DISCUSSION

The Order Coccidia contains 25 genera (Hammond and Long 1973; Olsen 1986), two of which are *Isospora* (oöcysts with two sporocysts, each containing four sporozoites) and *Eimeria* (oöcysts with four sporocysts, each containing two sporozoites). *Isospora* is common in reptiles and *Eimeria* is quite common in mammals, and is not uncommon in snakes. Unfortunately, formalin fixation of the viscera made it impossible to distinguish between oöcysts of these coccidial genera. Therefore it is not possible to accurately determine the percent of snakes that were infected with *Isospora*. Several viperid–murid life cycles have been demonstrated for coccidians (see Wacha and Christiansen 1982; Haefner and Frank 1984; Upton and Barnard 1988), so this is not unexpected.

Pentastomid ova were found in Okeene and Waurika snakes, but none was found in Waynoka snakes. Waurika is located in south-central Oklahoma, whereas the other two localities are north-central. It is therefore unlikely that this difference is meaningful. Adult pentastomids were observed in one Waurika snake (male), two Okeene snakes (male), and two Waynoka snakes (female). Pentastomids are not uncommon parasites of snakes, and fairly large infestations seem not to cause host debilitation (Self and Kuntz 1967; Self 1969; Cooper 1984).

Intraserosal trematode cysts (Hoff et al. 1984) were identified almost exclusively from males (14 of 16 instances); of the two females, one was non-reproductive. The most common site for these cysts was the serosal surface of the small intestine. Trematode ova were found in seven animals (five of them male; one female was non-reproductive). Lyon (1986) documented helminths from six Idaho lizard species, two genera of which (*Crotaphytus* and *Cnemidophorus*) are potential prey of Oklahoma *C. atrox*. If lizards are part of the life cycle of these parasites in Oklahoma (a likely assumption), our data would indicate differential predation by the sexes of *C. atrox* in late summer and fall.

Keenlyne (1972) reported differences in the summer feeding behavior of gravid female (versus male and non-reproductive female) *Crotalus horridus* in Wisconsin. Gravid females did not feed during the later stages of embryogenesis. As reported separately (Fitch and Pisani, in press), most of the female *C. atrox* in the populations reported here seem to follow an annual reproductive cycle. If reproductive females of this species follow the observed pattern of its congener (a pattern also reported for gravid *Agkistrodon contortrix*; Fitch and Shirer 1971), this could explain the observed differential trematode parasitism.

We additionally offer another possible, though conjectural, hypothesis for this observation. It is probable that the two lizard genera mentioned above commence fall dormancy earlier than does *C. atrox*, and that some individuals may select hibernation sites around *C. atrox* den sites. If male rattlesnakes return to den sites earlier than females, they may consume these lizards as their final fall meals, rendering them more susceptible to trematode infection. These two hypotheses are not mutually exclusive.

Finally, it is also conceivable that our observed ratio is a statistical artifact of the small percent of snakes overall that were recorded with pathologies. While the total number of snakes with pathologies is small, the strong bias observed is nonetheless interesting in light of the foregoing.

Pulmonary aspergillosis was seen in nine snakes from Waurika and Waynoka, but in none from Okeene. As remarked above for pentastomids, we feel this locality difference is not meaningful.

These findings are presented with the intent of providing a spring reference point for further and more detailed work. The life history of *Crotalus atrox* is not well known, and it would be instructive to follow the parasite cycle of this species through several years (a project we are presently not in a position to pursue).

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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Prepublication Announcement

Herpetological Circular No. 20

AGE DETERMINATION IN TURTLES

George R. Zug

A complete and detailed look at techniques used to determine the age of turtles, as well as a comparison of their effectiveness. The first section deals with known-aged samples via mark-release-recapture, and captive rearing; the second section looks at measures of size as a substitute for age, using body length or mass, and lens mass; a third area of this booklet addresses incremental growth markers for age determination with respect to scute growth zones, claws and rhamphothecae, and skeletochronology; and a fourth part covers age estimation through structural modifications as revealed by scute polishing, skeletal changes, and coloration changes. Bibliography. August 1991. 28 pages. ISBN 0–916984–24–9.

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THE FIRST REINTRODUCTION OF BLACK CAIMAN, *Melanosuchus niger*, INTO THE WILD

The black caiman (*Melanosuchus niger*) is a large crocodilian found throughout the Amazon River basin, the upper Essequibo and Berbice drainages in Guyana, and in coastal French Guiana. Owing to extensive commercial hide hunting which began in the 1940s, the black caiman has

suffered a dramatic decline in numbers and today is one of the most endangered of the New World crocodilians. Today, black caiman principally remain in small isolated populations and have been extirpated or are very rare over much of their former distribution (Plotkin et al. 1983). Other than the legal prohibition of hunting, which rarely has proven effective, virtually no conservation measures have been initiated in any of the countries where this species is found (Groombridge 1982). In Bolivia, the populations of black caiman have been described as being in danger of extinction (King and Videz-Roca 1989).

In 1989, a group of captive black caiman that were being maintained on the Hacienda El Caimán in northern Bolivia was offered for use in conservation programs. The black caiman on the hacienda had been collected during the late 1970s from the vicinity of Santa Rosa, Reyes and San Borja in the Bolivian Beni region. They were intended to form a breeding nucleus for a commercial farming operation. However, due to poor breeding success and financial difficulties, the owners were unable to keep the entire group and offered to donate a portion of the animals for a restocking project.

In August 1989, the German organization Aktionsgemeinschaft Artenschutz (AGA) offered financial support to transport the caiman for release back into the wild. The organization of the program in Bolivia was undertaken by the Asociación Boliviana Pro-Defensa de la Naturaleza (PRODENA). The Beni Biological Station, located in the Beni Department ca. 50 km east of San Borja, was chosen as a release site because it offered the best chances for protecting and monitoring the caiman after release. The area also provided an abundance of good habitat and was where some of the *Melanosuchus* stock kept on the Hacienda El Caimán originally came from.

The caiman were released in Normandía lagoon, a large (ca. 578 ha), shallow lagoon located close to the main biological station headquarters. Other release sites were considered to be unsuitable because of the possibility that natural black caiman populations may have been present and, without pre-release data from these lagoons, the subsequent conservation benefits of the release program could not be determined. Furthermore, the possibility of introducing unknown pathogens from the captive animals into the wild population had to be considered. Normandía lagoon was chosen because of its proximity to the park headquarters, facilitating control and population monitoring operations, and because the lagoon's population of *Caiman crocodilus yacare* had been well studied over a three year period immediately prior to the planned release of *Melanosuchus*.

The operation began on 26 June 1990 on the Hacienda El Caimán. Twenty-five adult and subadult caiman (1.5 - 2.9 m long; 6 males and 19 females) and eleven hatchling and yearling caiman were captured, measured, and marked (monel foot tags and tail scute notching).

All the caiman except the hatchlings and yearlings were released in Normandía lagoon on 3-4 July 1990. Apart from a few minor scrapes, all caiman appeared to be in excellent shape when turned loose. Within days of the release the first nocturnal survey was conducted to begin the monitoring effort. Continued monitoring of Normandía lagoon will be conducted by personnel of the Beni Biological Station. Population trends of both *Caiman crocodilus yacare* and *Melanosuchus niger* will be determined, and there will be intensive nest monitoring during the reproductive season (late October to early March).

The hatchling and yearling *Melanosuchus* were placed in a small artificial lagoon at the Biological Station headquarters. They will be reared there until they reach a length of ca. 1 m and then released into the wild.

This reintroduction effort demonstrates the increasing interest of a number of Bolivian institutions in addressing the country's wildlife conservation problems.

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TECHNIQUES

IDENTIFYING INDIVIDUAL SPOTTED SALAMANDERS BY SPOT PATTERN

Conventional marking techniques for amphibians are not considered adequate for salamanders (Ferner 1979). Since Ferner's summary the only new marking technique that has been proposed for salamanders is that of fluorescent marking (Taylor and Deegan 1982; Nishikawa and Service 1988). This technique individually marks salamanders, but the markings usually do not last longer than a year (Nishikawa and Service 1988).

This paper describes a technique in which individual spotted salamanders (*Ambystoma maculatum*) can be recognized by their spot pattern. The spot pattern is described by the number of spots on defined areas of the animal, eliminating the need for drawings or photographs. For this technique to be valid, each salamander must have a unique spotting pattern and its pattern must not change ontogenetically. The advantages of using natural variation to identify individuals are that salamanders are not damaged in any way and that individuals can always be recognized once the spot patterns are recorded. These data can also provide detailed information on the natural variation of spot numbers.

In this identification technique, all individuals with the same "head patterns" are

classified in a single group. This divides similar-looking salamanders into manageable groups. Individuals with the same head pattern can be further classified by the snout-vent spot counts, "neck" spot counts, and sex. The head pattern is described by summing spot numbers on four regions of the head. The four regions of the head are formed by the gular fold, the fold between the angle of the jaws, and an imaginary line drawn down the center of the head. The "neck" area is between the gular fold and the first costal groove posterior to the forelimbs. The sum of spots on the left and right side of this neck area are recorded. The snout-vent spot counts are from the tip of the snout to the posterior end of the cloaca; the sum of the left and right sides is recorded.

The method used to describe spots in between two regions (e.g., between the "head" and "neck," or in the center of the "head," "neck," or S-V regions) is by counting that spot as 1/2 in each of the regions. This datum is important to record, because it rarely occurs and is usually distinctive to the individual. The only exception to this rule is when a spot overlaps from the snout-vent area onto the tail; then the whole spot is counted as one in the snout-vent count. This is done because spots commonly overlap those two regions.

This technique was tested with two populations of spotted salamanders in Massachusetts. Of 174 individual salamanders caught at a site in Lenox , 97% could be identified using the system of spot counting; drawings and photographs of each specimen served as a reference. Of 70 adult individuals caught leaving a pond in Westport, 97% were individually unique as determined by this technique.

To help determine whether or not a salamander is a recapture, spot data should be organized in a notebook with a separate page for head pattern. Organized this way, many oddly patterned individuals are isolated and individuals with common patterns are divided into manageable groups. For example, the 174 individuals of the Lenox population showed 47 different head patterns; 27 individuals (15%) had unique head patterns. The most common head pattern was shared by 21 individuals. The data can also be entered into DBase (or other programs) and sorted to determine recaptures.

The technique described here is a time-efficient way to describe spot patterns and successfully identified 97% of the individuals in a population. Subjectivity is eliminated in describing spot patterns because only numbers of spots are used. If the spotting pattern does not change ontogenetically once an "adult" spot pattern is established, then an individual can be recognized throughout its life. Using patterns to identify salamanders also provides detailed information useful in describing intra- and inter-population variation.

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AN IMPROVED LABORATORY APPARATUS FOR EXAMINING THERMAL PREFERENCES OF REPTILES

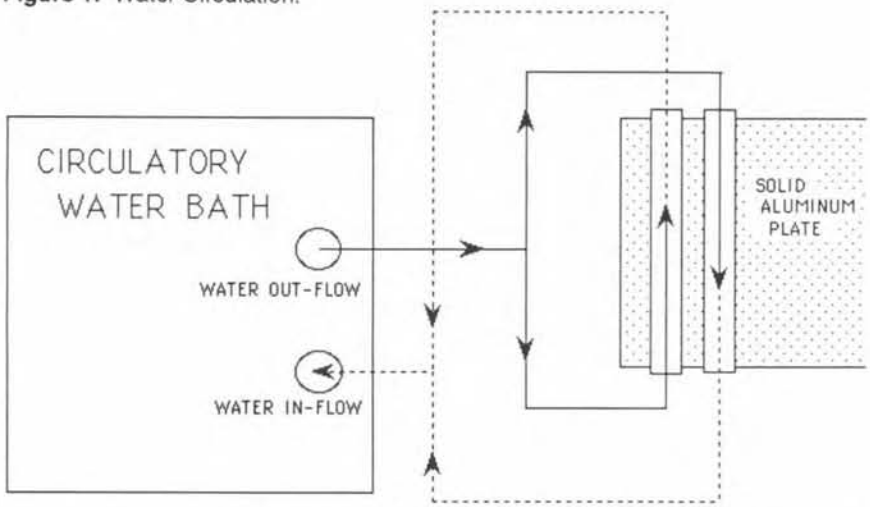
Studies of the thermal preferences of animals often require a consistent and predictable laboratory thermal gradient. Although several equipment designs have been described for use with reptiles (e.g., Dial 1975; Gregory et al. 1982), most produce temperature gradients that may be difficult to control or maintain. This paper describes an apparatus that uses circulating hot and cold water to generate an easily controlled and consistent temperature range for examining laboratory thermal preferences of reptiles. The design is similar to that described in the botanical literature (Cannefax 1962; Wagner 1967; Barbour and Racine 1967; Colosi 1975). An apparatus that provides the same and non-variable temperature range may be important for repeated experiments. Constant temperatures may also be important to certain experimental designs where it may not be possible to measure body temperature. For example, Lutterschmidt and Reinert (1990) measured substrate temperature to avoid physioloigcal responses resulting from the effects of surgically implanted transmitters or disturbance of reptiles by cloacal probing.

The gradient of this apparatus is generated by heated and refrigerated circulatory water baths (Cole Parmer) attached to opposite ends of a 152 x 30 x 2.54 cm solid aluminum plate. The plate has two grooves cut into the underside (3 cm apart) along the width of the plate at each end. Copper tubing is inserted into these grooves for the circulation of water. This arrangement of tubing allows the circulation of water to flow in opposite directions (across the width of the plate) to generate a constant temperature from front to back and a continuous gradient along the plate (Fig. 1).

A wooden frame with a thin sheet of aluminum attached to the bottom side (resting on the aluminum plate) may serve as a base and container to hold the gravel substrate (Fig. 2). A wooden box (cage) of dimensions 148 x 30 x 31 cm fits snugly into this wooden frame. The wooden cage has small circular access ports (diameter of 8 cm is suggested) cut into one of the length sides. The ports have covers which may be swung open for easy access with a thermistor probe to obtain substrate temperatures without disturbing the reptile. A wooden and screened top is hinged to the wooden cage (Fig. 2). A light source may be suspended above the gradient to provide a uniform light intensity throughout the gradient (Justy and Mallory 1985). This entire apparatus (except circulatory baths) is housed within a larger insulated wooden box to eliminate temperature changes as a result of ambient temperature variation. This structure can be lined with styrofoam or fiberglass insulation.

Some studies of reptilian thermal biology (e.g., Stewart 1965; Kitchell 1969; Gatten and McClung 1981) have used thermal gradients produced by heat lamps and dry ice. Thermal gradients generated by such methods may be easily influenced by ambient temperature fluctuation if the gradient is not well insulated. In addition, insulation of a gradient that uses heat lamps and dry ice may be difficult, if not impossible, because of its design. A thermal gradient that uses dry ice to gen-

Figure 1. Water Circulation.

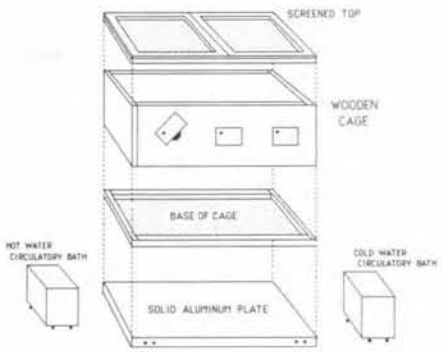


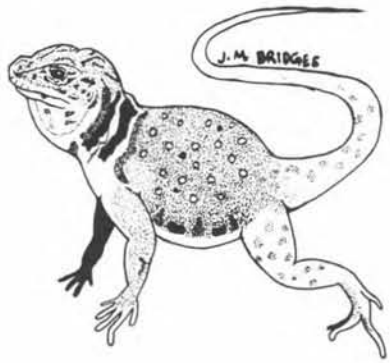
erate the lower temperatures may also require much maintenance. Conversely, gradients that use heated and refrigerated circulatory baths may easily maintain desired temperatures for long periods of time with little maintenance.

Daily readings of the apparatus described here showed stable substrate temperatures along the gradient for ca. two months of data collection. The mean temperatures (n = 52) at the warm end, middle, and cool end were 45.8°C (SE = 0.143), 29.6°C (SE = 0.145), and 14.7°C (SE = 0.151), respectively. Temperature settings of the heated and refrigerated circulatory baths were ca. 80.0°C and 5.0°C, respectively. The difference in temperature between the gravel substrate and the water or methanol-water mixture (in circulatory baths) is due to inefficiency in conduction. However, once water temperature is adjusted to generate desired substrate temperatures, the gradient temperature range will remain relatively constant even with moderate variation in ambient temperature

The thermal apparatus described in this paper may be a preferred design for long-term studies of reptilian thermal biology. It may provide a non-variable and continuous thermal gradient for almost any biological temperature range, depending on limitations of circulatory baths. However, this apparatus has an important disadvantage of expense. Gregory et al. (1982) describe a well designed thermal gradient (which uses heat lamps and dry ice) with an expected cost of $1600. The gradient described in this paper is considerably more expensive, ranging from $2500 and $4400, due to the cost of two circulatory baths.

Figure 2. Thermal Gradient.





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Table 1. Movement and activity areas of *Bufo americanus* between June-September 1988.

Toad No.	Sex	Mass (g)	Transmitter Mass as % of Body Mass	Monitoring Period	Unidirectional Movements (m)	Activity Area(s) (m^2)
004	F	48	4.8	8/14-9/7	12.3	303*
030	M	36	5.4	8/24-9/16	83/73	1/38
195	M	32	6.5	8/24-9/7	63	1.5
333	M	28	7.1	8/15-8/26	101	64
347	F	50	4.5	6/16-7/1	205/165	1/1
534	F	43	4.8	8/24-9/16	59	37

*excluded from calculation of mean activity area.

A RADIOTELEMETRY IMPLANT TECHNIQUE FOR USE WITH *Bufo americanus*

Tracking amphibians via radiotelemetry has been hindered because of the small size of many species and difficulties in attaching a transmitter. A rubber harness has been used with *Bufo bufo* (van Nuland and Claus 1981) and a Velcro® sew-on with *Rana palustris* (Johnson 1984) but my efforts to duplicate both methods with *Bufo americanus* were unsuccessful. Despite several design changes in the method of van Nuland and Claus (1981), skin abrasion around the limbs and animals slipping out of the harness were problems. A harness made of girdle material (Kingsmill 1990) may resolve these problems. The sew-on Velcro® method (Johnson 1984) involves sewing a piece of Velcro® to the dorsum of the animal. In addition to being traumatic for toads, this method resulted in bacterial/fungal infections under the Velcro® patch.

Reported herein is a surgical implant technique for toads which overcomes the problems of external attachment but is subject to limitations on size of the transmitter and the ability of the incision to heal. The procedure probably has limited application to frogs because of their thinner skin.

Internal loop SM1 transmitters weighing 0.06 g were purchased from AVM Instrument Company, Ltd. (2356 Research Drive, Livermore, California 94550) and used with either a mercury (Hg312) or lithium (Li803) battery depending on the mass of the animal. The battery-transmitter units were assembled so as to minimize the height of the package. The assemblage was first coated with a 1:1 mixture of paraffin-bee's wax to facilitate battery replacement, then two thin layers of dental acrylic and a coat of bee's wax. The final package had a mass of 1.8 - 2.3 g. Individual toads were anesthetized in 0.01% MS-122 (tricaine methanesulfonate) for 15-20 minutes. After washing the lateral-abdominal area with disinfectant (Betadine® and alcohol), a 15-20 mm longitudinal incision was made through the skin 1-2 cm left (or right) of the vertebral column. The anterior end of the incision was at a level approximately half way down the vertebral column. The transmitter was soaked in ethanol for 30 minutes, rinsed in sterile distilled water and inserted I.P. The incision was sutured. After applying more disinfectant, several layers of New Skin® (New Skin Company, Cody, Wyoming 82414) were sprayed on the incision to facilitate healing. Within 24 h, individuals were returned to the point of capture.

Six individuals (Table 1) were monitored with a LA12-DS receiver (AVM Instrument Co. Ltd.) for 12-25 days between June-September 1988. Monitoring was continuous during the first two hours, then every six hours during the first two days and once every 24 hours thereafter. Areas of activity were calculated by the minimum polygon method (Jennrich and Turner 1969).

Incisions healed completely in five of the six animals, and these individuals were monitored until the signal was lost or to the point of calculated maximum battery life. The incision on the sixth animal abscessed around the 10th day due apparently to improper suturing and the transmitter was removed. When monitoring terminated, the transmitters were removed, the incisions closed, and the animals released.

All six toads undertook initial movements of 12 - 205 m within 24 h, usually during the first 2 h of darkness. The movement was generally unidirectional with one or two shifts of 10-30°. Five of the six toads then established a small activity area of 1 - 64 m^2 (mean = 20.5 m^2, S.E. = 9.7, Table 1.). Three of these five toads remained in the activity area throughout the monitoring period. Two toads (#030, #347) undertook second unidirectional movements of 273 and 165 m seven days later, and established a new area of activity. The sixth toad (#004), made a series of circular movements within an area of 303 m^2 centered around the point of capture. The habitat of toad #004 was along a vegetated rocky bluff overlooking Lake Superior and differed from the wooded terrain of the other five toads. Because of the locality and comparatively large area traversed by toad #004, it was not included in calculations of mean activity area.

It is difficult to assess the total behavioral or physiological effect of the transmitter on the animal. Due to the looseness of the skin, the transmitter was not visible and did not protrude against the skin. Transmitters were removed from four of the six animals at the end of monitoring and all four individuals appeared healthy and had not lost weight. The distances of movement suggest little effect, but there are no valid comparative data.

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COPING WITH DEHYDRATION OF TRAPPED TERRESTRIAL ANURANS

One convenient way of sampling terrestrial anurans is to capture them in funnel traps placed alongside a drift fence (Campbell and Christman 1982; Clawson et al. 1984). Depending on how often the traps are checked, it is possible that a captured amphibian would dehydrate and die inside the trap. One way to minimize such mortality is to provide shade by placing forest litter on top of the funnel traps. Still, if the trap lines are not checked at frequent intervals, mortality is a strong possibility.

A study of a wood frog (*Rana sylvatica*) population in a mixed woodland habitat (dominated by *Acer rubrum* and *Betula populifolia*) near Trois-Rivières, Québec (46° 20' N 72° 34' E), was conducted in April 1991. Air temperature averaged ca. 10°C during the study. Drift fences were positioned so as to intercept frogs in their movements to a temporary pool.

The traps were checked and emptied daily at 0900, 1500, and 2100 h. During each trap visit, litter and top soil of the surrounding forest was placed on the sides and top of the traps, and drenched with water. Despite these measures, many specimens died or exhibited signs of dehydration.

For the next three days of trapping, I placed a piece of commercial multi-purpose sponge (ca. 10 x 5 x 7 cm) soaked with pond water in each funnel trap. Sponges remained moist for ca. 48 h after initial soaking, despite generally clear, sunny conditions. During the 72 h period in which sponges were used, I saw no evidence of thermal stress or dehydration in captured frogs. In one trap particularly exposed to the sun, I observed a frog with its urostyle surface in contact with the sponge. Roth (1973) and Christensen (1974) showed that the ventral pelvic integument is more vascularized in terrestrial than in semiaquatic anurans. Presumably, this difference facilitates the uptake of water from the substrate by terrestrial species.

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HERPETOLOGICAL HUSBANDRY

HUSBANDRY AND PROPAGATION OF THE RADDE'S VIPER *Vipera raddei raddei* BOETT

The Radde's viper *(Vipera raddei raddei)* is found in Armenia and the Nakhichevan region of the Soviet Union, as well as adjacent parts of Turkey and northwestern Iran. The species is included in the Red Data Book of the IUCN and the USSR. Information on the habitat and ecology of *V. r. raddei* in Armenia has been published (Bozhansky and Kudrjavtsev 1986).

Limited success has been achieved in the captive breeding of this species in the Soviet Union. Successful breeding occurred at the Laboratory of the Institute of Zoology of the Academy of Science of Armenia (Agasyan 1985) and the Khar'kov Zoo (Strelkov 1986a, b). General information on the breeding of Radde's viper in the USSR will soon be available (Kudrjavtsev and Mamet, in press).

METHODS

In recent years the snakes were maintained separately in terrariums measuring 70 X 60 X 60 cm. For mating they were placed together in a larger terrarium (140 X 60 X 60 cm), with a 10-12 mm thick substrate of fine gravel, and shelters of pieces of bark or plywood. Some bigger rocks were placed in the cage to assist shedding. The temperature was maintained at 25-32°C, under the heater about 35°C, depending on room temperature. A humidity chamber with moist sphagnum was placed in the cool corner. In the fall, during preparation for artificial hibernation, temperature at night occasionally dropped to 18° C. Food consisted of laboratory mice, with vitamins added as necessary: B-complex (0.4-0.8 ml/kg), sometimes Nutrobal (Vetark Products Ltd.). On rare occasions the largest specimens accepted young chickens. Artificial hibernation usually lasted from early November until February (in 1989-1990: from 1 November until 1 February); specimens were maintained at 10-12°C.

The loss of weight in snakes during hibernation ranged between 0.5 and 4% of their original weight (no correlation between the sex and weight loss was observed). All snakes fed the day after emergence from hibernation. In the group of four snakes (two males and two females), 1990 matings after hibernation were recorded as follows: male #1 and female #1 – 27 February; male #2 and female #1 – 4 March; and male #1 and female #2 – 10 March. These matings were followed by periods of heavy feeding. The females refused food as follows: female #1 – 28 March, female #2 – 4 April. Female #1 gave birth on 3 June to one live young (TL – 243 mm, SVL – 223 mm; mass – 9.96 g) and three infertile masses. Female #2 gave birth on 27 May to three young (TL – 249 mm, SVL – 228 mm; TL – 218 mm, SVL – 200 mm; TL – 233 mm, SVL – 210 mm; and masses – 10.36 g, 8.26 g and 9.06 g, respectively) and two infertile masses.

The young discarded the membranes in which they had been born within the first hours after birth. The first shedding took place during the first eight days of life. After the first shed two young started feeding on newborn mice; the other two refused food, and have consequently been force-fed, using newborn mice.

All four young snakes survived and as of 14 January 1991 measured as follows: TL – 287 mm, SVL – 265 mm, mass – 17.00 g (born to female #1; TL – 365 mm, SVL – 335 mm, mass – 25.30 g; TL – 226 mm, SVL – 210 mm, mass – 7.75 g; TL – 257 mm, SVL – 235 mm, mass – 9.75 g (born to female #2). All the young are listed in the same order as above, the two latter animals being those force-fed.

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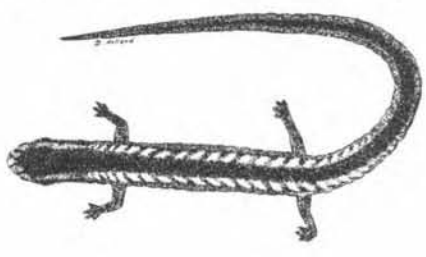
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LIFE HISTORY NOTES

See *Herp. Review* 22(2) for author's instructions.

ANURA

PHRYNOHYAS HEBES (NCN). **FEEDING.** Although largely feeding on invertebrates, occasionally frogs prey on representatives from all vertebrate classes. Here we report on the hylid frog, *Phrynohyas hebes*, feeding on a bat in the Pantanal (Santa Inês Ranch, Poconé, Mato Grosso, southwestern Brasil), on 30 May 1989. This frog is sometimes referred to as *P. venulosa* or *P. v. hebes* (Lutz 1973. Brazilian Species of *Hyla*. Univ. Texas Press, Austin, 260 pp.). The frog, an adult female (85.2 mm SVL), was found inactive at ca. 1500 h under the cover of a water-filled reservoir (500 l), ca. 2 m above ground. Shortly after collection the frog regurgitated a bolus of hair, bones, and a complete skull of the vespertilionid bat, *Myotis nigricans*.

In the Pantanal *P. hebes* shelters in tree cavities and crevices (pers. obs.), and probably the frogs share these shelters with bats. This habit would enhance the possibility of small bats being preyed on by *P. hebes*. Identifications of the frog and the bat were verified by I. Sazima. The frog is deposited in the Universidade Estadual de Campinas, São Paulo, Brasil (ZUEC 9001).

We thank C. F. B. Haddad for reading this note, and O. Cid for facilities at the Santa Inês Ranch.

Submitted by **CHRISTINE STRÜSSMAN**, Caixa Postal 1430, 78000 Cuiabá, Mato Grosso, Brasil, and **IVAN SAZIMA**, Departamento de Zoologia, Universidade Estadual de Campinas, 13081 Campinas, São Paulo, Brasil ●

TESTUDINES

APALONE SPINIFERA SPINIFERA (Eastern Spiny Softshell). **PATTERN DIMORPHISM.** Although it is well known that sexual dimorphism in carapacial pattern occurs in adult *A. s. spinifera* (Ernst and Barbour 1972. Turtles of the United States, Univ. Kentucky Press, Lexington, 347 pp.), the timing of the onset of these pattern differences is apparently unknown. The typical juvenile pattern of large, thick-bordered black carapacial ocelli is replaced in females as growth proceeds by a blotched pattern of lichen-like figures (Webb 1962. Univ. Kansas Publ. Mus. Nat. Hist. 13:429-611). Webb also indicated that one preserved *A. s. aspera* hatchling (PL = 3.5 cm) he examined had a blotched pattern; and the largest females that did not show any evidence of mottling were two *aspera* having PL = 7.6 and 8.0 cm.



Figure 1. Carapacial pattern in three young *Apalone s. spinifera*. Lower left specimen (CL = 56.4 mm) shows smudgy halos while lower right individual (CL = 77.2 mm) shows the mottling which develops subsequently in juvenile females. Upper left specimen (CL = 60.7 mm) demonstrates the typical hatchling/male pattern.

During the course of life history studies of *A. s. spinifera* in the vicinity of the Lamoille River, Chittenden County, Vermont in 1990, I examined about 60 live hatchlings and did not note a blotched pattern on any of them, i.e., they all had the typical juvenile pattern of ocelli. However, in connection with a subsequent experimental headstart (captive rearing for release) program, I observed six *spinifera* for nearly four months posthatching. All were fed a diet of chopped earthworms, live brine shrimp, bits of scallop meat, pieces of raw shrimp, and small freeze-dried *Euphausia pacifica* (Pacific plankton, Wardley's™). Mean dimensions (in mm, ranges in parentheses) of these six young at hatching were CL = 39.4 (37.7 - 40.8) and PL = 28.4 (26.9 - 29.3). Average live mass was 7.53 g (6.70 - 8.71).

Two of the six individuals developed the blotched pattern typical of females. The first indication of mottling (the development of a smudgy halo around each ocellus) was noted when these two young had attained a CL of roughly 52 mm and a PL of ca. 36 mm (see lower left specimen, Fig. 1). As growth proceeded, the dark pigmentation spread out to eventually produce the mottled pattern evident in the largest specimen shown in Fig. 1. The acquisition of the blotched pattern in very young females is obviously not correlated with attainment of sexual maturity (Webb op. cit.). The development of such early color/pattern dimorphism is surprising and represents another unusual facet in the ontogeny of *Apalone*, perhaps in some way related to the genetic control of sex determination in this genus (Vogt and Bull 1982. Copeia 1982(3):699-700).

This project was funded by the State of Vermont as a cooperative venture between the Nongame & Natural Heritage Program, Vermont Fish & Wildlife Department and Wetlands & Wildlife Associates.

Submitted by **TERRY E. GRAHAM**, Department of Natural & Earth Sciences, Worcester State College, Worcester, Massachusetts 01602, USA, and Wetlands & Wildlife Associates, 209 Pommagussatt Road, Rutland, Massachusetts 01543, USA ●

CARETTA CARETTA (Loggerhead). **PREDATION.** The anterior region of a *Galeocerdo cuvieri* (tiger shark) washed ashore on Georgia's St. Catherine's Island on July 26, 1990. The intact region measured 122 cm from anterior tip to just posterior of the gills, and the diameter of the jaws exceeded 55 cm. Using these measurements, the shark's length was estimated to be approximately 5 m. Stomach contents included two specimens of *Callinectes sapidus* (blue crab), one unidentified shark, feathers and beak of one *Pelecanus occidentalis* (brown pelican), and the intact carcass of a *Caretta caretta* (loggerhead). The carapace of the turtle was 47.50 cm long and 49.50 cm wide (curved measurement).

Shark predation of sea turtles is common but difficult to document. Dodd (1988. U.S. Fish and Wildl. Serv. Biol. Rep. 88(14):110 pp.) lists eight occurrences of *Galeocerdo* predation on *Caretta* worldwide. This discovery is the first documentation of such predation in Georgia waters.

Submitted by **PARKS SMALL**, 1850 Sand Dollar Lane, Vero Beach, Florida, 32963, USA and **TYRONE RAGAN**, 610 N. Lumpkin St., Cuthbert, Georgia, 31740, USA. ●

CLEMMYS INSCULPTA (Wood Turtle). **CLEANING SYMBIOSIS**. Mutualistic relationships in which one species cleans algae or ectoparasites from another are well known between fishes, and between reef fishes and sea turtles. J. Brockmann (pers. comm.) has seen freshwater fishes nibbling at large, stationary, algae-covered *Pseudemys* turtles in Silver Springs, Florida, but the turtles were evidently not presenting themselves to the fishes and simply resembled lumps of algae-covered substrate. There are several reports of freshwater turtles eating algae or skin from other individuals (Lotze 1963. Aquarien Terr. 16:220-221; Meshaka 1988. Herpetol. Rev. 19:88; Moll and Legler 1971. Bull. Los Angeles Co. Mus. Nat. Hist. Sci. 11:1-102).

In May and June of 1985 and 1986 in a creek in Centre County, Pennsylvania, I observed blacknose dace (Cyprinidae, *Rhinicthys atratulus*) apparently cleaning wood turtles on three occasions, and three times saw a turtle apparently unsuccessfully soliciting cleaning. On the three former occasions male turtles were observed in water 18-30 cm deep holding unusually still or moving very slowly. The neck was extended, and often one or more of the legs was extended out to the side in atypical fashion. Small schools of 3-6 dace, 5-7 cm long, darted at the head, neck, and outstretched legs, and could sometimes be seen nipping at the skin. On one of these occasions the turtle picked something off the creek bottom in his jaws, and the fish nibbled at it right from his mouth. On three other occasions another male behaved similarly, keeping motionless or moving very slowly for up to 1.5 h, with neck and legs outstretched, but I could not detect any fish closer than 5-7 cm to him.

Two of the cleaning episodes and one of the apparently unsuccessful ones occurred in a 5 m stretch of one pool. The three other episodes were each in a different location. This behavior may be more common than these few observations suggest. It was difficult to make these observations because of poor visibility underwater, and because the fish were extremely wary, easily disturbed by my presence, and dashed away each time the turtle moved.

Submitted by **JOHN H. KAUFMANN**, Department of Zoology, University of Florida, Gainesville, Florida 32611, USA

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GEOCHELONE DENTICULATA (Yellowfoot Tortoise). **MAXIMUM SIZE**. The reported maximum size for *G. denticulata* is 82.0 cm for males and 70.8 cm for females (Pritchard and Trebbau 1984. The Turtles of Venezuela, SSAR, 403 pp.). Here we report on a record size female specimen from the Zoo of the Museu Paraense Emilio Goeldi, Belem, Para, Brazil. The specimen was obtained from a private individual from Porto Velho, Rondonia, Brazil. No other information regarding its origin is available. The specimen is very dark in color with a pronounced flaring of the carapace over the hind legs and pronounced nuchal indentation.

Straight-line CL = 73.1 cm; maximum straight-line length (measured from midline at the rear of the carapace to the anteriormost edge of the carapace) = 75.9 cm; CW (at the level of the 6th marginal scute) = 45.2 cm; PL = 61.5 cm; maximum shell height = 33.0 cm; mass = 57.7 kg.

We wish to thank Antonio Messias Costa and Antonio Carlos Lobo Soares of the Goeldi Museum for their help, and the Rockefeller Foundation (International Partnerships Among Museums Program, AAM) for financial support.

Submitted by **RICHARD A. SAJDAK**, Milwaukee County Zoo, 10001 W. Bluemound Rd, Milwaukee, Wisconsin 53226, USA and **FLAVIO DE BARROS MOLINA**, Fundacao Parque Zoologico de São Paulo, CP 12954, Cep 04092, São Paulo, SP, Brasil.

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CROCODYLIA

CROCODYLUS ACUTUS (American Crocodile). **REPRODUCTION**. We report here the presence of a double-yolked egg, found in a *Crocodylus acutus* nest at the mouth of the Cuitzmala River, Jalisco, México, on 25 April 1991. The nest contained 27 eggs (mean size 78.3 X 43.7 mm, 91.2 g). Egg fertility in the clutch was 81.5%. The double-yolked egg was infertile, larger and heavier (79.4 X 43.6 mm, 94.4 g) than the mean; it was laid at the end of the oviposition. Presence of twin eggs and large eggs containing two embryos in *C. acutus* has been mentioned by Thorbjarnarson (1989. IUCN Publ. New Ser. CSG-SSC:228-259). Double-yolked eggs of *Alligator mississippiensis* are large, infertile, and laid at the beginning and end of oviposition (Ferguson and Joanen 1983. J. Zool. 200:143-177).

Submitted by **XOCHITL AGUILAR** and **GUSTAVO CASAS-ANDREU**, Departamento de Zoología, Instituto de Biología, UNAM, Apartado Postal 70-153, México, D.F. 04510, México.

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LACERTILIA

CNEMIDOPHORUS UNIPARENS (Desert Grassland Whiptail). **BEHAVIOR**. Various aspects of the behavior of the parthenogenetic whiptail *Cnemidophorus uniparens* have been described for captive populations (e.g, Crews and Fitzgerald 1980. Proc. Natl. Acad. Sci. 77:499-502; Moore et al. 1985. Anim. Behav. 33:284-289; Crews et al. 1986. Proc. Natl. Acad. Sci. 83:9547-9550). These and other studies show that agonistic behavior precedes pseudocopulation in parthenogenetic whiptails (e.g., *C. tesselatus*, *C. velox*, and *C. uniparens*, Crews and Fitzgerald op. cit.; *C. laredoensis*, Paulissen and Walker 1989. Southwest. Nat. 34:296-298). Confirmation of these behaviors in natural populations, however, has not been forthcoming. Agonistic behavior in wild whiptails was not reported in Mitchell (1979. Can. J. Zool. 57:1487-1499) as implied in Crews et al. (1983. *In* R. B. Huey et al, eds., Lizard Ecology, Harvard Univ. Press, Cambridge, Massachusetts, pp. 205-231). Paulissen and Walker (op. cit.) stated that pseudocopulation may be an abnormal artifact of cage conditions and it is "not part of the reproductive biology of parthenogenetic *Cnemidophorus* in natural conditions."

Bouts of pseudocopulatory behavior in whiptails begin with aggressive chases and head bobbing (Crews and Fitzgerald op. cit.). Because no other role has been ascribed to intraspecific agonistic behavior in these lizards, its occurrence in natural populations may represent initial stages of a pseudocopulatory bout. On 26 May 1975 I observed such behavior in adult *C. uniparens* in desert grassland habitat, 32 km SE Willcox, Cochise County, Arizona on the southern slope of the Dos Cabezas bajada. One female was initially observed to run from under a mesquite, then turn and face the area from which she came. At the base of the tree was another female bobbing her head, apparently with an open mouth. She chased the original female for approximately 15-25 cm whereupon the original female retreated a similar distance, each time turning and facing the aggressive female. This was observed on three occasions over a 30 s period. The original female attempted to circle around the base of the mesquite, whereupon she was chased away by the female on the other side. The original female then walked away bobbing her head. She then engaged in nervous foraging behavior. After her last chase the aggressive female under the mesquite began head bobbing and elevated a front foot (armwave). She,

too, subsequently engaged in foraging behavior. Physical contact was not made during the 7 min of observation. A similar series of observations was made on 11 June 1975 in the same area.

Crews et al. (1983. op. cit.) listed the following components of agonistic behavior in captive *C. uniparens*: armwaving, head nodding, bobbing, chasing, biting, aggressive gape, tail flick, face-off, tug-of-war over food, chain biting, and egg eating. All but the tail flick and those requiring physical contact were confirmed for the encounter I observed. The similarities between captive and field observations are not unexpected because most, if not all, of the captives in Crews et al. (1983. op. cit.) were from Cochise County, Arizona.

If the behaviors I observed were initial phases of pseudocopulation, then this behavior is not limited to captive populations of *C. uniparens* as Paulissen and Walker (1989. op. cit.) suggested. I did not observe pseudocopulation, therefore its occurrence in natural populations remains to be confirmed. Such behavior has been described for a natural population of the parthenogenetic *Lepidodactylus lugubris* (McCoid and Hensley 1991. Herpetol. Rev. 22:8-9).

Submitted by **JOSEPH C. MITCHELL**, Dept. of Biology, University of Richmond, Richmond, Virginia 23173, USA

SCELOPORUS VARIABILIS VARIABILIS (Rose-Bellied Lizard). **CANNIBALISM**. In July 1990, we collected an adult male *Sceloporus variabilis variabilis* (MZFC 04829: 59.0 mm SVL 118 mm TL) 1 km NE of Huehuetla, Hidalgo, México. Its stomach contained a hymenopteran (Formicidae) and a hatchling *S. v. variabilis* (18.5 mm SVL, 48.6 mm TL). The head of the hatchling had been crushed, but its jawbone and body were intact, and its tail had been broken into five fragments. This record extends the number of species of *Sceloporus* exhibiting cannibalism to eight. Cannibalism has previously been documented in *S. graciosus* (Knowlton 1934. J. Econ. Ent. 27(5):1001), *S. occidentalis* (Johnson 1965. Herpetologica 21(2):115-116), *S. chrysostictus* (Smith and Fritts 1969. J. Herpetol. 3(3-4):182-183), *S. undulatus* (Groves 1971. J. Herpetol. 5(3-4):205), *S. woodi* (Bowie 1973. J. Herpetol. 7(3):318), *S. magister* (Tanner and Krogh 1973. Great Basin Nat. 33(3):133-146; Vitt and Ohmart 1974. Herpetologica 30(4):413), and *S. torquatus* (Staton and Conzelmann 1975. Southwest Nat. 20(1):147-148).

Smith and Fritts (1969. J. Herpetol. 3(3-4):182-183) suggest that cannibalism of hatchlings can be accidental, but we believe that the present observation of hatchling ingestion in *S. v. variabilis* was deliberate. Two of us (FMQ, MMM) previously observed aggressive behavior from an adult male *S. grammicus* toward a conspecific hatchling. The adult caught the head of the hatchling and killed it but did not eat the smaller lizard. It is possible that cannibalism occurs more often in *Sceloporus* than has been recorded.

We would like to give special thanks to Arturo Gonzalez A., Jack Sites, Jr., and Irene Goyenechea M. for their comments on this manuscript and their assistance with the field work. H. M. Smith and R. R. Montanucci provided helpful information, and Hugo Ponce identified the insect. Funded by the Dirección General de Apoyo al Personal Académico (DGAPA) project IN201789.

Submitted by **F. MENDOZA QUIJANO**, **E. HERNANDEZ GARCIA**, **M. MANCILLA MORENO**, and **O. FLORES VILLELA**, Museo de Zoologia, Facultad de Ciencias, UNAM. Apdo. Post. 70-399, D.F. 04510 México.

SCINCELLA LATERALIS (Ground Skink). **PREDATION**. While many North American raptors commonly feed on small reptiles, reports of predation on reptiles by passerine birds other than corvids and shrikes (*Lanius*) are uncommon (Ross 1989. Amphibians and Reptiles in the Diets of North American Raptors. Wisconsin Endangered Species Report No. 59). Most published reports of small passerines feeding upon reptiles represent isolated incidents (e.g., Browning 1973. Chat 37(4):107).

During May and early June 1990, a pair of eastern bluebirds (*Sialia sialis*) that had nested in a man-made box in a rural yard surrounded by beech-dominated hardwoods (North Carolina, Chowan Co, 7.2 km SE center of Edenton) were observed feeding adult ground skinks (*Scincella lateralis*) to their young. This behavior was first observed on 25 May and at least 12-18 times during the next several days. Both parent birds brought skinks, and would usually shake them vigorously and beat them against the substrate to kill or stun them before feeding them to the young birds (see Fig. 1). One such sequence was recorded on videotape by M. L. Dunn and T. E. Howard.

Scincella are quite common in the area and obviously were a preferred food item for at least this pair of bluebirds. If the behavior of this pair of birds is at all typical, then passerine birds may be more important predators upon ground skinks and other small reptiles than is generally believed.



Figure 1. Predation on *Scincella lateralis* by eastern bluebird (*Sialia sialis*).

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural History, Box 27467, Raleigh, North Carolina 27611, USA and **PARIS R. TRAIL**, Rt. 4, Box 268-A, Edenton, North Carolina 27932, USA

VARANUS PRASINUS BECCARII (NCN). **BEHAVIOR**. An adult female *V. p. beccarii* (SVL = 286 mm, TL = 797 mm, mass = 237.5 g) displayed pre-oviposition and post-oviposition nest guarding aggression. Approximately one week prior to oviposition the female exhibited aggression towards keeper staff who were checking the nestbox for egg deposition. This aggression consisted of lunging, biting, tail slapping, and gular inflation.

On 16 January 1991 the female deposited four eggs in a sphagnum-filled nestbox attached to the side of the enclosure. Immediately the eggs were removed and she again showed aggression, but was not greatly persistent (likely due to physical exhaustion after egg laying). Two days following egg deposition, the adult male was reintroduced into the enclosure. The female immediately pursued the male, and began to bite him vigorously on the back. He attempted to escape by running and climbing, but was again cornered and attacked. At this time the male assumed a defensive posture by hiding his head beneath his foreleg, and compressing his body dorso-ventrally so that he was flat against the substrate. (It is interesting to note that the defensive posturing of the male differed greatly from the commonly observed threat posture of lateral body compression, tail coiling, and gular inflation.) The female, no longer able to effec-

tively bite him on the back, moved to his pelvic region where she could get a relatively secure grip. The male eventually escaped, and found seclusion in a hollow log. He was subsequently transferred into a separate enclosure.

On 1 April 1991 the male was again introduced into the enclosure with the female. The female was persistent in guarding the entrance of the next box, but did not aggressively pursue the male.

Female aggression before and after egg deposition has been observed in other captive groups of *V. prasinus* (J. Branham, pers. comm.). Although little is known of reproductive behavior of this species under natural conditions, we postulate that this behavior is inherent, and not an artifact of the captive environment.

Submitted by **CLAY M. GARRETT** and **MAX C. PETERSON**, Department of Herpetology, Dallas Zoo, 621 East Clarendon, Dallas, Texas 75203, USA ●

SERPENTES

CHONDROPYTHON VIRIDIS (Green Tree Python). **COMBAT FATALITY**. Numerous accounts of combat behavior between male snakes have been recorded. However, no record exists of the combat behavior leading to the death of one of the participants. Four animals (2 males, 2 females) were housed together in an enclosure measuring 90 X 90 X 150 cm. Numerous branches were available so no two snakes had to share the same branch. The snakes were misted daily. On 2 May 1990, the two males were observed in combat. The combat behavior resulted in moderately severe lacerations to both individuals. They were promptly removed from the enclosure, the lacerations were sutured, and they were housed individually. The suture were removed on 21 June 1990. The lacerations had healed with no infection noted.

On 7 September 1990, they were reintroduced to the previously described enclosure housing the females. On 2, 10, and 11 November 1990 the males were again engaged in combat. They were allowed to remain together this time, with the hopes that the dominant specimen would breed with females. On the morning of 12 November 1990 the males were observed coiled around each other on the enclosure floor. Closer inspection revealed that one of the animals was dead.

The gross necropsy of this animal revealed numerous lacerations on the skin as well as a ca. 15 cm long hemorrhagic area along the neck. Examination by a pathologist determined that there was no evidence of preexisting disease in this snake. Trauma was indicated as the most likely cause of death.

Submitted by **JANICE PERRY-RICHARDSON**, Audubon Park and Zoological Garden, PO Box 4327, New Orleans, Louisiana 70178, USA ●

CROTALUS ENYO CERRALVENSIS (Cerralvo Island Rattlesnake). **BEHAVIOR**. On 24 June 1989 at ca. 0115 h, in Arroyo Viejos, southwest end of Isla Cerralvo, Baja California, México, an adult *Crotalus enyo cerralvensis* was observed ca. 1.5 m above the substrate in a bush (*Pithecellobium confine*). The snake was observed as it exited the plant, moving easily and rapidly across its surface. The snake was followed over a distance of ca. 10 m and during this time it was observed ascending the lower branches of additional shrubs, eventually taking refuge in the crotch of a small bush. In contrast to *Crotalus enyo* on the adjacent mainland, this snake moved rapidly, both on the substrate and in the branches. The presence of this rattlesnake in brush ca. 1.5 m above the substrate suggests that this population may be partially arboreal in its habits.

Rhinocheilus lecontei etheridgei, another subspecies endemic to this island, also displays arboreal tendencies, having been observed in trees ca. 2 m above ground (Grismer 1990. Proc. San Diego Soc. Nat. Hist. 4:1-7). This behavior may be linked to predation on birds or the lizard, *Sator grandaevus*, which roost in trees and bushes. It is of interest that similar arboreal behavior has been observed in another insular endemic rattlesnake, *Crotalus catalinensis*, of Isla Santa Catalina (Grismer, pers. comm.). These observations highlight the need for additional ecological studies of insular rattlesnakes, as well as other insular taxa.

Submitted by **JIMMY A. MCGUIRE**, Department of Biology, San Diego State University, San Diego, California 92182, USA ●

EPICRATES (West Indian Boa). **REPRODUCTIVE LONGEVITY**. Lifetime fecundity of female snakes in a population has the potential for significant effects on individual fitness, abundance, turnover, and other factors relating to population ecology. Although there is some information on snake longevity (see Bowler 1977. SSAR Herpetol. Circ. No. 6, 32 pp.) little data exist on the maximum ages at which snakes reproduce. Four species of *Epicrates* reproduced at the Toledo Zoological Gardens during 1990 at ages approaching or exceeding fifteen years. On 14 September 1990, a female Puerto Rican boa, *E. inornatus* (TZS 833016), imported as an adult prior to 1973 (R. Collins, pers. comm.) gave birth to 11 offspring. On 26 October 1990, a female Jamaican boa, *E. subflavus* (TZS 853002), captive born in 1973 gave birth to 25 offspring. On 2 October 1990, a female Abaco boa, *E. exsul* (TZS 843000), captive born in 1975 gave birth to two offspring. On 2 June 1990, a female Ford's boa, *E. fordi* (PJT 029), captured as an adult near Thomazeau, Haiti in May 1977, gave birth to a single offspring. All the births reported above were the result of captive breedings.

Caution must be used in applying data garnered from captive animals to wild populations. However, the above examples illustrate that at least some species within this genus are physiologically capable of reproduction at an advanced age under certain conditions, and that the potential reproductive value of individual female *Epicrates* within a population may be quite high.

Submitted by **PETER J. TOLSON**, Toledo Zoological Society, 2700 Broadway St., Toledo, Ohio 43609-0110, USA ●

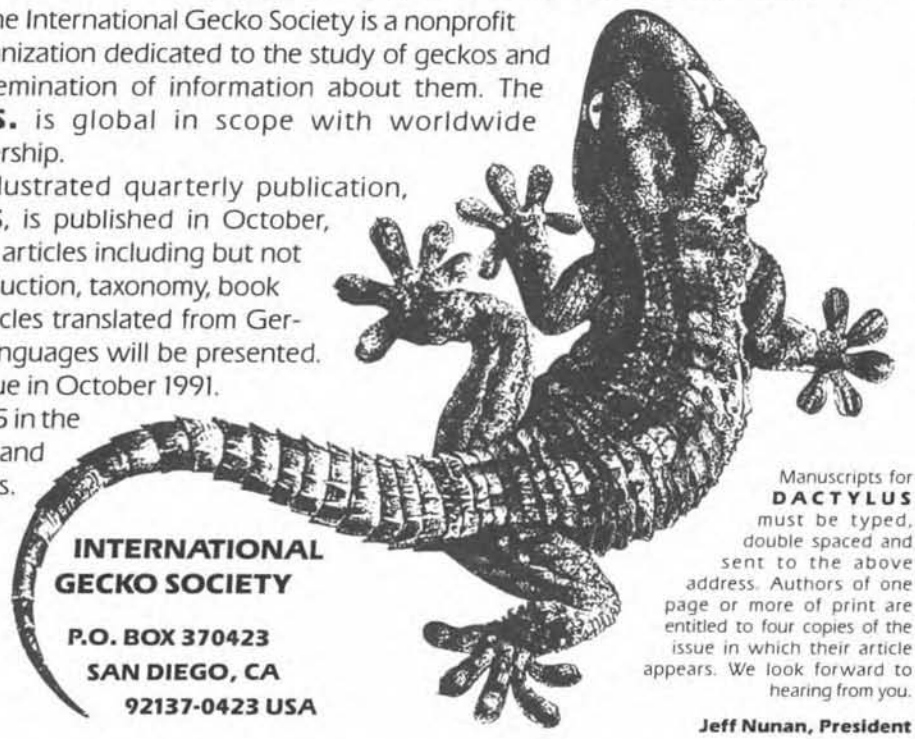
MASTICOPHIS MENTOVARIUS (Neotropical Whipsnake). **REPRODUCTION**. Dates of oviposition and clutch sizes are poorly known for many common neotropical snakes. On 23 March 1991 ca. 5 km S of Tlacotalpan, Veracruz, México, we saw a caracara (*Polyborus plancus*) feeding on a female *Masticophis mentovarius* (ca. 2 m TL). The snake contained 16 eggs averaging about 50 mm long. The eggs had smooth, flabby shells and apparently were not quite ready to be laid. Returning by the same route about 30 min later, a smaller (ca. 1.7 m TL) gravid female of this species was seen about 1 km S of the previous sighting. The posterior half of its body was badly crushed and scavenged. The number of eggs could not be determined accurately, but there appeared to be about 30, slightly more advanced than those of the first snake. The surrounding terrain was marsh and grassland virtually at sea level. Later the same day, a third female *M. mentovarius* (148 cm TL) was collected in sandy coastal hillocks about 11 km E of Alvarado. The posterior part of its body was shrunken and creased; apparently it had very re-

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cently deposited a clutch of eggs. Werler (1951. Zoologica 36:37-48) reported a captive specimen from Alvarado laid 17 eggs between March 23 and 25. Alvarez del Toro (1960. Los Reptiles de Chiapas, Instituto Zoologico del Estado, Tuxtla Gutierrez, pp. 156-157) reports that in Chiapas this species lays about 20 eggs in the spring. Our observations agree very closely with theirs.

Submitted by **SHERMAN A. MINTON** and **MADGE R. MINTON**, Indiana University School of Medicine, Indianapolis, Indiana 46202, USA ●

THAMNOPHIS SIRTALIS FITCHI (Valley Garter Snake). **FEEDING BEHAVIOR**. A small *Thamnophis sirtalis fitchi* was captured from the shallows of a small pond in Douglas Co., Oregon (T.25S., R.1E., Sec. 25, elev. 700 m) on 2 April 1991 at 1655 h. The water temperature was 17.0°C and both air and ground temperature measured 17.2°C. After gentle probing by one of us the snake began to gape and a large larval *Ambystoma gracile* emerged tail-first from its mouth. The snake measured 331.0 mm SVL with a head width of 7.6 mm, and had a mass of 14.8 g (after regurgitating prey). The salamander measured 104 mm TL with a head width of 14.5 mm, and had a mass of 7.1 g. The salamander was alive and survived for 24 h until such time as measurements were made at our laboratory. The salamander had abrasions both on the head's upper surface and along the dorsum of the tail base. Subcutaneous hemorrhaging was present in the abdomen and right lateral area of the head. During handling the salamander died. The snake appeared unharmed and survived. Both animals are currently in the Oregon State University collection.

Other *Thamnophis* have been observed to feed on larval salamanders having a mass equal to 88% of that of the snake (Lind and Welsh 1990. J. Herpetol. 24:104-106). Although both adult and possibly larval *Ambystoma gracile* possess toxic parotid and tail base glands (Brodie and Gibson 1968. Herpetologica 25:187-194), *T. sirtalis* have been observed to consume both larval and adult *A. gracile* in the laboratory with no ill effect (E. D. Brodie, Jr., pers. comm.).

Submitted by **HUGH LEFCORT, D. GRANT HOKIT, JOSEPH J. BEATTY,** Department of Zoology, Oregon State University, Cordley Hall, 3029, Corvallis, Oregon 97331-2914, USA and **CLYDE HAKELEV**, 628 N.W. 19 St., Corvallis, Oregon 97330, USA ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of a species' range, and thereby permit a more significant interpretation of its biology.

These geographic distribution records will be accepted in a **standard format** only, and all authors *must* adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in Collins, 1990, *Standard Common and Current Scientific Names for North American Amphibians and Reptiles, Third Edition*, Herp. Circ. 19: 1–41), LOCALITY (use metric for distances and give precise locality data), DATE (day-month-year), COLLECTOR, VERIFIED BY (*cannot* be verified by an author — curator at an institutional collection is preferred), PLACE OF DEPOSITION (where applicable, use standardized collection designations as they appear in Leviton et al., 1985, *Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology*, Copeia 1985(3):802–832) and CATALOG NUMBER (required), COMMENTS (brief), CITATIONS

(brief), SUBMITTED BY (give name and address in full — spell out state names — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged; institutional collection records will receive precedence in case of conflict). A good quality color slide or photograph may substitute for a preserved specimen *only* when the live specimen could not be collected for the following reasons: it was a protected species, it was found in a protected area, or the logistics of preservation were prohibitive (such as large turtles or crocodilians). Color slides and photographs *must* be deposited in a university or museum collection along with complete locality data, and the color slide catalog number(s) must be included in the same manner as a preserved record. All specimen identifications *must* be verified by another authority (not one of the authors). Before you submit a manuscript to us, check Censky (1988, *Index to Geographic Distribution Records in Herpetological Review: 1967–1986*) to make sure you are not duplicating a previously published record.

Please submit any geographic distribution records in the **standard format only** to the Section Co-editors, Joseph T. Collins (USA & Canadian records only), Museum of Natural History — Dyche Hall, The University of Kansas, Lawrence, Kansas 66045–2454, USA, or Darrel Frost (the rest of the world), American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024, USA. Short manuscripts are strongly discouraged, and are only acceptable when data cannot be presented adequately in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. J. 1980. Geographic Distribution: *Bufo woodhousii fowleri*. Herp. Review 25:198.

CAUDATA

AMBYSTOMA TIGRINUM TIGRINUM (Eastern Tiger Salamander). USA: TENNESSEE: Putnam Co: pond S jct. of Sheep Bluff Road & Round Cove Road, ca. 5 km W Rt. 70. 10 February 1990. J. H. Roberson. Collected as eggs, reared in laboratory. Verified by B. T. Miller. Middle Tennessee State University (MTSU 42C). County record (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Diss., Univ. Tennessee, Knoxville, 290 pp.).

Submitted by **JAMES H. ROBERSON**, 2225 East Main Street, Murfreesboro, Tennessee 37130, USA. ●

ANURA

BUFO BRONGERSMAI (Brongersma's Toad). MOROCCO: Prefecture of Marrakech: Skhour-des-Rehamna, 137 km S Casablanca on road to Marrakech (32°30'N, 07°55'W). 29 March 1991. Ignacio De la Riva. Verified by M. García París. Museo Nacional de Ciencias Naturales, Madrid, Spain (MNCN 16616). Second extra-Saharan record; 120 km NE of the initial one reported by Distre et al. (1989, Bull. Soc. Herp. Fr. 51:19–26).

Submitted by **IGNACIO DE LA RIVA**, Departamento de Biología, Facultad de Veterinaria, Universidad de Las Palmas, C/ Francisco Inglott Artiles 12A, 35016 Las Palmas de Gran Canaria, Canary Islands, Spain. ●

EPIPEDOBATES TRIVITTATUS (Three-striped Poison-dart Frog). VENEZUELA: ESTADO BOLIVAR: Imataca Forest Reserve (07°32'N, 61°09'W, elev. 300 m). 15 May 1990. Luís A. Balbas & José Ochoa. Verified by María José Praderio. MHNLS 11561–2 (adults). New record for Venezuela, but still within the Cuyuni-Essequibo River basin.

Submitted by **STEFAN GORZULA**, 14 Ferry Road, Millport, Isle of Cumbrae, Ayrshire KA28 0DZ, Scotland, & **LUIS A. BALBAS**, Departamento de Estudios Ambientales, Sección de Estudios Acuáticos, CVG EDELCA Guri, Apartado 28, Puerto Ordaz, Venezuela. ●

HYLA CINEREA (Green Treefrog). USA: TEXAS: Ellis Co: ca. 6.3 km N jct. I-35 & US Rt. 287. 22 April 1991. Mike V. Swallow. Verified by Jonathan A. Campbell. UTACV A-34002. New county record (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M Univ. Press, College Station, 434 pp.).

Submitted by **DAVID T. ROBERTS** & **PAULA D. SHILLING**, Department of Herpetology, Dallas Zoo, 621 East Clarendon Drive, Dallas, Texas 75203, USA. ●

HYLA CHRYSOSCELIS (Cope's Gray Treefrog). USA: TENNESSEE: Warren Co: Collins River at Rt. 127 crossing. 20 June 1991. J. L. Miller & B. T. Miller (Tennessee Scientific Study Permit 418). Verified by B. T. Miller. Middle Tennessee State University (MTSU 39A, 40A, 41A). New county record; extends known range into southcentral Tennessee (Redmond 1985, A biogeographic study of amphibians in Tennessee, Doctoral Diss., Univ. Tennessee, Knoxville, 290 pp.). Specimens collected as tadpoles; metamorphosed in lab. Species identification made by chromosome counts of squashed cells prepared from tadpole tails as described by Bogart (1968, Evolution 22:42–45).

Submitted by **JOYCE L. MILLER**, P. O. Box 71, Murfreesboro, Tennessee 37133–0071, USA. ●

PSEUDACRIS CRUCIFER CRUCIFER (Northern Spring Peeper). USA: WISCONSIN: Waukesha Co: Kettle Moraine State Forest-South Unit, Sec. 30, T5N, R17E. 24 May 1991. Donald M. Reed & Rachel E. Lang. Verified by G. S. Casper. Milwaukee Public Museum (MPM 23532). New county record (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Museum, 205 pp.).

Submitted by **DONALD M. REED** & **RACHEL E. LANG**, Environmental Planning Division, Southeastern Wisconsin Regional Planning Commission, P. O. Box 1607, Waukesha, Wisconsin 53187, USA. ●

CROCODYLIA

CROCODYLUS ACUTUS (American Crocodile) MEXICO: JALISCO: Municipio de la Huerta: desembocadura del Rio Cuitzmala. June 1988. Fausto R. Méndez. (IBH-7235 embryo). Verified by Gonzalo Pérez Higareda. First corroborated record of the species for the Mexican state of Jalisco, filling a gap between the states of Nayarit and Colima (Smith & Smith 1977, Synopsis of the Herpetofauna of Mexico. Vol. 5. Guide to the Mexican Amphisbaenians and Crocodilians, North Bennington, Vermont).

Submitted by **GUSTAVO CASAS-ANDREU** & **FAUSTO R. MENDEZ-DE LA CRUZ**, Colección Herpetológica, Instituto de Biología, UNAM, Apartado Postal 70-153, México, D. F. 04510, México. ●

LACERTILIA

EUMECES TETRAGRAMMUS BREVILINEATUS (Short-lined Skink). USA: TEXAS: Wise Co: 4.5 km (air) NE Wizard Wells (Jack County), Sid Richardson Scout Ranch, Devil's Den. 1 May 1991. M. B. Keck, D. P. Lawson & J. R. Mendelson III. Verified by Jonathan A. Campbell. UTACV R-30169. New county record (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M Univ. Press, College Station, 434 pp.). Extends known range 44 km NE of Parker County (McCord & Dorcas 1989, SSAR Herp. Review 20:94–96).

Submitted by **MICHAEL B. KECK**, **JOSEPH R. MENDELSON III**, & **DWIGHT P. LAWSON**, Department of Biology,

University of Texas, Arlington, Texas 76019, USA. ●

LEPIDODACTYLUS LUGUBRIS (Mourning Gecko). NEW CALEDONIA: Chesterfield Reefs: Loop Island (19°15'S 158°30'E), SE shore. 22 January 1991. Serge Sirgouant. Verified by Jens Vindum. CAS Color Slide 22.20(1). First record of a terrestrial reptile from the Chesterfield Reefs. Nearest known locality for this lizard is on the mainland of New Caledonia, 625 km to the east (Bauer & Vindum 1990, Proc. California Acad. Sci. 47:17–45).

Submitted by **JEAN CHAZEAU**, ORSTOM Centre de Nouméa, B.P. A5 Nouméa Cedex, Nouvelle-Calédonie & **AARON M. BAUER**, Biology Department, Villanova University, Villanova, Pennsylvania 19085, USA. ●

SERPENTES

LEPTOTYPHLOPS DULCIS (Texas Blind Snake). USA: COLORADO: Las Animas Co: Sharp Ranch, U.S. Army Pinon Canyon Maneuver Site, UTM 602.75-41.50.4, Sec. 30, T29S R57W. 4 July 1987. Verified by Hobart M. Smith. Univ. Colorado Mus. Herp. Color Slide 59. First documented record for county; extends range ca. 48 km N & 67 km W from previously known northwestern limit of species (Hammerson 1982, Amphibians and Reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, Connecticut 06457, USA **LARRY VALENTINE**, 1157 Highway 65, Eckert, Colorado 81418, USA & **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, Colorado 80219, USA. ●

LEPTOTYPHLOPS DULCIS DISSECTUS (New Mexico Blind Snake). USA: NEW MEXICO: San Miguel Co: Conchas Lake State Park, overlook on E side Conchas Dam. 22 August 1990. C. T. McAllister. Verified by Stanley Trauth. Arkansas State University Museum of Zoology (ASUMZ 16779). Extends range westward from east-central part of the state (Hahn 1979, Cat. American Amph. Rept. 231.1–231.2) and western Texas (Conant & Collins 1991, Field Guide to Reptiles and Amphibians of Eastern and Central North America, Third ed., Houghton Mifflin Co., Boston, 450 pp.).

Submitted by **CHRIS T. MCALLISTER**, Renal-Metabolic Lab (151-G), Department of Veterans Affairs Medical Center, 4500 S. Lancaster Road, Dallas, Texas 75216, USA. ●

LYCODON BUTLERI (Butler's Wolf Snake). THAILAND: KRABI PROVINCE: No other data. 18 July 1990. Merel J. Cox. Verified by Jarujin Nabhitabhata. Thailand Institute of Scientific and Technological Research, Ecological Research Department (TNRC 52 3852). Specimen was purchased from a dealer in Nakhon Si Thammarat Province who had obtained it from a hunter in neighboring Krabi Province in southern Thailand. First record for Thailand.

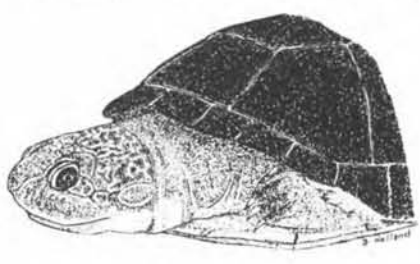
Submitted by **MEREL J. COX**, 695/17 Pracharaj Road, Soi Homhual, Bangkok 10800, Thailand. ●

SONORA SEMIANNULATA (Ground Snake). USA: TEXAS: Upton Co: 12.9 km NE McCamey off US Rt. 67. 17 April 1991. Chris T. McAllister. Verified by Lyndon A. Mitchell (Dallas Zoo). Arkansas State University Museum of Zoology (ASUMZ 17514). New county record partially filling a hiatus between Pecos & Reagan counties (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, 434 pp.).

Submitted by **CHRIS T. MCALLISTER**, Renal-Metabolic Lab (151-G), Department of Veterans Affairs Medical Center, 4500 S. Lancaster Road, Dallas, Texas 75216, USA & **STANLEY E. TRAUTH, V. RICK MCDANIEL, & RUSSELL B. MCALLISTER**, Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, USA. ●

TANTILLA CORONATA (Southeastern Crowned Snake). USA: TENNESSEE: Rutherford Co: cedar glade located along N border of Fall Creek Road (36°00'42"N, 86°26'18"W). 18 May 1990. B. T. Miller (Tennessee Scientific Study Permit 418). Verified by G. Murphy. Middle Tennessee State University (MTSU 30S). New county record (Gentry 1955, Tennessee Acad. Sci. 31:242–251; Telford 1982, Cat. American Amph. Rept. 308.1–308.2).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132, USA. ●



BOOK REVIEWS

Animal Cytogenetics, Volume 4: Chordata 2 Amphibia, by Max King. 1990. Gebruder Borntraeger Verlagshuchhandlung, Johannesstrase 3A, D-7000 Stuttgart 1, West Germany. 242 pp,, 45 figs., 10 tables. DM 198/ US $125. ISBN 3-443-26013-6.

Amphibian cytogenetics is a rapidly developing field of study. New and refined techniques for chromosome preparations have stimulated a large number of investigators to accumulate chromosomal information from gymnophionans, salamanders, frogs, and toads. Most amphibian chromosomes have typically resisted many of the banding techniques which are standard in mammalian cytogenetics but, with new techniques, the barriers are being removed. Morescalchi's (1973) review of amphibian cytogenetics contained fewer than 300 species which has been "the source" for karyological information. King's book, with chromosome references to more than 1000 species and subspecies, is long overdue. Writing such a book is an onerous task because the literature is very scattered in several fields and the systematics and nomenclature in the Amphibia has undergone considerable flux. King has accumulated 32 pages of references and his 37 pages in Appendices 1 and 2 contain a reference for each species as well as documentation concerning those species where information is available on banding, secondary constrictions, nucleolar organizing regions (NORs) or lampbrush configurations. The first half of the text provides a summary of amphibian classification which superimposes the karyotypic information (chromosome numbers and arm numbers) available for each family and subfamily as well as the distribution of the constituent genera. The rest of the text covers more recent information. Comparative banding information illustrates the usefulness of these techniques and there is a good, but short, section on lampbrush chromosomes. A section on the nucleolus organizing region is very comprehensive and draws on information from King's own research in this field. The evolution of genome size, sex chromosomes, and polyploidy are all dealt with in separate sections. The final section on phylogeny is anti-climactic for King only uses chromosome numbers and arm numbers to derive hypothetical trees which are drawn according to Australian custom (upside down!).

PRE-PUBLICATION ANNOUNCEMENT

GENERAL INDEX TO HERPETOLOGICAL REVIEW: 1967-1986 (EXCLUSIVE OF GEOGRAPHIC DISTRIBUTION RECORDS)

Ruth M. Zantzinger, George R. Pisani and Barbara Paschke

The long awaited 20-year cumulative index to *Herpetological Review* (1967-1986) will soon be printed. This volume incorporates the original 10-year index, and will be a valuable reference for locating articles in this diverse periodical. Separate author and taxonomic sections make it easy to use, and a new Obituaries section will aid persons interested in the history of herpetology. This volume will be ca. 88 pages in length, and will be sized 8.5 x 11 inches to match *Herpetological Review's* format. The index is designed to be used in conjunction with the Society's earlier publication, Index to Geographic Distribution Records in *Herpetological Review* (Vols. 1-17) by Ellen Censky.

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If you do not have a copy of Index to Geographic Distribution Records in *Herpetological Review* (Vols. 1-17), why not order it now and have the set? Copies may be ordered from the address above for $5 each, postpaid (US orders only— non-US postage as above, please).

All payments in US funds only.

I found several typographical and nomenclatural errors as well as some errors of fact. Some errors could be rather serious such as placing *Telmatobius montanus* in the genus *Caudiverbera* (pg. 73), not recognizing the synonymy of *Calyptocephalella gayi* and *Caudiverbera caudiverbera*, treating *Pachymedusa dacnicolor* as a ranoid (pg. 67) and considering *Eleutherodactylus* as being a family (pg. 145). King says he uses Frost (1985) as a taxonomic framework but his legend on Table 4 presents a hybrid classification using Frost's as well as Dowling and Duellman's (1978) classification. The factual errors are disturbing. I am particularly concerned about the section on polyploidy. In Table 10, *Xenopus epitropicalis* has 40 (not 36) chromosomes, two hexaploids, *X. boumbaensis* and *X. amieti*, are not included (these would be octoploids if *Xenopus laevis* - like frogs are considered tetraploids). *Bufo danatensis* should have a tetraploid number of 44 and not 88 and the tetraploid, African *Bufo asmarae* (4X = 40) is a synonym for *B.* sp. D and *B.* sp. (*kerinyagae*). *Bufo viridis* has no known natural tetraploid population but this species is listed as being 2X = 22 and 4X = 44. The tetraploid is probably *B. danatensis*. In the polyploid salamander listing, there are no known populations of hybrids involving only *Ambystoma laterale* and *A. tigrinum* as listed in Table 10. The *A. tigrinum* should be *A. texanum*. I do not believe that there is good evidence that either *Astylosternus diadematus* or any of the sirenids are polyploid. King states (pg. 135) that Kawamura (1952) and Moore (1955) used cold shock to induce higher levels of polyploidy in *Hyla versicolor* and then crossed these to *H. chrysoscelis* which gave rise to hexaploids. Tetraploidy in *H. versicolor* was unknown prior to Wasserman's 1970 paper (not 1980 as listed for *H. chrysoscelis* in Table 10) and these crosses were not done in the 1950's. The typographical and factual errors are distracting and could have been corrected with adequate proofreading.

The message that King delivers throughout the text is that amphibian chromosomes are very interesting and important for evolutionary cytogenetics but that there have been few studies that go beyond chromosome morphology (his stage 2 of 10 possible degrees of sophisticated analyses). Much more information from banding techniques and sequence organization is needed and a concerted effort is required in those groups which are under represented. In spite of the drawbacks (and the price of the book), King has produced a very necessary and stimulating treatment of amphibian cytogenetics at a time when this area of study is poised to receive the benefits of new knowledge in DNA technology which involves *in situ* hybridization using selective probes coupled with approaches using immunological techniques and interspecific homologous sequences.

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taxonomy and Vertebrate Evolution. Academic Press, New York, pp. 233-348.

Wasserman, A. O. 1970. Polyploidy in the common tree toad, *Hyla versicolor* LeConte. Science 167:385-386.

JAMES P. BOGART
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Colour Guide to the Snakes of Sri Lanka, by Anslem De Silva. 1990. R & A Publishing Ltd., 3 Highfield Villas, Newlands Hill, Portishead, Avon, England BS20 9AU, vi + 130 pp., 12 color plates including 69 photographs, 4 maps. Hardcover. £25.00 (approx. $40 U.S.).

This admirable little book is a concise guide to one of the more unusual snake faunas of any country. Of the approximately 80 species of terrestrial snakes in Sri Lanka, about half are endemic to the island. In addition, there are 13 species of sea snakes in its coastal waters. This diversity is substantial for an island only slightly larger than the state of West Virginia (in comparison, the entire United States, about 120 times as large as Sri Lanka has about 115-120 species of snakes). Sri Lanka boasts substantial radiations of typhlopids (10 species), uropeltids (15 species), and colubrids (42 species). De Silva has produced a comprehensive pictorial guide to this remarkable fauna. His work is intended to be a review of existing literature and not a detailed taxonomic or natural history treatment of the Sri Lankan snake fauna. It is successful in this goal. In general, the book is well-produced, although there are a few typographical errors or cases in which dates for references in the text and citation list do not correspond.

Somewhat less than half of the book's 130 pages is devoted to species accounts (57 pages). The remainder of the book consists of a general overview of the Sri Lankan snake fauna (11 pages), an account of man's relationship to snakes in Sri Lanka, including folklore and beliefs (8 pages), snakebite (venomous snakes, snakebite incidence, and indigenous and "western" treatments; 14 pages), keys to families, genera, and species (22 pages), references (11 pages), and an index to scientific names. Four outline maps show topography, climatic and vegetational zones, and political provinces.

The general overview of the snake fauna includes a helpful summary of the geology, climate, rainfall, and vegetation of Sri Lanka, as well as a concise introduction to the relationship of the Sri Lanka fauna to that of India and the Malayan region. Although these introductory accounts are brief, they are extensively referenced so that readers will have ready access to more detailed literature. The discussion of snake folklore provides many fascinating tidbits concerning witchcraft and beliefs about the behavior and coloration of particular species (we learn, for example, that some *Boiga forsteni* are red because of their vampire habits, and that "demon" cobras are thought to be used by certain snake charmers for assassinations). Equally entertaining is the account of traditional methods of snakebite treatment. Although the chapter on snake envenomation discusses the types of venomous snakes, incidence of snakebite, and statistics (age and sex of victims, site of bites, time of bites, etc.), De Silva does not provide an overview of recommended treatments of particular kinds of snakebite in Sri Lanka, nor characteristics of venoms of Sri Lankan snakes or their systemic effects on victims.

Although a chapter is devoted to "man and snakes" in Sri Lanka, De Silva gives us few clues as to how human activities affect snake distributions in Sri Lanka. Given that most of the distributions for species list only a few sites, I was left wondering whether island-wide distributions were truly so scantily documented. Further, what impact is human encroachment and habitat destruction having on the snake fauna? Is there sufficient knowledge to make these assessments?

The core of De Silva's book comprises the keys, species accounts, and color plates. The keys to families, genera, and species are all grouped together, which facilitates moving through them quickly with a specimen in hand. Although the keys are quite useful to have in a volume such as this, the characters used in them rely heavily on some features (e.g., dentition, and even head muscles and braincase structure!) which only the dedicated user will appreciate. None of these features are illustrated. Surely, more user-friendly keys could have been devised. The species accounts are brief, but informative. For each species these give common names (in Sinhala, Tamil, and English), natural history observations, distribution within Sri Lanka, status (commonness or rarity, endemic or not), references, and (sometimes) remarks concerning taxonomy. The natural history sections read much like field guide accounts, with brief statements concerning behavior, reproduction, habitats, diet, size, and distributions. Although knowledge of natural history is, in general, poor for Sri Lankan snakes, the accounts of sea snakes in De Silva's book show how much less is known for these species than for even many of the poorly known terrestrial snakes. The elusiveness of accurately assessing commonness or rarity is illustrated by comparison of contradictory statements for particular species in A. De Silva's Colour Guide and P. H. D. H. De Silva's (1980) treatment of the Sri Lankan fauna.

The addition of two features would have increased the usefulness of the species accounts. Particularly the inclusion of descriptive comments on the species themselves and of distinguishing features from similar species would have allowed greater facility in using this book as an identification guide. Except in the fortunate circumstance of having a specimen at hand represented in one of the color plates, identification of specimens will be impossible without using the keys, which are rather lengthy and involve examination of some features that are difficult or impossible to observe on live specimens, or without the aid of a microscope or dissection. Although brief descriptive comments on coloration and pattern for each species (and particularly of similar species) would have been valuable additions, they would also have lengthened the book substantially given the size of the fauna. Color and pattern descriptions are given in the keys for some species, but not for most. Readers will need to consult other references such as P. H. D. H. De Silva's (1980) larger work for detailed morphological descriptions of the species. Hence, De Silva's book falls a bit uncomfortably between a true field guide and a more technical review. Secondly, the inclusion of a map showing place names would have made the distribution sections of the species accounts (which are mainly lists of towns or villages) easier to interpret for those of us not more intimately acquainted with Sri Lankan geography. Fortunately, De Silva does provide a summary statement for each species about its occurrence in climatic/elevational zones of the country.

The color plates illustrate 53 of the 80 terrestrial snakes of Sri Lanka (a few species are represented by multiple photos), and are a central feature of the book. Most of the plates are from living specimens, although a few are represented by preserved ones (e.g., *Boiga barnesi*, *Liopeltis calamaria*). They are generally good.

These are extremely valuable in illustrating species for which good photographs are difficult or impossible to find in the literature (e.g., 8 of the 15 Sri Lankan species of uropeltids, *Balanophis, Cercaspis, Atretium, Haplocercus*).

The reference list spans the period from 1672 until the late 1980s, and includes most of the classic works on Sri Lankan herpetology and a number of early naturalists' accounts of the island and its people. Hence, it is valuable as a departure point for readers interested in the snake fauna and its natural history, and in the early European exploration of the country.

In summary, De Silva's "Colour Guide to the Snakes of Sri Lanka" is a helpful introduction to this fauna. Although the inclusion of additional descriptive material would have enhanced the usefulness of the book for identifications, the other information about these poorly known animals is well worth having summarized so concisely. I recommend the book to anyone who desires a quick overview of the fauna, an entré into background literature, and a visual feast of a substantial number of these remarkable snakes.

LITERATURE CITED

De Silva, P. H. D. H. 1980. Snake fauna of Sri Lanka with special reference to skull, dentition, and venom in snakes. National Museums of Sri Lanka, Colombo. 472 pp.

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Academy of Natural Sciences
1900 Benjamin Franklin Parkway
Philadelphia, Pennsylvania 19103, USA

Michigan Turtles and Lizards: A Field Guide and Pocket Reference, by James H. Harding and J. Alan Holman. 1990. The Michigan State University Cooperative Extension Service, East Lansing, Michigan. 94 pp. Available from: The Michigan State University Museum, East Lansing, Michigan 48824-1045, USA, $8.95 (substantial discount with the purchase of 10 or more copies).

The authors state that this small book is a practical guide for landowners, recreationists, students, educators, wildlife managers, naturalists and others who would like to identify the turtles and lizards of Michigan. In this they have succeeded admirably. It is not a reference book for the professional herpetologist, and should not be judged as such, but instead is a book of keys and illustrations compiled to aid the amateur not familiar with these animals. Only twelve species are covered: two lizards–*Eumeces fasciatus* and *Cnemidophorus sexliniatus*; and ten turtles–*Chelydra serpentina, Sternotherus odoratus, Clemmys guttata, C. insculpta, Terrapene carolina, Emydoidea blandingii, Graptemys geographica, Chrysemys picta, Trachemys scripta* (introduced), and *Apalone* (= *Trionyx*) *spinifera*.

To aid in identification of the turtles, labeled drawings of the shell are included along with a black lateral silhouette of each species. A key, based primarily on pattern and shape of the shell and head follows. While this key is simplistic, it is adequate and errorless. A key identifying the two lizards and separating them from salamanders is next. A glossary of selected terms used in the key and text is included immediately after the keys, but would better have been placed before the keys so that those using it could become familiar with the terminology before using them. Color photographs, for the most part good to excellent, illustrate the carapace, plastron and head of each turtle, and the body and head of the two lizards. Additional color illustrations of eggs, hatchlings, and some behavioral traits (basking, nesting) and a distribution map for each species are also included. The book is well illustrated!

There is a condensed account for each species that includes very brief sections on identification (a description of the reptile), distribution and status within Michigan, habitat, and habits (foods, reproductive biology). A serious reader might wish for more information in these accounts, but what is presented is to the point and accurate, and it was never the purpose of the book to present a complete life history of each species. The book ends with brief sections on conservation, the general biology of turtles and lizards, the study of turtles and lizards, and guidelines to care of turtles and lizards in captivity. A very brief bibliography of the major books on North American or Upper Midwest reptiles closes the book. Unfortunately, the table of contents is too brief and no index is included; the publication would have benefited greatly from both.

The book is paperback with an adequate binding and good quality paper.

Despite the few shortcomings mentioned above, this is a very good book that fills an important niche. More such state reference books for amateurs are needed to build interest in conservation of reptiles and amphibians. My hat is off to the authors for a job well done! I highly recommend this publication for anyone interested in turtles, lizards, or the herpetology of the Upper Midwest.

CARL H. ERNST
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Fairfax, Virginia 22030, USA

Frogs and Toads of the Natal Drakensberg, by A. J. L. Lambiris. 1988. University of Natal Press, P.O. Box 375, 3200 Pietermaritzburg, South Africa. x + 62 pp. No price given.

The mountain chain and great escarpment of East Africa is discontinuous; in South Africa the most continuous sharp escarpment and highest mountains are part of the Drakensberg in western Natal and adjacent Lesotho. These cool mountains form a stark contrast to the rest of South Africa; they support the Afromontane vegetation, which consists of heathers mixed with grassland at higher elevations and cool, moist forests at lower elevations. This region is home to a diversity of anuran amphibians, three of which are endemic.

"Frogs and Toads of the Natal Drakensberg" is a paperback field guide 14 x 20.5 cm. Following a preface by John C. Poynton and a brief introduction, the author presents illustrations and definitions of characters used in identifying adults and tadpoles, and a key to the adults. The majority of the pamphlet is devoted to accounts of the 25 species of anurans known from the Drakensberg region. Each account contains a description with illustrations of the hands and feet, comments on habitat and behavior, call and call site, breeding and development with illustrations of tadpoles and their mouths, local range, and comparisons with similar species. Tadpoles of only three species (*Breviceps maculatus, Rana dracomontana,* and *Leptopelis xenodactylus)* are unknown. The pamphlet concludes with three plates of water-color drawings of at least one individual of each species.

For anyone venturing into the precipitous Drakensberg in search of anurans, this pamphlet would be indispensible. The key to adults and illustrations of tadpoles are useful to anyone attempting to identify specimens from the region, and the information on habitat, behavior, breeding, and development will be useful to any worker compiling information on African anurans.

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The following statement-of-purpose appeared in the Introduction to the first issue of ***Herpetological Review*** in 1967 (Corson Hirschfeld, Editor):

> "*Herpetological Review* incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of individuals, institutions, literature and other components of the field. Perhaps equally important, the *Review* will provide a means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology, and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. ***HR*** publishes, in English, articles and notes of a semi-technical or non-technical nature, as well as book reviews, institutional features, commentaries, regional and international herpetological society news, research requests of SSAR members, and letters from readers directed to the field of herpetology. Articles reporting the results of experimental research, description of new taxa, or taxonomic revisions are not published in ***HR;*** such material should be submitted to the ***Journal of Herpetology*** (see inside front cover for address).

Manuscripts should be typewritten, double spaced, on 21.5 X 28 cm (8.5 x 11 inch) white paper. Authors are requested to submit four copies of feature article manuscripts. We strongly encourage submissions on a Macintosh disk in Microsoft Word 4.0, although other word processing programs in a Macintosh format (e.g, WordPerfect, MacWrite) are acceptable, as are DOS-formatted disks. Submission by disk will greatly facilitate the review and editing process and reduce the time from submission to publication. Submission on disk must be accompanied by hard copy. Refer to a recent issue of ***HR*** for style and format information. More detailed instructions for submission to Geographic Distribution, Life History Notes, and Recent Population Changes appear in a recent issue of ***HR*** under the appropriate heading.

Submissions for Life History Notes, Geographic Distribution, Herpetological Husbandry, Recent Population Changes, Regional Society News, and Legislative Alert should be sent directly to the appropriate section editor (see inside front cover for names and addresses). Feature articles, newsnotes, and other material should be sent to the Editor. Books for review should be sent directly to the Book Review Section Editor (name and address on inside front cover).

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HERPETOLOGICAL REVIEW

Volume 22 June 1991 Number 2

SSAR BUSINESS

1992 SSAR MEETING EL PASO, TEXAS

The 1992 annual meeting of the SSAR will be held on the campus of the University of Texas at El Paso (UTEP), 2-6 August. The meeting is being co-hosted by UTEP, El Paso Community College (EPCC), and Sociedad Herpetologica Mexicana.

Currently planned activities include a symposium on amphibian and reptile conservation. Tom R. Johnson is coordinating the symposium. To be considered for participation, please refer to *Herpetological Review* 22(1):2 for directions. Interested persons from Mexico and Central America should contact Oscar Flores Villela, Museo de Zoologia, Fac. de Ciencias UNAM. A.P. 70-399, Mexico D.F. 04510.

Other planned meeting activities include a Mexican food fiesta, social(s), a herp art exhibition, display of local herps, SSAR night at the Juarez Race Track, Mexican shopping tours for partners, and the auction. If enough interest is exhibited, a post-meeting visit to the Chihuahuan Desert Research Institute in Alpine, Texas (and nearby Big Bend National Park) will also be available.

Updates on this meeting will appear in future issues of *Herp. Review*. For further information, contact meeting co-chairmen:

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FARE DISCOUNT FOR SSAR MEETING

Individuals attending the SSAR/HL meeting at Pennsylvania State University in August are eligible for a 5% special meeting discount on Delta excursion flights to either Pittsburgh or Harrisburg. In making reservations with a travel agent or with Delta directly, refer to File Number R29180, to obtain the discount. ●

NEW HR EDITOR

This issue of *Herpetological Review* is the last issue for which I will be serving as the editor. After serving for eight years in this position, one which I have enjoyed immensely, I have decided to "retire" in order to catch up on some long-neglected projects. These have been some of the most exciting and rewarding years of my life and it is with no little regret that I pass the editorial mantle to my successor. As editor, I have had the opportunity to meet and correspond with herpetologists who taught me much, expanded my horizons, and humbled me with their skills and knowledge, whether they were authors or reviewers; I am greatly indebted to these individuals for sharing their wisdom with me.

There are literally hundreds of people — too many to thank individually — who have contributed to *HR* during my tenure as editor and whose advice has been valued and valuable. I extend my gratitude to the authors who have have submitted manuscripts for publication, to the reviewers who shared their expertise and editing skills with me, and to the many SSAR officers, editors, and other members who contributed to *HR* in many ways.

I would particularly like to thank the many people who contributed directly to the publication of each issue of *HR*. These are the section editors and managers, past and present. I would like to recognize these individuals who worked so hard carrying out their own responsibilities:

George Pisani (former editor and managing editor), Tom R. Johnson (artwork), John E. Simmons (past managing editor), Tom Tyning (current managing/desktop editor), Ellen J. Censky and Alvin L. Braswell (past section editors for Geographic Distribution), Joseph T. Collins and Darrel Frost (current section editors for Geographic Distribution), Peter J. Tolson (section editor for Life History Notes), Bern Tryon (section editor for Herpetological Husbandry), Jeffrey Black, Terry Hibbitts, Ray Ashton, and Janice J. Perry (past liaisons for Regional Society News), Steve Hammack (current liaison for Regional Society News), Patricia Riexinger and William S. Brown (past Legislative Alert section editors), Dale R. Jackson, and Kurt A. Buhlmann (current Legislative Alert section editors), Ralph W. Axtell (section editor for Recent Population Changes), Raymond J. Stein (past Advertising Manager), and Elizabeth A. Johnson (current advertising manager).

I would also like to thank those SSAR members who contributed to our recent move to desktop publishing. Without their skill and support, we could not have implemented this technology. These individuals are: Tom Tyning, Robert Hansen, Carole L. Hom, Eric M Rundquist, Christine M. Dwyer, Brian Paulson, Ellen Beltz, Jill Horwich, and Eloise Beltz-Decker. I would like to particularly thank George Pisani, long a stalwart of the Society, for laying the groundwork which was necessary for our move to desktop publishing.

I also acknowledge current and former Society presidents, secretaries, treasurers, directors, and other appointed and elected officials, for their assistance, suggestions, and constructive criticisms.

And now, it is time to introduce **the new editor of *Herpetological Review*.** Robert Hansen of Clovis, California, has, with a surprising degree of alacrity, accepted the yoke of the *HR* editorship, beginning with the next issue. For the past year, Bob has demonstrated his editorial skills by

formatting the Life History Notes for publication. He is a dedicated member of the Society, well respected as a scientist, highly skilled with computer/word processing technology — and eager. I can honestly say that I feel none of the anxiety felt by retiring editors when turning the reins over to their successor. I have full confidence that Bob will serve the Society well as editor of *Herpetological Review*.

All new correspondence regarding *HR* should be sent to Bob at his address (see inside front cover). All "old business" should be sent to me for resolution.

We also welcome the following new section editors: Lyndon A. Mitchell (Herpetological Husbandry), Stephen Corn (Life History Notes), and Aaron M. Bauer (Book Reviews). All correspondence regarding these sections should be sent directly to them (addresses below and on inside front cover of each issue of *HR*).

Finally, I would like to close this very interesting chapter of my life by reprinting a poem which first appeared in the Journal of the Irish Medical Association, 42(247):31-32, 1958:

The Editor's Passport

The Editor stood 'fore the Heavenly Gate,
He bowed before the Man of Fate,
Seeking admission to the fold.
"What have you done," St. Peter asked,
"To gain admission here?"
"I was the Journal's editor, Sir,
For many a weary year."
The Pearly Gates swung open wide
as Peter pressed the bell.
"Come in and choose your harp," he cried;
"You've had your share of hell!"

Good Luck, Bob!!

MJR ●

KUDOS TO OUTGOING HR EDITOR

On behalf of the SSAR, I want to thank Marty Rosenberg for his long-standing effort as editor of *Herp. Review*. Marty's 8+ year tenure ranks as the longest in *HR*'s history (a dubious distinction perhaps!). *HR* is a unique entity among herpetological publications, one that serves a broad community of both amateur and professional herpetologists. Producing such a hybrid publication is a difficult task and we have been fortunate indeed to have someone of Marty's talents and dedication at the helm. It is with no little trepidation that the new editor and staff take over, seeking to maintain the high quality that has characterized the efforts of Marty and his section editors.

I am especially pleased to have coerced Lyndon Mitchell of the Dallas Zoo and Stephen Corn of the U.S. Fish and Wildlife Service to come aboard as section editors for Herpetological Husbandry and Life History Notes, respectively. Further, a new section editorship has been added, that of Book Reviews, to be filled by Aaron Bauer of Villanova University. Correspondence regarding their respective sections should be sent directly to them, as follows:

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RWH ●

SYMPOSIUM ANNOUNCEMENT AND CALL FOR PAPERS

The SSAR Conservation Committee is considering sponsoring an Amphibian and Reptile Conservation Symposium at the 1992 annual meeting in El Paso, Texas. Our tentative plan includes a morning session focused on a specific topic such as a taxonomic group (e.g., sea turtles or iguanid lizards), region (e.g., desert, high elevation populations, rain forest), or conservation/management methodology. The committee is interested in co-sponsoring the morning session with persons or organizations involved with the selected topic. The afternoon session would be devoted to a broad spectrum of herpetological conservation and/or management topics. Papers of particular interest are those dealing with "hands on" projects directly related to habitat improvement, mitigation of threats, reproductive enhancement, and restocking or relocation of rare or endangered amphibians and reptiles.

To be considered for participation in the symposium, submit a preliminary abstract by 30 September 1991. Anyone interested in serving as a convener/organizer for the morning session should contact T. Johnson (below) with your ideas.

Final deadline for paper abstracts will be 31 January 1992. Send abstracts or questions to:

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Jefferson City, MO 65102-0180, USA ●

SSAR TRANSLATION PROJECT

The object of this project is to make available to SSAR members accurate translations of foreign language research articles. Since SSAR has not budgeted money for translation of articles, we must rely on contributions from members. If you have an article that has been translated, please send a copy (or reprint) of the original and the translation to the editor. A few people have volunteered to translate articles, and we are interested in hearing from any others who are willing to contribute their time.

If you have an article for translation that you feel would appeal to a large segment of the herpetological community, send a copy or reprint to the editor and we will try to have it translated. We presently have 181 articles available through the Translation Project. We have also listed articles available from the National Translations Center (NTC) and the National Museum of Natural History (marked SHIS). For copies of the NTC articles write to: NTC, John Crerar Library, 35 West 33rd Street, Chicago, Illinois 60616. For copies of SHIS articles write to SHIS Division of Reptiles and Amphibians, National Museum of Natural History, Washington, DC 20560. For copies of the SSAR translations include 50 cents for postage plus 07 cents per page xerox cost to the editor (address below). The number of pages of original and translation are in parentheses. Previous titles have appeared in *Herpetological Review* 10(3):82-83, 1979; 13(4):111-112, 1982; 16(1):2-3, 1985; 17(2):33-34, 1986. New titles will be published in *Herpetological Review* as they become available.

With this list Robert Aldridge is retiring as Editor of the Translation Project. Requests for titles from this list or any previous list should be addressed to the new Translation Editor:

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St. Louis, MO 63103, USA

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NEWSNOTES

ROYAL BRITISH COLUMBIA MUSEUM

During 1991 and 1992, the Royal British Columbia Museum will be packing and moving its anthropological, biological, and historical collections to allow for removal of asbestos in the collections buildings. During this time, some of the artifacts and specimens will be inaccessible. The Museum will meet all existing commitments regarding loans and research access and will endeavor to meet any additional requests. The exhibits building will remain open to the public.

For information regarding loans and research, contact Grant W. Hughes, Assistant Director, Collection Program, Royal British Columbia Museum, 675 Belleville Street, Victoria, B.C. V8V 1X4, Canada. (604) 387-5706. ●

EARTHWATCH GRANTS AVAILABLE

Earthwatch, a private non-profit organization that promotes significant scholarship by offering capital, labor, and greater visibility to the scientific community, will award more than 140 grants in 1992. Field grants range from $10,000 to $100,000, with the average grant about $20,000. Funds are contributed by nonspecialist volunteers who participate in the field research.

Preliminary proposals may be made by telephone or by a detailed letter. Upon favorable review, full proposals will be invited for submittal 12 months before the starting date of the project.

For further information, contact: Dee Robbins, Program Director, The Center for Field Research, 680 Mt. Auburn Street, P.O. Box 403, Watertown, MA 02172, USA. (617) 926-8200. ●

FIELD RESEARCH ASSISTANT

A field research assistant in herpetology is needed from January through June, 1992 and 1993 for biodiversity studies in the Philippines. Preference will be given to applicants who are either in or accepted to a graduate program and plan to use this research experience for their dissertation.

Applicants should have extensive field experience and be able to thrive for months in the field. All travel and living expenses will be provided with the applicant's university providing support between the seasons. The position will be awarded in August 1991.

Please send inquiries or a letter of application, resume, and three letters of recommendation to Dr. John W. Ferner, Adjunct Curator of Herpetology, The Cincinnati Museum of Natural History, 1720 Gilbert Avenue, Cincinnati, OH 45202, USA. (606) 344-3374 or (513) 621-3890. ●

NWRA GRANTS

The National Wildlife Rehabilitators Association announces its small grants program. This program makes available two $1,000 research grants in the field of wildlife rehabilitation. Each may be applied to one large project or several smaller research projects each totaling less than $1,000. Applicants must demonstrate financial need and submit a typewritten proposal that includes: name(s) and resume(s) of personnel involved, objectives of the project, a brief description of how the project will be carried out, a brief literature review, and an itemized budget.

An annual report on progress is required. It is expected that those receiving NWRA support will present the results of their projects at an NWRA national meeting within two years of receipt of the grant.

The deadline for submitting proposals for research grants is 15 December of each year. Recipients will be announced at the NWRA annual meeting in February and in writing.

Proposals should be submitted to: Mark Pokras, DVM, Tufts University School of Veterinary Medicine, Wildlife Clinic, 200 Westboro Road, North Grafton, MA 01536, USA. ●

REPOSITORY FOR FROZEN TISSUES

We wish to publicize the existence of the Collection of Frozen Tissues at the LSU Museum of Natural Science. The Collection is supported by NSF and LSU as a service to the research community. It contains tissue samples of over 30,000 vertebrate animals preserved at -70°C.

We are committed to proper curation and research use of frozen tissue samples. Although our freezer space is limited, we would like to offer our collection as a repository for personal research collections or orphaned collections that are no longer needed but are still valuable to the research community, and are perhaps occupying needed freezer space.

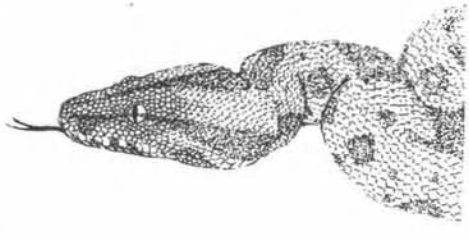
Materials donated to the Collection become the property of the Collection (our policy on Collection use is available upon request). If you have materials you wish to donate or would like to use materials in the Collection, please contact Dr. Robert M. Zink, Curator, Collection of Frozen Tissues, Museum of Natural Science, Louisiana State University, Baton Rouge, LA 70803, USA. ●

OPENING FOR WILDLIFE BIOLOGIST

The Division of Fish and Wildlife, Mariana Islands, is soliciting applications for a wildlife biologist. The job description is: Wildlife Biologist II - Herpetologist: Project leader for brown tree snake interdiction and control; Conduct/supervise trapping and search efforts; evaluate quarantine procedures and advise inspectors, shippers, and regulators on means of preventing snake introductions. Assess impacts of other introduced amphibians and reptiles and determine status of native herps as time permits. $23K. Contact ASAP: Arnold I. Palacios, Chief, Division of Fish and Wildlife, CNMI Government, Saipan, MP 96950. Country Code: 670-322-9095 or 9729. FAX 322-3386. ●

REPRINT SALE

The Carnegie Museum of Natural History is conducting an inventory reduction sale of its scientific publications (*Annals*, *Bulletin*, *Special Publications*) printed prior to 1985. A 50% price reduction is offered on research articles in herpetology, ichthyology, mammalogy, invertebrate zoology, anthropology, birds, vertebrate and invertebrate paleontology, and botany. Please write for listings of your choice to: Office of Scientific Publications, The Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, PA 15213-4080, USA. FAX (412) 622-8837. ●



MEETINGS

SYMPOSIUM ON NATURAL HISTORY COLLECTIONS

An International Symposium on the Preservation and Conservation of Natural History Collections will be held 10-15 May 1992 in Madrid, Spain. The symposium will focus on the concerns of the natural history community for the current status and future direction of anthropological, biological, and geological collections in the world.

The first circular is available now and includes an outline of the general program. A preliminary registration form is included. For further information, please contact: Julio Gisbert and Fernando Palacios, Museo Nacional de Ciencias Naturales, Jose Gütierrez Abascal, 2 28006 Madred, SPAIN. FAX: 1/5645078. BITNET: MCNMA13@EMDSIC1. ●

WORLD CONGRESS ON TOXINS

The 10th World Congress on Animal, Plant and Microbial Toxins will be held in Singapore, 3-8 November 1991. (Note - the previously advertised dates of 1-7 July have been changed.) The main theme of the congress will be "Recent Advances in Venom and Toxin Research." The tentative programme consists of eight plenary sessions and lecture sessions on venomous snakes of the world, poisonous and medicinal plants, mycotoxins and phycotoxins, toxic dinoflagellates and red tides, toxin-producing fungi and bacteria, food poisoning, and insects and arthropods. Numerous workshops and symposia are also scheduled.

For further information about and registration forms for this meeting, contact Dr. P. Gopalakrishnakone, Organising Chairman, 10th World Congress I.S.T., c/o Department of Anatomy, Faculty of Medicine, National University of Singapore, Singapore 0511, SINGAPORE. ●

6TH SEH MEETING

The 6th Ordinary General Meeting of the Societas Europaea Herpetologica will be held 19-23 August 1991 at the Hotel

"Agro," 1121 Budapest, Normafa u. 54. The meeting is being organized by the Hungarian Academy of Sciences, section of Biological Sciences, and the Hungarian Natural History Museum. The conference will consist of an invited plenary lecture, oral presentations in two parallel scientific sessions, poster presentations, social events, and post-congress excursions.

Information about and registration forms for this meeting can be obtained in the U.S. by contacting the editor of *Herpetological Review* at tel. (216) 368-3558, or by contacting the SEH Organizing Committee: SEH 6th O.G.M., Zoological Department, Hungarian Natural History Museum, H-1088 Budapest, Baross u. 13., Hungary. Tel. (361) 113-00-35, FAX: (361) 113-88-20. ●

DGHT MEETING

The Deutsche Gesellschaft fur Herpetologie und Terrarienkunde (DGHT) it holding its annual meeting 18-22 Setpember 1991 at the Unionssale, D 5300 Bonn. Members of SSAR are invited to attend and/or participate in this meeting. The congress language is German.

For further information, contact the DGHT, Adenauerailee 150-154, D-5300 Bonn 1, Germany. ●

ASZ ANNUAL MEETING

The 1991 Annual Meeting of the American Society of Zoologists with the American Microscopical Society, Animal Behavior Society, The Crustacean Society, and The International Association of Astacology will be held at the Hyatt Regency Hotel in Atlanta, Georgia, during the traditional post-Christmas period.

A 1 August deadline for receipt of abstracts of papers (oral or poster presentations) has been set. Posters are particularly encouraged.

Thirteen symposia and workshops are currently scheduled, including: Basic Animal Behavior Research in Zoos: A Link with the Wild; Neuropeptides — Synthesis, Release, Action, and Evolution; Development and Evolution of the Vertebrate Head; Strategies for Analyzing Neuropeptide Systems; and Structure, Development, and Phylogeny of Cranial Nerves.

For more information, contact: Mary Adams-Wiley, Executive Officer, American Society of Zoologists, 104 Sirius Circle, Thoasand Oaks, CA 91360. (805) 492-3585. FAX (805) 492-0370. ●

REGIONAL SOCIETIES

ADDRESS CHANGES

The following new societies/address changes have been submitted since the list of herpetological societies was printed in the June 1989 issue of *Herpetological Review*:

Herpetology Online Computer Network
P.O. Box 52261
Philadelphia, PA 19115, USA
ACCESS: (215) 464-3562 via modem

Philadelphia Turtle & Tortoise Club
c/o Mark F. Miller
9573 Walley Avenue
Philadelphia, PA 19115-3009, USA

Society officers are encouraged to forward to the SSAR Regional Society Liaison (see inside front cover of any HR) any address changes for their society. Newly formed societies are invited to announce their existence in this column, and established societies are invited to submit short descriptions of their organization for publication in this column.

CHICAGO HERPETOLOGICAL SOCIETY HERPETOLOGICAL GRANTS

The Chicago Herpetological Society (CHS) has established a program to award financial support for herpetological research, education, and conservation. *CHS Herpetological Grants* compliments the SSAR Grants-in-Herpetology program to provide more funds for herpetological research. Interested parties may apply for a grant in any one of the following categories, but may submit only one application per category per year. Not all categories may receive awards each year. Individual awards will not exceed $500.

1) Herpetology in Illinois. Proposals may address any aspect of herpetology in Illinois.

2) Graduate Student Research in Herpetology.

3) Undergraduate Student Research in Herpetology. Undergraduate and high school student research projects in herpetology for course credit, extra credit, science fairs, and the like should be submitted in this category.

4) Field Studies in Herpetology. Proposals involving travel expenses, survey collections and other fieldwork should be submitted here.

5) Conservation. Proposals involving threatened herpetological species or environments, declining populations, and similar problems are appropriate here.

6) Captive Management, Husbandry, and Propagation.

7) Miscellaneous. This category is for proposals that do not fit nicely into other categories.

Applicants must be dues-paying members of the CHS. The committee reserves the right to reassign the category under which a given proposal is submitted. Recipients of SSAR grants will not be eligible for CHS grants in the same calendar year. In the event that applications are lacking, awards in a given category may be withheld and allocated funds may be reassigned to another category. Recipients of grants are required to submit results of their subsidized work in writing within a reasonable amount of time for publication in the CHS *Bulletin* or elsewhere.

Applications will be similar to those for SSAR grants. Each must include:

1) Background and objectives of the proposal

2) Materials and methods for carrying out the project

3) Budget, not to exceed $500

4) Brief resume of the applicant

5) A letter of support from the most appropriate sponsoring party, such as faculty advisor or committee chairperson, course instructor, or the president of a sponsoring herpetological society.

The application must be typed, double-spaced, and must not exceed five pages, excluding resume and budget. Failure to follow this format may result in an application being rejected. All applications must

be submitted in duplicate and be received no later than 31 August 1991. Awards will be announced by 30 November 1991.

Submit applications or questions to:

Stephen L. Barten, D.V.M.
CHS Herpetological Grants
Vernon Hills Animal Hospital
1260 Butterfield Road
Mundelein, IL 60060
(708) 367-4070, FAX (708) 367-0374

CHS Herpetological Grants are funded primarily by proceeds from book sales. Your tax deductible donation to support this program would increase the amount of awards available while supporting valuable herpetological research. ●

LEGISLATIVE ALERT

This column is produced by the SSAR Conservation Committee to alert members of the herpetological community to recent and proposed regulatory changes involving amphibians and reptiles. We encourage SSAR members to notify us of any significant changes in state, national, or international conservation laws as they relate to these animals. For further details about any of the following, or to report additional changes, please contact Kurt A. Buhlmann, SSAR Conservation Committee, c/o Division of Natural Heritage, Virginia Department of Conservation and Recreation, 203 Governor Street, Suite 402, Richmond, CA 23219, USA.

The following final and/or proposed listings and regulations have been announced by governmental regulatory agencies. Pertinent *Federal Register* (FR) citations are given for U.S. notices.

U.S.: *Crocodylus porosus* (saltwater crocodile); proposal to reclassify all populations of saltwater crocodiles in Australia from endangered to threatened [FR 55(188):39489-39493, 9/27/90]

Populations of the saltwater crocodile in the Northern Territory have undergone significant recovery since protection from hunting in 1972. Analysis of all available monitoring results from 1975 to 1987 show that the density of wild saltwater crocodiles in tidal rivers has tripled since surveying began. Today, the species occupies the whole of their known range in the country. The proposed rule, if made final, would allow for the importation of specimens from ranching operations into the United States. Populations of saltwater crocodiles in other countries would remain in the endangered status.

U.S. *Graptemys flavimaculata* (yellow-blotched map turtle); has been formally listed as threatened [FR 56(9):1459-1463, 1/14/91], [see this column, *HR* 21(4):80, for details]

FLORIDA: *Gopherus polyphemus* (gopher tortoise); incidental take, draft rule (see this column, *HR* 21(4):80, for details.

Proposed rule was defeated by the five commissioners of the Florida Game and Freshwater Fish Commission, 13 January 1991.

NEVADA: The Desert Tortoise Conservation Center, near Las Vegas, opened 16 June 1990. It is the first large-scale research facility established to receive desert tortoises (*Gopherus agassizii*) salvaged from private lands under development. Tortoises from 11 different tracts of private land, totalling 7,200 acres, could be transferred to the center. The Bureau of Land Management (BLM) is in charge of the center. The Nevada Department of Wildlife is supervising the salvaging process (Endangered Species Technical Bulletin, Vol. XV, No. 9, Sept. 1990).

VIRGINIA: New regulations. Effective 15 October 1990 (VR 325-03, Virginia Department of Game and Inland Fisheries), "it shall be lawful to take and possess no more than three individuals of any single species of amphibian or reptile or 20 individuals of any single species of aquatic invertebrates and nongame fish for private use....It shall be lawful to take bullfrogs for private use except from the banks or waters of designated trout waters. The daily limit for bullfrogs shall be 15....It shall be lawful to take snapping turtles, crayfish and hellgramites for sale." Scientific collecting permits are required for all research activities. For more information contact: Virginia Department of Game and Inland Fisheries, 4010 West Broad Street, Box 11104, Richmond, VA 23230.

KURT A. BUHLMANN
SSAR Conservation Committee ●

FEATURES

HABITAT UTILIZATION AND FEEDING HABITS OF *NEUSTICURUS ECPLEOPUS* IN A BRAZILIAN TROPICAL RAINFOREST

Although there are about seven studies that include information about the ecology of the tropical rainforest microteiid lizard *Neusticurus ecpleopus*, most of the reports are anecdotal. In a revision of the genus *Neusticurus*, Uzzel (1966) argued that although these lizards are usually considered to have aquatic tendencies, observations that confirm this are scant. However, Vanzolini (1986) recently argued that all observations on *Neusticurus* species in the field suggest association with rivulets in the forest.

This study reports systematic field observations to evaluate habitat utilization and feeding habits of *Neusticurus ecpleopus*. The field work was carried out at the Igarapé de Bomba d'água, an area of primary tropical rainforest in Serra de Carajás (5°54'S, 49°53'W), Pará, Brazil, between 22 and 26 July 1987. An area of ca. 400 m^2 (26 x 15 m) containing a stream (50-100 cm wide, 5-20 cm depth) with two smaller ramifications (20-30 cm wide, 2-8 cm depth) was demarcated in the forest. At the time of the study, the soil surface of the area had dry leaf litter, except for a 10-35 cm-wide margin to the rivulets and stream, which presented wet litter. The extension of rivulets and stream was measured and summed, giving an estimate of total extension of water course in the area.

During four days, all the litter of the area was systematically stirred looking for lizards. When a lizard was sighted, its original position was recorded and an attempt was made to capture it. The snout-vent length of each captured lizard was measured to the nearest 0.1 mm with calipers. The temperature of the lizard, water, and air (1 cm above soil) were taken to the nearest 0.1°C, using a digital thermometer. After measurements, the lizard was toe clipped and released. A description of the microhabitat (dry or wet litter; in water or on stone) at the original position of the lizard was recorded and the distance from this point to the nearest water course measured. The width and depth of the nearest water course were also recorded. In a similar area more than

Table 1. Number of items, volume (in mm^3) and frequency of each type of prey of *N. eecpleopus* in Serra de Carajás (N=18)

Prey	Number	%	Volume	%	Frequency
Coleoptera (ad.)	20	12.6	114.5	20.2	0.39
Larvae	10	6.3	60.3	10.6	0.39
Diptera (ad.)	18	11.3	21.9	3.9	0.28
Larvae	54	33.9	97.8	17.2	0.56
Collembola	20	12.6	15.4	2.7	0.22
Hymenoptera (ants)	17	10.9	26.5	4.7	0.28
Hemiptera	3	1.9	6.3	1.1	0.11
Blattaria	3	1.9	52.9	9.5	0.11
Orthoptera	1	0.6	5.0	0.9	0.06
Homoptera	1	0.6	110.5	19.5	0.06
Chilopoda	1	0.6	6.7	1.2	0.06
Aranae	2	1.2	2.3	0.4	0.06
Unidentified parts of arthropods	-	-	46.8	8.2	-

200 m away, 18 *N. ecpleopus* were collected and killed for stomach content analysis. In the laboratory the stomach contents were identified to order, counted, and their volume estimated by multiplying their three dimensions (Schoener 1967).

Ninety-seven percent of the lizards were found near or in rivulets narrower than 50 cm and having shallow depth (3-8 cm). The low density of lizards by wider streams may be due to either a higher density of predators or a lower density of prey in these habitats. Most of the lizards (90%, N = 30) captured during the study were 20 cm or closer to a water course. Of these, three (10%) were found in water with belly and limbs submerged and head and dorsum exposed; the others (80%) were on wet litter at the margin. The mean distance between lizards and a water course was 17.1±20.9 cm (N = 30). Only one lizard (3%) was found on dry litter and it was the most distant from water (120 cm). These data agree with Vanzolini's 1986 statement, confirm previous observations (Fitch 1968; Sherbrooke 1975; Dixon and Soini 1975), and suggest that *N. ecpleopus* lives strongly associated with small streams in the forest. Five lizards escaped to shelter located under or between roots of trees at the margins of water courses, and exposed by water drainage.

Only 17% of the lizards captured during the study were adults. The high proportion of juveniles (83%) suggests that recruitment is occurring in the area during July. Sherbrooke (1975) in a study of the reproductive cycle of *N. ecpleopus* at Tingo Maria, Peru, showed that there they breed throughout the year, with seasonal fluctuations in percent of gravid females.

Data on some marked lizards indicated that they frequently return to the same point, probably a foraging site, on consecutive days. Since this lizard is not uniformly distributed in the forest, but associated with small streams, there is probably no biological significance in estimating its density per unit of forest. It is probably more appropriate to estimate its density by unit length of water course.

The data obtained in Serra de Carajás suggested an abundance of one lizard per 4-5 m of rivulet. This can vary with the dimension of the water course, as changes in depth and width of a stream probably are followed by changes in densities of prey and predators of *N. ecpleopus*.

Table 1 shows the number, volume, and frequency of each type of prey of *N. ecpleopus* at Serra de Carajás. Ten different types of prey were classified from the stomachs but most of the volume was composed of adult (20.2%) and larval (10.6%) Coleoptera and larval Diptera (17.2%). The simultaneous occurrence of aquatic (dytiscid coleopterans and aquatic dipteran larvae) and terrestrial prey (collembolans, blattarians, and *Ochaetomyrmex* ants) suggests that this lizard forages both in water and in wet litter.

The mean body temperature of *N. ecpleopus* in the area was 25.5±0.4°C (N = 8). Fitch (1968) found the mean body temperature of 26.8±0.5°C (range = 24.5-30.4°C) for 15 lizards in Santa Cecilia, Ecuador. The low body temperature of *N. ecpleopus*, which is characteristic of non-heliotherm lizards, was positively ($r = 0.63$; $N = 8$; $p > 0.05$), but not significantly, related to air temperature. There was a lower and not significant relationship between water temperature (=20.3°C) and body temperature ($r = 0.32$; $N = 8$; $p > 0.05$), suggesting that air must be the main source of heat for this semi-aquatic lizard.

I conclude that *N. ecpleopus* is a semi-aquatic non-heliotherm lizard strongly associated with rivulets in the forest and that it forages in the water and in the litter at the rivulet margins.

ACKNOWLEDGMENTS

I am grateful to W.W. Benson, I. Sazima, P.S. Oliveira, H.G. Bergallo, C.B.A. Ramos, and C. Strussman who kindly reviewed the manuscript and offered helpful suggestions. This study was supported by a grant N 130673/87 of the Conselho Nacional de Desenvolvimento Científico e Tecnológico.

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SOME NOTES ON SEA TURTLES

I. EVIDENCE FOR HAWKSBILL SEA TURTLES BREEDING IN GALAPAGOS ISLANDS

Specimens and records in the British Museum (Natural History) document, evidently for the first time, breeding of the hawksbill sea turtle (*Eretmochelys imbricata*)in the Galapagos. BMNH Nos. 1938.9.4.6-8 are catalogued under *Eretmochelys imbricata* as "eggs found in the Galapagos Islands 11/2/38 laid at 10 PM; T.O.M. Sopwith, Esq., 46 Green Street, W1." Number 80 (T.O.M.S.?) is labelled "22 days after oviposition;" number 81, "32 days after oviposition." Neither of these two embryos shows species-specific characteristics. Number 82, for which there is unfortunately no specimen, is labeled "24/3/38 (i.e. 41 days). This embryo showed definite signs of life for about 10 mins after removal (from the egg). Further specimens showed no further development as the weather became very cold."

A letter in the herpetology files from H.W. Parker to Sopwith, dated 8 November 1938, states "...I have examined the reptiles..." thus indicating that Parker himself had identified the embryos as *E. imbricata*. The collector (Sopwith?) presumably saw the female, for the time of laying is recorded. This species has not been recorded previously as breeding in the Galapagos (Green and Ortiz 1982; Witzell 1983).

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Green, D. and F. Ortiz-Crespo. 1982. Status of Sea Turtle Populations in the Central Eastern Pacific. *In*: Bjorndal (ed.) Biology and Conservation of Sea Turtles. Smithsonian Institution Press, Washington, D.C. Pp. 221-233.
Witzell, W.N. 1983. Synopsis of Biological Data on the Hawksbill Turtle *Eretmochelys imbricata*. FAO Fisheries Synopsis No. 137.

II. HAWKSBILL SEA TURTLE IN EGYPTIAN RED SEA

Frazier and Salas (1984) reviewed records of sea turtles in the Egyptian Red Sea, and commented that classic works such as that of Anderson (1898) made no mention of these distinctive animals. However, Anderson did obtain at least one sea turtle, BMNH 97.11.13.4, labeled "Gulf of Suez; Presented by Dr. J. Anderson," is an immature *Eretmochelys imbricata* (curved carapace length = 25 cm) in spirit.

LITERATURE CITED

Frazier, J. and J.B. Salas. 1984. The status of marine turtles in the Egyptian Red Sea. Biol. Conserv. 30(1):41-67.
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III. LOGGERHEAD SEA TURTLE FROM THE RED SEA

In reviewing specimens of *Caretta caretta* in the Red Sea, Frazier and Salas (1984) only listed rhamphothacae from Sinai (FSM 39107) and a photograph. A good osteological specimen was omitted; BMNH 1983. 1191, a skull with a total length of 30 cm, is catalogued as "Red Sea." It was transferred to the BM(NH) from the Rothschild collection in Tring, and no further data are known

LITERATURE CITED

Frazier, J. and J.B. Salas. 1984. The status of marine turtles in the Egyptian Red Sea. Biol. Conserv. 30(1):41-67.

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VIEWPOINT: A NEW TAXONOMIC ARRANGEMENT FOR SOME NORTH AMERICAN AMPHIBIANS AND REPTILES

Subsequent to the discussion by Frost and Hillis (1990) of species and the relevance of species concepts to practical taxonomy, it has become clear to me that a relatively large number of species of amphibians and reptiles in the United States have been camouflaged by the "subspecies" taxonomy that has grown up around what I now think is an out-dated viewpoint.

Besides providing recognition of the real species diversity in nature, a rigorous application of the evolutionary species concept (as discussed in Frost and Hillis, 1990) would also reduce the number of arbitrarily defined subspecies dramatically, although several subspecies complexes (e. g. *Ensatina esch-scholtzii*, *Lampropeltis getula*, *Lampropeltis triangulum*) undoubtedly contain a number of real species. I realize that in some cases the recognition of an obvious species (e. g. *Ensatina e. klauberi* elevated to *E. klauberi*) might leave the residual binomial (i. e. *Ensatina eschscholtzii*) representing a group of cryptic species of uncertain relationship to each other. However, because no changes can be made in these "agglomerative" taxa without some initial uncertainty, I have not addressed them here.

In my opinion, much of the specific and subspecific taxonomy in use by herpetologists today is arbitrary and lacks historical reality. It is also clear that the non-systematist public is generally unaware of this. The following list of "hidden" species is not exhaustive because of the ambiguity of evidence and information available to me. (Is *Pseudemys rubriventris bangsi* morphologically or genetically distinct from *P. r. rubriventris*?

Current Subspecies Name	Proposed Species Name
Salamanders	
Ambystoma macrodactylum croceum	*Ambystoma croceum*
Cryptobranchus alleganiensis bishopi	*Cryptobranchus bishopi*
Gyrinophilus palleucus gulolineatus	*Gyrinophilus gulolineatus*
Necturus maculosus louisianensis	*Necturus louisianensis*
Plethodon dorsalis angusticlavius	*Plethodon angusticlavius*
Plethodon vandykei idahoensis	*Plethodon idahoensis*
Pseudotriton montanus diastictus	*Pseudotriton diastictus*
Taricha torosa sierrae	*Taricha sierrae*
Frogs & Toads	
Bufo hemiophrys baxteri	*Bufo baxteri*
Bufo microscaphus californicus	*Bufo californicus*
Pseudacris streckeri illinoensis	*Pseudacris illinoensis*
Rana areolata capito	*Rana capito*[1]
Rana sylvatica maslini	*Rana maslini*
Scaphiopus holbrookii hurterii	*Scaphiopus hurterii*
Turtles	
Kinosternon flavescens arizonense	*Kinosternon arizonense*
Kinosternon flavescens spooneri	*Kinosternon spooneri*
Pseudemys concinna gorzugi	*Pseudemys gorzugi*
Pseudemys concinna suwanniensis	*Pseudemys suwanniensis*
Lizards	
Cnemidophorus burti xanthonotus	*Cnemidophorus xanthonotus*
Crotaphytus insularis vestigium	*Crotaphytus vestigium*
Eumeces egregius insularis	*Eumeces insularis*
Eumeces gilberti arizonensis	*Eumeces arizonensis*
Eumeces septentrionalis obtusirostris	*Eumeces obtusirostris*
Holbrookia lacerata subcaudalis	*Holbrookia subcaudalis*
Ophisaurus attenuatus longicaudus	*Ophisaurus longicaudus*
Sceloporus graciosus arenicolous	*Sceloporus arenicolous*
Sceloporus graciosus vandenburgianus	*Sceloporus vandenburgianus*
Uta stansburiana stejnegeri	*Uta stejnegeri*
Xantusia vigilis utahensis	*Xantusia utahensis*
Snakes	
Arizona elegans occidentalis	*Arizona occidentalis*[2]
Carphophis amoenus vermis	*Carphophis vermis*
Cemophora coccinea lineri	*Cemophora lineri*
Coluber constrictor mormon	*Coluber mormon*
Diadophis punctatus acricus	*Diadophis acricus*
Diadophis punctatus amabilis	*Diadophis amabilis*[3]
Drymarchon corais couperi	*Drymarchon couperi*
Elaphe vulpina gloydi	*Elaphe gloydi*
Farancia erytrogramma seminola	*Farancia seminola*
Lampropeltis triangulum taylori	*Lampropeltis taylori*
Lampropeltis calligaster occipitolineata	*Lampropeltis occipitolineata*
Lampropeltis pyromelana infralabialis	*Lampropeltis infralabialis*
Lampropeltis zonata multifasciata	*Lampropeltis multifasciata*
Lampropeltis zonata parvirubra	*Lampropeltis parvirubra*
Lampropeltis zonata pulchra	*Lampropeltis pulchra*
Masticophis bilineatus lineolatus	*Masticophis lineolatus*
Micrurus fulvius tener	*Micrurus tener*
Nerodia harteri paucimaculata	*Nerodia paucimaculata*
Pituophis melanoleucus catenifer	*Pituophis catenifer*[4]
Pituophis melanoleucus ruthveni	*Pituophis ruthveni*
Tantilla relicta pamlica	*Tantilla pamlica*
Tantilla rubra cucullata	*Tantilla cucullata*
Tantilla rubra diabola	*Tantilla diabola*
Thamnophis couchii gigas	*Thamnophis gigas*
Thamnophis sirtalis dorsalis	*Thamnophis dorsalis*
Virginia valeriae pulchra	*Virginia pulchra*

1 *Rana capito* would retain the subspecies *R. c. aesopus* and *R. c. sevosa*. *Rana areolata* would retain the subspecies *R. a. circulosa*. 2 *Arizona occidentalis* would retain the subspecies *A. o. candida*, *A. o. eburnata*, and *A. o. noctivaga*. *Arizona elegans* would retain the subspecies *A. e. philipi*. 3 *Diadophis amabilis* would retain the subspecies *D. a. modestus*, *D. a. occidentalis*, *D. a. pulchellus*, *D. a. similis*, and *D. a. vandenburgii*. *Diadophis punctatus* would retain the subspecies *D. p. amyl*, *D. p. edwardsii*, *D. p. regalis*, and *D. p. stictogenys*. 4 *Pituophis catenifer* would retain the subspecies *P. c. affinis*, *P. c. annectens*, *P. c. deserticola*, *P. c. pumilis*, and *P. c. sayi*. *Pituophis melanoleucus* would retain the subspecies *P. m. lodingi* and *P. m. mugitus*.

If so, it should be *Pseudemys bangsi*.) None-the-less, based on Conant (1975), Conant and Collins (1991), and Stebbins (1985), the following taxa exhibit two characteristics which reveal their specific distinctness: 1) They are mapped as allopatric (based on the best published evidence available), and 2) they are in some way morphologically (and presumably genetically) distinct.

I would encourage the adoption of the taxonomic arrangement listed above, unless or until data indicate differently. Indeed, some systematists have already recommended a number of the changes proposed above (see Collins, 1990). Not to do so continues the myth of morphologically distinct, allopatric subspecies, thereby diluting the species concept and obfuscating the evolutionary diversity of the North American (north of Mexico) herpetofauna.

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Conant, R. and J. T. Collins. 1991. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Third Edition. Houghton Mifflin Co., Boston. xviii + 450 pp.

Stebbins, R. C. 1985. A Field Guide to Western Reptiles and Amphibians. Second Edition. Houghton Mifflin Co., Boston. xvi + 336 pp.

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EVOLUTION OF ECOLOGICAL DIVERSIFICATION IN DESMOGNATHINE SALAMANDERS

The salamander subfamily Desmognathinae, with three genera and 14 species, is restricted to eastern North America. Communities of salamanders throughout much of this region contain a single species of *Desmognathus*, typically a "streamside" form, either *D. fuscus* or an ecological equivalent like *D. apalachicolae*, *D. auriculatus*, or *D. brimleyorum* (e.g., see Means 1975). These streamside species usually have an aquatic larval period of one year or less, generally 8-12 months as in *D. fuscus* (Wilder 1913; Organ 1961a; Danstedt 1975; Juterbock 1990). Following metamorphosis the salamanders live in moist habitats along the edges of streams.

In the southern Appalachian Mountains, particularly the southern Blue Ridge Physiographic Province, additional desmognathine species occur and multispecies communities are the rule. Some of the species in these communities are streamside forms, including *D. monticola, D. ochrophaeus, D. imitator,* and *D. santeetlah.* However, these communities also contain several ecologically specialized species — at one extreme the large, aquatic *D. quadramaculatus* and *Leurognathus marmoratus*, at the other the small, terrestrial *D. aeneus* and *D. wrighti.*

The life histories of the two aquatic species are characterized by lengthy larval periods of two years or more, followed by an aquatic (*L. marmoratus*) or semi-aquatic (*D. quadramaculatus*) mode of life after metamorphosis (Martof 1962; Bruce 1985, 1988). *Desmognathus welteri*, occurring in the western Appalachians, is another large species with a long larval period and semi-aquatic habits after metamorphosis (Juterbock 1984). Its ecology and life history are not as well known as those of other species.

In contrast, the two small, terrestrial species have no free-living aquatic larval stage (Organ 1961b; Harrison 1967). *Desmognathus aeneus* is usually found near seeps, but ranges far into the forest. *Desmognathus wrighti* is essentially a forest dweller, although it congregates in seeps in the colder months.

Communities of desmognathine salamanders in the southern Blue Ridge usually contain three to five species, though in some areas six or even seven species may coexist, e.g., in the Mt. Rogers-Whitetop area of southern Virginia (Organ 1961a) and in the Great Smoky Mountains (Huheey 1966; Tilley et al. 1978; Tilley 1981). A remarkable community of desmognathines occurs in the southern Nantahala Mountains, in the drainage basin of the Nantahala River in southwestern North Carolina, where six species are found: *Leurognathus marmoratus, Desmognathus quadramaculatus, D. monticola, D. ochrophaeus, D. aeneus,* and *D. wrighti.* This is the only documented locality where the two most aquatic species (*L. marmoratus, D. quadramaculatus*) and the two most terrestrial species (*D. aeneus, D. wrighti*) coexist with one another and with the streamside species *D. monticola and D. ochrophaeus.*

Perhaps the most interesting relationship involves *D. aeneus* and *D. wrighti*, which were first reported in sympatry in the region by Tilley and Harrison (1969). Although the latter species is not abundant in the southern Nantahalas, it seems to be present throughout the upper Nantahala River drainage basin at elevations of 1000 m and higher. The degree of habitat overlap has not been quantified for *D. aeneus* and *D. wrighti*, although I have observed them in proximity to one another in forest floor habitats along the Nantahala River at elevations of 1000-1100 m.

Is there anything about the southern Nantahalas which will account for the high diversity of desmognathines? One probable contributing factor is climate. These are the southern-most high mountains of the Appalachians, with a maximum elevation of 1,676 m (5,499 ft) on Standing Indian Mountain. Temperatures are moderate and precipitation is high, in fact the highest in eastern North America (Swift 1987). The long-term (54-year) average precipitation at Mooney Gap (1,364 m elevation) on the Little Tennessee-Nantahala Divide, is 2,362 mm (93 inches) per year. Precipitation is essentially nonseasonal; the driest month is October (161 mm), and the wettest is March (250 mm). This pattern appears to be typical for the southern Nantahalas. Climatic regimes in other areas of high desmognathine diversity in the southern Appalachians are similar, though somewhat cooler and drier.

The virtual restriction of the two most aquatic and two most terrestrial desmognathines to the southern Appalachians, and their coexistence only in the wet, mesothermal environment of the southern Nantahala Mountains, suggests that the evolution of aquatic as well as terrestrial adaptations in the subfamily have been largely confined to moist, stable, montane environments, where high precipitation provides appropriate stream and forest environments for speciation and ecological diversification. Even small streams of the southern Blue Ridge exhibit essentially permanent flow regimes, thus providing reliable habitats for stream-dwelling salamanders having long larval periods. At the same time, high moisture conditions prevail throughout the forest, providing favorable habitats on the forest floor for even the tiniest terrestrial salamanders.

The broad distribution of streamside desmognathines in eastern North America, including the Appalachians, suggests that this mode of life represents the ancestral adaptive zone of the subfamily, and that the subfamily had its origins as a streamside taxon throughout the upland sections of the eastern half of the continent.

The aquatic modes of life shown by *L. marmoratus* and *D. quadramaculatus* may represent derived life histories. I view these species as specialists; their lengthy larval phases, large metamorphic sizes, and large adult sizes are seen as derived rather than ancestral character states, evolved in the unique, restricted ecological theater of the southern Appalachians. Likewise, *D. aeneus* and *D. wrighti* have derived life histories, evolved in the same environment as that of the aquatic species, but showing exactly the opposite trends, leading to direct development and miniaturization. Hairston (1986, 1987) demonstrated experimentally that predation and, to a lesser degree, competition can account for the observed spacing of species on the aquatic-terrestrial habitat gradient in the southern Appalachians. In extending the argument to an evolutionary time scale, Hairston accepted Dunn's (1926) and Wake's (1966) views that adaptive radiation in desmognathines has proceeded unidirectionally from the large aquatic species to the small terrestrial forms; he identified predation as the main selective factor driving the process. Whether the predation theory can account for the evolutionary diversification of streamside ancestors in both the aquatic and terrestrial directions, simultaneously, remains an open question.

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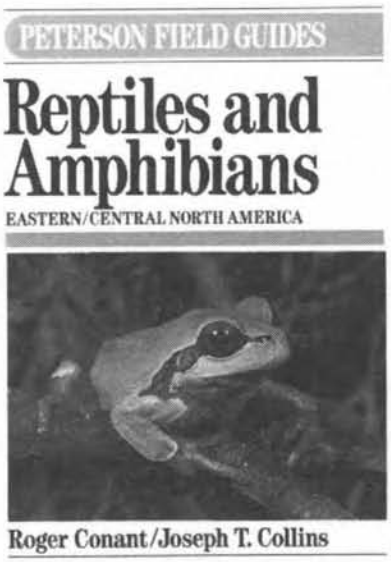
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NEW PETERSON FIELD GUIDE AVAILABLE AT SSAR MEETING



Copies of the new third edition of the Peterson field guide, *A Guide to Amphibians and Reptiles*, by Roger Conant and Joseph T. Collins, will be available at the SSAR meeting at a discounted price.

The authors and illustrator will be present at the meeting and there will be a book-signing party at some time during the week.

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ANESTHESIA AND TRANSMITTER IMPLANTATION EFFECTS ON GRAVID GARTER SNAKES (*THAMNOPHIS SIRTALIS* AND *T. ELEGANS*)

Radiotelemetry is being used with increasing frequency in the study of snake ecology (e.g. King and Duvall 1990; Charland and Gregory, In Press). Its utility rests, in part, on the assumption that neither the transmitter nor the implantation technique affect the behavior of the animal. The simplest method of placing a transmitter into a snake is through force-feeding. However, there is evidence that force-feeding transmitters to snakes causes a "feeding effect," in which the animal shows reduced movement similar to that found following the ingestion of food items (Fitch 1987). In addition, some snakes show a thermophilic response following feeding (Lillywhite 1987, Lutterschmidt and Reinert 1990) and transmitter ingestion may confound studies of thermoregulation.

Recently, surgical implantation of transmitters has become common and a number of anesthetics have been used in these procedures (e.g., ketamine, Weatherhead and Anderka 1984; methoxyflurane, Aird 1986; halothane, Larsen 1987). However, there is little information on the long term effects of these implantation techniques.

Gravid females of viviparous species would seem to be particularly vulnerable to side effects not only from the anesthetic, but also because the mass of the transmitter may interfere with the developing embryos. As part of a larger study on thermoregulation by gravid garter snakes (*Thamnophis*), I collected data on the effects of anesthesia and surgical implantation on gestation.

Gravid female *T. sirtalis* and *T. elegans* were collected by hand on the Creston Valley Wildlife Management Area, Creston, B.C. (49° 6' N, 116° 31' W, elevation 1700 m). The animals were housed in plastic shoeboxes with water provided *ad libitum*. The shoeboxes sat on a concrete floor and were never exposed to direct sunlight. Heat was provided by a heating pad placed so that one-quarter of the floor area of each box was heated.

A complete experimental design that would allow me to examine each aspect of the implantation prodecure and any interactions would require a considerable number of gravid females. For my purposes, I was interested only in whether the implantation procedure, as a whole, disrupted gestation and I chose a simpler design using fewer snakes. My original 2 conditions were 1) anesthesia and transmitter implantation, and 2) control (no anesthesia or implantation). In addition, I attempted to look at the effect of anesthesia alone by adding a third group consisting of animals that had been anesthetized only. I, therefore, had 2 studies with a common control. Since these studies do not represent a complete experimental design, the results must be interpreted cautiously.

The animals were assigned randomly (within species) to one of the three treatments: anesthesia only, anesthesia and

Table 1. Capture and parturition dates of *Thamnophis sirtalis* and *Thamnophis elegans* under different treatment conditions. (A) anesthesia only, (I) anesthesia and transmitter implantation, (C) control. Anesthesia and implantation procedures took place on 18 and 19 June 1988.

Species	Treatment	SVL (mm)	Capture Date	Parturition Date	Litter Size
T. s.	A	540	17 May	12 July	10
T. e.	A	475	12 May	11 July	9
T. s.	I	550	25 May	20 July	13
T.e.	I	520	17 May	13 July	10
T. s.	C	580	18 May	12 July	11
T. e.	C	535	17 May	6 July	9
T. e.	C	590	4 June	22 July	9

transmitter implantation, or control. The anesthetic used was methoxyflurane (Pitman-Moore, Inc., Washington Crossing, NJ) following the procedure of Aird (1986). A small volume of methoxyflurane was placed on a gauze pad by inverting the bottle once. The pad was placed in a capped 750 ml jar with the snake. Anesthesia was generally complete within 5 min, as shown by the flaccid appearance of the snake and the lack of a righting reflex. Recovery usually took from 1-2 h, at which time the snakes appeared to be behaving normally.

The transmitters used for implantation were models of those that I used for monitoring free-ranging gravid females (Custom Telemetry and Consulting, Inc., Athens, GA). The models were constructed of modelling clay and measured 8mm x 22 mm with a 12.7 cm whip antenna of flexible, plastic coated wire. The assembly was sealed in Plasti-Dip (PDI, Inc., Blaine, MN) and had a mass of ca. 4 g upon completion.

Following anesthesia a vertical incision was made in the snake's side anterior to the mass of developing embryos and the body of the transmitter inserted posteriorly. The transmitter was then massaged under the rib cage to lie extraperitoneally. The antenna was seated by running a 2 mm diameter plastic tube under the skin anterior to the incision and then sliding the antenna into it. The plastic tubing was then withdrawn through a small incision made at its anterior end leaving the antenna lying straight along the side. All incisions were then closed using 3-0 chromic sutures. The entire procedure typically took 20 min, including anesthesia.

Anesthesia and implantatiion of transmitters took place on 18 and 19 June 1988. This corresponded with the implantation of functioning transmitters into free-ranging study animals that were at a similar stage of gestation. Table 1 shows the parturition dates and litter sizes for *T. sirtalis* and *T. elegans* in the different treatments. There were no apparent differences in the parturition dates related to treatment and there were no stillbirths or obvious developmental anomalies among the neonates.

Parturition dates of captive animals were earlier than for snakes in the wild by 2-4 weeks, possibly because of the constant availability of a heat source in captivity. During the summer of 1988 parturition in the wild took place in the second and third weeks of August. One observation suggests that snakes in the wild were unaffected by the transmitter implantation technique. On 7 August I recaptured a gravid *T. elegans* that I was monitoring in the field (original capture, anesthesia, and implantation 9 July, release 12 July) because her transmitter had slipped out from under her ribs and appeared to be causing an abrasion. I returned her to the laboratory, anesthetized her and adjusted the transmitter position. On 12 August, just before release, she gave birth to a litter of eight neonates. There were no stillbirths or obvious developmental abnormalities.

These limited data suggest that this transmitter implantation technique may not interfere with the gestation of *T. sirtalis* and *T. elegans*. However, these data do not address the possibility that implantation influences aspects of the animal's physiology or behavior other than gestation, or that there may be long-term effects that do not manifest themselves until after the transmitter has been removed and the snake released. Given the popularity of radiotelemetry as a technique in snake ecology, this is an area in which much more work needs to be done.

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SOFT PLASTRA OF ADULT MALE SEA TURTLES: AN APPARENT SECONDARY SEXUAL CHARACTERISTIC

In contrast to many turtle species, chelonid sea turtles do not exhibit sexual size dimorphism (Carr 1952; Pritchard 1979). However, chelonid sea turtles do have several sexual dimorphisms (Carr 1952; Pritchard 1979) that appear to facilitate successful mating. Adult males have long prehensile tails with a heavy terminal nail in contrast to adult females whose tails barely reach the rear margin of the carapace. The claws on the front flippers of adult males are longer and more strongly curved than those of adult females. Additionally, the posterior portion of the carapace of adult females is commonly more rounded than that of adult males. Collectively, these morphological characteristics enhance a male's ability to successfully mount a female. These secondary sexual characteristics also provide a means by which investigators can sex adult chelonid turtles and thus, are of importance to population studies.

We have observed what we suspect is an additional secondary sexual characteristic in chelonid sea turtles. Figure 1a shows the plastron of an adult male loggerhead, *Caretta caretta*, captured in the Cape Canaveral ship channel during April of 1983. The scutes on the medial portion of the plastron are relatively soft, lacking the hard cornified layer and exposing relatively soft and leathery epidermal tissue. These soft areas do not appear to be skin separating the scutes, such as that seen in musk turtles, *Sternotherus* spp. Rather, these areas appear to be scutes which lack a cornified surface.

We initially observed soft plastra on adult-sized male loggerheads (straight carapace lengths of 80 cm or greater) that were captured by trawling (as described by Henwood 1987) in the Cape Canaveral ship channel from 13 April 83 through 19 April 83. The soft areas of the plastra

varied in size, the smallest comprising the medial area of the anal scutes (Fig. 1b), whereas the largest included the medial portion of the entire plastron (Fig. 1a). While a complete survey was not taken of the 73 adult-sized males captured during the trawling, soft plastra appeared to be prevalent, but a well cornified plastron was noted for one adult-sized male (straight carapace length of 97.3 cm). All immature loggerheads (n=17) and adult-sized female loggerheads (n=5) captured during the trawling had well-cornified plastra.

We initially suspected that these soft areas may have resulted from abrasions during recent matings. However, several of the turtles had barnacles growing on these areas (Fig. 1b) suggesting that they had not been abraded by recent mating. It is possible, however, that barnacles may have grown on the plastra since the last mating.

Soft plastra have also been observed on adult male loggerheads from the waters of Heron Island Reef on the southern portion of the Great Barrier Reef (Colin Limpus, Queensland National Parks and Wildlife Service, pers. comm.). We have also observed soft plastra on adult male black turtles, *Chelonia agassizi*, that were captured off the coast of Michoacan, Mexico, near Playa Colola during November of 1989 (n=11). Adult female black turtles (n=8) captured in the same area had well-cornified plastra. Additionally, 15 adult male Kemp's ridleys, *Lepidochelys kempi*, maintained in captivity in Texas and on the Cayman Islands had soft plastra (Fig. 1c). Five of these males were maintained in separate tank and thus had no opportunity to mate. The 15 adult female Kemp's ridleys at those same facilities all had well-cornified plastra (Fig. 1d). The plastra of the adult male Kemp's ridleys at Cayman Turtle Farm, Ltd., remained soft over a 14 month period. To date, there have been no published reports describing plastra of male Kemp's ridleys from the wild. However, soft plastra are apparent in a published photo of a male olive ridley, *Lepidochelys olivacea*, captured off the coast of California (Hubbs 1977) and in the photo of a male olive ridley (Fig. 1e) captured off Oaxaca, Mexico (photo courtesy of John Hendrickson, University of Arizona).

We speculate that soft plastra could enhance a male's mating ability by increasing tactile sensation and/or by decreasing slippage during mounting. The lack of a soft plastron on one adult-sized male loggerhead captured in the Cape Canaveral ship channel suggests that soft plastra may not be exhibited by all adult males, that they may be temporary phenomena, or that some of the adult-sized loggerheads we observed may have been sexually immature. It is conceivable that soft plastra occur only on males that are reproductively active. Multiannual reproductive cycles are well documented for female sea turtles (Carr 1952), but only a few studies have addressed reproductive cycles in male sea turtles (Limpus 1985; Wibbels et al. 1987; Wibbels et al. in press). Those studies suggest that while many adult loggerhead appear to be reproductively active on an annual basis (Limpus 1985; Wibbels et al. 1990), some may not be reproductively active during a given breeding season (Wibbels et al. 1987). Future observations are required to determine if soft plastra 1) are of significance to sea turtle reproduction, 2) occur in other sea turtle species, and 3) occur on a temporary or permanent basis.

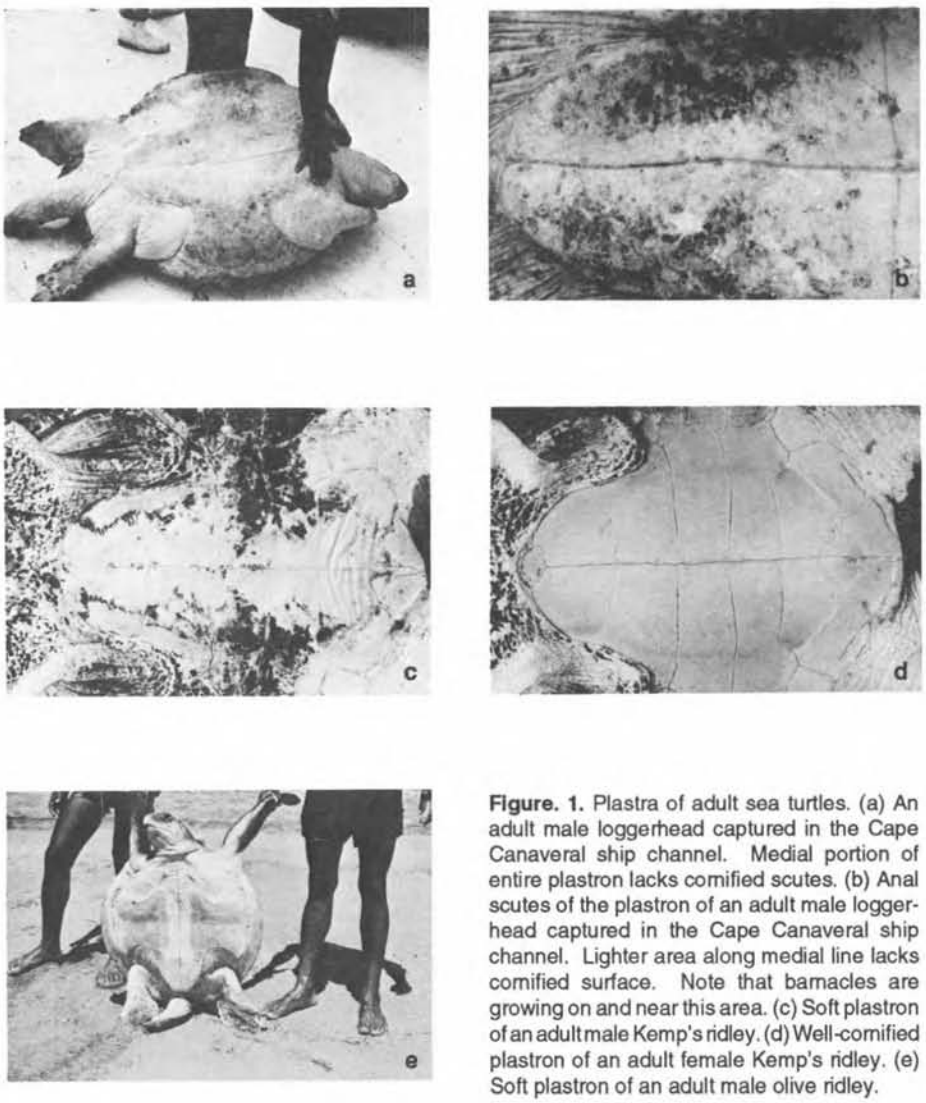


Figure. 1. Plastra of adult sea turtles. (a) An adult male loggerhead captured in the Cape Canaveral ship channel. Medial portion of entire plastron lacks cornified scutes. (b) Anal scutes of the plastron of an adult male loggerhead captured in the Cape Canaveral ship channel. Lighter area along medial line lacks cornified surface. Note that barnacles are growing on and near this area. (c) Soft plastron of an adult male Kemp's ridley. (d) Well-cornified plastron of an adult female Kemp's ridley. (e) Soft plastron of an adult male olive ridley.

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AN INTERSPECIFIC SATELLITE PAIR ASSOCIATION BETWEEN *HYLA CHYRSOSCELIS* AND *HYLA VERSICOLOR*

Although morphologically similar, the two species of the gray treefrog complex can be separated on the basis of chromosome number (*Hyla chrysoscelis*: 2n = 24; *H. versicolor*: 4n = 48; Wasserman 1970). The two species also differ in the pulse rate of the mating call with the pulse rate of *H. versicolor* being slower than *H. chrysoscelis* when both species call in the same chorus (Zweifel 1970; Jaslow and Vogt 1977). Although both species may occur sympatrically (Johnson 1966; Ralin 1968; Zweifel 1970; Jaslow and Vogt 1977; Bogart and Jaslow 1979; Hillis et al. 1987; Johnson 1987; Little et al. 1989), there are no reports of behavioral interactions between the two species in the field. We now report the occurrence of *H. versicolor* from western Tennessee and apparent differences in habitat preferences between *H. versicolor* and *H. chrysoscelis*. We also report an apparent satellite association between an adult male of *H. chrysoscelis* and an adult male of *H. versicolor*.

The study site is located ca. 20 km north of Memphis, Tennessee on the Memphis State University Meeman Biological Field Station (= field station) ca. 5.4 km east and 60 m above the banks of the Mississippi River. A population of *H. chrysoscelis* became established at the study site in 1987 when cattle tanks filled with water were placed next to a wooded area. Observations were made during the 1988-90 breeding seasons when frogs were captured, weighed, marked, and released at the point of capture.

Amplectant pairs were collected in 1988 at oviposition sites (cattle tanks), placed in plastic containers filled with 6-8 cm of pond water, and allowed to complete oviposition. Eggs were incubated and hatched at room temperature, after which samples of tadpoles from each clutch were placed in 0.005% colchicine solution for 24 hr and chromosomes were prepared from tadpole tail epithelia according to the procedure of Bogart (1967). During 1989, chromosome counts were determined for adult male gray treefrogs sampled at another chorus site, a roadside ditch ca. 1.73 km NW of the field station. Heparinized whole blood (obtained by cardiocentesis) was transferred to culture vials containing 5 ml of McCoy's 5A medium supplemented with 20% fetal calf serum, 0.1 ml of pokeweed mitogen, and 0.1 ml solution of penicillin-streptomycin-amphotericin B (antibiotic-antimycotic, GIBCO). Details of cell culture and harvest have been described previously by Beck and Mahan (1979). In addition to chromosome analyses, a representative sample of advertisement calls were recorded on a portable Panasonic tape recorder. Call differences between *H. chrysoscelis* and *H. versicolor* can be perceived by the human ear without

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bioacoustical analysis if both species are heard together in the same chorus (Zweifel 1970; Bogart and Jaslow 1979).

Chromosomal analysis of tadpole tissues from twelve clutches obtained from the field station revealed that all were diploid confirming our initial identification based on call parameters of males except for one (#65) that we identified as *H. versicolor*. Male #65 was captured on three of 18 nights at the field station during 1988, the last being on 25 July during a chorus of 41 males. On this night (2300 h, 24° C, > 95% humidity), after 3.9 mm of rain, we detected a satellite male (#139) crouched silently below calling male #65 ca. 20 cm distant in a posture typical of satellite males observed in our population and elsewhere (Roble 1985). We sampled the chorus continuously from 2030 to 2300 h prior to observing male #139 and did not observe him call earlier in the evening. Thus, it was unlikely that he was resting between calling activity. Additionally, the next nearest calling male to male #139 (besides male #65), identified as *H. chrysoscelis,* was ca. 2 m distant so that male #139 was unlikely assuming satellite behavior in response to another nearby calling male. We also did not hear male #139 calling before we approached male #65 so our presence was not responsible for the quiet behavior of male #139. We first caught male #139 on 11 July and identified him as *H. chrysoscelis* based on call parameters. His SVL was 40.0 mm and mass was 5.0 g; SVL of male #65 was 56 mm and mass was 11.2 g. The body size of male #139 suggested that this individual recently reached sexual maturity because males in western Tennessee begin calling just before reaching 40 mm SVL (Ritke et al. 1990). Later during the evening of 25 July, male #65 was found in amplexus with female #131. We were unable to sample tadpoles from this clutch and thus could not determine species identity for this female; she was not captured again.

Based on call parameters and chromosome counts, our sample of gray treefrogs at the field station during 1988 (204 males, 152 females) was comprised of *H. chrysoscelis* with one male identified as *H. versicolor* (male #65). The size relation between *H. chrysoscelis* and *H. versicolor* (male #65 was 3.0 mm longer in SVL than the largest *H. chrysoscelis* captured during the 1988 breeding season at the field station; see Ritke et al. 1990) is similar to that reported for sympatric populations in the midwestern United States where males of *H. versicolor* average larger than males of *H. chrysoscelis* (Jaslow and Vogt 1977; Bogart and Jaslow 1979; Matson 1990). This relation, however, may not hold for other geographic areas (Ralin 1968).

Chromosome counts of calling males (N = 8) sampled from the roadside ditch revealed that four were diploid (= *H. chrysoscelis*) and four were tetraploid (= *H. versicolor*). This agreed with our initial identification of these frogs based on call parameters. Although we did not perform a chromosome count of male #65 from the field station during 1988, his call pattern was similar to males of *H. versicolor* sampled from the roadside ditch during 1989 that were identified by chromosome counts.

The finding that satellite associations within the gray treefrog complex may be comprised of both species has not been previously reported. Such a scenario might lead to hybridization between *H. chrysoscelis* and *H. versicolor* if satellite males intercept gravid females as they approach calling males in order to initiate amplexus, as has been suggested for *H. chrysoscelis* (Roble 1985).

A tentative distribution map for *H. chrysoscelis* and *H. versicolor* (Romano et al. 1987) indicated that *H. versicolor* did not occur in western Tennessee. Our chromosomal analyses, however, confirmed that both species are common below the bluffs of the Mississippi River and form mixed-species choruses. The chorus site along the roadside ditch is ca. 3.0 km east of the Mississippi River and along with the surrounding forested areas, frequently floods during the spring rains (March-May). Based on auditory sampling of adult males along the roadside ditch during 1990, *H. versicolor* comprised 20-60% of chorusing males. However, population estimates of *H. versicolor* from the field station and from three other chorus sites (described in Ritke et al. 1991) that are also located on the bluffs above the Mississippi River comprised < 3.0% of the chorusing males. Apparently, *H. versicolor* prefers the bottomland conditions more characteristic of the Mississippi River floodplain where moisture levels (standing water and humidity) are greater than on the surrounding bluffs. These observations agree with those of Ralin (1968) who found that *H. versicolor* preferred more humid conditions than *H. chrysoscelis*, even in the same habitat. Although such preferences may influence the local distribution of both species of gray treefrogs, it is unclear what effects such preferences may have on the overall geographic distribution of *H. chrysoscelis* and *H. versicolor*.

ACKNOWLEDGMENTS

Special thanks to Alan P. Jaslow for confirming the identity of male #65 based on call parameters and for greatly improving an earlier version of the manuscript. Jeffrey G. Babb and Mary K. Ritke provided expert field assistance during the course of this study.

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TECHNIQUES

A SAFE AND SIMPLE METHOD OF BLOOD COLLECTION FROM RATTLESNAKES

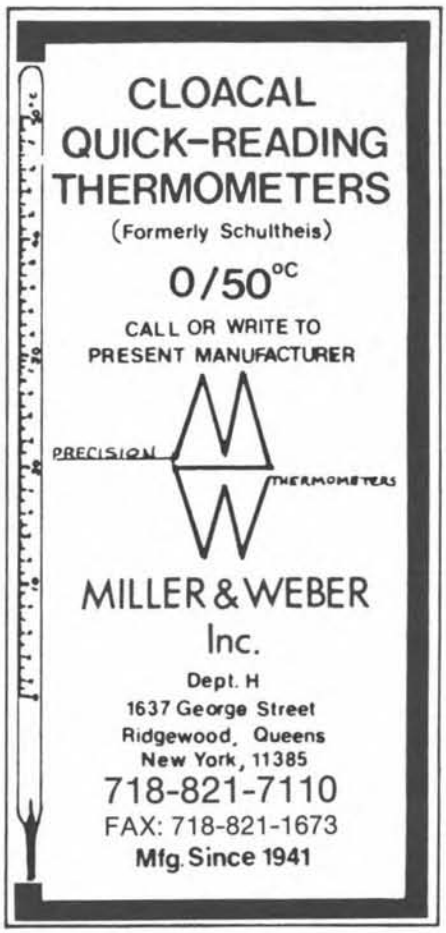
The collection of blood samples from living animals is a routine requirement of many research protocols. Cardiac puncture is the most commonly used method for blood collection from living reptiles (Sooter 1955; Dessauer 1970; Branch 1973; Cooper and Jackson 1981). However, this method carries the risk of mortality from cardiac tamponade as a result of blood effusing into the pericardium (Coulson and Hernandez 1964; Wallach 1971). It can also be difficult to master and, because of the need to work in the anterior region of the body, dangerous for the researcher sampling unanesthetized venomous snakes.

Blood can also be collected from the caudal artery or caudal vein of lizards and snakes by inserting a needle through the mid-ventral region of the tail (Esra 1975). Collecting blood from caudal vessels is less dangerous for the animal and the investigator, but it too can be difficult to master because of variation in the location of vessels (Brazaitis and Watanabe 1982). Here we describe a safer, simpler and comparatively less traumatic method for collection of blood from the caudal vessels of rattlesnakes.

We restrain the snake in a squeeze box having one open end (modified from Quinn and Jones 1974) so that its tail remains outside the box. Any restraining method that leaves the rattle accessible would be suitable (e.g., Gillingham et al. 1983; King and Duvall 1984). Blood collection is made using a sterile, disposable 1 cc tuberculin syringe fitted with a sterile disposable needle. We use a 21 G 1" needle for snakes over 60 cm total length and a 26 G 3/8" for smaller specimens. Larger bore needles are used whenever possible to improve flow rate and reduce damage to the rather large blood cells. The distal portion of the tail and proximal portion of the rattle is swabbed with 70% isopropyl alcohol. The needle is inserted at an obliquely posterior angle between the first and second proximal segments on the ventral side of the rattle (Fig. 1). This places the tip of the needle into the living tissue contained within the terminus of the proximal (basal) rattle segment. Gentle suction is created by very slowly pulling the syringe plunger. To achieve maximum blood flow, it is occasionally necessary to reposition the tip of the needle in the tissue by rotating it, or slightly increasing or decreasing the penetration until a caudal vessel is punctured. The greatest flow rates and yields are obtained when the body temperature of the snake is relatively high (25° to 30° C), and the tail is positioned lower than the rest of the snake's body. Warming the tail in the palm of the hand or briefly submerging it in warm water may also increase blood flow.

After collection, the blood is immediately transferred to sterile blood tubes containing heparin or EDTA. To reduce damage to blood cells, the needle is removed from the syringe before expelling the blood, and mixing is accomplished by gentle rotation (Kaplan 1968). In most cases clotting of the needle puncture occurs very rapidly, but the clotting speed can be enhanced by briefly applying direct pressure to the puncture site with an alcohol swab.

We have used this technique to collect 64 blood samples from 52 timber rattlesnakes (*Crotalus horridus*) ranging in size from 43.6 cm to 126.8 cm in total length (70 g to 1680 g in body mass).



Several snakes have been subjected to repeated sampling over the past two years. No visible injury or infection has been noted, and subsequently formed rattle segments appear to have developed normally. Using this method, we have drawn single sample volumes as large as 1.0 ml from adult *C. horridus*. However, we normally collect between 0.25 and 0.50 ml of blood in a single sampling. This technique should be suitable for most rattlesnakes that have a total length of greater than 45 cm.

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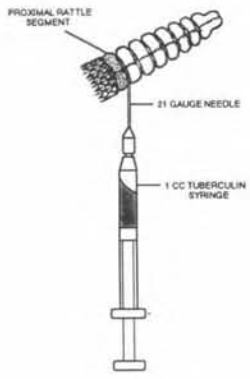


Fig. 1. Location of needle insertion for collecting blood from the tail of rattlesnakes. The tip of the needle is inserted into the living tissue at the terminus of the proximal rattle segment

HERPETOLOGICAL HUSBANDRY

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented materiel to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, are frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Lyndon A. Mitchell, Department of Reptiles and Amphibians, Dallas Zoo, 621 East Clarendon Drive, Dallas, TX 75203, USA.

CAPTIVE BREEDING OF THE TIMOR MONITOR (*VARANUS TIMORENSIS SIMILIS*)

Varanus timorensis is a small monitor that ranges through northern Australia, New Guinea, and Timor; the subspecies *V. t. similis* occurs in northeastern Australia and southern New Guinea (de Bitter 1981, Cogger 1983). Relatively little information has been published concerning the reproductive biology of this species. This report describes reproduction in a captive group of three male and one female *V. t. similis*. Courtship and copulation occurred in three consecutive years, and young were successfully hatched and raised from two of the three clutches of eggs that the female produced.

Materials and methods

Three wild-caught adult male and one female *V. t. similis* were obtained from animal dealers in 1980-81. The males measured approximately 210, 210, and 220 mm in snout-vent length (total lengths 510, 490, and 470 mm), and the female, 210 mm (TL 515 mm). The lizards were maintained in a glass-fronted wooden terrarium measuring 195 X 36 X 60 cm high. Branches and rocks were provided, and the cage floor was covered with newspaper, under which the lizards frequently hid. Water was available in a large, shallow pan, and a box of dry soil was present, into which the lizards occasionally burrowed, and in which eggs were deposited. A single 60W incandescent bulb provided a hot-spot for basking, and the terrarium was also illuminated by a 40W Vita-lite fluorescent tube. A variety of foods was provided, including crickets, small mice, whole fish, earthworms, and canned dogfood. The lizards were fed two to three times per week. Light cycle was ca.12L:12D, but this schedule was not rigorously maintained. Daily temperatures were 26-30°C, with night temperatures of 20-23°C. Conditions remained the same throughout the year.

Eggs were removed within several hours of laying in each case and incubated on a raised aluminum screen in a glass-covered 40 L aquarium with approximately 1 cm of water on the bottom. This tank was placed inside a thermostatically controlled wooden incubator, and the eggs were maintained at 90-100% humidity at a temperature of 28-30° C.

Young were housed individually in 60 L aquaria with newspaper substrate and cardboard tubes for shelter. Terrarium lighting and temperatures were similar to those for adults. The young were fed 3-4 times per week on crickets, baby mice, earthworms, catfood, and small fish, with vitamin and mineral supplementation once weekly.

Observations and discussion

Although three male monitors were present in the group, only one male was observed copulating with the single female. This male, the largest and most heavily built individual, was clearly the dominant animal in the group. Not only did it appear to be the only male to successfully copulate, but it was also the most aggressive feeder, often driving the other lizards away from food. Moehn (1984) suggested that short-term pair-bonding may occur in *V. timorensis*; since in this

case the same male mated with the same female for three consecutive years, longer-term bonding might also occur, at least in captivity. Alternatively, this male's mating success could simply be due to its dominance in the social group. Auffenberg (1981) also reported pair-bonding in a varanid (*V. komodoensis*).

Courtship and copulation were only observed during a short period in each year in which reproduction occurred (Table 1). During each breeding period, the male was observed pursuing the female and repeatedly copulating with her throughout the day. Detailed data on mating behavior were not collected; however, Moehn (1984) published observations of courtship and copulation in this species. Observations of this group of *V. timorensis* support Moehn's (1984) conclusion that the breeding season is short in this species, and the fact that it occurred at the same time each year for three consecutive years suggests that reproductive activity may be determined by an "internal clock", since conditions for this captive group did not vary throughout the year. The breeding period for this group coincided closely with that reported by Moehn (1984), who observed courtship and copulation between 9 and 20 February in a captive pair of *V. timorensis*.

Prior to egglaying, the female monitor's stomach appeared swollen, but gravidity seemed to have little effect on her behavior; each year, she remained active and fed normally up to the day of egglaying. Eggs were laid in dry soil, loosely covered, in each year. The female became very active and fed voraciously for several weeks after oviposition in each case.

In each year, eggs that failed to develop showed heavy fungal growth and collapsed within a week of laying. Young hatched in 1983 began feeding on small crickets five to six days after hatching; 1984 young took crickets within a week of hatching.

The times for egglaying for *V. t. similis* given here (Table 1) differ from those reported by de Bitter (1981) and Behrmann (1981) for *V. t. timorensis* (18 May, and 4 and 6 September, resp.). Possibly, breeding habits are different for this subspecies. The incubation periods reported here (Table 1) are within the range previously published for *V. timorensis*. Incubation periods described by de Bitter (1981) were 135 and 140 days; Behrmann's (1981) eggs hatched after 93 and 100 days; and Rüegg (1974) reported an incubation period of 139-140 days for *V. t. similis*.

All four young were healthy and feeding well as of October 1986, but their growth to that time was slow. Of the two hatched in 1983, the larger measured ca. 135 mm snout-vent (total length 340 mm, mass 47.9 g), and the smaller, 135 mm s-v (TL 330 mm, mass 31.8 g). The larger of the two hatched in 1984 was 145 mm s-v (TL 365 mm, mass 32.4 g), and the smaller, 140 mm s-v (TL 355 mm, mass 34.5 g).

Table 1. Mating, egglaying, incubation and hatchling data for *Varanus timorensis similis*.

	1982	1983	1984
Time of Mating Activity	first week Jan.-first week Feb.	first week Jan.-first week Feb.	mid-Jan.-mid-Feb.
Egglaying date	28 Feb.-1 March (overnight)	27-28 Feb (overnight)	15 March (afternoon)
Number of eggs laid	5	5	5
Number surviving	0	2	2
Hatching date	-	29,30 June	29 July, 2 Aug.
Incubation period (days)	-	121,122	136,140
Hatchling length (mm)			
Snout-vent	-	63, 57	63,70
Total	-	90,87	90,92
Hatchling mass (g)	-	4.2, 4.1	5.3, *

* Not weighed

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LIFE HISTORY NOTES

Life History Notes is analogous to Geographic Distribution. Individual notes should, with few exceptions, concern only one species, and authors are requested to choose a keyword which best describes the nature of their note (e.g., Reproduction, Longevity, Morphology, etc.). Figures are permissible to illustrate any data, but should **replace** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles submitted to this section will be reviewed and edited prior to acceptance.

Standard format for this section is as follows: SCIENTIFIC NAME (in caps), COMMON NAME (lower case, in parentheses) as it appears in Collins (1990. **Standard Common and Current Scientific Names for North American Amphibians and Reptiles, 3rd ed.**, Herp. Circ. 19:1-41), KEYWORD (in caps). DATA on the animal. Place of deposition or intended deposition of specimen(s), and catalog number(s). Then skip a line and close with SUBMITTED BY (Name(s) in caps, and address(es) in full). (NCN) should be used for common name where none is recognized. References may be briefly cited in text (refer to a recent issue for citation format).

ANURA

BUFO BUFO (European Common Toad). **REPRODUCTIVE MORTALITY**. The

breeding season of *Bufo bufo* in southern England may be as short as two or three weeks and, on any one night over the course of the season, there may be as many as five males for every female. Males obtain mates by searching for unpaired females and by attempting to displace males already engaged in amplexus with females (Davies and Halliday 1978. Nature 274:683; 1979. Anim. Behav. 27:1253). We observed mating behavior in a population of *Bufo bufo* breeding in a small culvert connected to Willen Lake in Milton Keynes, Buckinghamshire, England, on 9 and 10 March 1985. Mating activity at this site was especially conspicuous due to the presence of large "mating balls" of writhing toads on the substrate of the culvert. We removed eight balls from the water, and determined the sex composition of each. Each ball consisted of a single female toad surrounded by from five to fourteen males (mean number of males = 9). Three of the eight females were dead. In one case, a string of spawn extended from the cloaca of the dead female. Similar sex-differential mortality has been reported in the frog *Rana sylvatica* (Phillips and Wade 1990. Herp. Rev. 21:59).

On 10 March we attempted to count the total number of adult toads present in the culvert. Only three females were found (all alive), all at the center of mating balls. Thirty males were counted in mating balls, and at least 30 single males were observed. We thus estimate the operational sex ratio to be highly skewed towards an excess of males. We counted no more than 10 strings of spawn in the culvert over the duration of the breeding season, further evidence for a preponderance of males at this site.

Whether mating balls are the cause of female mortality or whether they simply form around dead females is unclear. However, if the former is the case, mortality due to intense competition among males may represent a significant cost of reproduction for female *Bufo bufo*. It may also have a severe negative effect regarding population survival, especially for populations of relatively small size.

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BUFO PUNCTATUS* X *BUFO RETIFORMIS (Red-spotted Toad, Sonoran Green Toad). **NATURAL HYBRIDIZATION**. Hybridization in nature is widespread among bufonids (Sullivan 1986. J. Herpetol. 20(1):11-21). However, few natural hybrids have been observed in the *B. punctatus* group (Ferguson and Lowe 1969. Amer. Midl. Nat. 81(2):435-466). Herein we report the discovery of a natural hybrid between *B. punctatus* and *B. retiformis*.

On 21 July 1986, while road-riding on Route 15, 6.9 mi. NE of Quijotoa, Pima Co., Arizona, the first author discovered a hybrid female (Fig. 1) along the edge of a rain-formed pool. Using the following measurements of SVL (68.3 mm), tibia length (25.1 mm), parotoid length (9.5 mm), parotoid width (6.8 mm), eyelid length (7.8 mm), postorbital crest (POC) length (7.1 mm), and POC to POC distance (20.5 mm), we calculated five ratios and compared these to Ferguson and Lowe's (op. cit.) ratios for pure *B. punctatus* and *B. retiformis*, two likely candidates for the parent species. The presumed hybrid was intermediate to *B. punctatus* and *B. retiformis* in three of the five ratios (tibia length/parotoid length, 2.64; parotoid length/eyelid length, 1.22; and parotoid length/parotoid width, 1.40). SVL/parotoid width (10.98) was closer to *B. punctatus* while SVL/POC to POC (3.33) was closer to *B. retiformis*. Two other potential parent species, *B. alvarius* and *B. cognatus*, were eliminated because the presumed hybrid was: 1) dissimilar in body color; 2) lacked both warts on the legs and white warts at the angle of the jaw; and, 3) differed in cranial crest structure.

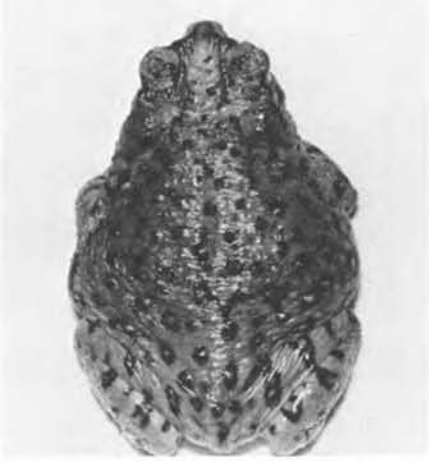


Figure 1. A natural hybrid between *B. punctatus* and *B. retiformis*.

Ferguson and Lowe (op. cit). crossed *B. punctatus* and *B. retiformis* in the laboratory and obtained metamorphosed offspring. However, until the discovery of this specimen, no natural hybrids were known. Although these parent species differ ecologically and behaviorally in zones of sympatry, hybridization might occasionally occur in high-density heterospecific breeding aggregations in which males may adopt alternative reproductive tactics such as active-searching or satellite behavior.

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RANA TEMPORARIA (Common Frog). **MASS MOVEMENT**. *Rana temporaria* has a great tolerance of cold and breeds earlier in the year than any other amphibian; breeding migrations can sometimes involve mass movement (Fuhn 1960. Amphibia. Ed. Acad. R.P.R., Bucharest. 288 pp; Smith 1969. The British Amphibians and Reptiles. Collins, London).

On 24 April 1986 at 1200 h, a mass movement of this species was observed at Cîmpusel (1300 m alt.), on the East Jiu Valley, Retezat Mountains, Hunedoara Department, Romania. The snow was ca. 1 m high and air temperature was 16° C. At an elevation of 100 m on the other (and unshaded) side of the river, the snow was completely melted and active adders (*Vipera berus*) were observed. The warm air produced a rapid snow melt, especially around trees, fences, and paths. In this area, frogs were observed emerging from hibernacula and jumping towards the nearby stream. The area from where the frogs appeared was ca. 200 m^2, situated 10-20 m from the stream. Emergence from hibernation coincided with an increase in air temperature by noon; nighttime temperatures were below 0° C. The only observed breeding site was ca. 250 m downstream; ca. 20 animals were observed, mostly males. An amplexing pair was found close to the stream, resting on ice. When observed, the female started to creep and jump towards the stream.

The movement of frogs was in one direction and appeared synchronous, lasting only 30-40 min. Their slow pace may have been caused by the ice substrate and their emaciated condition. After reaching the stream they were carried away by the stormy waters and lost from sight. Four km downstream, in a clearing free of snow, a number of egg masses and tadpoles of *Rana temporaria* were observed.

Voucher specimens were deposited in the collection of the Deva Museum, Deva, Romania.

Submitted by **COGALNICEANU**

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CAUDATA

PLETHODON VEHICULUM (Western Red-backed Salamander). **REPRODUCTION**. Although Carl (1943. Brit. Columbia Prov. Mus. Handbook, No. 2:1-62) reported a clutch/nest site of *P. vehiculum* from British Columbia, and two clutches have been reported from a single site in Oregon by Hanlin et al. (1979. J. Herpetol. 13(2):214-216), no natural nest sites of this species have been documented for Washington state. On 13 May 1989 such a nest site with a recently deposited (no embryos present) clutch was discovered on a N-facing slope (ca. 45° grade) inclining toward Dalco Passage (ca. 300 m distant) in an old-growth stand of mixed conifers and maples at Point Defiance Park, Tacoma, Pierce Co., Washington (T.21N., R.2E., Sec. 15). Two adult *P. vehiculum* (SVL = 52.5 mm female, 45.0 mm male) were in attendance. Both adults were close to the clutch, one within ca. 3 cm; however, sexes were not noted at collection.

Carl (1943) provided little detail and no quantitative data concerning the British Columbia nest site. However, the detailed report of Hanlin et al. (op. cit.) provides for interesting contrasts between the Oregon and Washington sites. Though no information provided by the Point Defiance nest site contradicts their determination of a Mode III reproductive strategy for *P. vehiculum*, no stream or seep occurs within the immediate proximity of the Washington site and no rocks were present as reported in association with the Oregon site.

The clutch was deposited directly on the substrate under a large (150 x 50 x 10 cm), oblong and irregular shaped bark slab of Douglas fir (*Pseudotsuga menziesii*), bark side up. Substrate was moist loamy soil, mixed with Douglas fir and hemlock (*Tsuga* sp.) needles and other organic debris. The opaque outer envelope exhibited reddish-brown adhering soil particles from the substrate; the living ova were yellowish-cream in color, the individual ova envelopes transparent.

Consisting of 11 ova, this clutch is the numerically largest naturally deposited clutch yet reported for *P. vehiculum*. Overall, the clutch measured 14 x 11 mm with the outer envelope intact. Various measurement ranges (in mm) of the ova, after 11 months of preservation in 10% isopropanol, are as follows (means in parentheses): greatest ovum length with individual gelatinous envelope, 5.1-6.1 (5.5); greatest ovum length not including individual envelope, 4.3-5.0 (4.7); greatest ovum width with individual envelope, 4.3-5.2 (4.7); greatest ovum width without individual envelope, 3.7-4.9 (4.2); greatest distance from ovum to outer edge of individual gelatinous envelope while suspended in fluid, 1.0-2.5 (1.7).

Observations of parental brooding behavior were attempted in the laboratory (19-20.5° C) at irregular intervals from (2100 h) 13 May 1989 until (1230 h) 18 May 1989 by which time the eggs (still in the outer envelope) had begun to exhibit indications of spoilage. Only the female was recorded to coil about the eggs. No brooding behavior per se was observed after approximately 1100 h 14 May 1989.

Sympatric invertebrates observed or collected at the site included slugs (*Ariolimax columbianus*), carabid beetles, terrestrial isopods (*Oniscus* sp.), and centipedes (*Scolopocryptops sexspinosus*). The presence of small invertebrates at the site may indicate a nest site choice providing a food supply for brooding adults, as discussed by Hanlin et al. (op. cit.).

Voucher specimens, including the adults, will be deposited in the James R. Slater Museum of Natural History (Accession #: BRN0142). We thank E. L. Karlstrom and D. R. Paulson for reviewing the manuscript.

Submitted by **BRADFORD NORMAN** and **MELISSE SWARTWOOD**, c/o Herpetological Lab, James R. Slater Museum of Natural History, University of Puget Sound, 1500 North Warner, Tacoma, WA 98416, USA ●

HEMIDACTYLIUM SCUTATUM (Four-toed Salamander). **PREDATION**. Ernst and Barbour (1989. Snakes of Eastern North America. George Mason University Press, Fairfax, Virginia. 282 pp.) summarized food habits of the pigmy rattlesnake, *Sistrurus miliarius*, and included frogs, toads, lizards, snakes, nestling birds, and mice as vertebrate prey. Although some prey is ambushed, Ernst and Barbour (op. cit.) suggested that most are actively sought. We report on the four-toed salamander, *H. scutatum*, as a new prey item of *S. m. streckeri* from Arkansas.

On 17 October 1990, one of us (BGC) came upon a snake/salamander interaction in an area marked "Wildlife Habitat Zone" in the Ouachita National Forest, Garland Co., Arkansas, just north of National Forest Road 384 (T.3S., R.22W., Sec. 32). The encounter was observed at 1115 h; the sky was clear, and the air temperature was ca. 24° C. The rattlesnake (a male, 408 mm SVL) was positioned in a very tight S-shape with its snout less than 25 mm from the right lower side of the salamander's trunk. The salamander (a female, 35 mm SVL) was slowly twitching its arms, legs, and tail, although the trunk and head remained still. Following these observations, both animals (Arkansas State University Museum of Zoology 16836 - snake; ASUMZ 16838 - salamander) were collected; the salamander died within five minutes after being placed in a plastic bag. The salamander was examined after fixation and revealed a 4 mm circular region of the lower right abdomen that was translucent compared to the surrounding tissue and suggests a possible site of envenomation.

Submitted by **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA, and **BETTY G. COCHRAN**, Caddo Ranger District, P.O. Box 369, Glenwood, AR 71943, USA ●

TESTUDINES

CLEMMYS GUTTATA (Spotted Turtle). **SIZE MAXIMA**. An unusually large *Clemmys guttata* was captured April 1990 in a small pond in North Hampton, New Hampshire 0.3 miles E of U.S. Route 1 on Route 101D. The CL = 13.64 cm. Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston. 429 pp.) lists the record at 12.7 cm. No record of a larger specimen could be located.

The turtle was kept as a "pet" by a young man who presented it to a wildlife rehabilitator in September 1990 when the turtle demonstrated advanced symptoms of starvation. The turtle died within 24 h. The turtle was donated to the Museum of Comparative Zoology, Cambridge, Massachusetts (MCZR176001) where the CL was verified by José P. Rosado, Collection Manager.

Submitted by **DAVID B. TAYLOR**, P.O. Box 263, Byfield, MA 01922, USA ●

GOPHERUS POLYPHEMUS (Gopher Tortoise). **DRINKING BEHAVIOR**. Various drinking behaviors have been described for tortoises inhabiting dry environments. Auffenberg (1963. Anim. Behav. 298(11):72-73) described how *Psammobates tentorious*, *Kinixys*

homeana, and *Homopus areolatus* use their unique shell shape and behavior of lifting the shell with the hind legs to direct water flow toward the front of the shell and the head. Desert tortoise (*Gopherus agassizii*) drinking was described by Luckenbach (1982. In R. B. Bury (ed.), North American Tortoises: Conservation and Ecology. USFWS Res. Rpt. No. 12:1-37). The only observation of drinking in this species is from puddles or springs; similar descriptions have been found in the literature for the *Gopherus polyphemus* or other species in the genus. We have observed gopher tortoises drinking from temporary ponds as they foraged after heavy rains. Temporary pools are uncommon in the sand hill habitat of this species except possibly during the rainy season.

Our initial observation of drinking behavior in *Gopherus polyphemus* was of a newly captured tortoise from recently destroyed sand dunes in St. John's Co., Florida. It was observed drinking at the mouth of its newly constructed burrow at the beginning of a heavy rain. Since that observation, we have observed this behavior on more than 30 occasions over the past four years. We have been able to entice tortoises into drinking at the mouth of the burrow when soil conditions were dry and it had not rained for at least ten days. Under normal circumstances, when the tortoise is approached while it is near the burrow's entrance, it retreats immediately. However, the tortoise appeared oblivious to human presence when drinking.



Figure 1. Gopher tortoise drinking at entrance to burrow.

When we have observed the tortoise drinking at the beginning of rain storms (n = 11) and when the burrow mouth was sprinkled moderately from a garden hose (n = 22), the behavior observed was the same. Upon arriving at the mouth of the burrow from below, the tortoise moves up to the point where it is just inside of the burrow mouth. It positions its body sideways so it is blocking the entrance to the burrow and its head is at the corner where the wall and floor of the burrow meet (Fig. 1). The foreleg facing the entrance is extended forward and into the surface of the sand. Any surface flow into the mouth of the burrow is interrupted by the extended leg and diverted toward the head. Upon arrival, the tortoise immediately forces its head into the sand to nearly eye level and begins to drink. The tortoise may drink in this manner for more than 4 min (n = 4), but most frequently for under 3 min (n = 12).

We measured the time it took the tortoise to appear from below the surface to the mouth of the burrow as we sprinkled the mouth. The mean response time was 1 min 28 sec; the shortest response time was 18 sec, the longest 3 min. If the ground was moist or if rain had been recorded, the tortoise would not respond. The depth of the burrow was measured at ca. 2.2 m.

During heavy rains, water seems to flow from several directions outside to either edge of the burrow which act as a gathering point or vortex. Particularly, water moves from the edge of the sand shelf in front, to the edges of the burrow's mouth.

Gopher tortoises generally inhabit well-drained, sand-based soils in upland habitats. Water percolates rapidly through these soils and rarely stands in puddles. Tortoises quite rarely have either permanent or ephemeral streams or ponds within their home ranges (Deimer 1988. Gopher tortoise status and harvest impact determination. Final report, Florida Game and Freshwater Commission. Tallahassee, Florida). Throughout most of this species' range, during its active period (ca. March-November), much of the precipitation falls in short-lived, heavy rains during convection thunderstorms. The drinking behavior documented here is a unique adaptation to a habitat where surface water may be available for very short, infrequent periods throughout most of the year.

Submitted by **RAY E. ASHTON, JR.**, Water and Air Research, Inc., 6821 S.W. Archer Road, Gainesville, FL 32607, USA and **KEVIN J. ASHTON**, 611 NW 79th Dr., Gainesville, FL 32602, USA

TRIONYX FEROX (Florida Softshell). **REPRODUCTION**. A large female (PL 351 mm, CL 450 mm) collected 25 June 1976 on Payne's Prairie Preserve, Alachua Co., Florida and reported earlier by Iverson (1985. Florida Sci. 48:41-44), bore 5 sets of corpora lutea (11, 9, 5.5, 4, and 2 mm) and one set of 30 preovulatory follicles (17-19 mm). Luteal scars, by descending size class, numbered 28, 25, 16, 24, and 22; the largest set corresponded precisely to the number of oviducal follicles, only one of which was yet shelled. An additional unovulated follicle from each of the two sets was undergoing atresia. Observations of sporadic nesting in this population through July and into early August, as well as additional dissections revealing that preovulatory follicles are not retained through winter, strongly suggest that this female would have laid a sixth clutch in 1976. Her annual reproductive potential of 145 eggs for that year is by far the maximum confirmed for North American members of this genus (*Apalone*, sensu Meylan 1987. Bull. Amer. Mus. Nat. Hist. 186(1):1-101).

While my observations of incubation period (to hatching) at 27-30° C generally concur with those of Iverson (op. cit.), the following data from eggs of this population extend our knowledge of this species' development at cooler temperatures. Four eggs from two clutches pipped at 111-116 days, whereas all eggs incubated at 20° C died early during embryogenesis.

Research on Payne's Prairie was conducted via permits from the Florida Department of Natural Resources.

Submitted by **DALE R. JACKSON**, Florida Natural Areas Inventory, 1018 Thomasville Road, Suite 200-C, Tallahassee, FL 32303, USA

TRIONYX SPINIFERUS SPINIFERUS (Eastern Spiny Softshell). **BURYING BEHAVIOR**. According to Ernst and Barbour (1972. Turtles of the United States. Univ. Kentucky Press, Lexington. 347 pp.) the spiny softshell buries itself by flipping silt over its back until it is completely concealed. Carr (1952. Handbook of Turtles. Comstock Publ. Assoc., Ithaca, New York. 542 pp.) believed that the soft-margined shell is probably more of an adaptation for burying in the bottom than for aquatic locomotion. He noted "the ease with which it may be shuffled into the bottom soil by sidewise movements and the conspicuously low mound that it makes when so covered." Newman (1906. J. Comp. Neurol. Psychol. 16(2):126-152) reported two large female *T. spiniferus* confined in shallow water within a pen that buried themselves by rocking the body from side to side and throwing mud up to cover the carapace. This movement was continued

until they sunk deeper and had only the snout sticking out of the mud. Newman did not indicate how the animals "threw" the mud, but our observations of softshell burial indicate that the procedure employed is quite different. While all of our observations have concerned animals burying in sand substrates, M. Plummer (pers. comm.) has seen smooth softshells, *T. muticus*, bury in sand, mud, and gravel in the same manner we describe here.

During the course of field studies on *Trionyx s. spiniferus* near the mouth of the Lamoille River at Lake Champlain, Chittenden Co., Vermont, we watched hatchlings, juveniles, and adult males bury themselves in sandy underwater substrates. We made similar observations on young maintained in an aquarium with 3.5 cm of medium-grained sand obtained from the lakeshore where turtles were known to bury. In-tank water depth above the sand averaged 10 cm. Temperature was maintained at 24-25° C by a submersible aquarium heater.

Burying progresses as follows: the head is thrust into the sand and then partially retracted as powerful thrusts of the forelimbs and hindlimbs cause the turtles to literally "crawl" under the sand. The anterior end is drawn down into the sand as the forelimbs are first extended and then swept to the side to pull the animal forward. While the forelegs are pulling, the hindlegs are pushing (forwards and upwards) to assist forward momentum and at the same time raise the rear margin of the animal's carapace. After moving for several cm in this fashion the animal ceases forward movements and suddenly demonstrates a rapid waggle or shimmy of its rear end causing the sand to settle smoothly over the carapace. Normally, after the shimmy, the only indication of a buried softshell is a slightly elevated crescent-shaped ridge of sand left near its anterior end. This ridge forms just ahead of the turtle as it bulldozes its way through the sand.

The bury-and-shimmy behavior is demonstrated immediately post-hatching and is used thereafter by all subadults, adult males, and probably adult females. Although we have not observed burial in adult female *T. spiniferus*, M. Plummer (pers. comm.) has seen adult female *T. muticus* burying in the same manner, and has on occasion noted that females will bury out of water on a sandbar after first laying their eggs. In all cases when we have released adult female *spiniferus* in the wild, they have elected not to bury and have instead moved rapidly to deeper water. All other softshells we have released have adopted the bury-shimmy strategy. This behavioral adaptation enables them to lie inconspicuously buried in very shallow water.

It is common to find males and young spiny softshells buried right at the water's edge along sandy beaches and sandbars, but we have never found females in these situations. M. Plummer (pers. comm.) has seen female *T. muticus* bury right along shore in the nesting season, however. In Vermont, softshell burial during the warmer parts of the year is almost always in water that is shallow enough to allow the turtles to extend their long neck to the surface for air, without first emerging from hiding. Burial in shallow water also confers a thermal benefit (Plummer 1977. Copeia 1977(3):431-440). On two successive days Plummer found 110 *T. muticus* hidden along a sandbar where water temperature was 6.5° C higher than in the adjacent river channel. While hand-capturing buried *T. spiniferus* in Vermont on 28 June 1990, we took temperatures at four softshell burial sites and then along a 20 m transect extending lakewards through a bed of rushes to open water. Water temperature in the lake was 22° C but at the burial spots it was as high as 30.5° C.

We would like to thank R. Guthrie for graciously showing us how to track and locate buried softshells last spring in Alabama, and for calling their unique "shimmy," as he dubbed it, to our attention.

Submitted by **TERRY E. GRAHAM** and **ANDREW A. GRAHAM**, Wetlands & Wildlife Associates, 209 Pommagussett Road, Rutland, MA 01543, USA

APALONE SPINIFERA (Spiny Softshell). **BEHAVIOR**. We observed a female spiny softshell (CL = 37.8 cm) squirt blood from both eyes in response to handling. The turtle was captured 27 June 1988 in Bayou Duplantier, ca. 0.5 km S of the Louisiana State University campus, Baton Rouge, Louisiana. The turtle was temporarily housed in a large plastic tub partially filled with water. On 2 July 1988 the tub was drained and the turtle removed. The turtle was in a state of obvious agitation as it was lifted from the tub and simultaneously emitted a jet of blood from each eye. This action was sudden and lasted ca. 1 sec. The blood was propelled ca. 15 cm at an angle of ca. 45° from the longitudinal axis of the head.

Repeated attempts at later dates to induce this behavior for further observation and photography proved unsuccessful. A similar blood spurting behavior has been noted in several species of *Phrynosoma* (Smith 1946. Handbook of Lizards. Comstock Publ. Assoc., Ithaca, New York. 542 pp.), but we are unaware of this behavior having been reported for any species of turtle.

Submitted by **STEVEN G. PLATT** and **CHRISTOPHER G. BRANTLEY**, Wettanda Ecological Services, P.O. Box 701, Madisonville, LA 70447, USA

SAURIA

ANOLIS CAROLINENSIS (Green Anole). **WINTER ACTIVITY**. On 31 December 1990 and 13 January 1991 an adolescent male was observed sunning itself in Athens, Georgia (33°56' N — 83°25' W); on the latter occasion the air temperature was no higher than 8° C. This lizard and two others had been seen repeatedly in chilly weather since October. They live in a pile of pinestraw on top of which is a black plastic sheet, resulting in temperatures higher than ambient. The climate of Athens is temperate, with first frost normally 15 October, but this winter was one of a series of mild ones and the temperature was below freezing only a few times.

Submitted by **MICHAEL A. COVINGTON** and **CATHY COVINGTON**, 285 Saint George Driver, Athens, GA 30606, USA

ANOLIS LIVIDUS (NCN). **FEEDING**. Anoles are typically reported as sit and wait predators with few exceptions. Prey descriptions based on stomach contents consist largely of invertebrates, presumably engulfed live. This note describes natural feeding by an anole on non-living matter.

On 19 June 1981 during a study of male *A. lividus* behavior on Montserrat, B.W.I., an anole was observed to descend to the ground, travel ca. 1 m, and begin feeding. The substrate here was well-shaded and generally consisted of bare, dark soil. Where the lizard was feeding, a conspicuous white spot was visible on the soil surface. The lizard repetitively grabbed at the white material and appeared to be consuming it. No motion of small invertebrates was observed in the material. The observer was less than 2 m from the lizard and the scene was clearly visible. The lizard was captured, its sex determined, and released. The anole was a sexually mature female. Upon closer examination, the whitish material was found to be an eggshell, apparently from a bird. An abandoned bananaquit (*Coereba flaveola*) nest

was in the trees above the site. The eggshell was dry, well-fragmented, and obviously not from a recent hatching. No invertebrates were observed on or in the eggshell material. Anoles feeding on ants were seen previously and subsequently, with ants readily observable in the feeding lizard's jaws. Montserrat is an island of volcanic origin and calcium supplementation of the diet for the demands of reproduction may be the origin of this behavior.

Submitted by **PHILIP H. STEVENSON**, 4814 Bromley Lane, Richmond, Virginia 23226, USA

ANOLIS WHITEMANI (NCN). **TAIL AUTOTOMY**. We examined 178 museum specimens (Albert Schwartz Field Series, ASFS, Univ. Kansas Mus. Nat. Hist.; Bobby Witcher Memorial Collection, Avila College; U.S. Natl. Mus., Smithsonian Institution) taken from 21 different sites on Hispaniola and in seven different months. Tails available for examination (many had been lost, presumably during capture) were inspected for indications of breakage and regeneration. The xeric habitats occupied by this anole (O.A.S. 1969. Survey of the natural resources of the Dominican Republic, Study on the development and planning of natural resources. Report of the Technical Assistance Mission to the Dominican Republic carried out by the Natural Resources Unit of the Department of Economic Affairs in 1965-1966. Gen. Secretariat of the Org. Amer. States, Washington, D.C.) and rainfall patterns (Salcedo et al. 1983. Atlas de diagramas climáticos de la República Dominicana. Secretaría de Estado de Agricultura, Sto. Domingo) are very similar at collecting localities. For all statistical tests, a = 0.05.

Seventeen of 98 specimens whose tails were available for examination displayed evidence of autotomy. Frequency of tail loss was higher in females (F: 0.21, n = 43; M: 0.15, n = 55), but not significantly so ($x^2 = 1.28$). There was no significant correlation between SVL and frequency of autotomy (r = 0.11).

Tail autotomy is most commonly associated with predation (Arnold 1988. *In:* Gans and Huey (eds.), Biology of the Reptilia, Vol. 16, pp. 235-273. Alan R. Liss, New York), although Schoener and Schoener (1980. Copeia 1980:839-850) indicated that intraspecific interactions might also be responsible, and that these two factors demonstrate a largely inverse relationship in lizards. In either case, it is expected that males would demonstrate higher frequencies of tail breakage as they are more territorial and, as a result, more likely to be exposed to predation or involved in agonistic intraspecific interactions (Parker and Pianka 1973. Herpetologica 29:143-152). The slightly higher (but statistically insignificant) frequency of autotomy in female *A. whitemani* remains unexplained, as does the lack of correlation with SVL. Larger (= older) individuals would have been expected to demonstrate higher rates of tail loss, merely due to increased opportunities (see Schoener and Schoener, op. cit.).

The overall frequency of autotomy in this species is lower than that reported in most populations of Bahamian anoles (Schoener and Schoener, op. cit.). This may be a result of the arid habitats in which *A. whitemani* is found. The harsh environment could be reflected in lower densities of potential predators. Saurophagous snakes in the genera *Antillophis*, *Hypsirhynchus*, and *Uromacer*, and birds, especially kestrels (*Falco sparverius*), have been collected and/or observed in sympatry with *A. whitemani*, but never in large numbers. Also, the densities of lizard populations are low. In 1990, 24 man-hours of effort were necessary to collect each *A. whitemani* at one study site in Peravia Province; by comparison only 0.25 man-hours were needed to collect specimens of *A. chlorocyanus* at a more mesic site in San Cristobal Province. These lower population densities would probably result in fewer incidents of territorial defense.

We wish to thank Darrel R. Frost and John S. Simmons for providing access to the ASFS at the Museum of Natural History, University of Kansas. George R. Zug and Elyse J. Beldon of the Smithsonian Institution loaned specimens. John S. Parmerlee, Jr., Jaime D. Villa, and members of the Avila College Field Biology classes of 1986, 1988, and 1990 helped in the field. Sixto and Ivonne Incháustegui provided assistance in the Dominican Republic. José A. Ottenwalder of the Parque Zoológico Nacional facilitated opportunities for field work. Permits were graciously provided by Emilio A. Bautista M., Director, Departamento de Vida Silvestre, República Dominicana.

Submitted by **MICHAEL A. CUSUMANO, DEBORAH J. PFLANZ,** and **ROBERT POWELL**, Department of Natural Sciences, Avila College, Kansas City, MO 64145, USA, and **DONALD D. SMITH**, Department of Medicine, University of Kansas, Kansas City, KS 66103, USA

CNEMIDOPHORUS SEXLINEATUS (Six-lined Racerunner) and ***COPHOSAURUS TEXANUS*** (Texas Earless Lizard). **SPIDER PREDATION**. A number of invertebrates are reported to prey on reptiles (see Greene 1988. *In*: Gans and Huey (eds.), Biology of the Reptilia, vol. 16, Ecology B, pp. 1-152. Alan R. Liss, New York; and McCormick and Polis 1982. Biol. Rev. 57:29-58 for reviews). Only a few accounts exist of spider predation on lizards (e.g., Cokendolpher 1977. J. Arachnol. 5:184; Corey 1988. J. Arachnol. 16:392; and Blondheim and Werner 1989. British Herpetol. Soc. Bull. 30:26-28.). We report two instances of predation by araenomorph spiders on juvenile lizards.

On 15 June 1985, one of us (JCG) observed a dead *Cnemidophorus sexlineatus* (SVL = 52.5 mm; AUM 32930) being pulled into a burrow by a lycosid spider, *Geolycosa* sp. The incident took place 7.65 km W of Cannon Town, Okaloosa Co., Florida. The lizard was apparently recently killed and its right eye socket digested.

In the other instance, MKC and MJW observed a *Cophosaurus t. texanus* (SVL = 26 mm, mass = 0.5 g; TCWC 66686) being preyed upon by another lycosid spider, *Arctosa littoralis* (TL = 16 mm, mass = ca. 0.4 g). The incident took place at Lake E. V. Spence, 3.3 km W of Robert Lee, Coke Co., Texas. The lizard had three puncture marks on its throat and a collapsed right eye. The spider was discovered under a rock with the already dead lizard, manipulating it with apparent ease.

In areas of rocky shoreline at Lake Spence, both spiders and Texas earless lizards occur in abundance. In this situation, spider predation on small juvenile lizards might not be a rare event.

We thank J. R. Dixon for comments on this note. We also thank Allen Dean for the identification of *Geolycosa littoralis*.

Submitted by **MARTIN J. WHITING, JAMES C. GODWIN**, and **MARY K. COLDREN**, Department of Wildlife and Fisheries Sciences, TX A&M University, College Station, Texas 77843, USA

EUMECES SEPTENTRIONALIS (Prairie Skink). **PISCIVORY**. The prairie skink is a North American lizard characterized by a diet that is primarily insectivorous (Breckenridge 1943. Amer. Midl. Nat. 29:591-606). Fish have not been previously recorded as a food item (reviewed in Somma and Cochran 1989. Great Basin Nat. 49:525-534). On 3 June 1990 be-

tween 0930 and 1030 h, six *Eumeces septentrionalis* (three gravid females, one male, and two juveniles) were captured from amongst riprap and beneath stone slabs on the earthen dam forming the windward shoreline of Burchard Lake, Pawnee Co., Nebraska (T.12N., R.10E., Sec. 4). The three females and one juvenile were placed in the same collecting bag. Within ca. 1 h a large fecal pellet was found in the bag. It contained the remains of a small fish (probably a cyprinid), represented by numerous small (ca. 2 mm diam), cycloid scales, two fin rays, and one partially digested amphicoelous vertebra. It was not possible to determine which lizard excreted the pellet.

Prairie skinks in this population feed largely upon the numerous roaches (*Blatta* sp.) and crickets (*Gryllus* sp.) which live beneath the riprap and flat limestone rocks upon the dam (pers. observ.). The rocks and riprap also provide shelter for the skinks, including nest sites for brooding females (Somma 1990. Bull. Chicago Herpetol. Soc. 25:77-80). The insects are attracted to left-over food and bait discarded by fishermen. It is likely that the ingested fish was discarded bait left on the dam or was washed ashore with the wind-blown drift (dead vegetation, invertebrates, and fish) as carrion.

Active foraging for fish in the water has only been described in a few species of lizards including *Varanus indicus*, *V. mertensi*, *V. mitchelli*, *V. semiremex* (Cogger 1986. Reptiles and Amphibians of Australia. 4th ed. Reed Books, Sydney) and *Shinisaurus crocodilurus* (Schmidt and Inger 1957. Living Reptiles of the World. Doubleday & Co., Garden City. 287 pp.). While aquatic behavior has been observed in southern populations of *E. septentrionalis*, it only occurred as a form of escape behavior (Taylor 1935. Univ. Kansas Sci. Bull. 23:1-643; Black 1975. Herp. Rev. 7:111). It is unlikely that this terrestrial lizard actively forages in the water. Fish, in the form of dropped food and other nest spillage, constitute half the diet of the Seychelles skinks, *Mabuya seychellensis* and *M. wrightii*, living among breeding colonies of Lesser Noddies (*Anous tenuirostris*) on Cousin Island (Brooke and Houston 1983. J. Zool. (Lond.) 200:179-195). It should not be surprising that skinks eat fish when available as carrion, in light of the fact that they are considered intensive foragers that rely on both visual and chemical cues to detect prey (Regal 1978. In Greenberg and MacLean (eds.), Behavior and Neurology of Lizards, pp. 183-202. Natl. Inst. Mental Health, Rockville, Maryland; Huey and Pianka 1981. Ecology 62:991-999; Vitt and Cooper 1986. J. Herpetol. 20:408-415). Thus, the probability that the fish in this observation was eaten as a result of opportunistic scavenging upon carrion seems the most parsimonious explanation. While this is the only recorded instance of a North American skink eating fish, it is probable that this behavior occurs, albeit infrequently, in other populations of skinks living along shoreline habitats.

I thank D. Ferraro, D. Lokke, J. Lokke, and J. Young for their invaluable assistance in the field. The manuscript was greatly improved by the proofreading and criticism of J. M. Matter.

Submitted by **LOUIS A. SOMMA**, Department of Zoology, University of Florida, Gainesville, FL 32611, USA ●

SCELOPORUS UNDULATUS (Prairie Lizard). **RAFTING**. Although oceanic rafting of terrestrial organisms has been documented (Carlquist 1965. Island Life. Natural HIstory Press, Garden City, New York; Schoener and Schoener 1984. Oecologia 63:289-294), there are no published accounts of rafting on freshwater systems. The genetic constitution of individual populations and the distribution of organisms on the mainland may be significantly affected by rafting of individuals between populations or to new locations. For example, Smith (1946. Handbook of Lizards. Comstock Publ. Assoc., Ithaca, New York. 542 pp.) proposed that downstream transport of northern prairie lizards (*Sceloporus undulatus garmani*) on floating logs or other debris may account for the expansion of their range eastward in Kansas and Oklahoma. Seasonal rains in Oklahoma often flood the shores of rivers and streams. The propensity of *S. undulatus* for log piles (Ferguson et al.

U. S. Forest Service, Department of Agriculture

Publication Announcement

THE REPTILES AND AMPHIBIANS OF THE CIMARRON NATIONAL GRASSLANDS, MORTON COUNTY, KANSAS

Joseph T. Collins & Suzanne L. Collins

with Photographs by the Authors

This booklet defines the reptile and amphibian diversity of the Cimarron National Grasslands, and includes accounts of the 31 species known to reside there. The text accounts contain standard common names, characteristics, size and size maxima, habits and habitats, when the species was first discovered in the Grasslands, current abundance, and reproduction and food preferences. The introduction contains a summary of herpetological explorations in Morton County, a checklist of the herpetofauna, and remarks on their threatened status. A complete bibliography is included. There are 32 color photographs of amphibians and reptiles, and eight color photographs which display the rugged beauty of this wilderness area in extreme southwestern Kansas. *viii + 60 pages, 40 color photographs, 3 figures. January 1991.*

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This publication financed and co-sponsored by

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1983. *In:* Huey et al. (eds.), Lizard Ecology, pp. 134-148. Harvard Univ. Press, Cambridge, Massachusetts) enhances the probability of dispersal by rafting in this species during floods. Here we present evidence of such dispersal by *Sceloporus undulatus* in Oklahoma.

Two adult *Sceloporus undulatus*, one male (SVL = 51 mm, TL = 125.5 mm) and one female (SVL = 50 mm, TL = 129.5 mm) were recovered from a log floating down Pennington Creek in Tishomingo, Johnston Co., Oklahoma on 4 April 1989. The water level in the creek was elevated ca. 2 m above base flow due to recent rains. The log, ca. 2 m long by 40 cm diam, was first observed floating towards a dam ca. 3 m in height. The log floated over the dam and was submerged for 10 sec in the pool below the dam. At this time the two *S. undulatus* were captured and both survived in captivity for several weeks following rescue. In addition to these lizards, at least two other lizards were noted scrambling about a mass of logs and other debris that had accumulated below the dam. Although we were unable to catch these lizards for measurements, their presence adds support to the hypothesis that downstream transport in *S. undulatus* may be common. If rafting occurs frequently, not only will it serve as a mechanism for transporting organisms to new locations, but it will also facilitate gene flow between populations.

We thank T. Heger and D. Hillis for comments on the manuscript.

Submitted by **NANCY A. HEGER**, Department of Zoology, University of Texas, Austin, TX 78712, USA and **JAMES SHERRIN**, Department of Science, Murray State College, Tishomingo, OK 73460, USA

SERPENTES

AGKISTRODON PISCIVORUS CONANTI (Florida Cottonmouth). **FORAGING BEHAVIOR**. A snake's tail can be used for a variety of functions. For instance, the tail can be used to anchor the animal is it descends from basking sites in trees (Burkett 1966. Univ. Kansas Publ. Mus. Nat. Hist. 17(9):435-491). On 27 September 1989, 12 October 1989, and 30 October 1989, an adult female cottonmouth (ca. 105 cm TL) was observed in close proximity to a 32 m drift fence array on Eglin Air Force Base, Okaloosa Co., Florida. On two occasions, I observed the snake hook its tail and posterior one-third of its body around half of the top of the pitfall bucket and lower itself into the bucket. Thus anchored, the snake swirled its head around in the debris in the bottom of the bucket several times as if searching for prey items; however, I did not observe the capture of any prey.

Hooking the tail on the bucket rim allowed the bulky snake to effectively search the bucket for prey (238 amphibians and reptiles were caught in nine months of survey at this location). Mammals and birds have been documented predators on animals falling into pitfall traps, but this is the first recorded instance of a cottonmouth systematically and repeatedly searching pitfall buckets. Although *Masticophis flagellum* has been observed to anchor its body with its tail during ambush (Jones and Whitford 1989. Southwest. Nat. 34(4):460-467), my observations appear to be only the second instance of a snake employing its tail to anchor the body while foraging.

I wish to thank Howard Kochman and Paul Moler for reviewing this manuscript. I would especially like to thank C. Kenneth Dodd, Jr., without whose assistance this work would not have been possible.

Submitted by **KARL R. STUDENROTH**, P.O. Box 1194, Melrose, FL 32666, USA

BOTHROCHILUS PAPUANUS (Papuan Olive Python). **KERATOPHAGY**. *Bothrochilus papuanus* is now known to exhibit ophiophagic tendencies both in the wild (O'Shea 1988. Herp. Rev. 19(2):36) and in captivity (Boos 1983. ASRA Journal 2(1):28; B. W. Tryon, pers. comm.). During July 1990 a large specimen (2 m+), in the process of sloughing its skin while maintained in a relatively restricted glass aquarium at the National Museum of Papua New Guinea, was observed to undergo ecdysis and then devour a section of its own sloughed skin. The snake was healthy and well fed so such behavior may suggest that this species is potentially cannibalistic.

Submitted by **MARK T. O'SHEA**, 46 Buckingham Road, Penn, Wolverhampton, WV4 5TJ, England, and **ILAIAH BIGILALE**, National Museum of Papua New Guinea, Waigani, NCD, Papua New Guinea

CHONDROPYTHON VIRIDIS (Green Tree Python). **COMBAT FATALITY**. Numerous accounts of combat behavior between male snakes have been reported, although no record exists of combat-related mortality. Four animals (two males, two females) were housed together in an enclosure measuring 90 x 90 x 150 cm. Numerous branches were available so no two snakes had to share the same branch. The snakes were misted daily. On 2 May 1990, the two males were observed in combat. The combat behavior resulted in moderately severe lacerations to both individuals. They were promptly removed from the enclosure, the lacerations were sutured, and the snakes housed individually. The sutures were removed on 21 June 1990. The lacerations had healed with no infection noted.

On 7 September 1990, the two males were reintroduced to the enclosure housing the females. On 2, 10, and 11 November 1990, the males engaged in combat. They were allowed to remain together, with the hopes that the dominant male would breed with the females. On the morning of 12 November 1990, the males were observed coiled around each other on the enclosure floor. Closer inspection revealed that one of the individuals was dead.

The gross necropsy of this animal revealed numerous lacerations on the skin as well as a six-inch long hemorrhagic area along the neck. The pathologist determined that there was no evidence of preexisting disease in this snake, and that trauma was the most likely cause of death. The carcass will be deposited at Louisiana State University.

Submitted by **JANICE PERRY-RICHARDSON**, Audubon Park and Zoological Garden, P.O. Box 4327, New Orleans, LA 70178, USA

CONTIA TENUIS (Sharptail Snake). **PREDATION**. On 30 March 1986 at 1030 h, one of us (BT) found a DOR adult western toad (*Bufo boreas*) with an adult *Contia tenuis* (also dead) protruding from its mouth. Both appeared to have been run over by a vehicle the previous evening. The location was in the Sierra Nevada foothills near Penryn, Placer Co., California. The specimens were not collected.

A recently-ingested adult *C. tenuis* was found in the stomach of a brook trout (*Salmo fontinalis*) collected 18 June 1983 in Providence Creek ca. 4.8 map km WSW Dinkey Ranger Station, T.10S., R.25E., Sec. 23 (NE corner), ca. 1600 m elev., Sierra National Forest, Fresno Co., California. The trout was collected via electroshocking during a survey of fish populations by California Department of Fish and Game biologists B. Ehler and R. Goss. The preserved *Contia* is in the collection of RWH and will be deposited at MVZ.

Submitted by **ROBERT W. HANSEN**, 16333 Deer Path Lane, Clovis, CA 93612, USA, and **BLAKE THOMASON**, 5267 E. Turner Ave., Fresno, CA 93727, USA ●

LOXOCEMUS BICOLOR (Burrowing Python). **FEEDING BEHAVIOR**. This neotropical snake is primarily fossorial and presumably nocturnal (Mora 1987. J. Herpetol. 21:334-335). Little information is available about its diet. Greene (1983. Amer. Zool. 23:431-441) found two teiid lizards and two rodents in the stomach of museum specimens and Mora (op. cit.) and Mora and Robinson (1984. Rev. Biol. Trop. 32:161-162) reported that *L. bicolor* feeds on reptile eggs and described egg-eating behavior. Additional information on its constricting behavior in the laboratory was reported by Willard (1977. Copeia 1977:379-382) though the prey item was not specified. Here I report that this species also depredates hatchling iguanids. The observations were conducted at the Dr. Rafael Lucas Rodríguez National Wildlife Refuge (Palo Verde), Costa Rica (10°21' N— 85°21' W).

Ctenosaur (*Ctenosaura similis*) and iguana (*Iguana iguana*) hatchlings excavate a narrow tunnel to facilitate their exit from the nest at the beginning of the rainy season (Mora 1989. Herpetologica 45:293-298). Three *L. bicolor* were observed at night in exit tunnels. On 6 May 1986, one *L. bicolor* (ca. 1 m TL), was observed half way in the exit tunnel of a ctenosaur nest. When removed, the snake held a hatchling ctenosaur in its mouth and when palped, at least two more hatchlings were in its stomach. The other two snakes were observed on 8 May and 9 May, in nests of ctenosaurs and iguanas, respectively; neither snake could be captured.

I thank M.I. Di Mare and C. McDonough for their comments on the manuscript. Financial and logistical support was provided by the World Wildlife Fund, Organization for Tropical Studies, and the Subdirección de Vida Silvestre de Costa Rica.

Submitted by **JOSÉ M. MORA**, Welder Wildlife Refuge, P.O. Box 1400, Sinton, TX 78387, USA ●

STORERIA OCCIPITOMACULATA OCCIPITOMACULATA (Northern Redbelly Snake). **BEHAVIOR**. Jordan (1970. Herpetologica 26:466-468) found captive *Storeria o. occipitomaculata* stiffening and feigning death when attacked. Vogt (1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Publ. Mus., Milwaukee. 205 pp.) reported that although he had handled hundreds of *S. occipitomaculata*, only once did he encounter an individual which seemed to feign death. That individual, found on a cold day in May, became stiff and was able to be held erect like a match stick. In this note I report a dissimilar death feigning behavior of wild *S. o. occipitomaculata*.

On a warm day in May 1988, when I captured an individual (ca. 8 cm SVL) on a gravel road near Sturgeon Bay, Door Co., Wisconsin (T.28N., R.26E., Sec. 29), it ceased moving and its body became flaccid. As I held the limp snake in my open palm, it rolled its head to one side and exhibited the lip flaring display described by Gosner (1942. Copeia 1942:181-183). After several minutes of inactivity, the snake started to crawl out of my hand. When I caught it with my other hand, its body again went limp. The snake was placed on the road and after a short period of immobility, it crawled away.

Later that evening, when a second *S. o. occipitomaculata* was picked up, it also ceased moving and did not try to escape. When placed on the ground it crawled away. The air temperature was considerably cooler than in the previous encounter. Neither of the snakes I observed stiffened their bodies while feigning death.

I thank P. A. Cochran for comment on an early draft of this note.

Submitted by **DREUX J. WATERMOLEN**, Wisconsin Department of Natural Resources, P.O. Box 10448, Green Bay, WI 54307, USA ●

THAMNOPHIS SIRTALIS PARIETALIS (Red-sided Garter Snake). **POPULATION MORPH VARIATION**. Over the past five years, we have captured unusual color morphs of the red-sided garter snake, *Thamnophis sirtalis parietalis*. These morphs include melanistic individuals as well as individuals lacking the dorsal and lateral stripes; having no red or yellow coloration; or lacking either the dorsal or lateral stripes (Fig. 1). All individuals were collected at overwintering hibernacula located on small islands in Lake Winnepegosis, Manitoba, Canada. As these populations are comprised of only an estimated few hundred individuals, the relative proportion of these unusual morphs is estimated to be significant.

The reproductive isolation of these populations appears to be substantial. Interestingly, individuals on these islands migrate by swimming to the mainland after spring emergence and return to the islands in the fall to hibernate. It is not known if all the snakes leave the islands. In one case, the snakes must swim up to two miles across open water to reach the nearest shoreline. How members of these island populations can locate and return to these islands in the fall is unknown.

Members of these populations are an interesting natural experiment. No melanistic morphs have ever been reported from mainland populations in Manitoba. This suggests an interesting population genetics phenomenon, perhaps a founders effect. Because the islands are relatively small they present an ideal model system for field studies on the genetics of populations and island biogeography.

Finally, as pointed out by King (1988. Herpetologica 44:451-458), melanistic morphs may be especially susceptible to collection because of their unusual appearance and greater commercial value. At present, the ecological impact of continued collecting on these islands is unknown. However, collecting there during spring or fall aggregations would be expected to dramatically affect morph frequencies owing to the relatively small population sizes.



Figure 1. Color variation in individual *T. s. parietalis* collected on islands in Lake Winnipegosis, Manitoba, Canada. A typical member of this species (left), an individual lacking yellow lateral stripes and red side blotches (center), and a melanistic morph (right).

Submitted by **ROBERT T. MASON**, Department of Zoology, Oregon State University, Corvallis, OR 97331, USA, **STUART MACMILLAN**, Natural Resources Institute, 177 Dysart Rd., Winnipeg, Manitoba, Canada R3T 2N2, **JOAN M WHITTIER**, Department of Anatomy, University of Queensland, St. Lucia, Queensland, Australia 4067, **RANDOLPH W. KROHMER**, Toxicology Pathology Services, Inc., 10424 Middle Mt. Vernon Rd., Mt. Vernon, IN 47620, USA, and **WILLIAM H. KOONZ**, Wildlife Branch, Department of Natural Resources, Winnipeg, Manitoba, Canada R3H 0W9 ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of a species' range, and thereby permit a more significant interpretation of its biology.

These geographic distribution records will be accepted in a **standard format** only, and all authors *must* adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in Collins, 1990, *Standard Common and Current Scientific Names for North American Amphibians and Reptiles, Third Edition*, Herp. Circ. 19: 1–41), LOCALITY (use metric for distances and give precise locality data), DATE (day-month-year), COLLECTOR, VERIFIED BY (*cannot* be verified by an author — curator at an institutional collection is preferred), PLACE OF DEPOSITION (where applicable, use standardized collection designations as they appear in Leviton et al., 1985, *Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology*, Copeia 3: 802–832) and CATALOG NUMBER (required), COMMENTS (brief), CITATIONS (brief), SUBMITTED BY (give name and address in full — spell out state names — no abbreviations).

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Please submit any geographic distribution records in the **standard format only** to: Joseph T. Collins or Darrel Frost, Section Co-editors, Museum of Natural History — Dyche Hall, The University of Kansas, Lawrence, Kansas 66045–2454 USA. Short manuscripts are strongly discouraged, and are only acceptable when data cannot be presented adequately in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic Distribution: *Lampropeltis triangulum multistriata*. SSAR Herp. Review 25: 198.

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). USA: VIRGINIA: Henry Co: 0.1 km E Chatmoss area, jct SR 777 & SR 620. 7 September 1991. T. D. Schwaner. Verified by J. T. Collins. Virginia Museum of Natural History (VMNH R 178-179 & KU Color Slide 8914). New county record.

Submitted by **TERRY D. SCHWANER & JOHN M. ANDERSON**, Virginia Museum of Natural History, Martinsville, VA 24112. ●

AMBYSTOMA TIGRINUM (Tiger Salamander). USA: IDAHO: Owhyee Co: Sec 7, T3S, R5W. 4 October 1990. Mark Vinson. Verified by Chuck Peterson. Idaho Mus. of Nat. Hist. (IMNH 498). New county record and range extension (Nussbaum, Brodie & Storm 1983, Amphibians and Reptiles of the Pacific Northwest, University Press of Idaho, Moscow; Stebbins 1985, A Field Guide to Western Reptiles and Amphibians, Houghton Mifflin Co., Boston).

Submitted by **MARK VINSON**, USDI, Bureau of Land Management, 3948 Development Avenue, Boise, ID 83705. ●

NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS (Central Newt) USA: TEXAS: Van Zandt Co: 34 km SE Canton off FM 279 at Edom. 25 April 1991. D. K. Bibb. Verified by Stanley E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 17589). New county record partially filling a distributional gap in the northeastern part of the state (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CHRIS T. MCALLISTER**, Renal-Metabolic Lab (151-G), Department of Veterans Affairs Medical Center, 4500 South Lancaster Road, Dallas, TX 75216 and **D. KEITH BIBB**, 906 South Cedar Hill Road, Cedar Hill, TX 75104. ●

PLETHODON WEBSTERI (Webster's Salamander). USA: MISSISSIPPI: Jefferson Co: 8 km W Fayette. 27 February 1991. T. Mann and J. Lazell. Verified by Robert Jones. MMNS 2749 and MCZ 115794-796. New county record extending the range northward in loess blufflands as predicted by Dundee and Rossman (1989, The Amphibians and Reptiles of Louisiana. Louisiana State Univ. Press), and approaching within 44 km of the Claiborne County population documented by Vandeventer and Young (1987, Herp. Review 18 (2):39). Sixth known population in Mississippi. We have now seen dozens of Mississippi individuals and several from Alabama. All are easily recognized as distinct from *Plethodon dorsalis* on color characters (paler sides and bellies; boldly ringed fingers and toes) despite various assertions to the contrary.

Submitted by **JAMES LAZELL**, The Conservation Agency, 6 Swinburne Street, Jamestown, RI 02835 and **THOMAS MANN**, Mississippi Museum of Natural Science, Jackson, MS 39202. ●

PLETHODON WEBSTERI (Webster's Salamander). USA: MISSISSIPPI: Wilkinson Co: ca. 1 km SW Pond, Clark Creek Natural Area. 21 December 1986. D. A. and N. J. Rossman. LSUMZ 46614. 26 January 1991. M. K. Moore, D. A. Good, and J. S. Doody. LSUMZ 50800. Both verified by H. A. Dundee. New county record and the first record from SW Mississippi. Extends range ca. 12 km N previously isolated Louisiana locality (Dundee & Rossman, 1989, The Amphibians and Reptiles of Louisiana, Louisiana St. Univ. Press) and slightly reduces the distributional gap between the Louisiana locality and the nearest west-central Mississippi locality in Claiborne County (Vandeventer & Young, 1987, Herp. Review 18: 39).

Submitted by **DOUGLAS A. ROSSMAN, MICHAEL K. MOORE, DAVID A. GOOD** and **J. SEAN DOODY**, Museum of Natural Science, Louisiana State University, Baton Rouge, LA 70803. ●

ANURA

BUFO AMERICANUS CHARLESMITHI (Dwarf American Toad). USA: MISSISSIPPI: Claiborne Co: Port Gibson Road, ca. 1 km SW Regantown. 5 February 1991 (calling, 16° C). T. Mann. MMNS 2729 (3). Natchez Trace, ca. 1.8 km SSE Rocky Springs. 6 February 1991. T. Mann. MMNS 2731. Port Gibson Road, ca. 1.8 km N Regantown. 18 February 1991. T. Mann. MMNS 2743. Port Gibson Road Ca. 2.2 km SSW Rocky Springs. 18 February 1991. T. Mann. MMNS 2745. Wilkinson Co: Clark Creek Natural Area, ca. 1.6 km SW Pond. 20 February 1991. J. Lazell.

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Submitted by **JAMES LAZELL**, The Conservation Agency, 6 Swinburne Street, Jamestown, RI 02835 and **THOMAS MANN**, Mississippi Museum of Natural Science, Jackson, Mississippi 39202. ●

BUFO DEBILIS (Green Toad). COLORADO: Baca Co: Picture Canyon, Sec. 7, T35S R47W. 12 June 1988. G. A. Hammerson. Verified by Hobart M. Smith. UCM Zoology Color Slide 41. First record for county; fills hiatus between previous records in southwestern Kansas (Collins 1982, Amphibians and reptiles in Kansas. Univ. Kansas Mus. Nat. Hist. 356 pp.) and southeastern Colorado (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.; Livo 1988, Herp. Rev. 19:61).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

BUFO PUNCTATUS (Red-spotted Toad). COLORADO: San Miguel Co: 2 km W Dolores River bridge on Colo. Rt. 141, vic. Slick Rock, southwestern corner of T44N R18W. 17 June 1988. G. A. Hammerson. 1.3 km E Dolores River bridge on Colo. Hwy 141, Sec. 32, T44N R18W. 17 June 1988. G. A. Hammerson. UCM Zoology Color Slide 42. Verified by Hobart M. Smith. First records for county (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

BUFO VALLICEPS (Gulf Coast Toad). USA: MISSISSIPPI: Wilkinson Co: 10.5 km (by road) W Lessley. 10 July 1987. D. A. Rossman, P. A. Myer, and R. Driesbach. Verified by D. A. Good. LSUMZ 47101. New county record and the first record from southwestern Mississippi. Extends range ca. 25.5 km NNW nearest Louisiana locality (Dundee & Rossman, 1989, The Amphibians and Reptiles of Louisiana, Louisiana St. Univ. Press).

Submitted by **DOUGLAS A. ROSSMAN**, Museum of Natural Science, Louisiana State University, Baton Rouge, LA 70803. ●

PSEUDACRIS CLARKII (Spotted Chorus Frog). USA: NEW MEXICO: Colfax Co: 6.4 km ESE Cimarron. 15 July 1963. Ray D. Burkett. Verified by Joseph T. Collins. KU 78132. This specimen represents a new state record and extends the range ca. 325 km west. Tinkle and Knopf (Herpetologica 20(1):42-47) report a single specimen (TTU 916) from adjacent Bailey County, Texas, 15.2 mi NW Sudan.

Submitted by **CHARLES W. PAINTER**, Endangered Species Program, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, NM 87503, and **RAY D. BURKETT**, Department of Natural Sciences, Shelby State Community College, P.O. Box 40568, Memphis TN 38174-0568. ●

PSEUDACRIS FERIARUM FERIARUM (Upland Chorus Frog). USA: VIRGINIA: Henry Co: 0.1 km E Chatmoss area, jct SR 777 & SR 620. 7 September 1991. T. D. Schwaner. Verified by J. T. Collins. Virginia Museum of Natural History (VMNH R184). New county record.

Submitted by **TERRY D. SCHWANER** & **JOHN M. ANDERSON**, Virginia Museum of Natural History, Martinsville, VA 24112. ●

RANA SYLVATICA (Wood Frog). USA: VIRGINIA: Henry Co: 0.1 km E Chatmoss area, jct SR 777 & SR 620. 5 September 1991. T. D. Schwaner. Verified by J. T. Collins. Virginia Museum of Natural History (VMNH R176-177 & KU Color Slide 8915). New county record.

Submitted by **TERRY D. SCHWANER** & **JOHN M. ANDERSON**, Virginia Museum of Natural History, Martinsville, VA 24112. ●

SPEA INTERMONTANA (Great Basin Spadefoot). COLORADO: Moffat Co: 1.6 km E jct. county roads 4 and 88, T12N, R93-94W. 14 June 1990. G. A. Hammerson. UCM 56222. 3.8 km W jct. county roads 4 and 88, T12N, R94W. 14 June 1990. G.A. Hammerson. UCM 56223-56225. All verified by Hobart M. Smith. Identification based on examination of frontoparietal bones and fontanelle (Zweifel 1956, Am. Mus. Nov. 1762:1-45). Fills large hiatus between previous Colorado and Wyoming records (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.; Baxter and Stone 1985, Amphibians and reptiles of Wyoming. Second edition. Wyoming Game and Fish Dept.).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

TESTUDINES

APALONE SPINIFERA (Spiny Softshell). USA: WISCONSIN: Brown Co: Fox River, below De Pere dam, W shoreline just downstream from Nicolet Paper Company, De Pere (Sec. 21, T23N, R20E). 31 May 1988. H. Quinlan. Verified by P. A. Cochran. University of Wisconsin-Green Bay Richter Collection (0320). Adult male and female collected in fyke net. First record for Brown County and first published record for Fox River drainage below Lake Winnebago (Vogt, 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Public Mus. 205 pp.). That *A. spinifera* is not a recent arrival is suggested by a preserved specimen in the St. Norbert College teaching collection labeled "Fox River-1938"; however, severe pollution may have eliminated or reduced populations until water quality improved in recent years. Collection of a juvenile (carapace length 69 mm) on 28 September 1989 indicates that the population is reproducing.

Submitted by **P. A. COCHRAN**, Division of Natural Science, St. Norbert College, De Pere, WI 54115. ●

KINOSTERNON FLAVESCENS (Yellow Mud Turtle). COLORADO: Yuma Co: 12.5 km S, 1 km W Idalia. 10 July 1987. L. J. Livo. Verified by Hobart M. Smith. UCM Zoology Color Slide 52. Confirms presence in S. Republican River drainage, where a single previous record was based on an undocumented (but reliable) observation in the 1970s (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

TERRAPENE CAROLINA (Eastern Box Turtle). USA: MARYLAND: Worchester Co: Assateague Island National Seashore (38°12'15"N, 75°08'40"W). 14 September 1990. Terry D. Schwaner. Verified by J. T. Collins. Virginia Museum of Natural History (VMNH photograph R180 & KU Color Slide 8916). First verified record for the island. Jack Kumer, National Parks Service, stated that a NPS employee had unwittingly introduced several adult box turtles to the park area in the early 1970s. This may account for a reported observation by Lee (1973, Bull. Maryland Herp. Soc. 9:110-111). The new record is a juvenile (carapace length = 92 mm; 4-5 growth rings on a costals), which suggests that the introduced population may be reproducing.

Submitted by **TERRY D. SCHWANER** & **JOHN M. ANDERSON**, Virginia Museum of Natural History, Martinsville, VA 24112. ●

LACERTILIA

ANOLIS PORCATUS (Cuban Green Anole). DOMINICAN REPUBLIC: DISTRITO NACIONAL: Aeropuerto Internacional de "Las Americas." 20 January 1991. R. Powell and J. S. Parmerlee, Jr. Verified by D. D. Smith. Bobby Witcher Memorial Collection (BWMC 04369), Avila College, Kansas City. Two juvenile males were observed in a brief survey of shrubs and trees immediately adjacent to the terminal building. This represents the first Dominican record of this introduced species outside of Santo Domingo and adjacent suburbs (Powell et al., 1990, Amphibia-Reptilia 11(4):421-425) and is over 20 km E of the nearest published locality (Powell, 1990, Herp. Rev. 21(4):96). Extensive efforts during 1990 to find the species in intervening areas were fruitless, indicating that the airport population is probably allopatric to other Dominican *A. porcatus* and most likely represents a separate introduction, either from Santo Domingo or Cuba.

Submitted by **ROBERT POWELL** & **JOHN S. PARMERLEE, JR.**, Department of Natural Sciences, Avila College, Kansas City, MO 64145. ●

CNEMIDOPHORUS SEXLINEATUS SEXLINEATUS (Six-lined Racerunner) USA: TEXAS: Van Zandt Co: 34 km SE Canton off FM 279 at Edom. 25 April 1991. D. K. Bibb. Verified by Stanley E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 17590). New county record filling a hiatus between Henderson, Kaufman, and Smith counties (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CHRIS T. MCALLISTER**, Renal-Metabolic Lab (151-G), Department of Veterans Affairs Medical Center, 4500 South Lancaster Road, Dallas, Texas 75216 and **D. KEITH BIBB**, 906 South Cedar Hill Road, Cedar Hill, TX 75104. ●

EUMECES OBSOLETUS (Great Plains Skink). TEXAS: Runnels Co: Lake Moonen, 9.6 km W Ballinger. 27 June 1989. Troy D. Hibbitts. Verified by James R. Dixon. TCWC 66911. A juvenile caught at boat ramp. County record.

Submitted by **TROY D. HIBBITTS**, Department of Wildlife and Fisheries Science, Texas A&M University, College Station, TX77840. ●

EUMECES SEPTENTRIONALIS OBTUSIROSTRIS (Southern Prairie Skink) USA: OKLAHOMA: Major Co: Newton Ranch, SW of St. Rt. 281 (Sec. 19, T22N, R15E). 23 April 1990. T. Anton and G. Moore. Verified by J. T. Collins. KU 217162–163 + KU Color Slides 8876-77 (2 specimens). New county record.

Submitted by **THOMAS G. ANTON**, 1020 Grove Street, Apt. #406, Evanston, IL 60201 & **GARY MOORE**, Route 2, Box 20, Wellston, OK 74881. ●

GAMBELIA WISLIZENII (Longnose Leopard Lizard). COLORADO: Mesa Co: 4.6 km by road NW Colo. Rt. 141 at Gateway, Rd. 4.1, Sec. 34, T15S, R104W, west side of Dolores River. 19 June 1988. G. A. Hammerson. UCM Zoology Color Slide 43. Verified by Hobart M. Smith.

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First records for state in Dolores River drainage (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

OPHISAURUS ATTENUATUS ATTENUATUS (Western Slender Glass Lizard). USA: KANSAS: Rooks Co: Sec. 27, T7S, R19W. 21 June 1990. Travis W. Taggart (KU 216115); Sec. 35, T10S, R17S. 25 June 1990. Travis W. Taggart (KU 216116); Trego Co: Sec. 9, T11S, R21W; 8 July 1990. Travis W. Taggart. (KU 217218). All verified by J. T. Collins. Extends range 60 km northwest and 53 km WSW of previously known range in Ellis County (Collins, 1982, Amphibians and reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8: 1–356). The three specimens mark the northwestern limits of the known range of the species.

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, KS 67601. ●

OPHISAURUS ATTENUATUS ATTENUATUS (Western Slender Glass Lizard). TEXAS: Hopkins Co: 7.5 km NE Dike on Farm Road 69. 23 April 1988. Troy D. Hibbitts and Terry L. Hibbitts. Verified by James R. Dixon. TCWC 66913. DOR. County record.

Submitted by **TROY D. HIBBITTS**, Department of Wildlife and Fisheries Science, Texas A&M University, College Station, TX 77840. ●

AMPHISBAENIA

RHINEURA FLORIDANA (Florida Worm Lizard). USA: FLORIDA: Sarasota Co: 3.2 km S Osprey (NW 1/4, SW 1/4, SW 1/4, Sec. 13, R18E, T38S). 13 December 1990. John A. Johnston, Jr. Verified by Paul E. Moler. UF 79732. New county record and extends range ca. 34 km S Manatee (eastern Bradenton), Manatee County, in the coastal region of SW Florida (Gans, 1967, *Rhineura floridana*. Cat. American Amph. Rept. 43.1–43.2; Ashton & Ashton, 1985, Handbook of Reptiles and Amphibians of Florida, Windward Press). Discovered in mesic flatwoods at Oscar Scherer State Recreation Area while raking duff 2 days after a prescribed burn.

Submitted by **TERRY HINGTGEN**, District 8 Administration, Florida Park Service, 1843 South Tamiami Trail, Osprey, FL 34229. ●

SERPENTES

ARIZONA ELEGANS (Glossy Snake). COLORADO: Montezuma Co: 1.6 km NE San Juan River on U.S. Hwy 160, Sec. 21, T32N, R20W. 16 June 1988. G. A. Hammerson. UCM Zoology Color Slide 45. 1.9 km SE Utah line on Colo. Rt. 41, T33N, R20W. 16 June 1988. G. A. Hammerson. UCM Zoology Color Slide 46. 3.5 km NW jct. Colo. Rt. 41 & U.S. Rt. 160, T33N, R20W. 17 June 1988. G. A. Hammerson. UCM Zoology Color slide 44. 8.2 km SE Utah line on Colo. Rt. 141 (4.5 km E & 9.5 km N Four Corners National Landmark). 12 June 1990. L. J. Livo. UCM Zoology Color Slide 50). All verified by Hobart M. Smith. First records for county and for western Colorado (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

BOTHROPS ALTERNATUS (URUTU). BRAZIL: GOIAS: Município Rio Verde: BR060, Sítio Buriti. 31 May 1988. Benedito

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Flávio de Andrade. Universidade Católica de Goiás (UCG 2004); Município Jataí: BR 060, 0.5 km N jct. of BR 364, within city limits. Chácara do Alemão. 11 June 1990. Hans Norbert Rubly. UCG 4442; Município Jataí: BR 364, 50 km W Jataí at junction of GO 050. Fazenda Querência. 8 August 1990. Arismildo Martins Fonseca. UCG 4532. All verified by William W. Lamar. New state record, extending known range northwestward over 170 km from closest published locality. The presence of *Bothrops alternatus* has been reported in the surrounding states of Minas Gerais and Mato Grosso do Sul, and from the southeastern region of Brazil. The above three records are the first reported for the southern state of Goiás. This species was expected, but unknown, until these collecting efforts. This region is part of the upper Paraná River basin, sharing some geographical features with eastern Mato Grosso do Sul, and western Minas Gerais and São Paulo, where *Bothrops alternatus* is widely distributed.

Submitted by **MARTA REGINA MAGALHÃES, FERNANDA ELISA COSTA PAULINO & NELSON JORGE DA SILVA, JR.**, Centro de Estudos e Pesquisas Biológicas, Universidade Católica de Goiás, Ave. Universitária, 1440, Setor Universitário, 74.210, Goiânia, Goiás, Brazil. ●

COLUBER CONSTRICTOR (Racer). COLORADO: Kit Carson Co: 17 km S & 16.5 km W Idalia. 29 May 1988. L. J. Livo. UCM 56048. Washington Co: 5 km W & 0.5 km N Cope. 30 May 1988. L. J. Livo. UCM 56049. Both verified by Hobart M. Smith. First records for counties (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.). Garfield Co: Trail Canyon, 3 km N & 11 km W Echo Lake. 4 July 1988. L. J. Livo. UCM Zoology Color Slide 53. Verified by Hobart M. Smith. Extends range in western Colorado into East Salt Creek drainage and helps fill hiatus in poorly known range in western Colorado and eastern Utah (Wilson 1978, SSAR Cat. Am. Rept. Amph. 218.1-218.4; Corn and Bury 1986, Herpetologica 42:258-264.

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

CROTALUS VIRIDIS (Western Rattlesnake). COLORADO: Delta Co: ca. 6.5 km E Hotchkiss. 2 August 1987. L. Valentine. Verified by Hobart M. Smith. UCM 56206. Extends range ca. 55 km east in Gunnison River drainage (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

ELAPHE GUTTATA EMORYI (Great Plains Rat Snake) USA: TEXAS: Ellis Co: 6.4 km SW Midlothian off US Rt. 67 at Ward Spur. 27 April 1991. Chris T. McAllister. Verified by Stanley E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 17573). New county record filling distributional gap between Johnson (McAllister 1987, Herp. Review 18(1): 20), Kaufman, and Navarro counties (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CHRIS T. MCALLISTER**, Renal-Metabolic Lab (151-G), Department of Veterans Affairs Medical Center, 4500 South Lancaster Road, Dallas, TX 75216. ●

LAMPROPELTIS CALLIGASTER CALLIGASTER (Prairie Kingsnake). USA: KANSAS: Ellis Co: Sec. 1, T15S, R18W. 27 June 1990. Travis W. Taggart and Scott Meyers. Verified by J. T. Collins. KU 216130. Extends the range west and northwest 50 km from the nearest record in Russell County, Kansas (Collins, 1982, Amphibians and reptiles in Kansas. Second ed. Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. 8: 1–356).

Submitted by **TRAVIS W. TAGGART**, 2302 Donald Drive, Hays, KS 67601. ●

LAMPROPELTIS CALLIGASTER CALLIGASTER (Prairie Kingsnake). TEXAS: Limestone Co: 1.12 km S Mt. Calm on Farm Road 339. 10 May 1989. Troy D. Hibbitts. Verified by James R. Dixon. TCWC 66918. DOR male. County record.

Submitted by **TROY D. HIBBITTS**, Department of Wildlife and Fisheries Science, Texas A&M University, College Station, TX 77840. ●

LAMPROPELTIS GETULA (Common Kingsnake). COLORADO: Montezuma Co: 0.8 km NE San Juan River on U.S. Rt. 160, Sec. 21, T32N R20W. 15 June 1988. G. A. Hammerson. UCM Zoology Color Slide 47. 6.75 km SE Utah line on U.S. Rt. 160 (3 km N & 11 km E Four Corners National Landmark). 12 June 1990. L. J. Livo. UCM Zoology Color Slide 51. Both verified by Hobart M. Smith. These records suggest widespread occurrence in southwestern Colorado, where species previously was known only from a single specimen collected in 1966.

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

LEPTOTYPHLOPS DULCIS DISSECTUS (New Mexico Blind Snake). USA: NEW MEXICO: Rio Arriba Co: Embudo, Mark Rendleman residence. July 1990. M. Rendleman. Verified by W. G. Degenhardt. University of New Mexico Museum of Southwestern Biology (MSB 51605). Specimen was discovered during excavations approximately 15 m below the surface and 23 m into a hillside. Rio Arriba Co: Santa Clara Pueblo, Wayne Tafoya Residence. 18 July 1989. T. L. Brown. University of New Mexico Museum of Southwestern Biology (MSB 51606). Both verified by W. G. Degenhardt. New county records. (Hahn, 1979, *Leptotyphlops dulcis*. Cat American Amph. Rept. 231.1-231.2).

Submitted by **CHARLES W. PAINTER**, Endangered Species Program, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, NM 87503, and **TED L. BROWN**, Environmental Improvement Division, 1190 St. Francis Drive, Santa Fe, NM 87503. ●

MASTICOPHIS FLAGELLUM (Coachwhip). COLORADO: Kit Carson Co: 21 km S & 11.5 km W Idalia. 29 May 1988. L. J. Livo. UCM 56050. Lincoln Co: 18 km S & 1.5 km W Punkin Center. 5 September 1988. L. J. Livo. UCM Zoology Color Slide 54. Verified by Hobart M. Smith. First records for counties (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy,

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NERODIA RHOMBIFER (Diamondback Watersnake). TEXAS: Erath Co: 0.32 km W jct. Tex. Rt. 220 on U.S. Rt. 67. 29 April 1989. Troy D. Hibbitts. Verified by James R. Dixon. TCWC 66917. DOR. County record.

Submitted by **TROY D. HIBBITTS**, Department of Wildlife and Fisheries Science, Texas A&M University, College Station, TX 77840. ●

OPHEODRYS AESTIVUS (Rough Green Snake). USA: VIRGINIA: Henry Co: jct of SR 640 & Phospho Springs Rd, 3 km NNE Ridgeway. 7 September 1989. Terry D. Schwaner. Verified by Richard Hoffman. Virginia Museum of Natural History (VMNH R3). New county record.

Submitted by **TERRY D. SCHWANER** & **JOHN M. ANDERSON**, Virginia Museum of Natural History, Martinsville, VA 24112. ●

RAMPHOTYPHLOPS BRAMINUS (Braminy Blind Snake). USA: MASSACHUSETTS: Suffolk Co: Boston, North End. 25 November 1990. Ralph Kunkel. Verified by Charles Meszoely. Northeastern University Center for Vertebrate Studies (NUVC 193). First record of introduction in state. Nearest records for this exotic, tropical, fossorial, parthenogenic snake in continental United States are introduced colonies 1150 km south in Hialeah, Miami, and Coral Gables, Dade County, and Lake Okeechobee, Palm Beach County, Florida (Delorey & Mushinsky, 1989, Herp. Review 18: 56; Wilson & Porras, 1983, Univ. Kansas Mus. Nat. Hist. Spec. Pub. 9: 1–89; Wynn et al., 1987, American Mus. Novitates 2868: 2).

Submitted by **V. WALLACH**, **GWILYM S. JONES**, & **RALPH R. KUNKEL**, Center for Vertebrate Studies, Department of Biology, Northeastern University, Boston, MA 02115. ●

REGINA GRAHAMII (Graham's Crayfish Snake) USA: TEXAS: Kaufman Co: 16 km S Kaufman off FM 3094 at unnamed stock tank on Roberts Ranch. 20 March 1991. D. K. Bibb. Verified by Stanley E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 17350). New county record filling a hiatus between Dallas and Van Zandt counties (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CHRIS T. MCALLISTER**, Renal-Metabolic Lab (151-G), Department of Veterans Affairs Medical Center, 4500 South Lancaster Road, Dallas, TX 75216 and **D. KEITH BIBB**, 906 South Cedar Hill Road, Cedar Hill, TX 75104. ●

RHINOCHEILUS LECONTEI (Longnose Snake). COLORADO: Otero Co: 4.8 km N, 3.2 km E Timpas, just E Timpas Creek, T25S, R57W, jct. Secs. 13 & 24. 10 June 1988. G. A. Hammerson. Verified by Hobart M. Smith. Fresh shed skin (UCM 56209) in rodent burrow. First record for county; extends range 36 km west (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

SISTRURUS CATENATUS (Massasauga). COLORADO: Las Animas Co: 12.8 km N & 40 km E Trinidad, NW 1/4 Sec. 19, T32S, R61W, County Rd. 48.0. 1 October 1988. J. D. Wieland. Verified by Hobart M. Smith. UCM 56216. First record for county; extends known range southward into apparent hiatus between previous Colorado records (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.). and those in adjacent states (Stebbins 1985, Field guide to western reptiles and amphibians. Houghton Mifflin, Boston).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

SISTRURUS CATENATUS EDWARDSII (Desert Massasauga). TEXAS: Coleman Co: 4 km S jct. U.S. Rt. 67 on Ranch Road 503. 29 May 1989. 4.8 km S jct. U.S. Rt. 67 on Ranch Road 503. 3 June 1989. Troy D. Hibbitts. Verified by James R. Dixon. TCWC 66915, 66916. Scale rows on first specimen (TCWC 66915), a small male, were 23 as in *S. c. edwardsii.* Scale rows on the second specimen (TCWC 66916), a small female, were 25 as in *S.c. tergeminus,* but with little ventral pattern as in *S. c. edwardsii.* These specimens represent a county record from the eastern edge of *S. c. edwardsii* range at an area of intergradation with the eastern subspecies *S. c. tergeminus.*

Submitted by **TROY D. HIBBITTS**, Department of Wildlife and Fisheries Science, Texas A&M University, College Station, TX 77840. ●

TANTILLA GRACILIS (Flathead Snake) USA: TEXAS: Johnson Co: 17.5 km SW Cleburne off U.S. Rt. 67 on County Road 1120 at Georges Creek Ranch. 24 March 1991. C. T. McAllister and J. T. McAllister, III. Verified by Stanley E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 17349). First record for the county filling distributional gap between Ellis, Hood, and Somervell counties (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CHRIS T. MCALLISTER**, Renal-Metabolic Lab (151-G), Department of Veterans Affairs Medical Center, 4500 South Lancaster Road, Dallas, TX 75216. ●

TANTILLA HOBARTSMITHI (Southwestern Blackhead Snake). COLORADO: Delta Co: 5 km E Eckert, Sec. 16, T14S, R94W. 21 May 1986, 31 May 1986. 12 June 1986, 29 June 1986, 5 June 1988. L. Valentine. UCM 56182-56183, 56186, 56190, 56210. Ca. 2.5 km W Cedaredge. 18 May 1986. L. Valentine. UCM 56181. First records for county; extends range ca. 70 km ESE (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.). Mesa Co: John Brown Canyon, 4.3 km by road from Colo. Rt. 141. 16 June 1990. G. A. Hammerson. UCM 56226. All verified by Hobart M. Smith. Extends range into Dolores River drainage. These records suggest widespread occurrence in westcentral Colorado; range poorly known in Colorado and eastern Utah (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.; Cole and Hardy 1981, Bull. Am. Mus. Nat. Hist. 171:199-284).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

TANTILLA NIGRICEPS (Plains Blackhead Snake). COLORADO: Kit Carson Co: 16 km S & 12 km W Idalia. 28 May 1988. T. L. Wilcox and L. J. Livo. Verified by Hobart M. Smith. UCM 56051. First record for county (Hammerson 1982, Amphibians and reptiles in Colorado. Colorado Div. Wildl., Denver. 131 pp.).

Submitted by **GEOFFREY A. HAMMERSON**, The Nature Conservancy, 46 Kelsey Street, Middletown, CT 06457, **LARRY VALENTINE**, 1157 Highway 65, Eckert, CO 81418, and **LAUREN J. LIVO**, 1215 South Osceola Street, Denver, CO 80219. ●

ADDITIONAL DEPARTMENTAL RECORDS FOR THE HERPETOFAUNA OF HONDURAS

Over a span of fourteen years, distributional treatments have appeared for the amphibians, non-snake reptiles, and snakes of Honduras (Meyer and Wilson, 1971, 1973, and Wilson and Meyer, 1985, respectively). During the same time and beyond, field work has continued in the country, resulting in the accumulation of a number of departmental records, some of which have been previously reported (Hahn, 1971; Hahn and Wilson, 1976; O'Shea, 1989; Wilson, Myton, and Cruz, 1976; Wilson, McCranie, and Porras, 1979). We have accumulated a substantial amount of new such records between and including 1979 and 1989. We anticipate the preparation of new, expanded treatments of the amphibians and non-snake reptiles (Wilson and McCranie, in prep.), but because the appearance of these works may come several years in the future, we feel it worthwhile to present these records now as an aid to other workers in the field. Recent snake records supplementing those in Wilson and Meyer (1985) are also included. The records detailed below are arranged according to department. All specimens were collected by at least one of the authors, except where noted. Vegetational formations (Holdridge, 1967) are given when representing the first record for a given species in that formation in Honduras. Other comments are given where appropriate.

DEPTO. ATLÁNTIDA

Eleutherodactylus ridens. Quebrada de Oro, 820-880 m. Subtropical Wet Forest formation. 17 May 1988. Field Museum of Natural History (FMNH) 236380. Extends range about 185 airline km. west of only previously known Honduran locality (Meyer and Wilson, 1971).

Rana maculata. Quebrada de Oro, 820-880 m. 18 May 1988. FMNH 236382.

Sceloporus malachiticus. Cordillera de Nombre de Dios, S slope Cerro Búfalo, 1780 m. 2 June 1980. University of Kansas Museum of Natural History (KU) 194320.

Hydromorphus concolor. Quebrada de Oro, 900 m. 22-23 May 1988. FMNH 236400-01.

DEPTO. CHOLUTECA

Gymnophthalmus speciosus. Vuelta de las Viejas, Punta Ratón. No date. Gustavo Cruz. KU 216146.

Rhinoclemmys pulcherrima. 1.6 km N Cedeño. 13 August 1985. KU 209310.

DEPTO. COLÓN

Bolitoglossa mexicana. Mountains behind Trujillo, 230-250 m. 18 June 1989. FMNH 236378.

Eleutherodactylus noblei. Mountains behind Trujillo, 460 m. 19 June 1989. Tropical Moist Forest formation. KU 214778.

Ptychohyla merazi (tadpoles). Mountains behind Trujillo, 460 m. 19 June 1989. Tropical Moist Forest formation. FMNH 236385.

Coniophanes bipunctatus. 2.9 km S Puerto Castillo, near sea level. 21 June 1989. FMNH 236396.

Leptodeira septentrionalis. Mountains behind Trujillo, 460 m. 19 June 1989. FMNH 236403.

DEPTO. COMAYAGUA

Plectrohyla guatemalensis. Montaña de Comayagua, above Río Negro, 1640 m. 4 May 1982. KU 209683-84.

Sceloporus malachiticus. Montaña de Comayagua, Cerro Volcán, 1750 m. 29 July 1980. Northwestern State University of Louisiana (NSU) 5242-43.

DEPTO. COPÁN

Agalychnis moreletii. Laguna del Cerro, 770 m. 7 August 1982. KU 200526-28.

Centrolenella fleischmanni. Laguna del Cerro, 770 m. 10 August 1982. KU 200525.

Hyla bromeliacia. Quebrada Grande, 1330 m. 10 August 1982. FMNH 236384.

Phrynohyas venulosa. Copán. 13 May 1985. Gustavo Cruz. KU 209307.

Anolis laeviventris. Quebrada Grande,

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1480 m. 6 May 1988. FMNH 236388.

Anolis lemurinus. La Playona, 180 m. 11 May 1988. FMNH 236390-91.

Sceloporus malachiticus. Quebrada Grande, 1260 m. 8 August 1982. KU 200570.

Clelia clelia (hemipenes only, adult discarded). Laguna del Cerro, 770 m. 10 August 1982. FMNH 236395.

Porthidium nummifer. Below Quebrada Grande, ca. 1300 m. 21 July 1983. KU 203011.

Sibon nebulatus. La Playona, 180 m. 11 May 1988. FMNH 236412.

Tantilla taeniata. Above Quebrada Grande, ca. 1600 m. Lower Montane Wet Forest formation. 6 May 1988. FMNH 236413. The highest previously recorded elevation for this species was 1000 m (Wilson, 1982). The pale middorsal stripe is confined to the middorsal scale row, a condition heretofore unrecorded for this species (Wilson, 1982). The pale nuchal band is divided medially.

Urotheca elapoides. Quebrada Grande, 1370 m. Lower Montane Wet Forest formation. 4 May 1988. FMNH 236406.

Depto. Cortés

Anolis laeviventris. Cerro Cusuco, 1550 m. Lower Montane Wet Forest formation. 21-22 May 1980. KU 194277-85.

Gymnophthalmus speciosus. Santa Elena, 716 m. 6 February 1980. Louisiana State University Museum of Zoology (LSUMZ) 38853.

Mesaspis moreletii. Cerro Cusuco, 1720 m. Lower Montane Wet Forest formation. 2 August 1982. KU 200587-88. First Caribbean versant record for Honduras (Meyer and Wilson, 1973).

Drymarchon corais. Cerro Cusuco, 1550 m. Lower Montane Wet Forest formation. 4 August 1987. FMNH 236398.

Depto. El Paraiso

Bufo luetkenii. Near Ojo de Agua, 665 m. 10 August 1985. KU 209260-61.

Bufo marinus. Near Ojo de Agua, 665 m. 10 August 1985. KU 209263.

Hypopachus variolosus (tadpoles). 18.6 km NW Mandasta, 1435 m. 12 August 1985. FMNH 236379.

Physalaemus pustulosus. Near Ojo de Agua, 665 m. 10 August 1985. KU 209281.

Gymnophthalmus speciosus. 30.6 km NW Mandasta, 1500 m. 12 August 1985. KU 209314.

Leptodeira annulata. 11.1 km SSE Villa San Francisco, 710 m. 11 August 1985. KU 209329-30.

Depto. Francisco Morazán

Thamnophis fulvus. Cerro Cantagallo, 1840 m. 16 August 1985. KU 209349.

Depto. Intibucá

Ptychohyla spinipollex. Zacate Blanco, 2010 m. 17 June 1980. KU 192897-98.

Mesaspis moreletii. Zacate Blanco, 2103-2271 m. 31 January 1980. LSUMZ 38826-27.

Sceloporus variabilis. Ca. 15 km E La Esperanza, 1490 m. 19 June 1980. KU 194331-33.

Drymarchon corais. 2.7 km N Jesús de Otoro. 29 January 1980. Louis Porras. LSUMZ 38830.

Depto. La Paz

Eleutherodactylus rugulosus. ca. 7 km S Marcala, 1540 m. 22 June 1980. KU 195553.

Leptodactylus fragilis. 17.0 km N Marcala, 1510 m. 19 August 1987. FMNH 236381.

Anolis sminthus. Ca. 5 km S Santa Elena, 1980-2000 m. 20-21 June 1980. KU 194300-04.

Mabuya unimarginata. 17.0 km N Marcala, 1510 m. 19 August 1987. FMNH 236393.

Mesaspis moreletii. Ca. 5 km S Santa Elena, 1990 m. 21 June 1980. KU 194262-66.

Sceloporus malachiticus. Ca. 5 km S Santa Elena, 1990 m. 20 June 1980. KU 194327-28.

Depto. Lempira

Plectrohyla guatemalensis. Naranjos, above Villa Verde, Cerro Celaque, 1930-1940 m. 25 April 1982. KU 209663-65, 209700.

Ptychohyla spinipollex (tadpoles). Above Villa Verde, Cerro Celaque, 1480 m. 28 April 1982. KU 216145.

Anolis crassulus. Naranjos, above Villa Verde, Cerro Celaque, 1960 m. 25 April 1982. FMNH 236387.

Mesaspis moreletii. Cerro Celaque, E slope, 2530 m. 26 April 1982. KU 200586.

Sceloporus malachiticus. Cerro Celaque, E slope, 2530 m. 26 April 1982. KU 200562.

Crotalus durissus. La Campa. 8 May 1985. Gustavo Cruz. KU 209358.

Ninia sebae. Above Villa Verde, Cerro Celaque. 6 August 1985. KU 209332.

Depto. Ocotepeque

Ninia sebae. Río Chiquito, 6.0 km W La Labor, 1460 m. 12 August 1987. FMNH 236404-05.

Depto. Olancho

Plectrohyla guatemalensis. Sierra de Agalta, 1000 m. Subtropical Wet Forest formation. 8 August 1986. KU 209686.

Anolis laeviventris. Sierra de Agalta, 1470 m. 5 August 1986. FMNH 236389.

Sceloporus malachiticus. Sierra de Agalta, 1470 m. 5 August 1986. FMNH 236392.

Bothrops asper. Sierra de Agalta, 1060 m. 10 August 1986. FMNH 236415.

Clelia clelia. Sierra de Agalta, 990 m. 11 August 1986. FMNH 236394.

Dipsas bicolor. Sierra de Agalta, 1000 m. Subtropical Wet Forest formation. 7 August 1986. FMNH 236397. Extends range about 120 airline km. north of locality of only previously known Honduran specimen (Wilson and Meyer, 1985).

Drymobius chloroticus. Sierra de Agalta, 1000 m. 7 August 1986. FMNH 236399.

Imantodes inornatus. Sierra de Agalta, 990 m. Subtropical Wet Forest formation. 6 August 1986. FMNH 236402.

Scaphiodontophis annulatus. Sierra de Agalta, 1000 m. 7 August 1986. FMNH 236410.

Sibon dimidiata. Sierra de Agalta, 990 m. 9 August 1986. FMNH 236411.

Depto. Valle

Rana berlandieri complex La Orilla, ca. 3.5 km S Amatillo. 11 March 1988. FMNH 236383.

Anolis sericeus. Isla Zacate Grande. 25 June 1980. KU 194287.

Sceloporus squamosus. Isla Zacate Grande. Tropical Dry Forest formation. 25 June 1980. KU 194329.

Agkistrodon bilineatus. San Lorenzo. No date. Gustavo Cruz. FMNH 236414. First mainland record for Honduras. Recorded from Isla Zacate Grande, Depto. Valle by Cruz et al. (1979).

Crotalus durissus. 3.7 km N San Lorenzo. 14 August 1985. KU 209357.

Depto. Yoro

Celestus bivittatus. Montaña de Macuzal, above El Portillo, 1590 m. Lower Montane Wet Forest formation. 6 July 1983. FMNH 236386. First Caribbean versant record for Honduras (Villa and Wilson, 1988).

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BOOK REVIEW

Life History and Ecology of the Slider Turtle, by J. Whitfield Gibbons (with 31 other contributors), 1990. Smithsonian Institution Press, 470 L'Enfant Plaza, Suite 7100, Washington, D.C. 20560 (send orders to Dept. 900, Blue Ridge Summit, PA 17294). xiv + 368 pp. $60.00 + shipping.

This book is the culmination of 20 years of research on turtle biology at the Savannah River Ecology Laboratory (SREL), part of the U.S. Department of Energy's Savannah River Plant (SRP) in South Carolina. The driving force behind this project is Whit Gibbons, who has been associated with SREL since its inception and now serves as its senior ecologist. Fifteen of the 24 chapters are authored in whole or in part by researchers who were at SREL at the time of writing. The book features the yellow-bellied slider (*Trachemys scripta scripta*), but many readers familiar with the primary literature emanating from SREL over the last two decades will not be surprised to find research on other turtle species liberally discussed and/or referenced throughout the text. This is a technical book, and the content is explicitly empirical. It is well-bound and well-printed, and its format (8 1/2 x 11 inches) makes it easy to read. Collecting the bibliography in one place at the end of the book also facilitates use.

The book is organized into six more-or-less coherent sections. Section 1 contains three introductory chapters authored by Gibbons, the last in collaboration with J. D. Congdon. The essence of the first chapter is a series of testable hypotheses concerning the movement and energy allocation patterns of turtles, reflecting in part the unavoidable *a posteriori* nature of the analyses of a project of this magnitude and duration. I liked the ecological definition of a population presented here, emphasizing as it does the stochastic influences of the local environment on parameters delimiting one. Two unique features included in this chapter are comprehensive appendices on SREL turtle publications and Ph.D. dissertations on turtles, respectively.

Chapter 2 describes in detail the physical features of SRP as they pertain to the subject matter, and provides a delightful series of anecdotes and descriptions of the research and habitats involved which are particularly entertaining for anyone who has worked on similar long-term projects and/or with government agencies. I was confused by the statement that SRP was acquired from "public lands" in 1951, and infer that since 30-40% of SRP was once farmland that acquisition and/or condemnation of private lands was involved.

Chapter 3 emphasizes the utility of turtles in studying the evolution of life histories in long-lived iteroparous organisms. Gibbons and Congdon are able to provide a unique cautionary perspective from long-term studies on turtles of the extreme variability in life-history parameters within species' populations exposed to different environments, between different species exposed to the same or similar environments and between the sexes in the same species.

Section 2 contains 4 chapters which serve to illustrate the still problematic phylogenetic relationships among and nomenclatural status of slider turtle populations, and the techniques which can be brought to bear on these problems. Ernst provides a concise, cogent exposition of the taxonomic history of emydine turtles, and accepts the *Chrysemys-Pseudemys-Trachemys* arrangement first proposed by Agassiz and most recently codified by Seidel and Smith (1986). He recognizes five species of *Trachemys*, and 14 subspecies within the sole mainland species *scripta*. Seidel and Jackson also accept Agassiz' arrangement but suggest that the precise phylogenetic relationships among contemporary emydine genera are far from clear. They indicate that fossils assignable to *Trachemys* may be as old as 7 million years, and that some subspecific differentiation among mainland *scripta* may be traceable in Pliocene fossils. Legler, however, does not recognize the Agassiz split and considers *scripta* a polytypic species of *Pseudemys* (*sensu lato*) with 17-18 subspecies, describing two as new herein. I found Legler's thorough discussion of the biogeography and phylogenetic relationships among slider populations particularly enjoyable, providing much fodder for future work, although some of the scenarios he rejects seem no more arbitrary than those accepted. All three of these chapters strongly suggest that the potential for recognition of multiple species within *scripta* is high. Smith and Scribner provide a succinct and

very interesting exposition of extremely high levels of genetic differentiation among and between populations of sliders on SRP, noteworthy again because of the long-term nature of the study and the high mobility of these turtles. This chapter has important implications for elucidating the effects of selection in a highly dynamic, unpredictable habitat mosaic on the genetic structure of long-lived, late-maturing animals.

Section 3 presents six chapters on reproduction and growth, perhaps the most interesting of which is the exhaustive review and synthesis by Congdon and Gibbons on the biology of turtle eggs. They point out an interesting difference between species with flexible-shelled and rigid-shelled eggs; eggs of the former type are developmentally sensitive to the hydric environment of their incubation medium and this leads to differences in the selection regimes experienced by turtle species depending on which egg type they possess. In addition, concepts of parental investment have to be modified for turtles since energy stores are apportioned between two separate processes, embryogenesis and fueling the hatchling after hatching. The hatchlings of many turtle species overwinter in the nest, and a wide variety of parental investment strategies of energy allocation ensue.

The following chapter by Gibbons and Greene present a wealth of data on clutch frequency, size and age at sexual maturity and other parameters for *T. scripta* and other SRP turtle species, and once again highlights the importance of long-term studies as key to the understanding of life-history evolution. It turns out that male *T. scripta* on SRP reach sexual maturity at a certain size whereas females reach sexual maturity at a specific age; however, complex interactions with other life-history parameters render these demographic determinations imprecise. Similarly, interactions between clutch size and other morphological and environmental characteristics complicate a direct positive relationship between female body size and clutch size. The most confusing chapter of this book is the one by Dunham and Gibbons on growth. It contains a pedestrian review of techniques for the measurement of size and analysis of growth, and concludes with a discourse upon factors affecting growth which have very little to do with turtles. Whereas it seems clear that indeterminate growth occurs in SRP *T. scripta*, it is unclear whether differences in growth rates exist between the sexes. The authors state (p. 139) that "the two sexes grow at the same absolute rate before and after reaching the asymptote..." and (p. 141) "...the absolute growth rates of females must be significantly higher than those of males in all populations." The confusion perhaps results from the lack of a clear exposition of what the two free parameters of the growth models they employ mean biologically in this case.

The three remaining chapters discuss slider populations from other areas. Mitchell and Pague support the relationships of size to reproductive characteristics and patterns of growth developed for SRP *T. scripta* for populations in southeastern Virginia. Moll and Moll provide a nice table summarizing reproductive data for neotropical slider populations (which they refer to as *Pseudemys scripta*). They conclude that any differences in reproductive (or other ecological) characteristics between temperate and tropical populations are ones of degree, not kind, and directly related to longer growing seasons in the latter habitats. These authors view the reproductive ecology of sliders as an exaption which, along with a certain degree of habitat alteration, allowed these turtles to successfully invade the tropics. Vogt provides limited data to suggest that the critical temperature for producing males in tropical Mexican populations of *T. scripta* is 1°C lower than that for temperate populations, and speculates that nests of the former are actually experiencing lower temperatures in nature. He contravenes without supporting evidence the conventional wisdom and considerable data suggesting that size determines sexual maturity in female sliders. The population Vogt studied appears to be heavily skewed towards adults, and he attributes this to heavy predation, especially by *Crocodylus moreleti*. The abundance of juvenile *Staurotypus triporcatus*, a sympatric bottom-dwelling species, is cited as evidence to suggest that it is not nest predation which is responsible for the skewed population structure of *Trachemys*. This observation only allows inference concerning the relative effects of nest predation on *Staurotypus* and, without additional data, allows no discrimination between the effects of distinct avenues of predation on the demography of the slider population in question.

Section 4 contains a set of six chapters relating in diverse ways to the demography of and interactions between slider populations. In the initial chapter Gibbons discusses somewhat redundantly how the assessment of sex ratios in turtle populations is complicated by trapping and sampling biases, differential seasonal activity and mobility between the sexes, and interpopulational variation in movement patterns. One of the most important questions raised, yet to be adequately addressed with data, is whether or not females in species with temperature sex determination manipulate sex ratios by behavioral means to conform with Fisher's theory of parental investment in the sex least costly to produce and in shortest supply. Arguably the most important chapter in this book follows in which Frazer, Gibbons and Greene employ a wealth of excellent data to construct a complete life-table for *Trachemys scripta* on SRP. They provide a first-class review of survivorship in turtle eggs and hatchlings, and re-emphasize the challenges to accurate evaluation of life-histories in long-lived, iteroparous species in which individual females do not reproduce annually but continue to harvest and expend energy. I can recall few such quality treatments in animal ecology (certainly only Don Tinkle's work on *Uta* in herpetology) and I expect this one to become a classic in the field.

The remaining chapters in this section are all interesting. Gibbons, Greene and Congdon provide a qualitative characterization of movement patterns in turtles and an assessment of associated selective benefits and risks. They make the curious assertion that individual female sliders leave aquatic habitats on SRP and travel in the same general direction overland on consecutive nesting forays because "... a nesting individual would be expected to follow a known route that resulted in her own survival and a satisfactory nest on a previous occasion..." without defining the latter statement or indicating how it would be assessed. Colonization by sliders of newly-constructed farm ponds in Mississippi reported by Parker (using *Pseudemys* as the generic name) reveals that most colonizers are immature animals. Population turnover in these habitats remained higher than for nearby established ponds throughout the study, growth rates were slower, and population densities and biomass remained lower. Schubauer, Gibbons and Spotila compared home ranges of *T. scripta* estimated by mark-recapture methods and radiotelemetry on SRP and found that the latter method yielded areas that were significantly larger for both sexes. Most of the increase was due to the land portion of the home range. Home range size was significantly correlated with body mass for females and with the length of time monitored for males. The final chapter in this section by Lovich, McCoy and Garstka is a discussion of melanism in *T. scripta*. The

effect of melanism on turtle taxonomy is reviewed. The onset of melanism in male sliders is not strictly dependent on age, size, or the attainment of sexual maturity. A comprehensive study of steriod metabolism in this species demonstrated significant differences between melanistic and non-melanistic individuals and suggests to the authors a direct albeit not exclusive connection to melanophore action and melanin deposition. The direct action of steroids at the level of gene expression was not investigated, however. A thoughtful discussion on the adaptive significance of melanism ensues and the suggestion is made that melanism serves as an important visual cue in social interactions.

Section 5 contains four chapters on bioenergetics. Parmenter and Avery provide a standard review of the feeding ecology of *T. scripta*, emphasizing that the nutritional requirements for the species are largely unknown. They state (p. 264) that effects of temperature on growth rates and the attainment of sexual maturity are unknown while citing (p. 266) several studies on increased temperatures promoting growth in this species, and ignoring the studies which have demonstrated a positive relationship between size and sexual maturity in female sliders. Hinton and Scott contribute a particularly interesting chapter on the use of radioisotopes in ecological research, not the least because of the lengthy sponsorship of SREL activities on SRP by the Department of Energy and its predecessors. A very useful discussion of radionuclide kinetics, which must be understood in at least a general way to make their use and interpretation in radiobiology meaningful, serves as the basis of the chapter. Although of greatest utility in metabolic studies, the potential of radioisotopes in chelonian biology remains largely untapped. Spotila, Foley, and Standora develop a climate space model based on various biophysical parameters thought to influence thermoregulatory behavior of *T. scripta* which was found to adequately predict such behavior in two aquatic habitats on SRP. The remarkable capacity of this species to survive long periods of underwater winter dormancy via altered physiology is noted. The final chapter in this section by Esch, Marcogliese, Goater, and Jacobson is a unique review of the taxonomy and phylogenetic relationships of helminth parasites and turtle hosts and the potential uses of these parasites as indicators in turtle biology. Data from turtles on SRP support the hypothesis that a correlation exists between local habitat stability and parasite numbers and species diversity. The authors make a clear case that the distribution and abundance of parasites in turtles is a potentially very useful tool for attaining a deeper understanding of several aspects of host biology, such as the ontology of diet and feeding behavior, seasonal movements, and zoogeography.

The final section of this book contains a single chapter by Gibbons which serves as an epistle on the value of long-term ecological research. The turtle research at SRP has provided the critical data needed to address biological questions such as the ontology of reproduction in long-lived species, indeterminate growth in reptiles, sex ratios in vertebrates, and the effects of long-term variability in environmental parameters on demographics of natural populations.

I found almost no typographical or other errors in this book. The most noteworthy are in Chapter 5, where the *Chrysemys nelsoni* species account published in the Catalogue of American Amphibians and Reptiles is erroneously attributed to "Herpetological Circulars," a completely different series published by SSAR. Also, two citations by the same author, *a* & *b* in the text, are reversed in the bibliography. If I have to find fault with this book, my major criticism would be that it contains no explicit review of the conservation status of slider turtle populations, although Chapters 4, 7, and 11 briefly touch upon certain aspects of this issue. Evidence of a largely circumstantial nature has been accumulating for some time that certain populations, particularly *T. s. elegans* in Louisiana, are threatened, leading to a recent petition to include this taxon in Appendix II of CITES (Dane, 1989) which was unsuccessful. These threats include the annual replacement of turtle farm breeding stocks with up to an estimated 100,000 adult turtles from wild populations, removal of an additional estimated 765,000 wild-caught turtles for human consumption, habitat destruction, and worldwide introduction of sliders with unforeseen biological consequences into areas where they are not native (Warwick et al. 1990). This book would have been the ideal opportunity to focus this issue and bring it to the attention of the people who are likely to be most interested.

This is an important book, and likely to remain a classic of its kind for some time to come. I highly recommend it, despite the price, to anyone interested in turtles or in long-term ecological research in general. The book is a superb summary of ecological research on turtles and will prove especially valuable to those without the opportunity to become intimately familiar with the primary literature in the field, and belongs in every well-equipped science or general library for that reason alone. Those people who denigrate descriptive biology, or who despair about the future of science that is not explicitly directed at *a priori* hypothesis testing, need only read this book to discover how valuable such endeavors really are.

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PUBLICATION RECEIVED

Lizards of the Genus *Emoia* (Scincidae) with Observations on Their Evolution and Biogeography, by Walter C. Brown. 1991. Memoirs of the California Academy of Sciences Number 15. The California Academy of Sciences, Scientific Publications, Golden Gate Park, San Francisco, CA 94118, USA. ISBN 0-940-228-24-6. $25 + $2.25 s&h (California residents add 6.5% sales tax). vi + 94 pp.

The 72 recognized species of the lizard genus *Emoia* are described, including 13 new species and three new subspecies. Includes a section on Observations on the Evolution, Relationships of Species Groups, and Distribution of Emoia. Numerous black and white photographs of specimens, two color plates of eight photographs each, several range maps.

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Society For The Study Of Amphibians And Reptiles

Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (4 issues annually), **Herpetological Review** (4 issues annually), and occasional issues of **Facsimile Reprints in Herpetology**. Members may purchase other Society publications at reduced rates.

ANNUAL DUES 1991

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HERPETOLOGICAL REVIEW

Volume 22 March 1991 Number 1

SSAR BUSINESS

SSAR ELECTION RESULTS

The results of the 1990 SSAR election are as follows:

President-elect.....Edward O. Moll
Secretary.....J. Eric Juterbock
Treasurer.....Douglas H. Taylor
Board - Regular....Louis J. Guillette, Jr.
Board - Regional Societies.....
Stephen H. Hammack

A total of 672 ballots were cast in this election.

The Society extends its congratulations to the new officers, and its gratitude to the Nominating Committee [Carl Gans (chair), Kraig Adler, Robert Gordon, and Martin J. Rosenberg], and SSAR Elector (Ruth M. Zantzinger) for their hard work, and to the outgoing President and Board Members for their service during their terms. ●

1991 SSAR/HL MEETING

The 1991 Joint Annual Meeting of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League will be held at the Pennsylvania State University, University Park, PA, 6 - 11 August. A detailed program and call for papers was mailed in late February to members of both societies. Additional information can be obtained from Linda R. Maxson, Department of Biology, 208 Mueller Lab, Pennsylvania State University, University Park, PA 16802.

Erratum: In the December 1990 issue of *Herpetological Review*, the incorrect days were given for the symposium on "Captive Management and Conservation of Amphibians and Reptiles." This symposium will be held on *Friday* and *Saturday*, 9 -10 August. ●

SSAR COMMITTEES FOR 1990 - 1991

Following the annual meeting in New Orleans, Louisiana, President William Brown appointed the following committees and coordinators for the current year, to report to the Board at the annual meeting at Pennsylvania State University. Individuals with important matters pertaining to the activities of Society committees should contact the relevant committee chair. Addresses for committee chairs and coordinators are included in the inside rear cover of each issue of HR.

Conservation: Dale R. Jackson (Ch.), John Behler, Kurt A. Buhlmann, William E. Cooper, Jr., Nat B. Frazer, Tom R. Johnson, Thomas E. S. Langton, Paul E. Moler, John J. Moriarty

Grants-in-Herpetology: Darrel R. Frost (Ch.), A. Dale Belcher, Maureen Donnelly, Thomas H. Fritz, Jerry Johnson, Michael V. Plummer, Don S. Wilson

Kennedy Student Award: Ken R. Marion (Ch.), David Duvall, Robert E. Gatten, Jr., Joseph C. Mitchell

Long-range Planning: James L. Christiansen (Ch.), Harold A. Dundee, George R. Pisani

Nominating: Margaret M. Stewart (Ch.), Kraig Adler, Carl Gans, Martin J. Rosenberg

Regional Societies: Stephen H. Hammack (Ch.), John J. Moriarty, Louis Porras

Resolutions: George R. Pisani

Zoo Liaison: Ronald R. Goellner

Common and Scientific Names: Joseph T. Collins (Coordinator), Robert L. Bezy, S. Blair Hedges, J.R. McCranie, Peter C.H. Pritchard, David M. Sever

Joint Meeting Coordinator: Joseph T. Collins

Elector: Ruth M. Zantzinger

Translations Coordinator: Randy Krohmer ●

SSAR CONTRIBUTORS

SSAR wishes to recognize the following members who have contributed to the financial resources of the Society for the year 1990. These contributions make it possible for the Society to provide benefits to the membership that otherwise would be impossible. Many thanks.
— Douglas H. Taylor, Treasurer

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SSAR SUPPORTS NATIONAL INSTITUTES FOR THE ENVIRONMENT

In response to an appeal to all national biological professional societies from the Committee for the National Institutes for the Environment (NIE), the Board of Directors of SSAR has recently voted unanimously to endorse the proposed NIE and, on behalf of the Society, the following resolution has been sent to the Committee for the NIE in Washington:

Whereas, environmental health must be regarded as seriously as human health;

Whereas, a solid scientific basis is essential for effective programs to protect the environment;

Whereas, there is a need in the United States for a coordinated national program to support fundamental and applied environmental research encompassing a wide variety of disciplines aimed at understanding, preventing, and solving environmental problems:

Whereas, such research is presently uncoordinated and largely underfunded;

Whereas, a consensus is emerging in the scientific community that a government agency that supports mission-oriented competitively-awarded research, analogous to the way that the National Institutes of Health (NIH) supports biomedical research, may be the most appropriate vehicle to encourage, promote, and support environmental research;

Therefore, the SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES supports the concept of creating a National Institutes for the Environment and request to participate in the planning and development of such an Institute.

Background Information on the NIE: A proposal to establish an NIE was developed by a committee headed by Dr. Stephen Hubbell of Princeton University and by Dr. Henry Howe of the University of Illinois - Chicago. A non-profit organization, the Committee for the National Institutes for the Environment, has been established to coordinate this effort. The Committee for the NIE has opened a Washington office in the American Institute of Biological Sciences (AIBS) headquarters building in Washington. Director of the Committee is Dr. David E. Blockstein. The Committee for the NIE will spearhead efforts to establish an NIE (for further details, see *Bioscience* 40(8): 567, Sept. 1990).

The committee may be contacted at:

Committee for the National Institutes
for the Environment
730 11th Street NW
Washington, D.C. 20001
TEL: (202) 628-4303 FAX: (202) 628-4311

The NIE proposal is an effort to greatly expand environmental research and education to drive environmental policy through a new funding agency. Of the $9 billion in federal extramural support for science, 11% goes to environmental sciences (broadly defined). This amount could be increased and the results of this research made more applicable to solving environmental problems through an interdisciplinary agency, analogous to the National Institutes of Health. The present proposal is to set up a series of problem-oriented institutes that would support competitively-awarded mission-oriented environmental research. These five institutes would focus on (1) biotic resources, (2) ecosystem management, (3) sustainable resources, (4) changing human environments, and (5) climate change.

Legislation is now pending in Congress to have the National Academy of Sciences (NAS) conduct a study of the NIE concept. The study would evaluate the current state of research and training in environmental sciences in the United States, and would assess how an NIE might be structured to meet those needs. The Committee for the NIE is providing background for these research efforts to be undertaken by the NAS.

The support which SSAR now has given to the Committee for the NIE by endorsing its efforts is only a first step. In addition, we have been asked to join forces with the other two national herpetological societies, the Herpetologists' League (HL) and the American Society of Ichthyologists and Herpetologists (ASIH), to provide data on research in our discipline. Such data would be gathered under recommendations to be developed by a three-way working group representing each society within the herpetological community on the proposed NIE. Merging the herpetological membership lists of the three societies and conducting a national survey have been proposed.

Plans for an NIE are still in an early conceptual stage. As of late August 1990, a number of organizations have endorsed the NIE including: AIBS, American Ornithologists' Union, American Society of Mammalogists, Council of Scientific Society Presidents, Ecological Society of America, Society for the Study of Evolution, and a number of private environmental organizations.

The present announcement is to alert the membership of SSAR on this initiative by the Society. Until a three-way working group is formally established by the three herpetological societies, the Conservation Committees of SSAR and HL will act as conduits for input of suggestions. Please contact either the committees or the individuals below:

Dr. William S. Brown, Immediate Past President, SSAR
Department of Biology
Skidmore College
Saratoga Springs, NY 12866, USA

Dr. Joseph C. Mitchell, Chair, HL Conservation Committee
Department of Biology
University of Richmond
Richmond, VA 23173, USA ●

SYMPOSIUM ANNOUNCEMENT AND CALL FOR PAPERS

The SSAR Conservation Committee is considering sponsoring an Amphibian and Reptile Conservation Symposium at the 1992 annual meeting in El Paso, Texas. Our tentative plan includes a morning session focused on a specific topic such as a taxonomic group (e.g., sea turtles or iguanid lizards), region (e.g., desert, high elevation populations, rain forest), or conservation/management methodology. The committee is interested in co-sponsoring the morning session with persons or organizations involved with the selected topic. The afternoon session would be devoted to a broad spectrum of herpetological conservation and/or management topics. Papers of particular interest are those dealing with "hands on" projects directly related to habitat improvement, mitigation of threats, reproductive enhancement, and restocking or relocation of rare or endangered amphibians and reptiles.

To be considered for participation in the symposium, submit a preliminary abstract by 30 September 1991. Anyone interested in serving as a convener/organizer for the morning session should contact T. Johnson (below) by 30 June 1991, with your ideas.

Final deadline for paper abstracts will be 31 January 1992. Send abstracts or

questions to:

Tom R. Johnson, Herpetologist
SSAR Conservation Committee
Missouri Department of Conservation
P.O. Box 180
Jefferson City, MO 65102-0180, USA
(314) 751-4115 X-201 ●

NEWSNOTES

LAUNCHING OF A NEW BOOK SERIES: BIOLOGY OF THE AMPHIBIA

The book series *Biology of the Reptilia*, edited by Carl Gans, is a unique and monumental contribution to herpetology. It presents comprehensive reviews of all aspects of reptilian biology. These are more detailed and more exhaustively documented by literature than is possible in most review articles or than is usually achieved in books. It is an ongoing series with topics treated as sufficient information comes to hand to warrant a review. Now past its 16th volume, it has become the most authoritative single source of information on reptiles that is available. It has been, and continues to be, invaluable to herpetologists.

There is no equivalent reference work for the Amphibia. The book *Biology of Amphibians* (Duellman & Trueb 1986) is an excellent general work, clearly written and well illustrated, and with a remarkable depth and breadth for a single volume. It will be the standard general reference on amphibians for many years to come and the oncoming generation of herpetologists will consider it the "amphibian bible" much as their predecessors regarded G.K. Noble's (1931) *The Biology of the Amphibia*.

However, no single volume fulfills the need for a sequential, monographic treatment of specialized topics. Certain subjects have been covered at levels equivalent to the standard *Biology of the Reptilia* in the three volumes of Physiology of the Amphibia (Moore 1964, 1974; Lofts 1976) and in The *Reproductive Biology of Ampibians* (Taylor and Guttman 1977), but it has now been 26 years since the first of these works and 14 years since the last one and many topics are in need of updating. The forthcoming book *Environmental Physiology of the Amphibians* (Feder and Burggren, in press, University of Chicago Press) will bring some of those topics up to date and treat new ones. Collectively, these works leave large gaps in physiology unaddressed, and there are not equivalent, recent reviews for most other aspects of amphibian biology.

Recognizing that the discipline of amphibian biology has reached sufficient maturity to warrant detailed, multi-volume review and that such a need has only been partly filled, with no committment to continue the process, it was decided to launch a new series: *Biology of the Amphibia.* It is viewed as an ongoing series of multi-authored volumes, to be treated at the same level and with the same degree of comprehensiveness as *Biology of the Reptilia.* The proposed series will not compete with the titles mentioned above. Recently reviewed topics will not be covered in early volumes of the series, but will be reserved for such time as an update is required.

The editor of the series will be Harold Heatwole, assisted by individual co-editors for particular volumes. Michael Tyler and Margaret Davies have agreed to serve in that capacity for one each of projected volumes. The publishers Surrey Beatty & Sons Pty. Ltd., now well known to herpetologists through a number of high quality publications on amphibians and reptiles, have undertaken to launch the series pending review of manuscripts for the first three volumes. Authors have been contacted for some chapters and parts of those volumes are now in preparation.

The purpose of this notice, in addition to announcing the series, is to solicit suggestions and participation by herpetologists. Interested authors should address queries or send titles and tentative outlines of chapters, as well as target dates for completion, to: Harold Heatwole, Department of Zoology, University of New England, Armidale, NSW 2351 Australia. Phone (067) 732468; FAX (067) 711869. This will permit organizing contributions into appropriate volumes and allow planning of a publishing timetable. It is anticipated that the first three volumes will deal with the topics of (1) Sensory Perception and Maintenance Behaviour, (2) Taxonomy, and (3) Osteology. Consequently, contributions in these areas are sought especially. Anyone wishing to nominate a topic on which he or she would be willing to serve as co-editor should do so. ●



MEETINGS

1991 IHS

The 15th International Herpetological Symposium on Captive Propagation and Husbandry will be held 19 - 23 June 1991 in Seattle, WA. Over thirty speakers will present papers on many aspects of amphibian and reptile husbandry and propagation, and six workshops are scheduled on the husbandry and propagation of rare boas and pythons, turtles, tortoises, varanids, other lizards, and amphibians.

For a complete program and registration, contact: IHS, Inc., c/o Brian P. Backner, M.D., 17 Margaret Road, Sharon, MA 02067, USA ●

SYMPOSIUM ON THE TIMBER RATTLESNAKE: CONSERVATION AND PROTECTION

The Massachusetts Audubon Society is planning a day-long seminar on Saturday, December 7 at a location to be announced in Western Massachusetts. The program will include status reports on *Crotalus* populations in New York, New England, and New Jersey and feature conservation methods for this species. A main goal is to consider a petition to have the northeastern population listed as Federally endangered. For further information as it becomes available, send a SASE to: Rattlesnake Symposium, Conservation Department, Massachusetts Audubon Society, South Great Road, Lincoln, MA 01773, USA ●

REGIONAL SOCIETIES

ADDRESS CHANGES

The following address changes or notifications of new societies have been submitted since the list of herpetological societies was printed in the June 1989 issue of *Herpetological Review.* Please make the appropriate changes in your listing of regional herpetological societies.

Arizona Herpetological Association
P.O. Box 39127
Phoenix, AZ 85069-9127, USA

Central Kentucky Herpetological Society
3564 Rockyhill Terrace
Lexington, KY 40517, USA

Hoosier Herpetological Society
P.O. Box 40544
Indianapolis, IN 46204, USA

International Society for the Study of
Dendrobatid Frogs
c/o Ed Tunstall
2320 W. Palomino Drive
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New England Herpetological Society
P.O. Box 1082
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New York Turtle & Tortoise Society
163 Amsterdam Avenue, Suite 365
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Venomous Snake Society
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Wisconsin Herpetological Society
P.O. Box 366
Germantown, WI 53022, USA

Wyoming Herpetological Society
P.O. Box 1907
Casper, WY 82602, USA

Society officers are encouraged to forward to the SSAR Regional Society Liaison (see inside front cover of HR) any address changes for their society. Newly formed societies are invited to announce their existence in this column, and established societies are invited to submit short descriptions of their organization for publication in this column.

IGUANA SOCIETY

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FEATURES

SALINITY CORRELATIONS OF THE LEECH *Placobdella multilineata* ON ALLIGATORS

Leeches reported to occur on the American alligator (*Alligator missipiensis*) include *Placobdella multilineata* from Florida (Forrester and Sawyer 1974; Cherry and Ager 1982), *Placobdella papillifera* from Texas (Smith et al. 1976), and *Philobdella gracilis* from southeastern Louisiana (Viosca 1962). While procuring data on other studies involving the American alligator (Brantley 1989, Platt 1990), we made observations of leech infestation on juvenile, subadult, and adult alligators within an estuarine swamp and marsh between Lakes Pontchartrain and Maurepas in southern Tangipahoa and northern St. John the Baptist Parishes, Louisiana. A salinity and elevational gradient exists in this area, which includes swamps, a marsh-scrub zone with salinities from 0–3 ppt during different times of the year, and an intermediate salinity marsh type zone, where salinities fluctuate between 0 and 5 ppt.

One-hundred and five juvenile (< 1.2 m total length [TL]) and subadult (1.2–1.8 m TL) alligators were hand collected between 13 April and 24 September 1988 (Brantley 1989). An additional 81 subadult and adult (> 1.8 m TL) alligators were collected between 10 and 19 September in the area by hunters. All animals were inspected for ectoparasites externally as well as inside the mouth and cloaca. A relative estimate of leeches present was noted (0 = none; 0–50 = slight; > 50 = heavy). Representative leeches were taken alive to the laboratory for identification. Salinities were recorded at the site of capture using a portable salinity-conductivity-temperature (SCT) meter. Animals collected by hunters were assigned to one of the habitat zones.

Placobdella multilineata was observed on 13 of the 186 (7.0%) of the alligators examined. No other leech species were observed. Most alligators with leeches were collected from the freshwater swamp and no salinities greater than 0 ppt were recorded from any capture location of an infested alligator. Six of the alligators collected in the freshwater swamp along with the single infested alligator from the marsh-scrub zone had slight cases of leech parasitism. The remaining six animals from the freshwater swamp were heavily infested with leeches. *Placobdella multilineata* was observed mostly on the dorsal tail scutes. Other sites of attachment included the head, back, legs, and inside the mouth. No detrimental effects due to leeches were noticed on any alligator. This study suggests that *Placobdella multilineata* cannot tolerate salinities greater than 0 ppt. Since *P. multilineata* is the suspected vector for the blood parasite *Haemogregarina crocodilinorum* in American alligators (Khan et al. 1980), this has significant implications. In coastal areas within the range of the American alligator and in commercial farming of this species, leech and possibly haemogregarine parasitism could be controlled by creating low salinity environments.

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SURVIVAL OF BILLBUGS (*Sphenophorus* spp.) EGESTED BY WESTERN TOADS (*Bufo boreas*)

Curculionids (weevils/billbugs) are eaten by toads, but are not always digested. Smith and Bragg (1949) found a small, unidentified weevil that regularly survived ingestion by *Bufo cognatus*; Fair (1969) documented the survival of *S. phoeniciensis* through the digestive tract of *B. boreas*; and Barrentine and Seeno (1988) found that *S. venatus vestitus* survives passage through the digestive tract of *B. boreas*.

The western toad (*Bufo boreas*) is common in suburban central and southern California, where residential landscaping and irrigation practices often provide suitable habitats for survival. Such habitats often include warm season turfgrasses (Beard 1973). Billbugs (Coleoptera: Curculionidae) are known to infest these grasses. In this study I determined the dietary frequency of billbugs (*Sphenophorus* spp.) in Western toads (*B. boreas*) foraging arthropods from a residential lawn, and calculated the survival frequency for egested billbugs.

MATERIALS AND METHODS

Freshly egested fecal pellets were collected from eight Western toads foraging from a 0.06 ha residential lawn (cultivar of *Cynodon dactylin x C. transvaalensis*) in Bakersfield, CA. Pellets were collected daily between 0500-0800 h from mid-June to mid-August of 1987 and 1988. Individual pellets were stored in unsealed plastic vials for four days at 24-28°C and 35-45% Relative Humidity.

Vials were examined twice daily and live (emergent) billbugs were removed and tallied. After four days, pellets were dissected to quantify dead (non-emergent) billbugs. Other prey items found in fecal pellets were not identified in this study.

RESULTS AND DISCUSSION

Billbugs (*S. phoeniciensis* and *S. venatus vestitis*) were present in 87.3% (370) of 424 fecal pellets. A total of 4,406 billbugs were recovered from 370 pellets. Billbug density (number of billbugs per pellet) ranged from 1 to 64; mean density was 11.9 (SD = 12.0, 370). Nearly 68% (2,978) of the 4,406 billbugs emerged unaided from pellets within four days after fecal egestion.

Fair (1969) reported a billbug (*S. phoeniciensis*) survival frequency of 47.2% (17/36) from a sample of six toad (*B. boreas*) fecal pellets. Barrentine and Seeno (1988) found a billbug survival frequency (for mixed *S. phoeniciensis* and *S. ventatus vestitus*) of 62.0% (186/300) for 54 toad (*B. boreas*) pellets. Overall billbug survival frequency in the present study is higher than that reported by Fair and similar to that reported by Barrentine and Seeno. Differences in survivorship frequencies between the three studies may be attributable to differences in survivorship between *Sphenophorus* spp. In this study, no attempt was made to assess survivorship frequencies for *S. phoeniciensis* and *S. venatus vestitus* separately. Further research will address possible differences between these species' survivorship.

Billbug mortality may be due to the effects of mechanical and chemical digestion and/or to the inability to escape entombment from a desiccating pellet. Notably, less than one percent of the dead (nonemergent) billbugs in toad fecal pellets were disarticulated. Billbug survivorship, therefore, appears to be due mostly to post-egestive, rather than pre-egestive, causes. Hence, toads (*B. boreas*) may derive little (if any) nutrition from ingested billbugs.

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BEHAVIOR OF THE GRAY TREEFROG (*Hyla chrysoscelis*) DURING THE NON-BREEDING SEASON

During the breeding season, male gray treefrogs (*Hyla chrysoscelis)* congregate at breeding sites and vocalize in order to attract gravid females. On such occasions, behavioral observations of this nocturnal species can be made with relative ease (e.g., Godwin and Roble 1983; Roble 1985 *a,b*; Morris 1989; Morris and Yoon 1989; Ritke et al. 1990; Ritke and Semlitsch 1991). After the breeding season most individuals apparently disperse from breeding sites and are, for the most part, non-vocal (pers. obs.). As a result, virtually no information is available regarding the biology of the gray treefrog during this period. We observed the behavior of *H. chrysoscelis* during the non-breeding season, primarily during October and November 1989 at the Memphis State University Meeman Biological Field Station in Shelby Co., Tennessee (see Ritke et al. 1990 for a description of the study site), as part of an ongoing study of this species.

On 1 October an adult male (male #1, SVL = 43 mm, mass = 6.9 g) was found in a knothole cavity of a sassafras tree (*Sassafras albidum*) 1.9 m above ground. On 3 October another adult male (male #2, SVL = 46 mm, mass = 8.7 g) and a

juvenile frog (sex undetermined; frog #3, SVL = 31 mm, mass = 2.4 g) were found in a knothole cavity of an elm tree (*Ulmus* spp.) 5.1 m above ground, submerged in tannin-colored water with their heads protruding above the surface. All three frogs were toe-clipped for later identification. Another adult male (male #4; not measured or marked) was located on 13 October in a third knothole cavity of a sassafras tree 2.5 m above ground. Park et al. (1950) suggested that gray treefrogs may use knothole cavities as resting sites. McComb and Noble (1981) confirmed the use of knothole cavities by gray treefrogs in Louisiana, primarily during the non-breeding season.

During the day at temperatures ≥ 25° C, frogs were observed with their heads protruding from knotholes or sitting on the rims of knotholes. On one occasion (15 October, 1452 h, 30.0° C), male #4 was observed outside his knothole cavity perched on a limb 0.4 m above the entrance to the cavity. These frogs may have been waiting to ambush prey; we once observed (22 Oct. 0343 h, 27.3° C) male #2 leap ca. 0.3 m from his resting position and consume a prey item. After consuming the prey, he returned to his original resting position on the rim of the knothole.

At dusk, frogs emerged from knotholes when temperatures were ≥15.8° C, and assumed the water-conserving position (sensu Ralin 1981) on limbs, usually horizontal and < 2.0 m from their resident knothole cavity. Infrequently, male #2 and frog #3 were observed climbing higher into the canopy until they were lost from view. Our observations revealed that gray treefrogs are "sit-and-wait" predators, remaining motionless on limbs and allowing prey to come within striking distance. After sunset, wood roaches (*Parcoblatta lata, P. uhleriana, Ischnoptera deropeltiformis*) and camel crickets (*Ceuthophilus* spp.) sometimes drink from water-filled cavities. Thus, frogs may be staying near knothole cavities to prey on these and other arthropods that may arrive during the night (see also McComb and Noble 1981). Additionally, remaining near knothole cavities might enable frogs to quickly escape predators.

During the breeding season, male gray treefrogs are thought to be territorial, defending perch sites (locations used to call and attract gravid females) from conspecific males by pushing and shoving intruders (Fellers 1979; Ritke and Semlitsch 1991). The observation of two frogs occupying the same knothole cavity suggests that adult males may not defend daytime resting retreats from other frogs during the non-breeding season and there is evidence that this may also be the case during the breeding season (Swink 1977). Furthermore, on several occasions (e.g., 23 October, 1936 h, 20.9° C), we observed male #2 and frog #3 sitting on the same branch, < 0.50 m apart, without exhibiting any kind of aggression even though the close proximity of both frogs may have resulted in intraspecific competition for food. The non-aggressive behavior of male #2 towards frog #3 may also indicate that adults are more tolerant of younger frogs.

On 18 October (1900 h, 3.8° C) after several days and nights of cold weather (2.0-7.0° C), we observed male #4 nearly buried in moist, organic material in his resident knothole cavity with only a portion of his back and eyes exposed. Male #2 was found in his resident knothole cavity completely submerged in tannin-colored water. On 19 October (1745 h, 6.1° C) and 20 October (1330 h, 11.7° C) both frogs were observed again in their respective cavities. By 21 October (1210 h) the air temperature had warmed considerably (21.4° C) and male #2 was now sitting on the rim of the knothole; male #4 was no longer inside his cavity, his whereabouts unknown.

Frogs were not observed in knothole cavities after mid-November when the mean high temperature for the month was 0.4° C. Thus, gray treefrogs apparently do not use knothole cavities as hibernation sites. On 10 December (1500 h, -0.6° C) an unmarked adult male (not weighed or measured) was found 20 m from the edge of the study site, hibernating under 8 cm of moist sod. During the cold spell of October, daytime air temperatures inside the cavities of the three knotholes ($\bar{X}$ = 5.7° C, SD = 0.74) were not appreciably warmer than air temperatures directly outside ($\bar{X}$ = 5.1° C, SD = 0.95). Thus, frogs would not gain a significant temperature advantage by hibernating inside knothole cavities.

During our searches of the understory and canopy during October, we located two metamorphs from the 1989 breeding season (3 Oct., 1930 h, SVL = 13 mm, mass = 0.2 g; 22 Oct., 2200 h, SVL = 25 mm, mass = 1.6 g). Both frogs were located 3.0 m above ground on a horizontal tree branch with a hollow cavity. The small size and logistics of the entrance to the cavity prevented examination to determine if frogs were using this cavity as a daytime resting site. Roble (1979, 1985*b*) found that metamorphs of gray treefrogs in Wisconsin and Kansas, respectively, rarely ascended into trees to forage prior to their first hibernation. More data are needed to determine if foraging in trees by first-year metamorphs is a general phenomenon at our study site.

It was apparent during this study that gray treefrogs exhibit some degree of site fidelity as they almost always returned to their resident knothole cavity after nightly foraging bouts. Furthermore, on 20 April 1990, male #1 and male #2 were located in the knothole cavities they occupied the previous autumn. These frogs, however, vacated their cavities after the first breeding chorus of 1990 (29 April). For unknown reasons, gray treefrogs did not occupy the knothole cavities observed in this study during the 1989 or 1990 breeding seasons (mid-April to mid-August). It was apparent that males at our study site ascended high into trees (> 8 m) during the breeding season. Thus, the knothole cavities used by gray treefrogs in this study may have been too low to the ground.

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PSEUDOCOPULATION IN *Lepidodactylus lugubris*

The mourning gecko, *Lepidodactylus lugubris*, is a widespread species that occurs throughout the Indo-Australian Archipelago and Oceania. Because of this species' apparent propensity for colonization, many populations, particularly those of Australia and the islands in the Pacific Basin, have been attributed to either historical or pre-historical human-aided dispersal (Cogger 1985; Gibbons 1985). Probably enhancing this ability to disperse is parthenogenesis (Cuellar and Kluge 1972), a process that potentially allows a single female to be a founder. Ineich (1988) showed that populations of *L. lugubris* in French Polynesia are actually a complex of unisexual clones, bisexuals, and hybrids. Populations of *L. lugubris* on Guam are all parthenogenetic females but are composed of two morphotypes most closely resembling Ineich's clones 'A' and 'C'. In our sample, 76% are the clone 'A' type, and the remainder, clone 'C'. Despite our biological and distributional grasp of *L. lugubris*, few behavioral studies have been conducted. This paper will describe a portion of the behavioral repertoire of clone 'A'.

From November 1988 to July 1990, we observed three species of gekkonids (*Gehyra mutilata, Hemidactylus frenatus,* and *L. lugubris*) in a house in the village of Malojloj, Inarajan Municipality, Guam, Mariana Islands. On 7 August 1989 at 1835 h we noticed three *L. lugubris* in close proximity on an inside wall adjacent to an open window. The largest of the geckos approached and climbed onto the back of a second, orienting itself parallel to the second. No biting was observed and both were tail-waving (Marcellini 1977) . The superior (male-like) individual firmly grasped the inferior (female-like) individual behind the forelimbs with her forefeet. The female-like gecko then raised her tail (still waving) and exposed her vent. The male-like gecko then swung its tail and vent beneath the female-like's and cloacal apposition resulted. This position was held for less than two minutes when we apparently disturbed the behavior by using a flash during photographing. The female-like gecko immediately disengaged and moved several feet away (behind a picture on the wall and probably out of sight of the male-like gecko) and the male-like gecko then displayed apparently at us and assumed and 'arch-back' agonistic stance (Marcellini 1977) at a 90° angle to us. During the entire pseudocopulatory episode, the third individual remained ca. 30 cm from the two pseudocopulators and exhibited tail-waving.

A distinct vocalization was associated with the pseudocopulatory event. Immediately prior to our noticing the three participants, a series of very soft, evenly spaced (about one second interval) "chucks" was heard. These vocalizations continued throughout the pseudocopulatory event but we were unable to discern which of the three geckos was calling. We have also heard these vocalizations in association with four other incidents of intraspecific interactions in which mounting but not pseudocopulation was observed. These latter incidents closely resemble what Werner (1980) termed 'apparent homosexual behavior' and are possibly what Brown and Sakai (1988) observed and regarded as dominance interactions.

Both geckos were collected. The male-like *L. lugubris* (Michael J. McCoid, Private Collection, MJM 1173) had a SVL of 44.1 mm and contained two vitellogenic follicles 5.7 mm diam. The female-like gecko (MJM 1174) was 40.6 mm SVL and contained two non-vitellogenic follicles 1.6 mm diam. Any conclusions on the relationship of ovarian cycle to behavior (Moore et al. 1985) are precluded because of the sample size.

A second pseudocopulation was observed 1 July 1990 at 2000 h. Both geckos appeared to be clone 'A' types but almost immediately disengaged and fled when a light was turned on. Because of the observational brevity of the encounter, neither female was collected and no vocalizations heard. Pseudocopulation has also been observed in other populations of *L. lugubris*. David Crews (pers. comm.) recorded pseudocopulation on Coconut Island, Hawaii and I. Ineich (pers. comm.) observed this behavior in French Polynesia. In two instances, the latter person noted that the pseudocopulators were clone 'A' types.

Pseudocopulation has been documented in other lizards. Crews and Fitzgerald (1980), Moore et al. (1985), and Crews et al. (1986) suggested that pseudocopulation was closely tied to ovarian stage and was hormonally mediated in teiid lizards. They, along with Gustafson and Crews (1981), also suggested that pseudocopulation may enhance egg output. Brown and Sakai (1988) indicated that pseudocopulation may occur in *L. lugubris* and reported a social component to egg production. Recently, Paulissen and Walker (1989) questioned the role of pseudocopulation in teiids and suggested that it may be an artifact of captivity.

While the relationship between pseudocopulation and vocalization may be equivocal, our observations of agonistic interactions (ca. 20 person-hours) did not include the above described call. The only vocalization associated with the agonistic interactions was similar to that described by Marcellini (1977) as Single Chirp and may function as a release or escape call in intraspecific encounters. Since we began this study, ca. 400 person-hours have been invested and only

two pseudocopulatory events observed. Importantly, though, vocalizations similar to those associated with pseudocopulation and mounting can be heard nightly at the study site, suggesting that the relatively rare events observed are, in fact, very common in *L. lugubris*. Our observations, both visual and acoustic, on free-living *L. lugubris* suggest that pseudocopulation may be an important component of the behavioral repertoire of, at least, clone 'A'.

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DANGEROUS TO MAN? A RECORD OF AN ATTACK BY A BLACK CAIMAN (*Melanosuchus niger*) IN GUYANA

The black caiman (*Melanosuchus niger*) is a large crocodilian and the largest of the Neotropical caimans. Verifiable records indicate that this species attains a total length (TL) of at least 4 m, and possibly 5-6 m (MacCreagh 1961; Medem 1981; Thorbjarnarson and McIntosh 1987). Black caiman are distributed throughout the Amazonian drainage, although populations also occur in coastal French Guiana and Guyana, and are classified as endangered throughout all range states (Groombridge 1982). The principal causes of the decline of this species have been unrestricted large-scale hide hunting and the incompatibility with domestic livestock and humans (Plotkin et al. 1983). It is this last aspect, the relative danger to humans posed by the presence of black caiman, that I discuss in this paper.

Although any crocodilian longer than 2 m TL is capable of inflicting serious or fatal wounds to humans, only two of 23 species of Crocodilia are regularly reported as being predators of humans. These are the Nile (*Crocodylus niloticus*) (Graham and Beard 1973) and saltwater crocodiles (*C. porosus*) (Webb et al. 1978). Two additional species, the mugger crocodile (*C. palustris*) (Deraniyagala 1939) and the American alligator (*Alligator mississippiensis*) (Pooley et al. 1989) have also been implicated in attacks on humans. While it is important to recognize the potential for dangerous encounters between most crocodilians and humans, management decisions must be tempered by the probability of such occurrences.

The large size and formidable appearance of adult black caiman have inspired fear and earned them the reputation of being possible predators of humans (Reese 1923; Guggisberg 1972; Caras 1975; Medem 1981; Pooley et al. 1989), although few records of authenticated attacks by this species are available. Thurn (1883:130), commenting on the crocodilians of Guyana, wrote "They are rarely harmful to man, though one occasionally hears stories of how an arm or leg has been snapped off by one of these reptiles....Generally when lying, basking, on the surface of the water the cayman is a sluggish animal, and it is not dangerous to bathe, in shallow water, close by them, if the bather only keeps his eye upon them and is prepared to run as soon as the cayman seems about to move." Bates (1863:294-295) earlier observed black caiman populations at a time of pristine abundance during 11 years of field investigation in the Amazon basin. He remarked on "...the timidity or cowardice of the alligator," stating that "He never attacks man when his intended victim is on his guard; but he is cunning enough to know when this may be done with impunity...." Bates went on to describe how a besotted native, ignoring warnings of the presence of a large black caiman, went to bathe at Caiçara, Brazil, and was promptly seized and drowned by the animal. A second, unsuccessful attack on a young boy that occurred in the 1890s is described by MacCreagh (1961:188-189), who also recounted bathing harmlessly in the presence of black caiman. These are the sole authenticated literature records of attacks by a black caiman of which I am aware aside from the questionable, colorful account of Norwood (1958:192-195, 1960:iv). In a highly adventurous tale reminiscent of Indiana Jones, Norwood describes how his Amerindian guide and solesurviving prospecting companion succumbed to attacks by 'alligators' while thrashing through the swamps delirious and near death from snake bite near the headwaters of the Essequibo River in southcentral Guyana. The stated size of one of the killed 'alligators' was 15', sug-

gesting *M. niger*. While surveying Guyanese caiman populations, I learned of an actual witnessed attack on a human by a black caiman.

In June 1989, I visited Apoteri (4°00'N, 58°36'W), a small (est. pop. about 300) Macusi Amerindian village on the middle Essequibo River, Guyana. While there, I interviewed 18 year old Augustine Alfred who was attacked and badly mauled by a black caiman in the Essequibo River during December 1982 and subsequently lost most of his left arm. Augustine was 11 when the attack occurred; he was bathing and swimming with a friend near shore at dusk. While playing and splashing, his friend dove and grabbed him. Augustine then dove and made a similar gesture toward his friend and surfaced. His friend resubmerged and the next Augustine knew, he was seized on the upper left arm by the caiman and shaken vigorously back and forth. The suddenness of the attack at first led him to think that his friend was again teasing him. Augustine apparently went into an immediate state of shock and didn't remember feeling any pain from the attack, nor were he or other observers able to estimate the size of the caiman. Luckily, his uncle was nearby in a canoe and witnessed what was occurring. His uncle promptly paddled and rammed his canoe into another stationary canoe tethered near the two boys. That action appeared to startle the caiman and it released its hold on Augustine. Augustine was taken to safety and was found to have his upper humerus broken and protruding at both ends and hanging by badly torn flesh. The village radioed for help and Augustine was airlifted the next morning to the public hospital in the capital city Georgetown. Surgeons were unable to repair the damage and amputated the lower 3/4 of Augustine's left arm, after which he spent two months in the hospital recuperating.

Following the attack on Augustine, Apoteri villagers set baited shark hooks and caught and killed about 20 *M. niger* up to 3.7 m TL. Although black caiman had previously taken village dogs at Apoteri and downriver at Kurupukari village, this was the only attack on a human within living memory of village elders. The fact that this instance occurred at twilight and was preceded by raucous splashing undoubtedly contributed to the attack. It is impossible to determine whether the reaction by the caiman was a foraging or territorial defensive response. Certainly the size of a young boy is comparable to the sizes of larger prey items such as fish [e.g., arapaima (*Arapaima gigas*)] or river turtles (*Podocnemis expansa*). However, the incident occurred during the courtship season, and the possibility that the attack was territorial in nature cannot be rejected.

My own experience with wild black caiman indicates that they are most unaggressive compared to other crocodilians and can be readily approached. I was able to census large adult animals (>3m TL) routinely at a distance of 1-2 m in a rubber dinghy, where I was very vulnerable to attack, with no response other than seeming curiosity by the spotlighted caiman. It is this behavior that has historically made black caiman particularly vulnerable to human exploitation (Magnusson 1982).

Is, then, the black caiman dangerous to humans?

Potentially, yes; in reality, no. Even granting imprudent human behavior, the odds of an attack by this species are infinitesimally small. The bad reputation and fear inspired by this species have been unjust and only served to promulgate its demise and counter conservation efforts. The presence, per se, of large adult black caiman in areas inhabited by humans does not warrant the removal of those animals. In localities where *Melanosuchus* populations are recovering the occurrence of a potential nuisance animal near human settlements should be evaluated on an individual basis by pertinent management authorities. Appropriate recommendations include live capture and removal for captive breeding, translocation for restocking, or lastly, selective culling - in that order. The purported incompatibility of black caiman with humans is more perceived than real and should not be accepted as a ruse by hide industry proponents to allow renewed harvesting of this still endangered species. Optional controlled harvest management should be instituted only after well documented population parameters have been studied and the species is accepted by international bodies as no longer endangered.

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Publication Announcement

THE REPTILES AND AMPHIBIANS OF THE CIMARRON NATIONAL GRASSLANDS, MORTON COUNTY, KANSAS

Joseph T. Collins & Suzanne L. Collins

with Photographs by the Authors

This booklet defines the reptile and amphibian diversity of the Cimarron National Grasslands, and includes accounts of the 31 species known to reside there. The text accounts contain standard common names, characteristics, size and size maxima, habits and habitats, when the species was first discovered in the Grasslands, current abundance, and reproduction and food preferences. The introduction contains a summary of herpetological explorations in Morton County, a checklist of the herpetofauna, and remarks on their threatened status. A complete bibliography is included. There are 32 color photographs of amphibians and reptiles, and eight color photographs which display the rugged beauty of this wilderness area in extreme southwestern Kansas. *viii + 60 pages, 40 color photographs, 3 figures. January 1991.*

Price $7.00 postpaid. Make checks payable to U. S. Forest Service. Orders may be sent to U. S. Forest Service, Cimarron National Grasslands, 242 Highway 56-E, P. O. Box J, Elkhart, Kansas 67950 USA.

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King for bringing the account of MacCreagh to my attention. This paper is Journal Series No. R-00741 of the Florida Agricultural Experiment Station.

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A GECKO NEW TO THE UNITED STATES HERPETOFAUNA, WITH NOTES ON GECKOES OF THE FLORIDA KEYS

Human impact on the environment of the Florida Keys has been severe, with extensive destruction or alteration of natural habitats. In spite of this, or perhaps because of it, these islands have proved fertile ground for the establishment of introduced species of lizards of the family Gekkonidae.

Wilson and Porras (1983) listed five species of introduced gekkonids, *Sphaerodactylus argus, S. elegans, Gonatodes albogularis, Hemidactylus turcicus and H. garnotii.* These species have established populations on one or more of the islands comprising the Florida Keys. The Mediterranean gecko, *Hemidactylus turcicus*, confined to edificarian habitat, and the parthenogenetic Indo-Pacific gecko, *H. garnotii*, are probably widespread among those keys linked by the interisland highway. Based on collections made in April of 1989 and 1990, we review the status of populations of *Gonatodes albogularis*, the two introduced and one native species of *Sphaerodactylus*, and report the establishment of a sixth exotic species of gecko on one of the Upper Keys.

The nominate subspecies of the reef gecko, *Sphaerodactylus n. notatus* is native to the south east coastal ridge of mainland Florida and the Florida Keys (Conant 1975; Lazell 1989). Our collections indicate that this species remains common throughout the larger Upper and Lower Keys. In 1989 we collected it on Key Largo (CAS 172078-79), Grassy Key (CAS 172080-82), and on Key West (CAS 172079-102). In 1990 we again collected it on Key West (CAS 174328-29), 174333), on No Name Key (CAS 174324, 174332), and sighted it on Duck Key.

Populations of the ocellated gecko, *Sphaerodactylus argus*, may be in decline. Since first reported from Key West (Savage 1954) there have been only infrequent reports on individual specimens. Wilson and Porras (1983) reported on a specimen collected on Stock Island in 1977, and Love (1978) collected another specimen in Key West. We have failed to collect specimens of this gecko on the Lower Keys.

The ashy gecko, *Sphaerodactylus elegans*, though less common than *S. notatus* in the western Lower Keys, is fairly abundant. We collected *S. elegans* in both 1989 (CAS 172091-92) and 1990 (CAS172330-31) along with *S. notatus* in Key West, on a large vacant lot on US Hwy. 1. In addition to Key West it has been reported from Big Coppit Key (Wilson and Porras 1983), Boca Chica Key (Duellman and Schwartz 1958) and Lazell (1989) lists Summerland Key, Stock Island, Middle Torch Key and Little Torch Key for which museum specimens exist and reports sightings on Cudjoe, Big Pine and Spotswood Keys. In 1990 we also collected this species on Raccoon Key (CAS 174334-36) between Key West and Boca Chicka Key.

The introduced yellow-headed gecko, *Gonatodes albogularis* has only been reported from Key West, and was apparently at one time abundant. However, Wilson and Porras (1983) stated that since 1971 it has become rare with no reported collections since that date. We collected specimens and observed additional individuals in 1989 (CAS172089. 174327) and again in 1990. These collections were made on the same vacant lot noted in the paragraph above.

Crawl Key is located east of Marathon Key and connected to it by the US highway 1 causeway. Most of this small key south of the highway is completely paved. However, a small area (ca. 0.2 ha) of scrubland dominated by Brazilian pepper (*Schinus terebinthifolis*) and Australian pine (*Casuarina equisetifolia*) remains. Two of us (RL and PGF) collected in this area on 20 April 1990, by removing the loose bark from the dead fallen trees, and by turning fallen dead tree trunks, loose rocks and wood trash. We secured five medium sized geckos from beneath these objects and an approximately equal num-

ber evaded capture. The five captures consisted of two non-gravid females (CAS 174852-53), two males (CAS 174850-51), and one female (CAS 174849) containing two large eggs. No other lizards were collected in this immediate area. We did not examine buildings immediately adjacent to our collection site and so cannot say whether this gecko is occupying buildings on Crawl Key. We recognized that these geckoes were probably *Hemidactylus* species but were neither *Hemidactylus turcicus*, nor *H. garnotii*. We later identified them as *Hemidactylus mabouia* (Moreau de Jonnès), a very widely distributed species native to Africa, but found also in the Malagasy Republic, South American and the Caribbean.

In tropical Africa *H. mabouia* is widespread south of the Sahara (Fitzsimons 1943; Kluge 1969). In South America it ranges in a costal belt from Montevideo, Uruguay to Georgetown, Guyana, and from the headwaters of the Amazon river in Peru and Ecuador and throughout its length in Brazil (Kluge 1969). In the Caribbean it is known from all of the larger and many of the smaller islands of the Lesser Antilles (listed in Schwartz and Henderson 1985), in the Greater Antilles it is common on Culebra, Vieques, and Mona Islands, Puerto Rico, and is also found at Guantánamo, Cuba (Kluge 1969, Rivero 1978).

The presence of *Hemidactylus mabouia* in the New World has often been ascribed to human-mediated introductions from Africa during the slave trade. Kluge (1969) provided evidence and argues for natural rafting as the means by which *H. mabouia* colonized South America and the Lesser Antilles. The Greater Antilles populations are probably recent accidental introductions by man. Wilson and Porras (1983) believed that all five previously reported species of exotic geckoes occurring in the Florida Keys arrived in Florida as accidental stowaways during the shipping of plants, produce or other commodities. The presence of *Hemidactylus mabouia* in the Florida Keys is most likely the result of an accidental introduction. Stowage on commercial shipping is not the only possible means of introduction, as pleasure craft frequently ply between the Florida Keys and the islands of the Lesser Antilles. *Hemidactylus mabouia* is common in the Virgin Islands where American registered pleasure craft are likely to call. The location of the Florida Keys population of *H. mabouia* makes its association with pet trade releases improbable.

The common name for *H. mabouia* is the house gecko or tropical gecko. The habitat of *H. mabouia* appears similar throughout its range. On Mona and Culebra Islands, Rivero (1978) found it in warehouses, and under planks, loose rocks, and loose concrete slabs. In Surinam it has been collected from the walls of brick houses and from human habitations in the forest (Hoogmoed 1973). In Africa it has been found in the roofing of native huts, on settlement houses, in hollow trees (Fitzsimons 1943; Pienaar 1978). The habitat in which we collected *H. mabouia* on Crawl Key is entirely in keeping with those reported above. The high density of *H. mabouia* at the Crawl Key collecting site and the presence of a female with well developed eggs suggest that the species is well established in this small area. Further collecting efforts in the surrounding areas will define the range occupied by this lizard in the Florida Keys.

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SCALELESS SNAKES AND A BREEDING REPORT OF SCALELESS *Elaphe obsoleta lindheimeri*

Snakes, by definition, are scaled reptiles. Most species possess large symmetrically arranged head scales, small dorsal body scales, and enlarged undivided ventral plates corresponding more or less with the number of vertebrae (Bellairs and Attridge 1975). Because their numbers, shape, and arrangements are fairly constant for each species, scales are used as recognition characters by taxonomists. Specific scale differences are generally assumed to have a heredi-



Figure 1. Rat snake, *Elaphe obsoleta lindheimeri*, with congenital absence of dorsal scales.

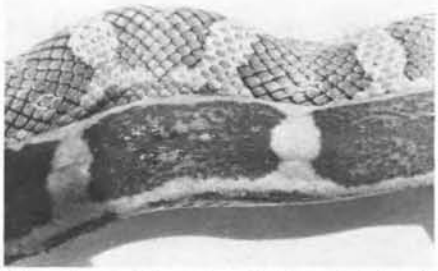


Figure 2. Scaleless rat snake *E. o. lindheimeri* , compared with normal. Dorsal view of body showing vestigial scales.

tary basis, and once fixed during development, scale number and distributions do not undergo further changes (Klauber 1956).

SCALELESS SNAKES

Snakes with anomalous and/or missing scales occur, but attract little notice unless the anomaly is marked or the number of missing scales greatly exceeds normal variation. Several species of snakes with complete, or nearly complete, absence of dorsal scales have been collected. In a *Thamnophis couchi* collected at King's Canyon, CA, the ventrals were reported as undivided (Stickel 1942). A *Pituophis melanoleucus catenifer*, collected near Oakland, CA, had ventral plates that were split into two to four sections (Licht and Bennett 1972). Two *Nerodia sipedon sipedon*, collected in Harford County, MD, possessed ventral scutes (Bennett and Licht 1975). A *Thamnophis sirtalis sirtalis*, collected in Chatham County, GA in 1989, was 584.2 mm long, lacked all dorsal scales, and had normal ventral plates. It is preserved in the Savannah Science Museum collection (R. Moulis, pers. comm.). A juvenile *Lampropeltis calligaster rhombomaculata* was collected in Lafayette County, MA in 1978, and is still living. The ventrals are divided medially by a deep cleft extending the entire length of the body, and the subcaudals are divided and separated (K. Fahey, pers. comm.).

Scaleless snakes have occurred in experimental situations. Albino *Crotalus atrox* in a captive breeding situation at the Atlanta Zoo produced two litters that contained young with no dorsal scales and undivided ventrals. Littermates included normal snakes and snakes with other scale anomalies (D. Herman, pers. comm.). Normal *Elaphe guttata guttata* in a captive breeding situation produced five scaleless young with undivided ventrals, along with normal offspring. All five died before hatching and had other anomalies, including ocular abnormalities and schistosomia (abnormal fusion of the ventral body wall,

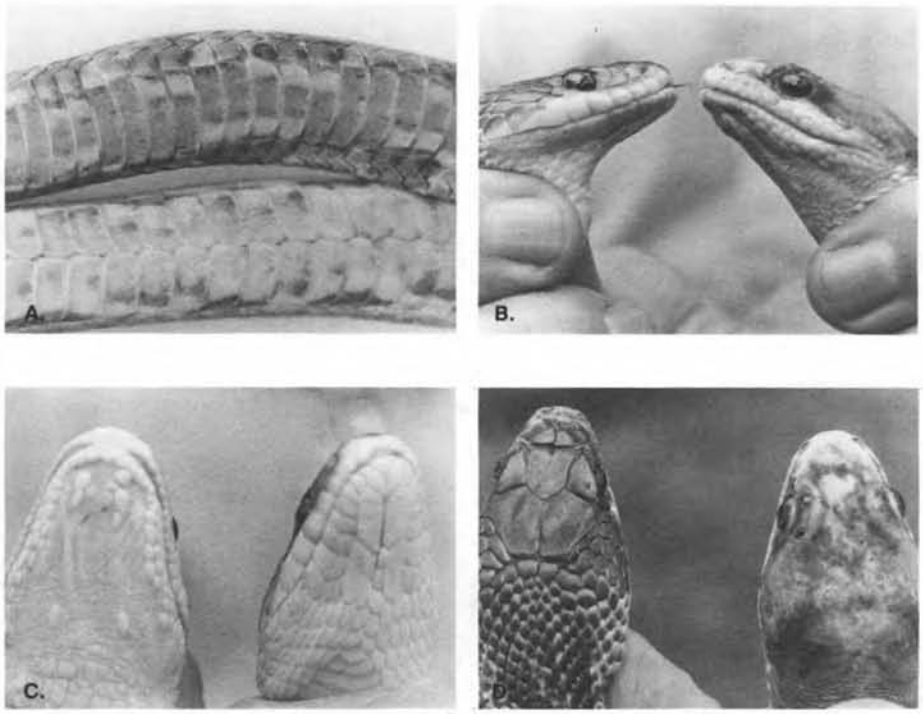


Figure 3. Scaleless rat snake, *E. o. lindheimeri*, compared with normal. A. Ventral scales B. Labials C. Chin D. Top of head.

resulting in doubling over effect) (S. Barten, pers. comm.). Murphy et al. (1987) have summarized literature reports of anomalous scalation patters in snakes.

SCALELESS *Elaphe obsoleta lindheimeri*

In 1985 we obtained a male and female scaleless juvenile *Elaphe obsoleta lindheimeri* on a breeding loan from the Bronx Zoo. The snakes hatched from a clutch of five eggs deposited by one of a group of normal snakes acquired as food for cobras. The other three hatchlings were normal. Collecting data for the mother snake are unavailable. The male scaleless snake survived; the female died of cryptosporidiosis before reaching maturity.

The surviving male snake (Fig. 1) is brick red with smoky black blotches. Aside from tiny partially developed scales scattered over the back and sides, it lacks all dorsal scales (Fig. 2), and the skin is velvety. Any loose skin forms fine wrinkles. The ventral and sub-caudal scales are divided medially by a deep longitudinal cleft (Fig. 3A), resulting essentially in two parallel rows of ventrals the entire length of the body. Occasional ventrals are further broken into several segments, but not divided. Several rows of small irregular upper and lower labials are present (Fig. 3B). The chin is naked except for scattered small irregular scales (Fig. 3C). Aside from two tiny supraoculars on the left side, no scales are present on the dorsal head (Fig. 3D).

In 1987 the scaleless male was bred to a normal female. Four fertile eggs were laid, producing three females and one male, all with normal scales and color pattern. The F1 females were sexually mature by 1989, and were bred to the original scaleless male, resulting in clutches of six, seven, and ten eggs. The 23 eggs produced four male and five female scaleless hatchlings. The scale defects of the hatchlings are essentially identical to those of the original scaleless male. The remaining 14 hatchlings had normal scales, color, and pattern.

In 1990 two F1 females were bred to a sibling, resulting in 22 eggs. All hatched, producing one male and four female scaleless phenotypes, and 17 normal hatchlings.

DISCUSSION

Though many herpetologists have never seen a scaleless snake, the few existing records suggest that a mutation for scalelessness may exist within many populations. The scaleless snakes that we have examined, and the ones described in reports, are grossly similar from the standpoint of lacking nearly all dorsal and lateral scales, but are divided into two subsets on the basis of the ventral scales: those with normal ventrals and those with ventrals divided by a longitudinal cleft. Not all may be caused by an identical mutation. Since naked snakes are conspicuous and apt to be reported when

found, the small number of records may indicate a low rate of mutation for the anomaly, low survival rate for scaleless individuals, or both.

The scaleless snakes in our possession move and feed normally. They often have difficulty with ecdysis because of the absence of scales. The thin cast has no "stretch" and the casting skin often rolls into a constricting band at the thick midsection of the snake. A normal spectacle is present.

We have had the opportunity to examine a total of 16 young scaleless *E. o. lindheimeri*, the original two from the Bronx Zoo, the nine hatched in 1989, and the five hatched in 1990. All have been much more colorful than normal, most of them suffused throughout with orange rust color. We do not believe, however, that these snakes have a color anomaly. Individual *E. o. lindheimeri* specimens vary considerably in color, largely as a result of differences in quantity and quality of red and yellow pigments in the skin that is visible between the scales. The color of the entire skin of the scaleless mutants is not obscured by a thick keratin layer and appears to be a continuation of the color that is exposed between the scales of a normal snake when the skin is stretched, as after the snake has ingested a large meal.

The results of the matings suggest in this instance that the absence of dorsal scales, with associated anomalies of scutellation, is caused by an autosomal recessive gene mutation. Homozygous recessive genotypes may then be resulting in monomorphic scaleless phenotypes. Aside from individual variation in color, all mutants are essentially identical. The mutant genes are not debilitating, and do not appear to be linked to lethal or debilitating genes. This may not be true of all mutations affecting scutellation. No snakes have been dissected to see if any visceral or skeletal defects accompany this mutation.

The scaleless mutation reported in this paper has no apparent evolutionary significance, but may be more than a curiosity. It could have potential scientific relevance.

Snakes' scales are cutaneous adaptations formed by backward overlaps of epidermis and the outermost dermis. This differentiation starts as soon as the embryo is covered by a distinct primordial epidermis and dermis. The normally unpaired ventrals arise as paired structures, fusing at the midline prior to birth or hatching (Maderson 1985). These developmental events between fertilization of the ovum and birth or hatching are better known than understood. This peculiar and startling mutation promised to provide a model for the study of the molecular and genetic basis of snake embryology.

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USE OF ROAD-KILLED AMPHIBIANS IN ALLOZYME ELECTROPHORESIS

Each spring populations of amphibians emerge from hibernation to migrate, court, and breed. Many of these animals are killed on roads en route to the breeding ponds. Heavy road mortality has prompted conservation measures such as bypass tunnels and warning signs to motorists, but their use is relatively rare, and highway mortality continues unabated in most places. Although road-killed specimens can provide valuable distributional data, the carcasses are usually severely damaged and of little use to investigators utilizing traditional morphological techniques in systematic and population biology.

In recent years, biochemical techniques have been applied increasingly to systematics and population genetic studies of amphibians. Many spring-breeding amphibians that meet their demise on roads are killed in cool, moist conditions that are conducive to the preservation of proteins and nucleic acids. Thus, these animals could provide much genetic information; large sample sizes are often needed, particularly for the estimation of population genetic parameters. The preservation of amphibian populations is receiving increasing and much-needed attention in the literature and popular press, and efforts to reduce the number of road-killed specimens certainly should continue. In the meantime many valuable data might be garnered from specimens that would be otherwise wasted, thereby reducing collecting pressure on the remaining animals.

In an ongoing study of allozyme variation in a population of Amb*ystoma texanum* near Lawrence, Kansas, I utilized road-killed and live-caught specimens. Herein I compare the utility of both types of specimens in the analysis of enzymatic proteins.

METHODS AND MATERIALS

Specimens were collected March-April 1989 and January-March 1990 from roads adjoining the Baker Wetlands area of Haskell Bottoms south of Lawrence, Kansas. Conditions were wet, and temperatures ranged from 2 to 5°C. Road-killed specimens were stored at -20°C within 1 h of collection or placed on dry ice and stored at -70°C. Live-caught specimens

were stored at 4°C until used, then anesthetized with a 10% benzocaine ointment (Maximum Strength Orajel) applied topically (Altig 1980). Liver and muscle were dissected when possible, but often skeletal muscle was the only tissue available from road-killed carcasses.

Liver and muscle tissues were homogenized together (when both tissues were available) in an equal volume of 0.01 M Tris-0.001 m EDTA-0.001 M mercaptoethanol. Centrifugation was at 20,000 x g for 20 min at 4°C, and the supernatants were pipetted into clean microfuge tubes. Two buffer systems and 12% horizontal starch gels were used to resolve 14 presumptive gene loci: lithium hydroxide, 20 V/cm for 5 h (S-Aat-A, Pep-A, Pep-B, Pgm-A); and Tris-citrate, pH 8.0, 12 V/cm for 5 h (M-Acoh, Gpi-A, M-ldh-A, S-ldh-A, Ldh-A, Ldh-B, M-Mdh-A, S-Mdh-A, M-Mdhp-A, S-Mdhp-A). Enzyme nomenclature is based on the recommendations of Buth (1983) and the International Union of Biochemistry Nomenclature Committee (1984) and enzyme abbreviations follow Murphy et al. (1990). Briefly, a prefix of "S" refers to a soluble/cytoplasmic locus, whereas "M" refers to a locus expressed in the mitochondria. The next group of letters is an enzyme abbreviation and is capitalized when referring only to the enzyme and not to particular loci (e.g., LDH). The last letter describes the order in which loci of a particular enzyme were formally described, with "A" referring to the first. Staining followed standard methods (Selander et al. 1971; Harris and Hopkinson 1976). Electrophoresis was at 4°C. Homogenates from road-killed and live-caught specimens were placed on the same gel for comparative purposes. Locus homologies were determined in a previous study of tissue specificity and relative mobility (Titus, unpubl. data).

RESULTS AND DISCUSSION

In most cases no difference in overall activity of enzymes was seen for the road-killed versus live-caught specimens. Exceptions to this pattern were in cases where only skeletal muscle was available from a road-killed specimen and the enzyme in question displayed higher activity in liver than in skeletal muscle (e.g., S-lcdh-A).

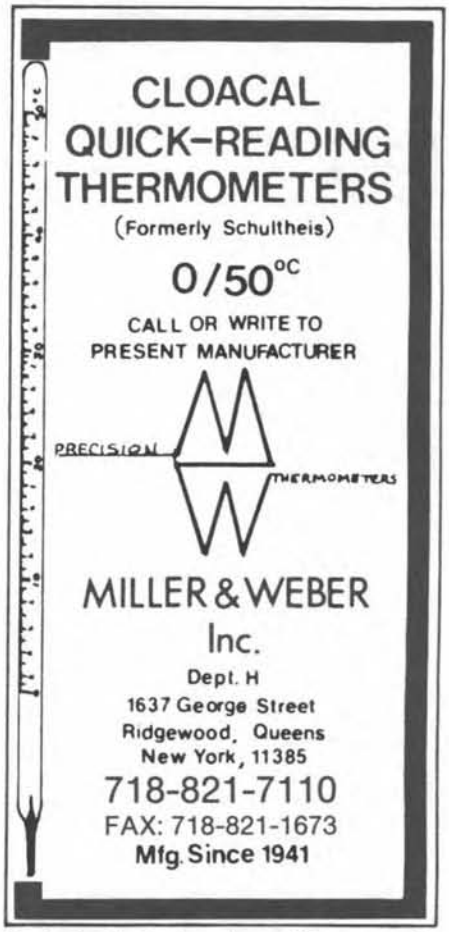
Secondary isozymes are bands resulting from various posttranslational modifications to the secondary or tertiary structure of a gene product; production of these multiple bands depends on numerous nongenetic factors involving both in vivo and in vitro processes (summarized by Richardson et al. 1986; Murphy et al., 1990). Secondary isozymes migrating anodally to the major isozyme were present in both road-killed and live-caught samples in S-Aat-A, Gpi-A, M-ldh-A, S-ldh-A, Ldh-B, M-Mdh-A, S-Mdh-A, Pep-A, and Pgm-A. The presence of secondary isozymes made the scoring of polymorphisms difficult at times, especially NAD+-dependent malate deydrogenases (MDH) and peptidases (PEP). However, no differences were seen in the amount or number of secondary isozymes in the two tissue treatments.

The elapsed time between death of the specimen and ultracold storage was the only difference between tissue treatments in this study, and seems to have made no difference in the amount or number of secondary isozymes produced. Previous work indicates that both the amount and number of secondary isozymes is reduced for many loci when homogenates are prepared from fresh rather than frozen tissues and when homogenates are used immediately without freezing (Titus, unpubl. data). Exceptions to this pattern are the malate dehydrogenase loci, which seem to produce secondary isozymes regardless of the tissue treatment. Thus, one advantage of utilizing live-caught specimens is the ability to homogenize and electrphorese fresh tissue without freezing, thereby avoiding the production of secondary isozymes that could interfere with the interpretation of polymorphic loci. However, this effect is negated as soon as tissues and/or homogenates are frozen, regardless of the collecting method.

Results indicate that if road-killed specimens are collected and frozen within 2 h of death, they provide metabolic enzymes equal in quality to those from tissues frozen from live-collected animals. The maximum amount of time that carcasses can be left without freezing has not been determined for these loci, but it is expected that this time will vary with the conditions under which the animals die, particularly temperature, as well as the species and loci that must be scored (Richardson et al. 1986). As with tissues from live-collected specimens, the investigator(s) should make every effort to minimize the time between death of the specimen and freezing of tissues. Driving roads during a breeding migration with a container of liquid nitrogen or dry ice is particularly effective in this regard.

Perhaps the major disadvantage of using road-killed animals in isozyme studies is the limited number of tissues available from some specimens. Often the viscera are missing or destroyed, and the only available tissue is skeletal muscle. Many amphibian isozymes exhibit tissue-specific expression and cannot be scored from skeletal muscle (e.g., S-Acoh-A [kidney and liver], Adh-A [liver], Iddh-A [liver, kidney, and gut], and M-Sod-A [heart]). These problems can be minimized by choosing loci that exhibit high activity in a variety of tissues (e.g., M-Acoh-A, Gpi-A, Pep-A, Tpi-A,and Mpi-A) or are strongly expressed in skeletal muscle (e.g. Ck-A), which is nearly always available.

Road-killed amphibians can be a valuable source of biochemical data and should be considered by biochemical geneticists as an alternative to live-caught specimens. Use of these specimens in biochemical analyses is not without problems, particularly with regard to the limited number of tissue types sometimes available. However, the needs of a study can often be met or supplemented without adding collecting pressure to a population already reduced by automobile traffic.



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MATING AND COMBAT IN *Varanus indicus*

The mangrove monitor has a range encompassing extreme northern Australia, New Guinea, and the Caroline, Marshall, and Mariana Islands (McCoy 1980). Introduced populations are known from the western Carolines (Uchida 1966). *Varanus indicus* is the only species of monitor in the Marianas and occurs on most islands except the northernmost three (Asuncion, Maug, and Fallaron de Pajaros) (G. Rodda, pers. comm.).

The best studied populations occur on Guam, the southernmost island in the Mariana chain. Dryden (1965) reported on food habits and feeding behavior and Wikramanayake and Dryden (1988) described reproductive ecology. Because of the reproductive cycle observed by Wikramanayake and Dryden and the size disparity between the sexes (males are larger than females), these authors predicted that copulation should occur in the latter part of the wet season to early dry season and that it may involve male-male combat and forced inseminations of females.

We herein report on observations of copulation and combat in *V. indicus* on Guam. Most observations were made viewing from inside a house in the village of Malojloj, Inarajan Municipality. Terminology is based on Auffenberg (1988). Monitors were abundant and could be observed virtually daily, sunning or actively foraging, at or adjacent to the study site.

Monitors were unmarked and sex was assumed from behavior described below.

Episode 1. On 15 April 1990 at 1405 h, a [ca. 1 m total length (TL) female] monitor was observed sunning on the top of an exposed rock face immediately adjacent to the house. At 1406 h, a second (ca. 1 m TL male) monitor appeared at the base of the rock face and slowly climbed up tongue-flicking and head-probing the surface of the rock. When the second monitor encountered the first, he immediately mounted the female and exhibited chin-rubbing on the dorsum of the female's head and forequarters. They were oriented head-to-head and slowly rotated in a clock-wise direction through 360° over a 18 min period with the male remaining superior. Two copulations were noted during this period, each lasting about 30 sec. During each intromission, the male rhythmically pumped 10 to 15 times. Intromission was immediately preceded by the male scratching the female with his right hind foot on the base of her tail. The female would then raise her tail and cloacal apposition resulted with the male using the right hemipene.

At 1424 h, a third monitor (ca. 1.2 m TL male) appeared at the base of the rock face and moved slowly up towards the copulators. The first male climbed off the female and faced the second male. Both displayed lateral compression and gular extension. The first male lunged at the second, larger male and ended up lateral to him in a parallel, head-to-tail position. Both simultaneously bit the base of the tail of the other, rolled down the rock face into the vegetation and out of view. The female remained quiescent during this combat and at 1426 h moved out of view behind the rock.

At 1430 h, the second male monitor (presumably the victor) reappeared at the base of the rock face and climbed slowly up the rock face and out of view (1435 h) behind the rock. At 1440 h both the female and and the second male moved up the far side of the rock and reappeared at the crest. Observations were somewhat obscured by vegetation but by 1452 h, at least two copulations had occurred.

The second (larger) male spent less time mounted on the female than the first (smaller) male. Most of the time, the second male was side-by-side to the female. During copulations, the second male used his hind feet to anchor himself and the female to the rock surface. Observations were terminated at 1452 h.

Episode 2. On 4 July 1990, 1655 h, a male (ca. 1.3 m TL) monitor was observed mounted on a female (ca. 0.9 m TL). Both were quiescent. On 5 July 1990, 0620 h, the presumed same two individuals were seen, still mounted, on the rock crest where they may have spent the night. At 1530 h, after a nine hour hiatus, observations were resumed and both monitors were on the rock face. Both remained quiescent until 1620 h when the female moved slightly and the male responded by chin-rubbing her head and forequarters. This sequence was repeated at 1645 h and 1647 h. At 1648 h the male exhibited a series of 10 to 15 pelvic thrusts lasting ca. one min, but there was no cloacal apposition. At 1653 h, the female attempted to move from beneath the male. The male maintained a straddling position and both moved clockwise through 360° over a six min period. At that time, the male scratched the base of her tail with his right hind leg and the female raised her tail, exposing her vent. Cloacal apposition

immediately followed. At 1704 h, the male disengaged, remained straddling the female, and both were quiescent until 1720 h. At that time, and at 1730 h and 1743 h, she moved slightly, each time eliciting chin-rubbing by the male on her head and forequarters. At 1744 h, the female rapidly moved from beneath the male, voided 2-3 cc of white fluid from her vent, and disappeared over the rock crest. The male rapidly followed.

The copulatory events seen on 15 April 1990 and 5 July 1990 occurred at the height of the dry season and at the beginning of the wet season, respectively. Additionally, a copulation was observed on 27 January 1989 (different site), at the beginning of the dry season. Wikramanayake and Dryden (1988) predicted reproductively associated copulation from September through January (late wet season to early dry season) which is contrary to our observations of copulatory behavior over the entire dry season and into the wet season (January through July). Our observations of mating correspond with the period of highest female Gonadosomatic Index (January to May) (Wikramanayake and Dryden 1988).

The predictions of male-male combat and forced inseminations by Wikramanayake and Dryden are supported by our observations. The second (larger) male in Episode 1 and the male in Episode 2 both maintained apparent physical and behavioral control of the females. Since the first male in Episode 1 was approximately the same size as the female and did not anchor himself or the female during copulations, size may be a factor in forced inseminations. In addition, size of males may play a role in combat as the larger of the two males in Episode 1 was the victor. During periods of the year with no mating behavior (February through December), size is important in dominance interactions. For example, control of basking sites is related to size as the largest individuals bask in the morning and are replaced by sequentially smaller individuals through the day.

ACKNOWLEDGMENTS

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TECHNIQUES

A TECHNIQUE FOR THE SAFE RESTRAINT OF VENOMOUS SNAKES

The various methods of immobilizing venomous snakes all have their associated advantages and limitations. The use of clear cast acrylic tubing (Murphy 1971) has become common over the years because of its safety and the reduced stress to the snake. A survey by the SSAR Zoo Liaison Committee (Zantzinger 1986) showed that 21 of the 30 submitting institutions routinely utilize acrylic tubing to restrain venomous snakes.

A problem often associated with this type of restraint is the coercing of the snake into the tube. Murphy (1971) recommended placing the snake on a smooth surface, directing the tube over the snake's head, then lightly tapping the posterior section of the snake's body. Almandarz (Fowler 1978a) and Fowler (1978b) suggested locating the tube along the intersection of a wall and floor to direct the snake into the tube. Both of these techniques are effective but offer limited control over the snake and can prove to be time consuming.

In 1982, at the Oklahoma City Zoo, we developed an alternative method of coercing a venomous snake into a tube that increases control, is time efficient, and eliminates many other variables that can interfere with this restraint process. This technique has been used successfully on numerous viperids, elapids (*Aspidelaps*, *Micrurus*, and *Naja* less than 1.5 m in length), and opisthoglyphs (*Boiga* and *Oxybelis*).

A sanitized plastic trash barrel is selected of a size that allows the snake to move freely about the bottom but does not enable it to climb upward over the rim. The barrel is filled with water (ambient temperature) to a depth that prevents the snake from securing itself on the bottom. A depth of ca. 12 cm is appropriate for many viperids. After the snake is placed in the barrel, an appropriate size tube (Murphy 1971, Fowler 1978) is placed over the snake's head, gently submerging



Figure 1. Placing the tube over the head of the snake causes the snake to move up the tube.



Figure 2. After the snake has moved a safe distance up the tube, immobilize the snake by simultaneously grasping its body and the tube.

it (Fig. 1). The acrylic tube should be a diameter that prevents the snake from turning backwards inside the tube, and the tube end opposite the snake can be closed with a plug for additional safety. Finding this submerged position undesirable, the snake searches upward into the tube, securing itself on this firm surface. When the snake has reached a safe position midway up the tube, its midbody should be firmly and gently pressed against the barrel bottom to prevent further movement. The snake's body and tube end should be grasped firmly with one hand (Fig. 2). The tubed snake then can be removed from the barrel for the desired procedure.

The snake is released from the tube by simply letting it move out of the tube into its enclosure while the tube is held with tongs.

This technique has been utilized at the Oklahoma City Zoo and Louisville Zoological Garden for the last eight years without incident. We believe that it increases handler safety, decreases trauma to the snake, and saves time that otherwise would be spent in coercing the snake to move into the tube.

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A METHOD OF SEXING THE DUMERIL'S MONITOR, *Varanus dumerili*

Many varanids lack sexually dimorphic external characteristics other than differences in size (length and mass) (Wikramanayake and Dryden 1988). This paper reports attempts to find a reliable, non-invasive technique for sexing *Varanus dumerili* at the National Zoological Park, Washington, DC. Previously, sex determination in this species was based on agonistic or submissive behaviors (Horn 1985; Davis et al. 1986) or hemipenial eversion in males. Snake sexing probes were used as described by Frye (1981), but the results were not consistent with observations of copulation and egg laying.

Initially, the pelvic area and anterior aspect of the tail were radiographed in an attempt to demonstrate keratinized or calcified hemipenial spicules or more pronounced ossifications similar to those seen in *V. komodoensis* by Shea and Reddacliff (1986). Four adult *V. dumerili* (1820-1980 g mass; 46.9-47.8 cm SVL) were radiographed on detail radiography casettes. However, no discernable evidence of hemipenial structures was revealed.

Fiberoptic laparoscopy was then used to make conclusive sex determinations. Each monitor was tracheally intubated and placed on inhalation anesthesia utilizing isoflurane (Aerrane®, Anaquest, Madison, WI) delivered in oxygen with a non-rebreathing T-piece apparatus. The animals were maintained at a surgical plane of anesthesia to achieve adequate relaxation for the procedure. Anesthesia also protected the lizards from possible trauma that might be incurred from the instruments while struggling under manual restraint, and it also protected the delicate instrumentation from damage.

A Wolf® (Richard Wolf Medical Instruments, Rosemont; IL) 2.7 mm arthroscope and its associated cannula were introduced at the cloacal opening and directed caudally at the lateral aspects, on each side of the cloaca, to enter the inverted hemipenes in a male or the cloacal evagination in a female. Observation of these structures was achieved by inflating them with air using a hand-bulb apparatus attached to the arthroscope cannula. Insufflation creates a visual space for viewing the structures in both sexes. Marked differences between them were demonstrated.

In the two males, insertion and inflation permitted cannulation of inverted hemipenes to a depth of 3.5-4.0 cm, and observation of the folded, expansive mucosa and any small mucosal structures on the walls of the inverted hemipenes. A constriction was encountered at a depth of 1.5 cm, but because of the anesthesia it was possible to pass the narrowing with the arthroscope and visualize the expanded cavity beyond.

In the two females, the pouches rapidly tapered caudally, only permitting insertion of the 2.7 mm-diameter arthroscope

to a depth of 1.5-2.0 cm. In all cases a narrow extension of each cloacal evagination, ca. 1.0-1.5 cm in depth, could be seen beyond this point.

Minton and Minton (1973) described the cloacal evagination in a group of dissected female *V. bengalensis*. They noted that the evaginations resembled those of males, but were about half the size. In *V. dumerili*, the distance corresponded to the arthroscopic penetration depth of the cloacal evagination in females. A 2 mm snake sexing probe would tend to stop at the hemipenial constriction in males, especially without anesthesia or inflation, and a male could easily be mistaken for a female.

Fiberoptic laparoscopy, allowing visualization of the cloacal evagination, can be used to make accurate sex determinations in adult *V. dumerili*. This technique may also be applicable to other varanids, as well as to other families of lizards where sex determination is difficult. It offers an alternative to coelomic laparoscopy, which visualizes the gonads.

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A NEW METHOD OF TRAPPING GOPHER TORTOISES (*Gopherus polyphemus*)

Two methods are normally used for capturing gopher tortoises (*Gopherus polyphemus*), other than picking them up when away from their burrows: 1) the use of a pitfall or bucket trap buried at the burrow entrance and 2) the use of a long, stiff piece of wire to hook and pull tortoises from their burrows. Both methods have drawbacks. Pitfall traps can be laborious to install. If not checked frequently, they can subject tortoises to heat stress from exposure to direct sunlight, and can cause drowning if the traps fill with water (E. Wester, pers. comm.). Also, installation of the bucket may damage tortoise eggs, which are often laid at the burrow entrance. Pullers can injure or kill tortoises due to damage by the wire; furthermore, they require experience and skill to be used successfully.

During the summer of 1988, we designed and tested a new trapping method for capturing gopher tortoises. The materials for building a trap are: one 1" x 2" x 8' board (the "arm"), two 1" x 2" x 8" boards (the "pivot supports"), one 2" x 2" x 4' board (the "upright"), three 5/16" x 3 1/2" standard bolts and nuts, six 5/16" standard flat washers, one net (see below for type), three eyescrews (#6 or #8), one spring (Century C355 or equivalent), nylon seine twine (#18, about 28 feet), and one trigger (see below).

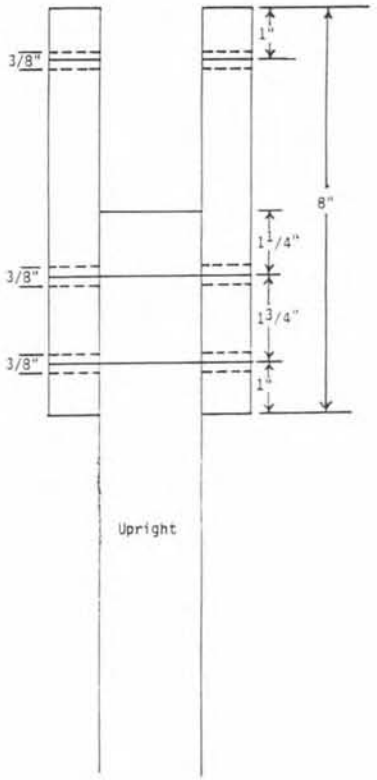


Figure 2. Top of "upright" of gopher tortoise trap showing placement of holes.

The basic design of the trap involves a spring-loaded arm which, when released by a trigger mechanism activated by the tortoise, raises a net to form a purse around the subject; the arm pivots on an upright that has been driven into the ground beside an active burrow (Fig. 1). One end of the upright is cut at a sharp angle to facilitate driving into the ground. The pivot is formed by attaching two 1" x 2" x 8" boards (the "pivot supports") to the top

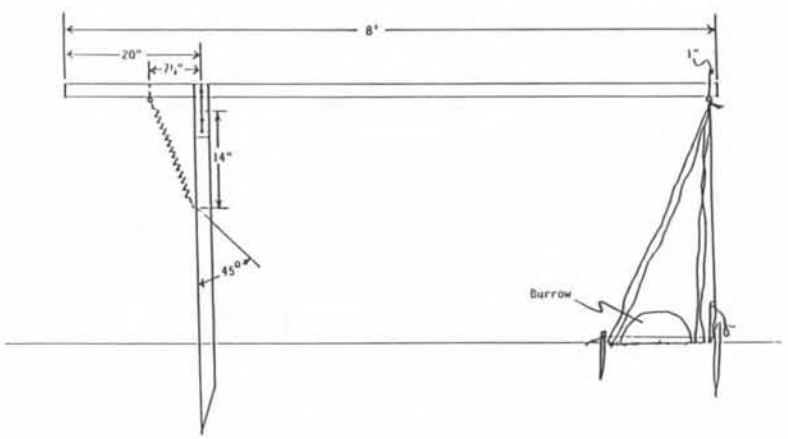


Figure 1. Gopher tortoise trap.

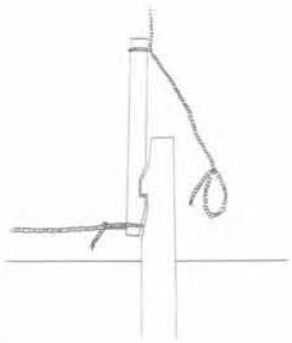


Figure 3. Trigger mechanism for gopher tortoise trap

end of the upright (Fig. 2). The supports are attached by drilling two 3/8" holes 1 3/4" in each pivot support, with the first hole being made 1" from the end of the support. A third 3/8" hole is drilled 1" from the opposite end of each pivot support. Two 3/8" holes are drilled in the upright at 1 1/4" and 3" from the top. Bolts are then used to attach the pivot supports to the upright so that each support extends 4" beyond the upright.

Attachment of the arm (1" x 2" x 8') requires drilling a 3/8" hole 20" from one end. The arm is placed between the pivot supports and a bolt serves as a hinge.

To install the spring, a small hole is drilled into the bottom of the short end of the arm 7 1/2" from the hinge. Another hole is drilled into the side of the upright 14" from its top and facing the previous hole (at a 45° angle). An eyescrew is then screwed into each hole until flush, and the spring is hooked between the eyescrews. A final hole is drilled 1" from the end of the arm opposite the spring, and an eyescrew is installed. The trigger and net attach to this "trigger eyescrew."

Many types of net can be used for the trap. Of all nets tried, a piece of volleyball net (4" nylon mesh) proved to be most reliable. We found 1/4" woven seine nets to be unsatisfactory. The tortoises had a tendency to destroy the net and escape. However, the volleyball net had a tendency to untie, and small juveniles passed through its large mesh. Another possibility may be a tennis net, though this is untried.

The net is cut into a square, 36" on a side. Four strings (63" long) are attached to the net, one to each corner. A small loop (0.5" diameter) is tied at one end of each string. Beginning at one corner, a string is woven along one margin of the net and the loop is tied securely to the adjacent corner (we found this helpful to prevent the loop from "backsliding" through the weave). The next string is passed through this secured loop, woven, and attached as the previous string. The final two strings are placed similarly. The free ends of the strings are tied together and attached to the trigger eyescrew. The result is a net that will close at the top when the strings are pulled.

To construct a trigger, two relatively straight pieces of wood (we used tree branches) are cut, one ca. 5" long and 0.5" in diameter and the other ca. 12" long and 1" in diameter. Both are notched as in Fig. 3. The short piece of wood (the "upper trigger") is attached to a length of string 36" long, and the opposite end tied to the trigger eyescrew. Excess string should be left dangling from the upper trigger to allow a loop to be tied (Fig. 3). This will help facilitate setting the trap. The unnotched end of the long piece of wood (the "lower trigger") is whittled to a point to allow it to be driven into the ground. An additional 4' string serves as the "trip string."

Setting the trap involves five steps.

1) The trap is first "gauged" for proper placement beside the burrow using the following method: The spring is disconnected to allow the arm to swing freely. The upright is set to one side of the burrow entrance so that when the arm is flexed, the net spreads across the apron of the burrow and the trigger eyescrew is directly above the far edge of the net. This will assure that the tortoise cannot avoid contact with the net and trip string.

2) Once properly gauged, the top two bolts of the pivot support are removed and the bottom bolt loosened to allow the two pivot supports to swing out of the way. The upright is then driven into the ground until sturdy. The pivot supports and the arm are rebolted to the upright and the spring reconnected.

3) Next, the lower trigger is driven into the ground directly below the upper trigger. Once driven in, the trigger should be tested for a proper fit as in Fig. 3. At this point, the height of the closed net is adjusted so that the bottom of the net is about 3" off the ground when the arm is fully extended. This will assure that the net closes properly around the tortoise. The tension on the net should also be such that the netted tortoise can crawl partially into its burrow to avoid heat and predators. This is tested by pulling down on the net strings with the trap arm extended. The maximum tension should not exceed 2 lbs. Adjustments for too much or too little tension can be made by relocating the spring eyescrews on the upright and the arm.

4) The arm is swung down and the loop of the upper trigger placed on the lower trigger to act as a safety. The net is spread over the burrow apron, with one corner of the net inserted into the burrow entrance. Sand is spread over the net, particularly in the entrance, to prevent the tortoise from crawling under the net.

5) Finally, a non-slip loop is placed at one end of the trip string, and the other end is wrapped around an anchor stick. The anchor is pushed into the ground on the opposite side of the net from the trigger. This prevents the tortoise from missing the string when exiting its burrow. The trip string is stretched over the net and the trigger is set, this time with the loop in the trigger (Fig. 3). The safety loop is placed out of the way beside the trigger or temporarily tied to the upper trigger.

A snare trap can be set in 10 to 15 minutes with practice. Advantages of this type of trap are: minimization of overheating and drowning (none of the tortoises captured by this method in 1988 or 1989 appeared heat stressed), reduction of disturbance to eggs and/or hatchlings, and elimination of possible changes in the drainage pattern of the burrow (all potential problems with pitfall traps). Disadvantages include slight damage to the top of the burrow entrance, caused by rubbing of the strings attached to the net on the burrow entrance. Occasionally, abrasions by the net appear on the gopher tortoise's legs. However, we have never observed these abrasions to result in bleeding. Since this device is highly visible, it may be subject to theft or vandalism in some areas. We suggest checking traps every 3-4 hrs. and more often during extremely hot weather, since a net may snag a low-hanging limb or a root and prevent the tortoise from entering its burrow.

Thirty-one tortoises were caught during the summer of 1988. Three were recaptured the same year with the same trap while one was captured three times using this method. Of 47 tortoises captured in 1989, 18 were recaptured once and three were recaptured twice that year. Seventeen of the tortoises captured in 1989 were previously captured in 1988. The tortoises do not appear to become trap wary with this new design.

ACKNOWLEDGMENTS

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THE USE OF BACTINE® IN THE TREATMENT OF OPEN WOUNDS AND OTHER LESIONS IN CAPTIVE ANURANS

The long-term maintenance of amphibians (frogs and toads of the genera *Rana*, *Bufo* and *Hyla*) for research has been an on-going problem in our lab because animals acquire abrasions, sores and open wounds, infection from periodic sampling by maxillary-vein puncture, and injuries from banging their snouts against the holding containers while in captivity. Open sores that become infected may be fatal.

Bactine® (Miles Laboratories Ltd.), a topical antiseptic available in liquid atomizer or canned aerosol for human use, was found to be of great value when applied liberally to open wounds on anurans. The active ingredients, 0.14% w/w benzalkonium chloride and 2.6% w/w lidocaine hydrochloride in a non-alcohol base, are non-irritating to frogs and toads and appears to promote rapid healing. Bactine® is applied to the lesion once daily until a layer of white scar tissue covers the wound. Treated animals are housed separately.

We were first inspired to the potential effectiveness of this product by a report in which a cat suffering from massive electrical burns was successfully treated using this substance (Breathed 1986).

Bactine® appears to be effective for deep facial wounds, in which the maxillae, nasal and fronto-parietal bones become exposed, as well as wounds to the extremities, such as torn skin or lost digits. We observed that scar tissue formation began as early as one day post-treatment with the antiseptic, and cases of severe oedema were alleviated as rapidly, with no apparent adverse effects to the animals. Without Bactine®, wounds healed much more slowly, taking weeks or months, often becoming severely infected. This product has also been useful in cleansing the skin of anurans for aseptic venipuncture and may be useful in preparation for surgery without the use of stringent antiseptics (such as isopropyl alcohol) which are injurious to the thin, sensitive skin of frogs and toads. Although a controlled experiment is not presented in this report, three years of casual observation on the survival of field-collected anurans suffering from the aforementioned injuries before the therapeutic use of Bactine® was initiated, clearly shows a marked improvement in recovery rate with treatment. Other workers may wish to conduct controlled studies with the product to verify our observations.

With amphibian populations dwindling (Barinaga 1990), these animals are becoming increasingly difficult to find in the field. The novel application of this antiseptic for use on animals held in captivity may help to reduce the number of fatalities due to infection, and increase the number of anurans returned to the field after they have been studied.

ACKNOWLEDGMENTS

We are grateful for the support of Dr. Sherwin Desser and funding from NSERC (PGS I Scholarship to DM). We also thank Mark Siddall and Lisa Waldhauser for their comments on this manuscript.

Animals are maintained in accordance with the guidelines of the Canadian Council on Animal Care (1980-1984).

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A SIMPLIFIED FLUORESCENT MARKING TECHNIQUE FOR IDENTIFICATION OF TERRESTRIAL SALAMANDERS

Fluorescent pigments (available from Scientific Marking Materials, Inc., Box 24122, Seattle, Washington, 98124 and Radiant Color Co., 2800 Radiant Ave., Richmond, California 94804) were first used to mark vertebrates by Phinney et al. (1967), and have been used to mark salamanders by Ireland (1973, 1989), Taylor and Deegan (1982), and Nishikawa and Service (1988). Ireland (1973) applied fluorescent pigment paste with a hot probe. Taylor and Deegan (1982), Nishikawa and Service (1988) and Ireland (1989) applied pigments with gas pressure. These methods tagged terrestrial salamanders for up to one year and larval salamanders for shorter periods of time. These methods require either a heat source or compressed gas and a spray gun to induce superficial skin lesions and apply pigments. The pigments become incorporated into the disrupted skin and result in an identifiable tag when illuminated with UV light. Equipment necessary for pigment application may be cumbersome to use in some field situations. I have developed a simplified technique for application of fluorescent pigments to terrestrial salamanders in the field.

This method requires pigments, glycerol, blunt probe and a typewriter print eraser in the form of a pencil. The eraser point should be flattened to produce a disk equal to the size of the tag desired. I have found 1-2 mm diameter marks to be most efficient for *Eurycea longicauda* and 2-3 mm diameter marks most efficient for *Ambystoma maculatum*. I place the shaped end of the eraser on the surface I wish to mark and spin it two to three times with light downward pressure. The pressure should be enough to allow the abrasives imbedded in the rubber matrix of the eraser to slightly roughen the skin surface without damaging deeper skin tissues. I then dip the blunt probe in glycerol and then in the pigment which adheres to the glycerol and gently press on the skin surface disrupted by the eraser. By combining the 12 colors of pigment currently available to different parts of the body a large number of salamanders may be individually marked.

I have found this method will result in tags that can be readily distinguished on terrestrial salamanders for one season

(spring through fall) but is not reliable for longer periods of time. This method does not work well on aquatic larvae, possibly due the the rapid growth and subsequent loss of skin during this life stage. This technique does not appear to adversely affect salamanders. Although this method does not produce a long term tag, as does acrylic polymer injections (Woolley 1973; Cecil and Just 1978), it is simple, rapid and suitable for studies that require short term recognition of individuals.

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GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of a species' range, and thereby permit a more significant interpretation of its biology.

These geographic distribution records will be accepted in a **standard format** only, and all authors *must* adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in Collins, 1990, *Standard Common and Current Scientific Names for North American Amphibians and Reptiles, Third Edition*, Herp. Circ. 19: 1–41), LOCALITY (use metric for distances and give precise locality data), DATE (day-month-year), COLLECTOR, VERIFIED BY (*cannot* be verified by an author — curator at an institutional collection is preferred), PLACE OF DEPOSITION (where applicable, use standardized collection designations as they appear in Leviton et al., 1985, *Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology*, Copeia 3: 802–832) and CATALOG NUMBER (required), COMMENTS (brief), CITATIONS (brief), SUBMITTED BY (give name and address in full — spell out state names — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged; institutional collection records will receive precedence in case of conflict). A good quality color slide or photograph may substitute for a preserved specimen *only* when the live specimen could not be collected for the following reasons: it was a protected species, it was found in a protected area, or the logistics of preservation were prohibitive (such as large turtles or crocodilians). Color slides and photographs *must* be deposited in a university or museum collection along with complete locality data, and the color slide catalog number(s) must be included in the same manner as a preserved record. All specimen identifications *must* be verified by another authority (not one of the authors). Before you submit a manuscript to us, check Censky (1988, *Index to Geographic Distribution Records in Herpetological Review: 1967–1986*) to make sure you are not duplicating a previously published record.

Please submit any geographic distribution records in the **standard format only** to: Joseph T. Collins or Darrel Frost, Section Coeditors, Museum of Natural History — Dyche Hall, The University of Kansas, Lawrence, Kansas 66045–2454 USA. Short manuscripts are strongly discouraged, and are only acceptable when data cannot be presented adequately in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic Distribution: *Lampropeltis triangulum multistriata*. SSAR Herp. Review 25: 198.

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). USA: MISSOURI: Randolph Co: Rudolph Bennitt Wildlife Area. 27 August 1987. C. A. Phillips & E. J. Routman. Verified by mitochondrial DNA restriction pattern. UIMNH 95479 (11 larvae). Several hundred larvae were seined from a small pond; new county record; extends range ca. 30 km N of nearest record in Boone County. Ozark Co: Caney Mtn. Wildlife Area. 14 August 1987. C. A. Phillips & E. J. Routman. Verified by mitochondrial DNA restriction pattern. UIMNH 95480 (7 larvae). Several larvae were siened from a small pond; new county record (Johnson 1987, The Amphibians and Reptiles of Missouri).

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AMBYSTOMA TIGRINUM (Tiger Salamander). USA: MISSOURI: Howell Co: Tingler Lake. 3 May 1988. C. A. Phillips & E. J. Routman. Verified by Thomas Uzzell. UIMNH 95481-2 (adults) and UIMNH 95483 (3 larvae). Several larvae were seined from a large sinkhole lake; new county record (Johnson 1987, The Amphibians and Reptiles of Missouri).

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BATRACHOSEPS WRIGHTI (Oregon Slender Salamander). USA: OREGON: Hood River Co: Near rimrock on south-facing hillside above an unnamed tributary to Hood River, between National Forest Primary Route 44 (Dufur Mill Road) & National Forest Secondary Route 4410 (High Prairie Road), SW 1/4 NE 1/4 Sec. 21, T2S, R10E. 27 April 1990. J. Kirk. Verified by Joseph J. Beatty and Robert M. Storm. OS 90003. Wasco Co: Ridge top N Ramsey Creek, 0.1 km N National Forest Primary Route 44 (Dufur Mill Road), 0.4 km west of eastern boundary of Mt. Hood National Forest, SE 1/4 Sec.12, T2S, R11E. 26 May 1990. J. Kirk. Verified by Joseph J. Beatty and Robert M. Storm. OS 90002. Wasco Co: S side of Fifteenmile Creek canyon below rimrock, 0.8 km east of eastern boundary of Mt. Hood National Forest, N 1/2 Sec. 19, T2S, R12E. 28 May 1990. J. Kirk. Verified by Joseph J. Beatty and Robert M. Storm. OS 90001. Wasco Co: Near rimrock on S side of Eightmile Creek canyon, 6.0 km northwesterly via National Forest Secondary Route 4460 & Forest Route 4460/017 from National Forest Primary Route 44 (Dufur Mill Road), S 1/2 Sec. 2, T2S, R11E. 26 May 1990. J. Kirk. Verified by Joseph J. Beatty and Robert M. Storm. OS 90004. R. Forbes discovered the Ramsey Creek site on 7 October 1982. J. Kirk discovered the other sites and collected the voucher specimens on the dates indicated.

Voucher specimens also have been deposited in the Portland State University Collection of Vertebrates (PSU 3276-3279). These are the first records of any plethodontid from east of the crest of the Cascade Mountains in Oregon (other than in the Columbia River Gorge), and also are the first records of any plethodontid from Wasco County (Nussbaum et al. 1983, Amphibians and Reptiles of the Pacific Northwest, Univ. Press Idaho, 322 p.).

Submitted by **JAMES J. KIRK**, 4805 SE 58th Avenue, Portland, Oregon 97206, and **RICHARD B. FORBES**, Department of Biology, Portland State University, P.O. Box 751, Portland, OR 97207-0751, USA●

DESMOGNATHUS FUSCUS FUSCUS (Northern Dusky Salamander). CANADA: PROVINCE OF QUEBEC: MRC DE L'ERABLE, Canton de Chester, 1.9 km S and 3.8 km W of Trottier, Ruisseau Gobeil, 46° 02' N, 71° 44' W, 27 May 1985, 1000-1030hr, 1 specimen (spec) found, NMC 27404(1). MRC DE LOTBINIÈRE, 3.4 km S and 4.5 km E of Saint-Sylvestre, Rivière Filkars, 46° 19' N, 71° 10' W, 27 May 1985, 1355-1420hr, 1 spec, NMC 27409(1). MRC DES ETCHEMINS, Canton de Ware, 3.6 km S and 3.0 km E of Saint-Luc, unnamed tributary of Petite Rivière Etchemin, 46° 28' N, 70° 26' W, 28 May 1985, 1250-1320hr, 4 spec, NMC 27422(4). All specimens collected by W.F. Weller & J.E. Cebek. Verified by F.R. Cook, National Museums of Natural Sciences (NMC).
The above records extend range 170 km to the NE (Weller 1977. Can. Field-Nat. 91(3): 299–303), and 90 km to the N (Denman 1981. Herp Review 12(3): 82–83), and significantly fill the gap between records to the south reported in Weller (1977) and Denman (1981), to the east (DeGraaf and Rudis 1983. Univ of Massachusetts Press, Amherst, Mass), and to the S of two records from near the base of the Gaspé Peninsula (Cook 1984. National Museum of Natural Sciences, National Museums of Canada. 200pp). Number of specimens observed is indicated after the locality. Specimens were deposited in the preserved collection at the National Museum of Natural Sciences (NMC), Ottawa. Number after museum acronym refers to catalogue number, and, in parentheses, number of specimens retained. Notes and coloured photographs of habitats ar filed at NMC.

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EURYCEA BISLINEATA (Northern Two-lined Salamander). CANADA: PROVINCE OF QUEBEC: MRC DE L'ERABLE, Canton de Chester, 7.5 km S and 3.4 km W of Norbertville, Ruisseau Roux, East of Arthabaska, 46° 02' N, 71° 51' W, 27 May 1985, 0820-0840hr, 4 specimens (spec) seen, NMC 27401(3). MRC DE L'ERABLE, Canton de Chester, 4.8 km S and 2.8 km W of Chester-Nord, Rivière Gosselin, 46° 02' N, 71° 48' W, 27 May 1985, 0910-0930hr, 11 spec, NMC 27402(10). MRC DE L'ERABLE, Canton de Chester, 1.9 km S and 3.8 km W of Trottier, Ruisseau Gobeil, 46° 02' N, 71° 44' W, 27 May 1985, 1000-1030hr, 2 spec, NMC 27405(2). MRC DE L'ERABLE, Canton de Halifax, 2.5 km N and 2.3 km E of Vianney, Rivière Fortier, 46° 04' N, 71° 36' W, 27 May 1985, 1100-1130hr, 33 spec, NMC 27406(27), ROM 16515-19(5). MRC DE L'AMIANTE, Canton de Leeds, 1.4 km S and 4.4 km W of Kinnears-Mills, unnamed tributary of Ruisseau Bullard, 46° 12' N, 71° 26' W, 27 May 1985, 1250-1310hr, 25 spec, NMC 27407(22). MRC DE L'AMIANTE, Canton de Thetford, 1.9 km N and 3.8 km W of Saint-Daniel, Rivière de l'Or, 46° 01' N, 71° 13' W, 27 May 1985, 1655-1720hr, 15 spec, NMC 27414(9). MRC DE LOTBINIÈRE, 3.4 km S and 4.5 km E of Saint-Sylvestre, Rivière Filkars, 46° 19' N, 71° 10' W, 27 May 1985, 1355-1420hr, 6 spec, NMC 27410(6). MRC DE ROBERT-CLICHE, 4.6 km W of Saint-Séverin, Rivière Beaurivage, 46° 19' N, 71° 06' W, 27 May 1985, 1430-1450hr, 4 spec, NMC 27411(4). MRC DE L'AMIANTE, Canton de Tring, 5.3 km N and 2.6 km E of Saint-Méthode-de-Frontenac, Ruisseau Dupuis, 46° 05' N, 71° 02' W, 27 May 1985, 1545-1610hr, 2 spec, NMC 27412(1), plus eggs, NMC 27413. COMPTÉ DE BEAUCE, Canton de Shenley, 3.7 km W of Saint-Martin, Rivière Shenley, 45° 57' N, 70° 42' W, 27 May 1985, 1910-1940hr, 29 spec, NMC 27415(16), ROM 16520-24(5). MRC DE LA NOUVELLE-BEAUCE, Canton de Frampton, 5.8 km S and 4.7 km E of Frampton, unnamed tributary of Ruisseau Boulet, 46° 24' N, 70° 44' W, 28 May 1985, 1010-1025hr, 2 spec, NMC 27418(2). MRC DE BELLECHASSE, Canton de Frampton, 1.5 km S and 1.7 km E of Hemison, unnamed stream, 46° 30' N, 70° 41' W, 28 May 1985, 1115-1130hr, 6 spec, NMC 27419(6). MRC DE ROBERT-CLICHE, Canton de Cranbourne, 1.4 km S and 1.4 km E of Saint-Odilon, unnamed tributary of Rivière des Plante, 46° 20' N, 70° 39' W, 28 May 1985, 0940-1000hr, 1 spec, NMC 27417(1). MRC DE BELLECHASSE, Canton de Standon, 3.8 km S and 3.3 km E of Saint-Léon-de-Standon, Rivière des Fleurs, 46° 26' N, 70° 34' W, 28 May 1985, 1155-1210hr, 6 spec, NMC 27420(3). MRC DES ETCHEMINS, Canton de Watford, 0.8 km S and 0.6 km W of Quatre-Chemins, Rivière des Abénaquis, 46° 13' N, 70° 31' W, 28 May 1985, 0850-0915hr, 10 spec, NMC 27416(4), ROM 16525-27(3). MRC DES ETCHEMINS, Canton de Ware, 3.6 km S and 3.0 km E of Saint-Luc, unnamed tributary of Petite Rivière Etchemin, 46° 28' N, 70° 26' W, 28 May 1985, 1250-1320hr, 7 spec, NMC 27423(7). MRC DES ETCHEMINS, Canton de Roux, 1.4 km N and 1.4 km W of Saint-Magloire, Rivière Blanche, 46° 35' N, 70° 18' W, 28 May 1985, 1355-1415hr, 4 spec, NMC 27424(4). MRC DE BELLECHASSE, Canton de Mailloux, 3.2 km S and 3.9 km E of Saint-Philémon, unnamed tributary of Rivière du Pin, 46° 39' N, 70° 24' W, 28 May 1985, 1435-1455hr, 4 spec, NMC 27425(3). MRC DE MONTMAGNY, Canton de Montminy, 3.4 km N and 5.3 km E of Saint-Philémon, Rivière du Nord, 46° 42' N, 70° 23' W, 28 May 1985, 1410-1425hr, 4 spec, NMC 27426 (4). MRC DE MONTMAGNY, Canton de Montminy, 2.8 km S and 6.0 km E of Saint-Paul-de-Montminy, Décharge du Lac Colin, 46° 42' N, 70° 16' W, 28 May 1985, 1540-1600hr, 10 spec, NMC 27427(6). MRC DE MONTMAGNY, Canton de Montminy, 4.0 km N and 0.8 km E of Saint-Paul-Est, Ruisseau Dominique, 46° 46' N, 70° 19' W, 28 May 1985, 1620-1640hr, 3 spec, NMC 27428(2). MRC DE MONTMAGNY, Canton d'Ashburton, 8.0 km N and 5.0 km W of Notre-Dame-du-Rosaire, unnamed stream to Lac Morigeau, 46° 54' N, 70° 27' W, 28 May 1985, 1700-1720hr, 7 spec, NMC 27429(5), ROM 16528-29(2). COMTÉ DE L'ISLET, Minicipalité de paroisse de Sainte Cyrille-de-Lessard, 1.3 km S and 1.6 km E of St-Cyrille-de-l'Islet, Bras Riche, 47° 02' N, 70° 17' W, 29 May 1985, 1730-1745hr, 4 spec, NMC 27436(2). COMPTÉ DE L'ISLET, Municipalité de Sainte-Aubert, 2.3km S and 4.9 km W of Pellerin, Décharge du Lac Chouinard, 47° 08' N, 70° 09' W, 29 May 1985, 1550-1605hr, 1 spec. COMPTÉ DE L'ISLET, Minicipalité de Sainte-Aubert, 0.6 km S and 6.4 km W of Pellerin, Rivière Trois Saumons, 47° 09' N, 70° 10' W, 29 May 1985, 1525-1540hr, 6 spec, NMC 27435(5). COMPTÉ DE KAMOURASKA, Municipalité de Mont-Carmel, 2.9 km N and 2.8 km W of Bretagne, Rivière de la Boutelillerie, 47° 23' N, 69° 45' W, 29 May 1985, 1405-1430hr, 1 spec, COMTÉ DE KAMOURASKA, Municipalité de Mont-Carmel 3.6 km S and 3.4 km E of Eatonville, Décharge du Lac du Loup, 47° 18' N, 69° 38' W, 29 May 1985, 1325-1340hr, 4 spec, NMC 27434(4). COMPTÉ DE KAMOURASKA, Municipalité de Saint-Athanase, 2.2 km S and 2.1 km E of Picard, unnamed stream,

47° 29' N, 69° 28' W, 29 May 1985, 1135-1200hr, 9 spec, NMC 27433(5). COMPTÉ DE KAMOURASKA, Municipalité de ville de Pohénegamook, 0.2 km S and 0.6 km E of Pelletier, unnamed stream, 47° 32' N, 69° 24' W, 29 May 1985 1015-1030hr, 1 spec, NMC 27431(1). COMPTÉ DE KAMOURASKA, Municipalité de ville de Pohénegamook, 2.0 km N and 2.9 km W of St-Eleuthère, Rivière Boucanée, 47° 30' N, 69° 19' W, 29 May 1985, 1055-1110hr, 2 spec, NMC 27432(2). All specimens collected by W.F. Weller and J.E. Cebek. Specimens sent to NMC verified by F.R. Cook, and to ROM by R.D. MacCulloch.

These records close the gap between those to the southwest (Weller 1977. Can. Field-Nat. 91(3): 299-303), to the northeast (Denman and Denman 1985. Herp Review 16(3): 83; and Denman, Schueler, and Weller 1990. Herp Review 21(2): 36-37), and to the east (DeGraaf and Rudis 1983. Univ of Massachusetts Press, Amherst, Mass). Number of specimens observed is indicated after the locality. Some specimens wrre deposited in the preserved collection at the National Museum of Natural Sciences (NMC), Ottawa, and others in the frozen tissue collection at the Royal Ontario Museum (Rom), Toronto. Number after museum acronym refers to catalogue number, and in parentheses, number of specimens retained. Notes and coloured photographs of habitats are filed at NMC.

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GYRINOPHILUS PORPHYRITICUS PORPHYRITICUS (Northern Spring Salamander). CANADA: PROVINCE OF QUEBEC: MRC de l'Erable, Canton de Chester, 1.9 km S and 3.8 km W of Trottier, Ruisseau Gobeil, 46° 02' N, 71° 44' W, 27 May 1985, 1000-1030hr, 7 specimens found NMC 27403 (4 retained). W.F. Weller & J.E. Cebek. Verified by F.R. Cook, National Museums of Natural Sciences (NMC). Extends range 44 km to the NE (Weller 1977. Can. Field-Nat. 91(3): 299-303; see also Cook 1984. National Museum of Natural Sciences, National Museums of Canada. 200pp), and represents the northernmost record in North America. Notes and coloured photographs of habitat are file at NMC.

Submitted by **WAYNE F. WELLER**, 9 Mississauga Road North, Mississauga, Ontario, Canada, L5H 2H5, and **JOSEPH E. CEBEK**, P.O. Box 26, Little Britain, Ontario, Canada, KOM 2CO ●

NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS (Central Newt). USA: MISSOURI: CRAWFORD Co: Huzzah State Forest. 19 March 1988. C. A. Phillips & C. Byron. Verified by Thomas Uzzell. UIMNH 95492 (1 adult). Adults were seined from a small pond; new county record. RANDOLPH Co: Rudolph Bennitt Wildlife Area. 27 August 1987. C. A. Phillips & E. J. Routman. Verified by Thomas Uzzell. UIMNH 95484-7 (adults) and UIMNH 95488 (2 larvae). Aults and larvae were seined from a small pond; new county record. RIPLEY Co: Cupola Pond. 21 July 1988. C. A. Phillips & S. M. Phillips. Verified by Thomas Uzzell. UIMNH 95489-90 (adults) and UIMNH 95491 (4 larvae). Adults were dip-netted from a sinkhole pond; new county record (Johnson 1987, The Amphibians and Reptiles of Missouri).

Submitted by **CHRISTOPHER A. PHILLIPS**, Department of Ecology, Ethology, and Evolution, University of Illinois, Urbana, IL 61801, USA ●

ANURA

RANA PALUSTRIS (Pickerel Frog). USA: ILLINOIS: LEE Co: About 1.5 km NW of Franklin Grove, Franklin Creek (Sect. 13, T22N, R9E). 18 May 1962. L. Polly. Verified b P. W. Smith. Northern Illinois University Collection (NIU-HDW 560). First record for county, and extends the range about 35 km SE from earlier northern localities.

Submitted by **H. D. WALLEY**, Department of Biology, Northern Illinois University, DeKalb, IL 60115, USA ●

RANA SYLVATICA (Wood Frog). USA: WISCONSIN: KEWAUNEE Co: Kewaunee Marsh Wildlife Area (T23N, R23E, Sec 31). 24 June 1990. D. J. Watermolen. Verified by G. S. Casper. Milwaukee Public Museum (MPM 23472). Adult; new county record (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Publ. Mus., 205 pp.).

Submitted by **DREUX J. WATERMOLEN**, Wisconsin Department of Natural Resources, Green Bay, WI 54307, USA ●

RANA UTRICULARIA UTRICULARIA (Southern Leopard Frog) USA: TEXAS: JACK Co: ca. 3 mi E Wizard Wells. 11 June 1990. Clay M. Garrett and Mark R. Mateja. Verified by Jonathan A. Campbell. UTACV A-30751, UTACV A-30753. USA: TEXAS: JACK Co: E jct. US Rt. 380 and FM 1156 (12 mi W & 3 mi S Bridgeport). 11 June 1990. Brian E. Smith and Ann Marie T. Patterson. Verified by Jonathan A. Campbell. UTACV A30752. New county records extending range westward. (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CLAY M. GARRETT**, **MARK R. MATEJA**, **BRIAN E. SMITH**, Department of Herpetology, Dallas Zoo, 621 E. Clarendon, Dallas, Texas 75203, **ANN-MARIE T. PATTERSON**, and **AMY S. BRIDEGAM**, Department of Biology, UTA Box 19498, University of Texas at Arlington, Arlington, TX 76019, USA ●

TESTUDINES

GRAPTEMYS CAGLEI (Cagle's Map Turtle). USA: TEXAS: COMAL Co: 10 km SW of Fisher at Cypress Cove, 21 June 1989. West Texas State University Museum of Natural History (WT 12535), and Guadalupe River, 3 km SSE of Sattler on River Road, 26 July 1989, WT 12539. GUADALUPE Co: 5 km E of Schumansville at the upper end of Lake McQueeny, 20 March 1990, WT 12799. VICTORIA Co: Guadalupe River, 5 km SW of Nursery on FM 447, 28 May 1989, WT 12570, and Guadalupe River at Riverside Park in Victoria, 14 March 1989, WT 12126. KERR Co: Guadalupe River, 3 km SW Comfort on Hwy 27, 25 July 1990, WT 12886. GONZALES Co: 6 m SW of Gonzales on FM 2091 at Wood Lake, 18 March 1989, WT 12512, and 5 km ESE of Belmont on Alternate Hwy 90 at Lake Gonzales, 13 March 1989, WT 12576. All Specimens collected by Dan Porter and Flavius C. Killebrew. All specimens verified by Derl Brooks, Department of Biology and Geosciences, West Texas State University.

All are new county records except the specimens from Kerr and Gonzales Counties. The Kerr County specimen extends the original record 53 km ESE, and the Gonzales County specimen extends the previous record 20 km W (Haynes and McKown 1974, Tulane Stud. Zool. Bot. 18(4): 149). The new county records are from small disjunct populations in their respective counties. Funding for these surveys was from the Texas Coordinating Board's Advanced Research Program (Grant 1157) and a Killgore Research Grant.

Submitted by **FLAVIUS C. KILLEBREW** and **DAN A. PORTER**, Department of Biology and Geosciences, West Texas State University, Canyon, TX 79016, USA ●

GRAPTEMYS KOHNII (Mississippi map Turtle). USA: MISSISSIPPI: RANKIN Co:

Pearl River at Jackson, ca. 2.5 km north of US Rt. 25 bridge (Sec. 20, T6N, R2E). 5 September 1989. R. L. Jones and T. C. Majure. Verified by T. L. Vandeventer. Mississippi Museum of Natural Science (MMNS 2718, adult male). Same locality. 15 October 1990. R. L. Jones and K. R. Macaro. Verified by T. L. Vandeventer. MMNS 2719, adult male. First records from Pearl River (Lohoefener & Altig 1983, Mississippi Herpetology. Mississippi State Univ. Research Center Bull. No. 1, 66 pp.). Given the proximity to residential areas of Jackson, these specimens are believed to be either released captives or the progeny of released captives.

Submitted by **R. L. JONES** and **TERRENCE C. MAJURE**, Mississippi Department of Wildlife, Fisheries, and Parks, Museum of Natural Science, 111 N. Jefferson Street, Jackson, Mississippi 39201 and **KENNETH R. MACARO**, 124 Longmeadow Road, Brandon, MS 39042, USA ●

HYDROMEDUSA TECTIFERA (Tortuga de Rio). ARGENTINA: MISIONES: Oberá Department: Arroyo Chico, environs of Oberá City. February 1961. J. M. Cei, V. G. Roig and Benitez. Verified by R. F. Laurent. Herpetological collection, Instituto de Biología Animal, Universidad Nacional de Cuyo (IBA - UNC Chel, 0210). First record for the Department. The species was previously recorded from Misiones Department of Iguazú, General Manuel Belgrano (Waller & Chébez 1987. Hist. Nat. 7 (5): 53-59) and Leandro N., Alem (Richard & Morgenstern, 1990. SSAR Herp. Review, 21 (2): 39).

Submitted by **ENRIQUE RICHARD**, Instituto de Herpetología, Fundación Miguel Lillo, Miguel Lillo 251, 4000 - Tucumán, República Argentina and Proyecto Tortugas (FVSA), Sección NOA, Rivadavia 105 - 5to "G," 4000 - Tucumán, República Argentina ●

PHRYNOPS HILARII (Tortuga de Laguna). ARGENTINA: CORRIENTES: Goya Department: Santa Lucía river, environs of Goya City. 10 June 1988. Armando Morgenstern. Verified by Raymond F. Laurent. Herpetological Collection, Fundación Miguel Lillo (FML, Chelonii 028, Adult). First definite record with precise locality data known for the province. This species was previously cited for many years (since 1872) in the Corrientes sector of Paraná River (Gray, 1872. Ann. Mag. Nat. Hist. London (4) 10: 463 and Freiberg, 1939. Mem. Mus. Entre Ríos, Zool., 11:3-28), but this river is ca. 650 km long in the province.

Submitted by **ENRIQUE RICHARD**, Instituto de Herpetología, Fundación Miguel Lillo, Miguel Lillo 251, 4000 - Tucumán, República Argentina and Proyecto Tortugas (FVSA), Sección NOA, Rivadavia 105 - 5 to "G", 4000 - Tucumán, Republica Argentina ●

PODOCNEMIS ERYTHROCEPHALUS (Tracaja Piranga). BRASIL: PARA: 3 km upstream from Alter do Chao, Rio Tapajos, Laguna Jurucui; 23 April 1989. Richard C. Vogt & Augusto Fachin. Verified by C. J. McCoy. Adult female 23.5 cm carapace length. Specimen photographed (CMNH 34572), marked, and released; Alter do Chao Laguna Verde, Igaripe' II. 25 November 1989. Pierre Armond, Olga Victoria Castano, Tibisay Escalona, Thierry R. J. Gasnier, Hedelvy Gvada, Barbara Mann, Isnaldo Luiz Melo Da Silveira, Cesar Augusto Monje Carrillo, Ronis Da Silveira, Aydil de Souza Marques, Jose Carlos Paula Raposo, Franklin Rojas Sulrez, Waldemar da Rocha Amazonas Filho, and Richard C. Vogt. Verified by William Magnusson. Adult female 25.5 cm carapace length, with 9 oviducal eggs. Whole blood, heart, liver, and striated muscle frozen in liquid nitrogen. Instituto Nacional Pesquisas Amazonas (INPA 330). The validity of the Santarem records (Naturmuseum and Forschungsinstitut Senckenberg, Frankfurt; SMF 57952-3, collected by de Rover 1960) has been questioned by Mittermeier and Wilson (1974. Papeis Aulsos de Zoologia, Sao Paulo. Vol. 28(8):147–162) and Iverson (1986. A checklist with distribution maps of the turtles of the World. Paust Printing, 282 pp.). They thought that this species primarily occurred in black water rivers and suggested that the specimens from Santarem on the Tapajos River, a clear water river, might have been "stragglers from black water rivers." Also Mittermeier and Wilson mentioned they were unable to find them in the Santarem area and that the local inhabitants were unfamiliar with this species, however they cited six other vernacular names for the species not the one that is used by the locals in the Santarem-Alter do Chao area, Tracaja Piranga. In addition to these two specimens a subadult was examined in the house of a local resident of Alter do Chao. Both turtles were caught in unbaited fyke nets in clear water igarape streams 2 m deep in areas with submerged aquatic vegetation. These records extend the range of this species 24 km upstream from Santarem in the Rio Tapajos and document their natural occurence in clear water streams. George Rebelo also identified skeletal material and tracks of nesting females in the same area.

Submitted by **RICHARD C. VOGT**, Estacion de Biologia Tropical "Los Tuxtlas," Instituto de Biologia, Universidad National Autonoma de Mexico, Apartado Postal 94, San Andres Tuxtla, Veracruz, 95700, Mexico, **GEORGE REBELO**, **GLORIA MOREIRA**, **AUGUSTO FACHIN**, **THIERRY R. J. GASNIER**, **RONIS DA SILVEIRA**, & **BARBARA MANN**, Departmento de Ecologia, and **JOSE CARLOS PAULA RAPOSO**, Departmento de Ictiologia, Instituto Nacional Pesquisas Amazonas, Caixa Postal 478, Manaus, Amazonas, 69.001 Brasil, **PIERRE ARMOND** and **AYDIL DE SOUZA MARQUES**, Instituto Brasileiro do Meio Ambiente e do Recurso Naturais Ronovaveis, Superintendencia do Amazonas, BR 319-km 01 - Distrito Industrial, Manaus, Amazonas, Brasil, **ISNALDO LUIZ MELO DA SILVEIRA** & **WALDEMAR DA ROCHA AMAZONAS FILHO**, Instituto Brasileiro do Meio Ambiente e do Recurso Naturais Ronovaveis, Superintendencia do Para, Avenida Tapajos 2201, Laguinho, Santarem, Para, Brasil, **OLGA VICTORIA CASTANO**, Instituto de Ciencias Naturales, Universidad de Colombia. Apartado Aerea 7495, Bogota, Colombia, **CESAR AUGUSTO MONJE CARRILLO**, Kr. 43 no. 22C-81, Bogota, Colombia, **TIBISAY ESCALONA**, Calle Salto Canaima, Qta Tacarica, Cumbres de Curumo, Caracas 1080, Venezuela, **HEDELVY GVADA**, FUDENA, Apartado 70371, Caracas 1071 Venezuela, & **FRANKLIN ROJAS SULREZ**, Calle 2, Rsidencia Frailejon piso 2, Apartmento 2-B, Urbano Terraja del Avila, Caracas, Venezuela ●

PSEUDEMYS TEXANA (Texas River Cooter). USA: TEXAS: Wise Co: 7 mi W Bridgeport near pond on mainland side of causeway to Stripling Island, Lake Bridgeport. 11 June 1990. Amy S. Bridegam. Verified by Jonathan A. Campbell. UTACV R-27193. New county record extending range eastward. (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **AMY S. BRIDEGAM**, **ANN-MARIE T. PATTERSON**, Department of Biology, UTA Box 19498, University of Texas at Arlington, Arlington, Texas 76019, **BRIAN E. SMITH CLAY M. GARRETT**, and **MARK R. MATEJA**, Department of Herpetology, Dallas Zoo, 621 E. Clarendon, Dallas, TX, 75203, USA ●

SAURIA

EUMECES OBSOLETUS (Great Plains Skink). USA: TEXAS: Jack Co: 1.5 mi E & 0.75 mi S Wizard Wells. 24 June 1990. Clay M. Garrett. Verified by Jonathan A. Campbell. UTACV R-27194. New county record. (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CLAY M. GARRETT** and **BRIAN E. SMITH**, Department of Herpetology, Dallas Zoo, 621 E. Clarendon, Dallas, TX 75203, USA ●

SERPENTES

CORALLUS ENYDRIS (Deer Snake). BRAZIL, SÃO PAULO: Iguape: Estacão Ecológica da Juréia-Itatins (24° 32' S, 47° 15' W). On a forest trail bordering the Rio Verde 400 m from the sea, 09 December 1988. Female 100 + 28.5 cm. H. G. Bergallo, C. Strussmann and C. F. D. Rocha. Verified by Ivan Sazima. Museu de Historia Natural, Universidade Estadual de Campina (ZUEC 0723). First documented record for São Paulo State, extends the range to southern Brazil. The subspecies *C. e. enydris* is distributed in Southern Venezuela, Guianas, Ecuador, Peru, Bolivia, Northern, Western (Peters and Orejas-Miranda, 1970. Bull. U. S. Nat. Mus. 297:72-73; Cunha and Nascimento, 1978. Mus. Par. Emilio Goeldi, Publ. Avul. 31, 218pp) and Northeastern Brazil (Cordeiro and Hoge, 1973. Mem. Inst. Butantan 37:261-290) and the subspecies *C. e. cookii* occurs in Central America (Nicaragua to Colombia, Northern and Central Venezuela, Trinidad and Windward Islands) (Peters and Orejas-Miranda, 1970).

Submitted by **CARLOS FREDERICO D. ROCHA**, Setor de Ecologia, Instituto de Biologia, Universidade do Estado do Rio de Janeiro, Rua São Franciso Xavier 524, 20550, Maracanã, Rio de Janeiro, RJ, Brazil, **HELENA G. BERGALLO**, Departamento de Zoologia, Instituto de Biologia, Universidade Estadual de Campinas, C.P. 6109, 13081, Campinas, São Paulo, Brazil and **CHRISTINE STRUSSMANN**, Fundacão Estadual de Meio Ambiente, 78000, Cuiaba, Mato Grosso, Brazil ●

DIADOPHIS PUNCTATUS REGALIS (Regal Ringneck Snake). USA: NEVADA: Clark Co: Spring Mountains, Pine Creek Canyon, ca. 1500 m, 17 September 1967. R. Clark. Verified by W. Pratt. UNLV Natural History Museum (UNLV R-5229). A second specimen (DOR) found on the SE edge of the Spring Range, 0.3 km W of Mountain Springs, 1612 m. October 1988. B. Hardenbrook. Specimen photographed; not preserved. Verified by R. Marlow. A third specimen found in the McCullough Mountains, 823 m. 30 April 1989. D. E. Delaney. Verified W. Pratt. (UNLV R-6082). The first reported specimen from Clark County. A specimen (LMNRA#613) was previously reported from Boulder City (Schwartz, Austin, & Douglas 1978, Biota of Lake Meade National Recreational Area. National Park Service/Cooperative National Park Resources Studies Unit LAME Tech. Report #2, 72 pp.), but is no longer in the LMNRA collection; it was deaccessioned in 1983. The exact locality, "Boulder City," is questionable, although occurrence of this species there is possible. The three records reported herein may actually be the first verifiable specimens from Clark County. They extend the known range ca. 125–175 km SSE of Rainier Mesa, Nevada Test Site (Tanner 1969, Great Basin Nat. 29:31–34), ca. 200 km SSW Caliente and Beaver Dam Wash, Lincoln County, Nevada (Tanner 1952, Great Basin Nat. 12:63–64; ; Banta and Frantz, 1957, Herpetologica 13:192), ca. 150–175 km SW Figure 4 Canyon, Virgin Mountains, Mohave County, Arizona (Soderquist and Middlebrook 1984, Herpetol. Rev. 15:115), ca. 155–190 km W 209 Mile Canyon, Grand Canyon National Park (Johnson and Carothers 1983, Herpetol. Rev. 14:28), ca. 85–140 km NNW of Fort Mohave, Arizona (Fowlie 1965, Snakes of Arizona, Azul Quinta Press, Fallbrook, California), and ca. 115–165 km NW of Kingan, Arizona (Lowe 1964, The Vertebrates of Arizona, Univ. Arizona Press. p. 169.).

Submitted by **DANIEL E. DELANEY**, Nevada Department of Wildlife, 1500 N. Decatur Boulevard, State Mailroom Complex, Las Vegas, Nevada 89158, **PHILIP A. MEDICA**, Natural History Museum of Los Angeles County, Division of Herpetology, 900 Exposition Boulevard, Los Angeles, California 90007, & **D. GRADFORD HARDENBROOK**, U. S. Department of Interior, Bureau of Land Management, Las Vegas District, P.O. Box 26569, Las Vegas, NE 89126 (Present address same as DED), USA ●

LYCODON BUTLERI (Butler's Wolf Snake). THAILAND: KRABI PROVINCE. 18 July 1990. Merel J. Cox. Verified by Jarujin Nabhitabhata. Thailand Institute of Scientific and Technological Research, Ecological Research Department (TNRC 52 3852). This specimen was purchased from a dealer in Nakhon Si Thammarat Province who had obtained it from a hunter in neighboring Krabi Province in southern Thailand. This is the first record of this species in Thailand.

Submitted by **MEREL J. COX**, 695/17 Pracharaj Road, Soi Homhual, Bangkok 10800, Thailand ●

RAMPHOTYPHLOPS BRAMINUS (Brahminy Blind Snake). MÉXICO: JALISCO: Puerto Vallarta. 21 February 1990. Harold A. Dundee. Specimen found DOR on sidewalk of hotel grounds that were planted with various exotics. Verified by James R. Dixon. UNAM MZFC-04754. New state record. Nearest previous record at Rosario, Sinaloa is ca. 245 km N of Puerto Vallarta; more distant records lie eastward in Querétaro and southward in Guerrero (Dixon and Hendricks 1979, Zool. Verh. [173]: 1-39).

Submitted by **HAROLD A. DUNDEE**, Department of Ecology, Evolution and Organismal Biology, Tulane University, New Orleans, Louisiana 70118 & **OSCAR FLORES-VILLELLA**, Museo de Zoología, Universidad Nacional Autonoma de México, Apto. Postal 70-399, México, D.F. 04510, Mexico ●

REGINA SEPTEMVITTATA (Queen Snake). USA: ILLINOIS: Lee Co: Franklin Creek State Park, North Area, SW 1/4 of NE 1/4 Sec. 33, T22N, R10E. 22 June 1990. T. Anton & M. Redmer. Verified by A. Resetar. FMNH 238197. New county record. Second population from Rock River Watershed and a range extension of ca. 16–29 km southwest of record from near Oregon, Ogle County, Illinois (Smith 1961, Illinois Nat. Hist. Surv. Bull., 28 (1):298 pp.).

Submitted by **THOMAS G. ANTON**, 1020 Grove Street, Evanston, Illinois, 60201 & **MICHAEL REDMER**, 21 West 103 Par Lane, Itasca, IL 60143, USA ●

TANTILLA NIGRICEPS (Plains Blackhead Snake). NEBRASKA: Gosper Co: 6 km S & 2 km E Lexington. 9 October 1990. M. M. Peyton. Verified by John D. Lynch. Nebraska State Museum (NSM uncat. — Lynch will supply number to JTC). New county record and the most easterly collection for the species in Nebraska; only the second recent specimen collected within the state (Lynch, 1985, Annotated list of Amphibians and Reptiles in Nebraska. Transactions of the Nebraska Acadamy of Science).

Submitted by **MARK M. PEYTON**, Gothenburg Public Schools, 1415 Avenue G, Gothenburg, NE 69138, USA ●

DISTRIBUTIONAL RECORDS FOR TURTLES AND LIZARDS FROM NORTH KOREA

Locality data for reptiles inhabiting the northern half of the Korean Peninsula (Democratic People's Republic of Korea) have long remained unknown to wide publicity. Recently all the available information on the distribution of snakes in North Korea was summarized by Szyndlar and O (1987). Regarding turtles and lizards, the last paper covering the area (apart from a few publications in Korean language) was that of Shannon (1956). The aim of the present notice is to bridge this gap.

The following list of localities is based on specimens stored in the Zoological Institute of the Korean Academy of Sciences on Pyongyang (ZIP). The list does not include *Chinemys reevesi* and *Chelonia mydas* that, although present in the Pyongyang collection, are not labelled and therefore their localities remain unrecognized. A few specimens belonging to the collection of the Institute of Systematic and Experimental Zoology of the Polish Academy of Sciences in Cracow (ZZSiD), unless they were described by Szyndlar (1984), are also listed.

A number of the listed reptiles possibly were discussed in Won's (1971) monograph of the Korean herpetofauna. However, prior to 1984 the herpetological specimens from the Pyongyang collection were not catalogued and it is impossible to determine which of them were previously described. Taking into consideration that North Korea is an utterly strange area to most herpetologists, the locality names are accompanied by geographic coordinates.

TESTUDINES

TRIONYX SINENSIS (Chinese Softshell): NORTH PYONGAN: Island Unmu-do (30°24'N, 125°07'E). 15 May 1967. (ZIP 37).

DERMOCHELYS CORIACEA (Leatherback): SOUTH PYONGAN: Pyongwon county. 17 November 1960. (ZIP uncatalogued). This specimen is most likely identical with that recorded by Tong and Yon (1961).

SAURIA

EUMECES COREENSIS: NORTH PYONGAN: Island Sinmi-do (39°33'N, 124°54'E). 29 June 1965. (ZIP 41). Island Chongju (39°41'N, 125°13'E). 25 July 1979. (ZIP 42 and 43).

SCINCELLA REEVESI (Reeves' Skink): RYANGGANG: Paegam (41°34'N, 128°48'E). 25 (sic) January 1968. (ZIP 44 and 45). 25 (sic) February 1968. (ZIP 46-48). KANGWON: Ichon (38°28'N, 126°53'E). Date unknown. (ZIP 195 and 196). Kumgang-san (38°39'N, 128°07'E). 20 August 1969. (ZIP 149 and 150).

EREMIAS ARGUS (Mongolian Racerunner): PYONGYANG CITY: Taesong-san (39°04'N, 125°50'E). 17 May 1969. (ZIP 194). KANGWON: Cholwon (38°20'N, 126°53'E). Date unknown. (ZIP 130). Kumgang-san (38°39'N, 128°07'E). 22 July 1969. (ZIP 56 and 57). CHAGANG: Kae-gogae (40°25'N, 126°21'E). 18 May 1987. T. Tomek. (ZZSiD 686).

TAKYDROMUS AMURENSIS (Amur Grass Lizard): RYANGGANG: Paekdu-san (42°00'N, 128°05'E). 20 May 1970. (ZIP 132). NORTH HAMGYONG: Chilbo-san (41°02'N, 129°36'E). June 1978. (ZIP 131). NORTH HWANGHAE: Kumchon (38°09'N, 126°29'E). May-August 1968. (ZIP 274-282). 2 August 1969. (ZIP 124 and 125). SOUTH HWANGHAE: Haeju (38°02'N, 125°44'E). 1966. (ZIP 133-136). Suyang-san (38°09'N, 125°42'E). 14 October 1984. Z. Szyndlar. (ZZSiD 679-684). KANGWON: Ichon (38°28'N, 126°53'E). Date unknown. (ZIP 197-206). 1968-1969 9207-224). Kumgang-san (38°39'N, 128°07'E). 20 August 1969. (ZIP 146-173). Sambang-ri (38°43'N, 127°21'E). 2 August 1964. (ZIP 225-251). 13 June 1973. (ZIP 178-180). KAESONG CITY: Kaesong (37°58'N, 126°33'E). 1969. (ZIP 139-145). Pagyon-pokpo (38°04'N, 126°34'E), 16 October 1984. Z. Szyndlar. (ZZSiD 685).

TAKYDROMUS WOLTERI (Mountain Grass Lizard): PYONGYANG CITY: Taesong-san (39°04'N, 125°50'E). 17 May 1969. (ZIP 183-193). KANGWON: Kumgang-san (38°39'N, 128°07'E). 20 August 1969. (ZIP 148). Sambang-ri (38°43'N, 127°21'E). 2 August 1964. (ZIP 252 and 253). 20 August 1969. (ZIP 148, 174-177).

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Submitted by **ZBIGNIEW SZYNDLAR**, Polish Academy of Sciences, Institute of Systematic and Experimental Zoology, Slawkowska 17, 31-016 Krakow, POLAND ●

NEW COUNTY RECORDS FOR AMPHIBIANS AND REPTILES OF EAST TEXAS

These specimens represent new county records (Dixon 1987. Amphibians and Reptiles of Texas. A&M Uni. Press, College Station. 434 pp.) for five species of amphibians and reptiles from two counties of East Texas. Voucher specimens are deposited in the University of Texas at Yler (UTT) vertebrate collection. All specimens were collected by one or more of the authors and verified by Neil B. Ford.

ANURA

HYLA CINEREA (Green Treefrog). Van Zandt Co: On Madis Farm W. of Edom off FM 2339, 4.3 km off Hwy. 279. 4 August 1988. (UTT 568, 569). Specimens found at night near the edge of a pond.

HYLA CHRYSOSCELIS/VERSICOLOR (Cope's Gray Treefrog/Gray Treefrog). Van Zandt Co: On Madis Farm W. of Edom off FM 2339, 4.3 km off Hwy. 279. 21 October 1988. (UTT 570, 571). Specimens found during daylight in a wooded area.

TESTUDINES

STERNOTHERUS ODORATUS (Common musk turtle). Van Zandt Co: On Hwy.

80 W., 3 km off Hwy. 19 N. 4 June 1989. (UTT 575). Found on the shore of a pond.

SERPENTES

ELAPHE GUTTATA EMORYI (Great Plains Rat Snake). Henderson Co: 12.2 km S. of Brownboro on Hwy. 607. 15 July 1988. (UTT 567). Found DOR. Extends range eastward becoming adjacent to Smith and Van Zant counties, both recorded containing subspecies *Elaphe g. guttata* (corn snake).

HETERODON NASICUS GLOYDI (Dusty Hognose Snake). Henderson Co: On FM 317, 10 km off Hwy. 31. 26 May 1989. (UTT 574). Found DOR.

Submitted by **VINCENT A. COBB** and **LISA M. COBB**, Department of Biology, The University of Texas at Tyler, Tyler, TX 75776, USA. Present address of **VAC** and **LMC**: Department of Biological Sciences, Idaho State University, Pocatello, ID 83209, USA ●

NEW COUNTY RECORDS OF AMPHIBIANS AND REPTILES FROM TEXAS

Dixon (1987. Amphibians and Reptiles of Texas. Texas A&M Univ. Press, College Station. 434 pp.) provided current distributional maps for the state's 204 species of amphibians and reptiles. Additional county records have since then been reported (Calaway et al. 1988. SSAR Herp. Review 19:19; Carignan 1988. ibid. 19:60; Cheatham 1988. ibid. 19:19; Cobb and Cobb 1991. ibid. 22:25; Corder 1988. ibid. 19:21; and McAllister 1988. ibid. 19:61-62).

In this note we list nine new county records for Texas (Dixon op. cit.). All specimens have been deposited in the Arkansas State University Museum of Zoology (ASUMZ). Specimens were collected by the authors and identifications were verified by S.E. Trauth. Collections were conducted under the authority of the Texas Parks and Wildlife Department Scientific Permi (085) to SET.

ANURA

PSEUDACRIS CLARKII (Spotted Chorus Frog). Coke Co: 6.4 km E FM 2034, 38.5 km N Jct US 87 and FM 2034. 21 April 1988. (ASUMZ 10717). Crockett Co: 20.0 km S Barnhart on State Hwy 163. 22 April 1988. (ASUMZ 10718, 10719).

CAUDATA

AMBYSTOMA TEXANUM (Smallmouth Salamander). Brown Co: 20.7 km W Comanche on US 67. 23 April 1988 (ASUMZ 10749).

SAURIA

SCINCELLA LATERALIS (Ground Skink). Coke Co: 30.4 km N Jct FM 2034 and US 87 on FM 2034. 21 April 1988. (ASUMZ 10995).

OPHISAURUS ATTENUATUS ATTENUATUS (Western Slender Glass Lizard). Brown Co: 20.7 km W Comanche on US 67. 23 April 1988. (ASUMZ 10993).

SCELOPORUS OLIVACEUS (Texas Spiny Lizard). Schleicher Co: 34.8 km W Jct FM 2129 and US 277 on FM 2129. 22 April 1988. (ASUMZ 10788).

UROSAURUS ORNATUS ORNATUS (Eastern Tree Lizard). Schleicher Co: 34.8 km W. Jct FM 2129 and US 277 on FM 2129. 22 April 1988. (ASUMZ 10726, 10727).

SERPENTES

LEPTOTYPHLOPS DULCIS DULCIS (Plains Blind Snake). Runnels Co: 5.7 km E Ballinger on US 67. 23 April 1988. (ASUMZ 10738, 10739).

SALVADORA GRAHAMIAE LINEATA (Texas Patchnose Snake). Eastland Co: 7.5 km S Jct Interstate 20 and State Hwy 206 on State Hwy 206. 20 April 1988. (ASUMZ 10731).

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CAIMAN CROCODILUS IN THE "CAATINGA" OF SOUTHEASTERN PIAUÍ, BRAZIL

The Caatinga is a vast semi-arid region encompassing most of northeastern Brazil, *ca.* 35°–45° W. longitude and 3°–16° S. latitude (Reis 1976). This area is the largest dry region within the tropics (Markhan 1972; Reis 1976) and is bordered by much more mesic habitats.

Most of the Caatinga receives less than 500 mm of rain per year, although some areas receive more than 1600 mm, with great annual variation. Periods of severe drought may be followed by floods. There is a large degree of endemism among the plants (Lima 1960; Hayashi 1973; Hayashi and Numata 1976).

The herpetofauna of the Caatinga has been well-studied (Vanzolini *et al.* 1980), although several new taxa have been described recently (Rodrigues 1984, 1986, 1987, 1988; Manzani and Abe, *in press*). The only major reptile group considered absent is the Crocodilia (Vanzolini *et al.* 1980), although populations of broad-nosed caiman (*Caiman latirostris*) and dwarf caiman (*Caiman palpebrosus*) are recorded from the Rio São Francisco basin, which bisects the region. Common caiman (*Caiman crocodilus*) is known from the Rio Parnaíba, at its northwestern limit (Carvalho 1955). The Rio São Francisco and the Rio Parnaíba are the only perennial rivers in the region.

Southeastern Piauí lies near the western limit of the Caatinga, but climate and vegetation are typically xeric (Emperaire 1987). The region is drained by the Rio Piauí basin, which contours the Serra de Capivara massif and eventually joins the perennial Rio Parnaíba. The Piauí and its tributaries are all intermittent during the dry season and are composed of scattered ponds and lagoons along the sandy bed. The rivers run only during the rare heavy rains, which also cause floods.

Some tributaries of the Piauí (riacho São Domingos, Baixão da Boa Esperança) form large lagoons which are perennial, although subject to wide variations in water level. In one of these, Lagoa do Muquem (08°24'30"S, 42°22'20"W), we discovered a population of caimans (*Caiman crocodilus*) in December 1986, based on information obtained from natives.

A night count on 12 December 1986 showed 31 caimans over the southern half of the lagoon, mainly along the margins with denser vegetation. The reptiles were extremely wary and difficult to approach, probably as a result of persistent hunting. Estimated length of individuals sighted ranged from 60 to 80 cm TL.

Along the margin, at a place where the Caatinga was near the water, we found a pod of 30 small juvenile caimans, probably a few weeks old. Some of them were emerging from the bushes and moving toward the water, but no adults were

sighted. This pod probably hatched at the end of the dry season.

Another population of caimans was located in an artificial lake at Fazenda (ranch) Veneza (08°45'S, 42°16'W). This lake was constructed about 20 years ago by damming a tributary of the Piauí, which is 7 km downriver. It usually covers several hundred acres and may have a depth of ten meters, but during drought it may dry up completely. On such occasions the caimans are said to aestivate buried among the debris of a banana orchard at the base of the dam. This seems to be a favorite resting place, according to the landowner.

The caimans reportedly reached the lake on their own, walking or swimming when the Piauí became flooded. It is known that crocodilians will walk long distances over land in search of water and *C. crocodilus* is no exception (Guggisberg 1972; Gorzula 1978; pers. obs.).

In the lake, caimans were concentrated along the narrow, long bay with shallow water and abundant aquatic vegetation. A night count showed 13 caimans along the lake's shore. All individuals were small, 60–90 cm in total length. During the previous day a larger caiman, about 110 cm Tl, was found resting among the margin's bushes.

Caimans in southeastern Piauí are today a relic species restricted to the larger and more perennial water collections left in a xeric, semi-arid habitat. Rock paintings, dated from 6000 to 10000 years B.P. in several archeological sites in the Serra da Capivara massif, show caimans together with other water-loving species, such as capybaras (*Hydrochaerus hydrochaeris*) and marsh deer (*Blastocerus dichotomus*), indicating a more aquatic environment existed at that time. (Pessis 1987). With the recent progressive aridity, these species became extinct. The caimans managed to survive and even colonized newly formed areas of habitat. A similar but more extreme situation occurred in the Sahara, where several populations of Nile crocodiles (*Crocodylus niloticus*) survived in isolated lakes and ponds in the desert (Guggisberg 1972).

The caimans remaining in the Caatinga of southeast Piauí are now endangered due to persistent hunting and may soon be among the species left only as rock paintings.

ACKNOWLEDGMENTS

Our research was part of a faunal survey funded by the Fundação Museu do Homem Americano (FUMDHAM and CNPq). We wish to thank Niede Guidon for all the help and encouragement. Senhor Angelo received us in his home and permitted our work at Fazenda Veneza. Nilson Parente helped in field work. Dr. Samuel s. Sweet reviewed an earlier version of the manuscript and made useful suggestions.

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BOOK REVIEWS

Cytogenetics of Amphibians and Reptiles, by Ettore Olmo (ed.), 1990, Birkhauser Verlag, 270 pp.

Cytogenetics, the study of chromosomes, is an old field of research with a venerable history. It is fun to imagine the excitement that must have been felt by early workers who realized for the first time that chromosomes are packages of genes that can be counted and measured, and whose intricate behaviors during mitosis and meiosis can be observed or reconstructed. To many of these workers, cytogenetics seemed to offer the most direct route to understanding how organisms come to be: not only how they reproduce, but how they develop and how they evolve. In fact, this point of view is still valid in many respects, but the number of workers choosing to pursue this approach has been steadily dwindling.

The reason for the current unpopularity of cytogenetics is due to at least two factors. First, the job of using cytogenetics to study development or evolution has turned out to be much more difficult (and time-consuming) than ever imagined. Secondly, the more recent field of molecular biology has made an end-run around classic cytogenetics, effectively elbowing chromosomes aside to get directly at the DNA itself.

Nevertheless, cytogenetics has always had its staunch adherents, ranging from those who strive to incorporate molecular methodologies to those who are simply "in love" with chromosomes and won't give them up. Whatever the reason

for sticking with chromosomes, cytogeneticists are faced with new challenges centered on the question: "What good is the study of chromosomes?" This book, edited by E. Olmo, gives us a chance to take stock of what recent cytogenetics has to offer, at least as applied to certain organisms.

The book, as the editor points out, grew out of a symposium held at the First World Congress of Herpetology in Canterbury UK in 1989. Its goal is to present an overview of the current status of cytogenetics as applied to amphibians and reptiles. The book is truly international in scope, and contains 18 chapters divided among two sections, depending on whether they concern amphibians (10 chapters) or reptiles (8 chapters).

The amphibian section contains contributions from many of the most familiar workers in the field, including Morescalchi, Schmid, Macgregor, and Mancino, as well as some less familiar authors and their coworkers. This section begins with a creative essay by Morescalchi on the use of cytogenetics in sorting out the relationships among the lissamphibians. For those readers familiar with Morescalchi's writings, this is a typical example of his imaginative, broad-stroke reconstruction of the "Big Picture," using everything from genome size and metabolic rates to heterochrony and exploding karyotypes. I found it interesting and fun to read, but to be taken with a healthy grain of salt. Schmid and Macgregor also present typical products, Schmid with a competent overview of banding studies in amphibians, and Macgregor with a summary of the latest results of his research program on development and cytogenetics in *Triturus*. Two of the most important chapters in this section are those by Mancino and Kohno et al., who discuss powerful new approaches to cytogenetic studies.

The reptile section of the book includes chapters by King, Olmo et al., Mortiz, Becak et al., and several others. King's chapter is a thorough and convincing approach to the problem of origin of the reptiles of Australia, emphasizing the importance of using independent data sets to try to reconstruct biogeographic history. Mortiz presents evidence from his studies of gekkonid cytogenetics concerning the process of sex chromosome evolution, and argues convincingly that this is an ideal group in which to address this question. The chapter by Olmo et al. presents a useful compilation of cytogenetic information on lacertids, but suffers from the authors' apparent lack of confidence in using this wealth of information to make their own phylogenetic hypotheses.

Weaknessess of the book include the poor taxonomic representation (e.g. caecilians are hardly mentioned and only two salamander groups are focused on: *Triturus* and hynobiids), and the almost complete lack of phylogenetic analyses using current methodologies. Another, but less important, weakness is that the book is full of mistakes in spelling and English.

Overall, I found the book a welcomed, if somewhat disappointing, contribution to cytogenetics awareness. I think it will win few if any converts to the field, although I am sure the authors would counter that that was not the purpose of the book. On the other hand, it does serve the purpose of helping to keep cytogenetics alive despite unfavorable odds. I predict that cytogeneticists who "keep the faith" and continue to struggle to integrate new methodologies into their work will be paid off in the end with quantum leaps towards understanding genome structure and function in development and evolution.

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The Alligator Snapping Turtle: Biology and Conservation, by Peter C. H. Pritchard. 1989. Milwaukee Public Museum, 800 W. Wells St., Milwaukee, WI 53233-1478, USA, xii + 104pp., 20 color and 14 b/w photos, 1 map. Soft cover only, $29.95 + $2.50 shipping ($3.50 foreign); Wisconsin residents add $1.50 sales tax.

On a still morning in April 1990, on a bank of the Apalachicola River, FL, I laid motionless in the sand and watched what, for a brief moment, seemed to be an apparition from the Mesozoic. It was a female alligator snapping turtle, *Macroclemys temmincki*, slowly kneading her way from her nest in an attempt to conceal her still-moist eggs from predators. Mike Ewert, with whom I had just begun a study of the species' nesting ecology, described her as antediluvian, and truly she appeared to be so. The alligator snapping turtle is not only one of the largest but also one of the most archaic-looking of modern reptiles; in fact, its superficially striking resemblance to the Triassic *Proganochelys* (Gaffney 1990) is almost eerie. But surprisingly, as Pritchard reminds us in this book, this is anything but a primitive turtle, instead being a highly derived form in many respects. The largest living fresh-water turtle in North America, the alligator snapping turtle is nonetheless one of the most rarely seen (except by knowledgeable fishermen) and, consequently, one of the most poorly studied by biologists.

Because of its size and former abundance in the rivers of the southeastern United States, this turtle traditionally has supported one of the largest commercial harvests of any North American reptile. The species has certainly declined in abundance as a result, but no one really knows to what extent. Consequently, and despite the absence of sound population data, many people believe that the species is now in peril. One such person is renowned chelonian biologist Peter Pritchard, who persuaded the World Wildlife Fund (WWF) to support his proposal to gather preliminary information about the species and to determine its survival status as best he could within funding limitations. Weighing his options for the latter, Pritchard eschewed a classical field study ("the turtles were too hard to find" and "would give no useful insight into long-term trends") in favor of interviewing professional turtle trappers and knowledgeable field biologists. As he became increasingly disturbed about the species' survival prospects, he decided to prepare a formal petition to the U.S. government to designate this turtle as a Threatened species.

In this slender volume, which is a reworked version of his final report to WWF, Pritchard presents the results of his survey, along with a review of other biological information pertinent to this monotypic genus. Included are chapters on relationships and comparisons (chiefly a comparison of the Platysternidae and Chelydridae, a synopsis of fossil chelydrids, and a review of *Chelydra* life history), nomenclatural history, morphology (principally skeletal), distribution (including a summary of fossil *Macroclemys*), geographic variation (i.e., areas in need of investigation), size (mostly a discussion of record size turtles), diet and feeding mechanism, reproduction, movements, husbandry, exploitation, population status and trends, and conservation recommendations. Some chapters will interest but a few specialists, whereas others have broader appeal.

In reviewing this book, I feel it is important to point out not only what the book is, but also what it is not. It is not the final summation of a scientific study. There are no graphs, no tables of data, no statistics. Instead, Pritchard's goal was to "assemble available information — published and unpublished — on an extraordinarily inter-

esting chelonian that, for some reason, had been the subject of few field studies." Pritchard himself characterizes his book as an "odd" yet hopefully comprehensive view of what we know about *Macroclemys*.

My overall impression of the book is of having read a nearly endless series of anecdotes loosely woven into a species' biography. Nonetheless, for many aspects of this turtle's biology, this is all we have, and future students of the genus will owe their gratitude to Pritchard for compiling these widely scattered tidbits into a single source. The ecological chapters are weak, but so is our data base for the species. In matters of morphology, Pritchard is not hesitant to suggest possible functions (e.g., for carapacial keels and supramarginal scutes), and, although I generally found his explanations believable, they should not go unchallenged. For example, if the reduced plastron of chelydrids is a feature associated with the long neck and head-thrusting mode of feeding, as Pritchard suggests, then why do we see no sign of plastral reduction in other turtles, such as the emydid genus *Deirochelys*, that possess a similar trophic apparatus? Perhaps the reduced chelydrid plastron instead relates to a unique locomotor pattern or other function. Likewise, some of Pritchard's speculations about behavior patterns are weak in substance. To suggest that a female *Macroclemys* would find the embrace of a male twice to three times her size "more terrifying than erotic" is too anthropomorphic for me, and is an especially surprising statement coming from a man who shares a spousal relationship of similar proportions.

The chapter on distribution offers a state-by-state account of all records that Pritchard could locate and points to the need for scientific confirmation of records in many of the gaps. Unfortunately, the distribution map was cropped too closely to include the northernmost record (Rock Island Co., IL) given for the species. Although he remarks that no specimens are known from the St. Marks River system in the Florida panhandle, he notes (within a discussion of the Ochlockonee River system to the west) a specimen from the Wakulla River, which is confluent with the St. Marks. The year of collection is given for only a few of the listed museum records (compiled by J. Iverson); it surely was available for many more and could have provided an additional perspective.

The final and perhaps most important chapters of the book deal with exploitation of the species, its status, and recommendations for study and conservation. Pritchard's interviews successfully document locally heavy harvest by commercial fisheries, mostly in the 1960's and early 1970's, with probable depletion of local populations, particularly in southern Louisiana. With the recent decline of these fisheries, however, it would seem that the greatest long-term threat to the species may now be habitat degradation, chiefly via pollution.

As a result of his interviews, Pritchard submitted in 1983 a formal petition, accompanied by a copy of his preliminary report, to the U.S. Fish and Wildlife Service to list the alligator snapping turtle as a Federally Threatened species. Following governmental review, the petition was rejected, at least in part because of the lack of quantified data about past and present numbers and the level of exploitation. Of course, these data simply do not exist. In his book, Pritchard states his belief that the decision was largely political. Though that may be, I myself do not find the evidence that he presents in his book as making a compelling case that this species is likely to become endangered throughout a substantial portion of its range in the foreseeable future. I am convinced, however, of the need for a range-wide cooperative federal/state status survey of the species and the condition of and threats to its habitat. In a paper published after Pritchard's book had gone to press, George (1988) noted that this turtle is legally protected in seven states (including Florida, which allows limited harvest) and reported that a state-funded survey had been instigated in Louisiana. Until that survey is completed, the Louisiana Department of Wildlife and Fisheries should enact an immediate moratorium on the take of this species.

The physical nature of the book itself deserves mention. The large, bold print and glossy pages, printed in two-column (but surprisingly not right-justified) format, make for easy reading. Both color and black and white photographs are generally clear and of high quality; they presumably are at least partly responsible for the somewhat high price for such a slim book. However, for those of you who decide to spring the $30, I suggest you request a 90-day warranty. My copy literally self-destructed despite careful handling. By the time I had reached page 11, most of the preceding pages had already fallen out, and the binding was separating from the remainder. I called the publishers, who graciously offered to replace the copy and said they would do so for any defective book, although they had received no other complaints after having sold hundreds of copies already. I also learned the sad news that, because of budget cuts, this is the last book that MPM will publish for the foreseeable future.

For the size of the book, the index is extensive, including almost every noun mentioned, from broom handles to Antoine's Restaurant. The Literature Cited is thorough; a quick check of my own card file showed that the only references I list for the species that are not cited by Pritchard are either relatively cursory to his theme or too recent for inclusion. He in fact may go overboard in citing references; I question his practice of citing unpublished data from grant proposals and manuscripts, even though he gives appropriate credit.

With one exception, proof-reading seems to have been reasonably thorough; I found only about a dozen typographical errors. However, I was frustrated by the complete omission of a section of text of considerable length (two galley pages, copies available from PCHP) from the review of fossil *Macroclemys*, including reference to *M. auffenbergi* (the appropriate reference is included in the Literature Cited). Other minor errors reflect haste or carelessness - e.g., the incorrect listing of a contributor as Dr. and the placement of Earlham College in Illinois. Chelonian biologists are accustomed to the various applications by different authors of the words "costal" and "pleural" to either bones or epidermal laminae, but Pritchard employs the terms inconsistently even within the same chapter. After telling us that the specific epithet of *Macroclemys* appropriately ends in a single rather than a double "i," he then goes on to use both spellings throughout the book. Likewise, his discussion of size regularly alternates between metric and English measurements. A more thorough final bit of editing also would have reduced numerous cases of redundancy.

For professional and amateur herpetologists, agency personnel and conservationists who may have a need for information about the alligator snapping turtle, this book surely will be the most efficient means of gaining access to the pertinent literature. But it will be a long time before anyone will produce a *Macroclemys* biography that will approach the scale of knowledge contained about *Trachemys scripta* in Gibbons' (1990) recently published monograph. Extensive studies about North America's largest living fresh-water turtle are sorely needed.

Finally, a personal note: Peter Pritchard should be applauded for his efforts to draw public and scientific attention to the conservation of our world's

imperiled herpetofauna. It is an activity in which all members of our professional societies should urgently participate. The need has never been greater.

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Atlas Anima, volume 3, Amphibia and Reptilia, by Hiroshi Aramata. 1990. 375 pp., clothbound. Heibonsha Limited, Publishers, 5 Sanbancho, Chiyodaku, Tokyo 102, Japan. Price ¥11,300 (about US$87) plus postage.

This book is unique, for there is nothing like it in any language. Mr. Aramata, one of Japan's most popular writers, is also an amateur naturalist. Over many years he has amassed a superb collection of the classic works on natural history, mostly published before 1900 and beginning with the 16th century. Because of the rarity of these books, which contain some of the most exquisite illustrations of animals ever produced, Mr. Aramata decided to share these treasures by writing a five-volume series entitled "Atlas Amina." The amphibians and reptiles are covered in volume 3.

Following an historical review of the classification of amphibians and reptiles and a discourse on methods for their illustration, the book is organized into chapters arranged according to family or groups of related families. Each chapter provides discussions about the origins of scientific and common names of that family, and examples of the use of amphibians and reptiles in mythology, religion, Egyptian hieroglyphics, popular writing, sculpture, and folk tales, to mention only a few areas. All topics are profusely illustrated with black-and-white photographs and drawings copied from original works. The coverage is broadly international. The text, of course, is mainly in Japanese (although each chapter is introduced with familial terminology in Japanese, Chinese, Latin, English, French, German, Dutch, and Russian), but most figures are self-explanatory.

The main value of this book to herpetologists are the colored plates—about 450 of them, many of which have multiple figures! These are taken from dozens of classic authors such as Bonaparte, Cuvier, Duméril, Fayrer, Maki, Roesel von Rosenhof, and Sowerby and Lear. Each animal is identified by Latin, Japanese, and English names and is carefully referenced to its source. One of the book's indexes, which lists all sources of illustrations, conveniently permits the reader to find every plate in this volume that has been reproduced from a particular title. For example, we find colored illustrations from Albertus Seba's colossal atlas, the famous "Thesaurus" of 1734-1765, on 21 different pages. Probably no more than a few dozen colored copies of Seba exist and since many of his figures served as types for new species described and named by Linnaeus and other early authors, the scientific value of these reproductions is readily apparent.

Another example is Conrad Gessner, who in 1551-1587 published the first comprehensive illustrated books on zoology. Colored copies are very rare, since before the invention of color printing each copy had to be individually handcolored and only the richest patrons of that era could afford them. Mr. Aramata has reproduced Gessner's chameleon, the very figure chosen as the logo of the World Congress of Herpetology, but here we have it in full color.

From Andrew Smith's "Zoology of South Africa" there are 19 plates; from H. R. Schinz's atlas, 23; another 11 are from John Gray's "Illustrations of Indian Zoology"; a like number from Ramón de la Sagra's famous work on Cuba, which contains some of the finest handcolored plates of lizards and other reptiles ever executed; 14 from John Holbrook's "North American Herpetology"; and so on. As for Seba, many of the specimens illustrated by these authors served as types for new species described by them or others.

The quality of color reproduction is outstanding and true to the originals. One minor complaint is that several of the largest illustrations had to be spread across facing pages, thus losing part of the figure in the binding margin; it would have been preferable to use foldout pages for these illustrations.

The volume concludes with seven indexes: Sources of color plates; books mentioned in the text; names of authors and artists, with biographical information; indexes to Japanese, Latin, and English names; and a general index. There are also two extensive bibliographies which separately list works in Japanese and non-Japanese languages. Several of the indexes and bibliographies are extensively annotated.

The great value of having all of these classic illustrations of amphibians and reptiles under one cover cannot be overemphasized. The choice of which plates to reproduce displays good judgement, both from artistic and scientific points of view. Mr. Aramata and his editorial team are to be congratulated on this magnificent production. For most herpetologists this book will be their only opportunity to appreciate the remarkable artistic and printing capabilities of yesteryear which, in many respects, are superior to those of today. We have been spoiled by photography, for the camera often cannot capture the subtle shading made possible by genuine lithography, the "ideal" postures or whimsical expressions of some drawings, and certainly not the mythical dragons and beasts created with great imagination from the shriveled carcasses brought to European naturalists by travellers from distant lands.

This book faithfully reflects the best work of a vanished era when natural history artists were highly respected and liberally supported, and when they sometimes even wrote the books themselves because they were so knowledgeable about their subjects. Mr. Aramata's remarkable compilation allows us to appreciate their contributions as never before and to mourn their virtual disappearance.

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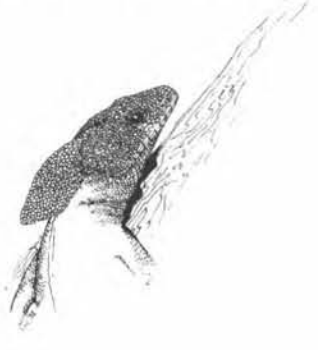
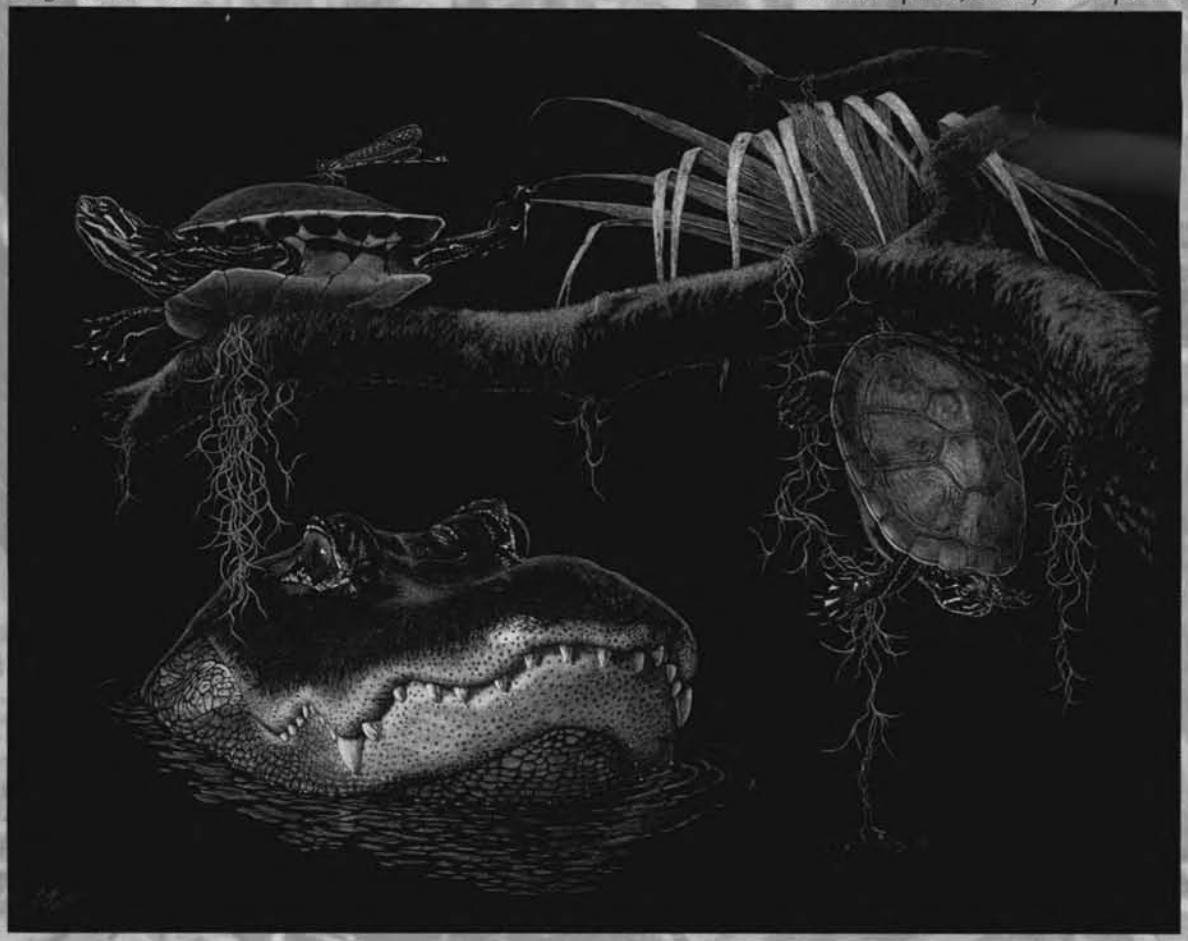


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Melissa Shoemaker

THE PROGRAM

The American alligator is a prominent feature of Florida's landscape, of which about 30 percent is wetland. The species has been exploited commercially both directly and indirectly; it has been killed, caricatured and held captive in roadside zoos. If there is a single animal which symbolizes Florida, it is the alligator.

The Florida Game and Fresh Water Commission has made sure that direct exploitation of alligators involves some restitution to the population. License and tag fees from the legal take of alligators currently bear most of the burden for research and management on the species. Poaching is no longer a threat to the alligator. Indirect exploitation — wetland habitat degradation or even commercialization of its name or image — results in no return to the species. Wetland habitat destruction is now its nemesis.



Howard Suzuki

Gregg Murray and the Florida Wildlife Federation offer limited edition prints and posters each year for the purpose of raising funds to support research on this natural treasure. Purchasers will have the option to get the same numbered print each year. The proceeds of the project will support the alligator research program established in the Department of Wildlife and Range Sciences of the University of Florida. The hallmark of that effort has been an interdisciplinary approach involving a variety of University and agency researchers. The financial support will include scholarships and fellowships to deserving students.

THE ARTIST

My favorite medium in art is scratchboard. I have been working with scratchboard for seventeen years. Scratchboard is a heavy paper—base artboard with a clay coating that is white in its original state. Black india ink is painted over the clay surface and dried. The ink is scratched away using a sharp tool to produce the image.

I have developed a color-technique to stratchboard, which is done by applying color into the scratches and carefully buffing any excess color off the black. The application of color has developed into a beautiful approach to the medium. Actually, I believe that this technique offers some of the best of both 'worlds' — the textures and detail of an etching, combined with the realism and beauty of color.

I currently make my home in central Florida near the Harris chain of lakes. I am a member of the Society of Animal Artists. I have received 'my share' of awards — most recently '88 Peoples Choice Award (1st Place) Ann Arbor, Michigan and '89 Best in Show (scratchboard) National Wildlife Art Show, Overland Park, Kansas.

BROKEN SILENCE

'Broken Silence' is the culmination of ideas derived from experiences that I've had in the field as a volunteer with biologists, working on alligator research, from the University of Florida. While checking an alligator nest, we found turtle eggs laid within the same nest. These eggs were from a species of turtle called the red-bellied slider. I've since seen these turtles peacefully resting with alligators on logs, in various waterways. I learned from my biologist friends that alligators larger than nine feet in length also feed on these turtles in Florida (if they can catch them!). It is this confrontation that has inspired my 'Broken Silence'.

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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "Herpetological Review incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of individuals, institutions, literature and other components of the field. Perhaps equally important, the Review will provide a means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology, and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi-and non-technical articles (original research should be submitted to the **Journal of Herpetology** - see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letter from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double spaced, on 8.5 X 11 inch paper, and should be sent in duplicate. We encourage submissions on Macintosh disks, though we can also work with TEXT (ASCII) files submitted on 3 1/2" IBM compatible floppies. **Herpetological Review** is composed on a Macintosh SE/30 using Microsoft Word and Aldus PageMaker. Format your documents full-page width; we will fit to **HR** format. Unpublished photographs of an unusual nature or of uncommon amphibians or reptiles may also be submitted. These should be 8 X 10 inch black and white, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled lightly on the back of each print. Return of unsolicited photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs solicited by the Editor will be returned at our cost.

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HERPETOLOGICAL REVIEW

Volume 21 December 1990 Number 4

1991 JOINT ANNUAL MEETING
of
THE SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES
AND
THE HERPETOLOGISTS' LEAGUE

at

THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK, PENNSYLVANIA
6 -11 AUGUST 1991

Meeting Site

Penn State's University Park Campus is located in central Pennsylvania in one of the most attractive mountain areas in the East. The University and the adjacent community of State College are situated on a wide plateau, 1,200 feet above sea level, between forested ridges of the Allegheny Mountains. The area is noted for its outdoor recreational opportunities which include swimming, boating, hiking, camping, caving, and skiing.

Penn State is a comprehensive land-grant University composed of 10 schools and colleges. Approximately 37,500 students are enrolled at the University Park Campus.

All sessions and symposia will be held in meeting rooms at the Keller Conference Center and the Kern Graduate Building. These buildings are within easy walking distance of each other.

Accommodations and Meals

Dormitory housing is available with or without a meal plan. Camping facilities are available at Bellefonte KOA Campground 12 miles N of State College. Blocks of rooms have been reserved at the following State College Hotels that are within walking distance: The Nittany Lion Inn (1-800-233-7507), Days Inn Penn State (814-238-8454 or 1-800-325-2525) and the Imperial Inn (1-800-782-0716). Additional hotels, diverse restaurants, bookstores, art museums, and entertainment are all within several blocks of the meeting site. Food service will be available in the dormitories, the student Hetzel Union Building and many unique eateries in downtown State College - a 5 minute walk from campus.

Recreational Facilities

An outdoor running track at the Track and Field Stadium (free) and an indoor track at Rec Hall (free) are available. Facilities in Rec Hall include courts for racquetball, squash, weight room, exercise room and other features. The outdoor pool is $1.50 per person per day and the indoor pool is $2.00 per person per day. The ice skating pavilion is $2.75 for adults and $2.25 for children (skate rental is $1.25). All prices are subject to change.

Transportation to State College

State College is located at the junction of Rts. 322 and 26, 35 miles south of I-80, Exit 24. University Park Airport is a 10 minute drive; taxi service and limousine service are available to the campus and downtown State College. State College is also served by Greyhound and Trailways Buses. Parking is available at $3.00 per day in University parking structures and lots within a block of the residence halls and meeting buildings.

Board and Business Meetings

The SSAR-HL Liaison Committee Meeting will be held on Monday, August 5. The SSAR Board Meeting starts Tuesday, August 6, 1991 at 10:00 am. The HL Board Meeting begins Tuesday, August 6, 1991 at 1:00 pm. The SSAR Business Meeting is scheduled Thursday, August 8, 1991 at 4:30 pm. The HL Business Meeting is scheduled Friday, August 9, 1991 at 4:30 pm.

SYMPOSIA AND SPECIAL SESSIONS

On Wednesday, August 7, a symposium on "Habitat Acidity and Amphibian Decline" is scheduled. Contact W.A. Dunson, Penn State, for more information.

On Saturday and Sunday, August 9 and 10, a two-day symposium entitled "Captive Management and Conservation of Amphibians and Reptiles," organized by J. B. Murphy (Dallas Zoo) and J. T. Collins (University of Kansas), will be held. This is a special symposium to honor Roger Conant for his lifelong contributions to herpetology.

A special session on Women in Herpetology is being planned - Interested participants should contact Carla A. Hass, Penn State for more information.

There will be a Special Performance by the former "Ohio Herp Society Choir" on Friday evening at the Auction.

The SSAR Auction (Joseph T. Collins, Auctioneer) will be held on the evening of 9 August. Please bring or mail contributed items for this event to: Linda R. Maxson, Penn State.

Tours of nearby attractions in Hershey, PA (amusement park, chocolate factory, zoo, gardens, etc) will be offered if there is sufficient interest.

Plans for an exhibit of herpetological works of art are being formulated. If you are interested in participating in an art exhibit, contact S. Blair Hedges, Penn State.

There will be a live exhibit of amphibians and reptiles in Mueller Laboratory - a 5 minute walk from Keller Conference Center. For arrangements, write to John D. Groves, Curator of Reptiles, Philadelphia Zoological Gardens, 34th and Girard Ave., Philadelphia, PA. 19104.

Collecting Permits

For Pennsylvania collecting permits, write to Clark Shiffer, PA Fish Commission, 450 Robinson Lane, Bellefonte, PA. 16823.

Meeting Announcement

A detailed program and call for papers will be mailed separately in late February. Additional information can be obtained from Linda R. Maxson, Department of Biology, 208 Mueller Lab, University Park, PA, 16802, USA. (814) 865-4562. All interested persons are welcome to attend. Non-members should write to the meeting chair for registration forms.

SSAR BUSINESS

SSAR ANNUAL MEETING REPORT: NEW ORLEANS 1990

The 33rd Annual Meeting of the Society for the Study of Amphibians and Reptiles was held jointly with the Herpetologists' League, 5–9 August 1990. Harold Dundee was chair of the local committee hosting our visit to Tulane University, in New Orleans.

The SSAR Board of Directors held their annual meeting between 1000 and 1815 hours (mercifully, with a couple of breaks,including lunch) on Sunday, 5 August 1990, in the University Center. The Board Meeting was attended by 10 of 12 board members, editors of all publications but one, numerous committee chairs or their designees, and several interested members. During the meeting, the reports of the officers, editors, and committee chairs were discussed, as were several items of old and new business (see below).

PRESENTATIONS

The activities of the Annual Meeting began at 0900 hours, Monday, 6 August, with the Plenary Session where we were welcomed by Harold Dundee and then treated to the HL Distinguished Herpetologist lecture by Henry M. Wilbur. This lecture, entitled "Salient Features of Amphibian Populations," was extremely relevant to the special symposium on Amphibian Declines (see below), as Wilbur generally concentrated on characteristics of amphibian populations and problems or concerns in their study. In addition to noting the recently oft-repeated claim that amphibians are very good models for population biology and may well serve as canaries in the coal-mine of environmental decline, he reminded us of the currency that amphibians, especially frogs, carry because "they are cute." Two major themes were to ask what is a population (and how do extinctions and colonizations function in meta-populations—the mostly discrete units found in isolated habitats); and, what are the limits of natural fluctuations in population size?

Contributed paper sessions began Monday afternoon and continued through Thursday, 9 August. These included sessions on Behavior (with 10 papers), Ecology (12), and Evolution (11) Monday; Ecology (12) on Tuesday; Evolution (11), Ecology (12 and 8), and Behavior (9) on Wednesday; and, Conservation Biology (12) and Morphology and Physiology (12) on Thursday. Approximately 250 authors from eight countries (Americas, Australia, and Europe) presented approximately 150 papers. There were 44 posters presented in three sessions, as well as an open meeting with the *Herpetologica* Editors and a *Catalogue of Amphibians and Reptiles* Desktop Publishing Workshop on Thursday afternoon.

SYMPOSIUM

In response to increasing concern among herpetologists about the apparent widespread amphibian decline, and following the widely reported "Irvine, California Workshop" in February, SSAR and HL co-sponsored a special symposium, "Global Crisis in Declining Amphibian Diversity: Analyses of Critical Components," on Tuesday, 7 August 1990, in McAllister Auditorium. Over three dozen participants presented information organized in three broad categories. John W. Wright, of the Los Angeles County Museum of Natural History, organized and moderated the symposium which ran from 8:30 to 5:00 p.m. Wright also described the scope and objectives of the program (generally, to present to a wide audience an overview of the extent of the amphibian decline problem and suggestions for needed action to confirm, understand, and rectify such problems as are acknowledged to actually exist), and presented an audio-tape message from David B. Wake. Wake presented his own impressions of West Coast salamander declines and summarized the findings and recommendations of the Irvine conference (see published accounts: Tree 5(7):203–204; Bull. Ecol. Soc. Amer.; BioScience 40(6):418).

The Symposium was comprised of the following topics and speakers:

REGIONAL ASSESSMENTS OF THE STATUS OF AMPHIBIAN POPULATIONS. *Canada*: Eastern - Lawrence E. Licht; and, Western - Theodore M. Davis. *United States*: Far West - Mark R. Jennings; Rocky Mountains - Steve Corn; Central - James E. Platz; Northeastern - Richard L. Wyman; and, Southeastern and Caribbean - C. Kenneth Dodd, Jr. *Latin America*: Mexico - Oscar Flores-Villela; Nuclear Central America - Jonathan A. Campbell; Costa Rica - George C. Gorman; Panama - Stanley A. Rand; Brazil - Jan Caldwell; and, Peru and Ecuador - William E. Duellman. *Other Regions*: James B. Murphy; and, Summary: Stephen G. Tilley.

POSSIBLE EXPLANATIONS OF DECLINES. Inexplicable Declines: Apparent Taxonomic and Elevation Patterns - Laurie Vitt; Long-Term Studies and Population Fluctuation - Andrew R. Blaustein, Joseph H. K. Pechmann & David E. Scott‹h‹ (SREL), Laurence E. Licht; Amphibians as Bio-indicators of Environmental Degradation - David F. Bradford; and, Possible Contributing or Causative Factors: Global Climate Change, Acid Rain - Richard L. Wyman; UV Radiation - David L. Correll; and, Disease - Elliot Jacobson.

REMEDIAL ACTIONS AND DIRECTIONS FOR THE FUTURE. Inventorying

and Monitoring Standards - Roy W. McDiarmid (Amphibian Handbook), Steve Corn, William E. Duellman, and A. Stanley Rand; Emergency Listing of Threatened and Endangered Species - George Drewry (DES, USFWS); Possible Sources of Funding - James L. Edwards (NSF, via letter); Future Coordination and Communication: Who will maintain the "FROGLOG?" - David B. Wake; Regional Societies and Amphibian Censuses - Steve Hammack and George R. Pisani; Role of Professional Societies - Kraig Adler; and, Role of Governmental Agencies and Other Organizations - Michael J. Bean (Environmental Defense Fund); and, National and International Conservation Efforts - George Rabb.

One thing was made very clear during the Regional *Assessments* — many herpetologists at least think that there is a decline in populations of amphibians, whether local or global in scope. Beyond that, there still seems precious little certainty. As admitted by the presenters, much of the "data" are anecdotal; of course, the vast majority of the remainder are not based upon any long-term evaluations of populations, so the data-base to seriously and adequately address this issue is sparse indeed.

Still it seems risky to ignore the volume of anecdotal and short-term data presented. Many of the populations in apparent decline are known or suspected to be so for the obvious and predictable reasons of habitat loss, destruction, or alteration.

Habitat loss or destruction seems to be most obviously important in Latin America and the southeastern United States. Thus, Campbell reports that Guatemalan rainforest has decreased 85% and a 1990 transect yielded one salamander where 281 individuals of eight species were seen in 1975. Similar, if not quite so severe, reports were made, e.g., for Puerto Rico by Dodd, Brazil by Caldwell, and Colombia by Duellman. Dodd also noted an 85% decrease in southeastern U.S. long-leaf pine habitats. Habitat alteration, through pollution, agriculture, development, or species introductions, appears likely a cause of decline in amphibian populations throughout the hemisphere. Examples include Davis's report on salamander populations in British Columbia, Jennings's on frogs in California, Wyman's on salamanders and frogs in New England, and even Rand's account of changes in frog populations when Barro Colorado Island (Panama) was isolated after canal construction.

The most perplexing and potentially the most ominous declines, however, are those of high altitude populations or those in apparently protected and pristine habitats. Davis noted the virtual extinction of *Rana pipiens* in Alberta and British Columbia. Similarly, several species of ranid frogs were reported in severe decline in the Rockies and Cascades by Jennings and Corn. Gorman reported the disappearance of the golden toad and *Atelopus* at the Monteverde Reserve in Costa Rica and Duellman a dramatic decline of various species in the Andes.

But no area seems immune. The stomach brooding frog appears to be extinct in Australia; and Licht reports cricket frogs nearly gone on Pelee Island in Lake Erie. Platz noted 16 midwestern U.S. species in decline and not all were peripheral species or those in prolonged decline.

As Steve Tilley summarized, "I hear habitat destruction over and over again."

Entering the realm of *Possible Explanations* requires that we entertain both more skepticism and more caution. It is obvious that habitat destruction does not explain all apparent declines. Vitt summarized apparent patterns to the decline and suggested that altitude was prominent as a common thread, especially in the Cascades, Rockies, and Andes, and *Rana* and *Atelopus*, especially, seemed affected, as well as northern, lowland populations of cricket frogs. He further noted that, although the effects of human population pressure, especially deforestation, could not be ignored, one potential factor in the apparent decline may be that herpetologists choose to study populations at peaks of the kinds of long-term fluctuations in size noted by Wilbur in the plenary session. Indeed, Blaustein reported on a population of Rana cascadae that disappeared between 1975 and 1976 and did not reappear until 1988. Pechmann documented different but dramatic fluctuations in species of *Ambystoma* in South Carolina.

Are amphibians appropriate bio-indicators? Bradford presented the rationale for considering amphibians to be a modern, world-wide equivalent of the canary-in-the-mine. Basically, they should be good canaries due to their complex life-cycle, with resultant variable life histories, habitat and trophic requirements, and environmentally-sensitive metamorphs; to the high permeability of skin and egg capsules in various environments; to their generally high fecundities and resultant population fluctuations; and, their often high biomass. What is not yet clearly answered is whether these make amphibians that different from other animals and whether there are documented cases of amphibians disappearing first in environmentally-degraded habitats.

Possible contributing factors are many. Wyman noted that evapotranspiration increases with temperature regardless of rainfall. He also presented evidence that as pH decreases, red-backed salamanders lose sodium and then water. Furthermore, as pH decreases, the number of both individuals and species of salamanders decreases dramatically. Jacobson reported that heavy metals suppress turtles' immune systems; improper nutrition has the same effect.

Obviously, given the uncertainty demonstrated in the preceding two sections, *Remedial Actions* and *Future Directions* may be neither obvious nor direct. Some steps, however, make a great deal of sense whether the apparent decline is real or not. The anecdotal nature of much of the evidence presented earlier in the session emphasizes the need to strengthen our knowledge of the biology and population status of our animals. Roy McDiarmid outlined a program being coordinated by the Herpetology Division at the U.S. National Museum. Perhaps the only thing that could be worse than no data, would be data that could not be compared and interpreted, often due to unknown or incompatible techniques of data collection. The USNM project seeks to establish comparability of sampling protocols and procedures for species inventory and population monitoring work.

Several emergency procedures were also suggested. For species in immediate danger of extinction, emergency listing on the federal endangered species list is possible, although temporary (240 days); some protection is available to proposed species according to Drewry. Solid data on populations are required. McClain demonstrated the limits to emergency captive propagation. Essentially it is a problem of numbers, since a maximum of 15-30 taxa could be so handled by U.S. zoos and aquaria. Strategic, careful planning would be required of the herpetological community if many species are threatened.

Continued efforts to understand and/or ameliorate any threats to amphibian diversity will be required at all possible levels. Pisani, following the analogy of Christmas (and other) bird counts, noted the potential for amateur herpetologists and the regional societies to become involved in supplying important help. Keeping in mind the "Fun Factor," regional groups might be very helpful in species

Two New SSAR Books On Middle East Herpetology:

THE SNAKES OF IRAN

by Mahmoud Latifi

ORIGINALLY published in 1985 in Farsi, the Persian language, Latifi's book is the only comprehensive review of the snakes of Iran. The author is Director of the Department of Herpetology and Antivenom Studies at the Razi Institute in Tehran. This English translation, supervised by Alan E. Leviton and George R. Zug, contains sections on general biology, snake venoms, and snake bite and its medical treatment. There is a key to the 60 species of Iranian snakes, a list by province of their distribution in Iran, and an extensive bibliography. The bulk of the volume (70 pages) consists of a descriptive account and information on size, diet, reproduction, habitat, and distribution for each species. Latifi's classification organizes snakes into eight families: Typhlopidae and Leptotyphlopidae (1 species each), Boidae (6), Colubridae (35), Elapidae (2), Hydrophiidae (5), Viperidae (9), and Crotalidae (1).

The **24 color plates** consist of two relief maps of Iran and 22 plates of snakes (66 individual figures) with species range maps. A new appendix has been added to this edition that contains a supplemental bibliography and a table showing the current terminology for Latifi's names.

Specifications: 164 pages, 24 color plates, 2 maps, 25 figures including 8 photographs in text, 6 x 9 inches (15 x 23 cm), clothbound. To be published March 1991.

Introduction to the HERPETOFAUNA OF IRAQ, KUWAIT AND THE ARABIAN GULF REGION

by Alan E. Leviton, Steven C. Anderson, Sherman A. Minton, and Kraig Adler

THIS HANDBOOK is intended as an introduction to the identification of the amphibians and reptiles of this central part of the Middle East. The region covered extends from the Turkish border south through Iraq, Kuwait, and northern and eastern Saudi Arabia. It also includes the waters of the Arabian (Persian) Gulf and the lowlands bordering it in southwestern Iran and on the Arabian Peninsula, thus also encompassing Bahrain, Qatar, and the United Arab Emirates. The book contains an annotated checklist of 144 species and subspecies, with citation of the original description for each taxon, a brief diagnosis, and a statement of the animals' distribution. There is also an illustrated identification key to all genera, species and subspecies.

The **16 color plates** depict representatives of every genus and most species covered in the book including all species of venomous snakes. Many of these species have never before been illustrated in color. There is a separate chapter on venomous snakes giving detailed descriptions, behavior, and ecology, plus a section on first aid and medical procedures for snake bite, and a table of recommended antivenoms with a list of sources. Also included is an extensive bibliography of Middle East herpetology and an appendix by John E. Simmons on collecting and preservation techniques.

Specifications: About 175 pages, 16 color plates (90 individual photographs), many maps and text figures, 7 x 10 inches (18 x 25 cm), clothbound. To be published June 1991.

TO ORDER

ADDRESS ORDERS to: SSAR Publications Secretary, Dr. Robert D. Aldridge, Department of Biology, St. Louis University, St. Louis, Missouri 63103, USA. Make checks payable to "SSAR." **Prices include shipping in USA**; overseas postage is additional. Overseas customers must make payment in USA funds or by International Money Order (include extra amount to cover bank charges), or by MasterCard or VISA (in which case account number and expiration date must be provided). For those paying by credit card, a 4% bank charge will be added to your credit card account. If you want information on SSAR membership, mark this box ❑ and return this form with your order.

The Snakes of Iran (ISBN 0-916984-22-2).

- Prepublication price to SSAR members if paid before April 1991 ❑ $17
- Price to Non-members and Institutions and to all others after publication ❑ $22

Herpetofauna of Iraq, Kuwait, and the Arabian Gulf Region (ISBN 0-916984-23-0).

- Prepublication price to SSAR members if paid before June 1991 ❑ $23
- Price to Non-members and Institutions and to all others after publication ❑ $28

SOCIETY · FOR · THE · STUDY · OF · AMPHIBIANS · AND · REPTILES

surveys or even population censuses if a standardized format were available for data collection. The potential exists for worldwide scope. Adler suggested that the professional societies, volunteer-staffed and poor as they are, are not themselves in the position to undertake or fund either the required long-term population studies or the series of careful studies evaluating specific environmental influences on amphibian mortality. They can be facilitators, and as such should produce an international, varied sub-discipline, task force to provide guidance to the herpetological community. Bean noted that, whereas the Endangered Species Act is not likely to be much support in this situation, state natural heritage or non-game wildlife programs receive federal money for conservation needs. Many federal jurisdictions, such as the Forest Service, Department of Defense, and Bureau of Land Management, also have legal mandates to maintain viable populations of vertebrates on their lands.

SOCIAL LIFE

There were additional activities which prevented us from spending the entire five days sitting in darkened lecture halls studying data. An opening social Monday evening included a Cajun band, Cajun dancers, and a Cajun humorist. It was a rousing good time, although the acoustics precluded hearing much of the entertainment and after running out of beer earlier, the social closed before 2300 hours! Tuesday evening involved a barbecue at the Audubon Zoo, where the Herpetology Department showcased an albino and an amelanistic alligator. Later that evening was the annual SSAR Auction, Joe Collins presiding. Fueled by the spirit of supporting the society and the meeting (as well as spirits proper), a lively crowd bid loudly (and also silently on selected items, in a new twist begun this year) for the many items of herpetological interest, including donations of books, equipment, and artwork donated by members and the exhibitors whose displays we perused in the University Center during breaks.

On Wednesday night and Thursday morning, Kraig Adler presented the video show, "Highlights of the First World Herpetological Congress." Wednesday night and Thursday afternoon, Adler, Dave Dennis, and Eric Juterbock presented the multi-media extravaganzas: "Herpetology — Past and Present," by Dennis and Adler, and "Amphibians of the Appalachians" and "Herpetology of the American West," by Dennis and Juterbock, again attended by a large and appreciative audience.

BUSINESS MEETING

The annual Business Meeting of SSAR was called to order by President Brown at 1630 hours on Wednesday, 8 August 1990, in the Stibbs Room of the University Center. He opened the meeting by summarizing the major business he had conducted during the year; three major items were: a membership announcement; formation of a review panel for the Catalogue; and, the special symposium.

Secretary Juterbock briefly summarized Sunday's Board Meeting and noted that those meetings have become incredibly free of controversy (nary a dissenting vote for the second straight year!) and almost short (adjournment before dinner!?!). He announced that the awaited membership drive is still in the offing, after several delays. The SSAR/HL Liaison Committee had by this point met several times. In addition to reports to be summarized, there were several items of note from committees: the Grants-in-Herpetology Committee is looking for a few (or many) good grant proposals in the area of zoo research; the Grants-in-Herpetology program was the recipient of a gift in memory of Cecelia Chang (it will fund a named grant each of next three years); and, the AAZPA Reptile Advisory Group wishes to meet with SSAR in 1991. The Board also agreed to the following: to pay 50% of additional expenses (since donations have already paid for printing and mailing announcements) for the Amphibian Decline Symposium; designate a new family membership category (at a price yet to be determined) which would allow professional spouses to both belong but only receive one set of publications; and, to name an ad hoc representative to the ASIH Public Affairs Committee's joint group working to respond to animal rights issues.

Treasurer Taylor reported that SSAR is financially sound. There were 2156 members as of the end of July 1990. A special projects fund of approximately $14,000 was accumulated and committed to publishing the Gloyd-Conant book (ca. $6000 of that already spent). A 1991 SSAR budget of $117,000 was approved by the Board and should be met; the income from society publications is very important in keeping the society solvent each year. The auction netted approximately $4000; this primarily supports meeting costs.

Sam Sweet, Editor of the *Journal of Herpetology*, stated that the Journal is in "great shape." It is within budget, manuscripts are being received in above normal numbers, and several recently adopted editorial conventions and stable budgets have allowed the lag time from acceptance to publication to be reduced from 17 to 9 months.

Herpetological Review, as reported by George Pisani, is making the transition to desktop publishing. Largely to reduce costs (but also to reduce lag time), about 20% of volume 20 resulted from desktop composition. Volume 21 may end up being 100% desktop. The cadre of keystrokers has been getting the job done, but anyone interested in helping out is certainly welcome to volunteer.

John Wright, who chairs the CAAR Review Panel, noted that the review was requested by the editor and will cover all aspects of Catalogue operations. Editor Villa reported that the 1990 accounts will be published in September. The Catalogue needs authors for new accounts in order to keep publishing on schedule.

Kraig Adler reported on **Facsimile Reprints in Herpetology** and **Contributions to Herpetology**. The 1956 Charles Bogert and Martin del Campo book, "Gila Monster and Its Allies," is planned for release in 1991. **Contributions**, Volume 6, the Gloyd-Conant *Agkistrodon* monograph is due in October. He proposed that SSAR publish the ten Plenary Lectures from FWCH as **Contributions**, Volume 7. A future **Contribution** could be the proceedings of the "Captive Breeding and Conservation of Amphibians and Reptiles" symposium proposed for the 1991 Annual Meeting to honor Roger Conant, a long-time friend of SSAR.

Secretary Juterbock reported for several committees. Six Grants-in-Herpetology of $300 each were awarded in three categories (*Herp Review* 21(3):45).

The winner of the Kennedy Student Award for Volume 23, 1989, of the *Journal of Herpetology* is Gabriel Moreno (Princeton University) for the paper, Behavioral and physiological differentiation between the color morphs of the salamander *Plethodon cinereus*, 23(4):335-341.

Juterbock announced the candidates for terms of office beginning in 1991. President-elect: Victor Hutchison and Edward O. Moll; Secretary: J. Eric Juterbock; Treasurer: Douglas Taylor; Director: Louis Guillette and Rodolfo Ruibal; and, Director (Regional Societies): Harold DeLisle and Stephen

Hammack. There were no nominations from the floor, so it was moved, seconded, and unanimously passed to accept the slate.

Joe Collins begged for sites for meetings in 1993, 1994, or beyond. Although there is the possibility of other meetings taking place outside the U.S. in 1993 and 1994, the SSAR Board decided to have a domestic meeting in those years, regardless.

After a long series of resolutions (see below), Linda Maxson presented a brief preview of the 1991 Annual Meeting at Penn State. She said to expect a "reasonably priced, fun, and intense meeting."

Finally, President Brown presented to President-elect Maxson the official SSAR presidential gavel, which she used to adjourn the meeting at 1745 hrs.

Respectfully submitted,
J. Eric Juterbock
SSAR Secretary

RESOLUTIONS

Decline of Amphibian Populations (Joint)

WHEREAS declines (sometimes drastic) in amphibian populations in many parts of the world have become increasingly apparent to the scientific community within the past several years; and
WHEREAS declining amphibian populations may signal major worldwide environmental degradation and precipitous declines of other life forms; and,
WHEREAS the evidence and opinion presented at the Symposium on Global Crisis in Declining Amphibian Populations indicates that the causes of these declines, though poorly understood, increasingly implicated environmental perturbations and changes produced by human activities; and,
WHEREAS a more thorough understanding of the causes and ramifications of these losses, and of the precipitant general loss of biodiversity worldwide, is in the best interests of humanity, which is obviously affected by environmental degradation; and,
WHEREAS there presently is no uniform system by which to assess critically the extent and causes of these worldwide losses of biodiversity; and,
WHEREAS the rate of this loss of biodiversity is so alarmingly rapid that time is of the essence in establishing such a system;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles (SSAR) and the Herpetologists' League (HL) hereby join other organizations in expressing grave concern over current declines in amphibian populations and biodiversity in general; and, be it
RESOLVED that the SSAR and HL strongly urge the world herpetological community, in particular the members of both amateur and professional herpetological societies, to join in creating effective mechanisms to assess the nature and scope of these declines, with the intent of soon advancing plausible hypotheses for these and marking recommendations to avert further losses; and, be it further
RESOLVED that the SSAR and HL endorse and strongly urge imminent political support and funding of research and monitoring leading to an understanding of the problem of amphibian decline and disappearance, and serving to establish a baseline of knowledge necessary for recommendation of further action that may be warranted.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, 8 August 1990 at the jointly sponsored Symposium on Declining Amphibian Diversity.

Turtle Nesting Habitat (Joint)

WHEREAS beaches in Brevard and Indian River Counties, Florida, contain the second densest aggregations of nesting loggerhead sea turtles (*Caretta caretta*) in the world; and,
WHEREAS a large number of green turtles (*Chelonia mydas*) also nest on these beaches; and,
WHEREAS these twenty miles of beach are significant both nationally and internationally for the conservation of these declining species, both of which are protected under provision of the Endangered Species Act of 1973; and,
WHEREAS beachfront development threatens the integrity of these high density nesting beaches; and,
WHEREAS these beaches have been targeted for acquisition as the Archie F. Carr Jr. National Wildlife Refuge in order to protect threatened and endangered nesting sea turtles, their eggs, and hatchlings;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles (SSAR) and the Herpetologists' League (HL), professional scientific societies devoted to the study of amphibians and reptiles, urge the Honorable George Bush, President of the United States, Manuel Lujan, Secretary of the Interior, and members of Congress, particularly those members on the Senate Appropriations Subcommittee, to support the acquisition of the Archie F. Carr Jr. National Wildlife Refuge; and, be it further
RESOLVED that these societies urge the U.S. Fish and Wildlife Service to vigorously use its staff and influence to support immediate acquisition and pursue funding for the Archie F. Carr Jr. National Wildlife Refuge in accordance with its February 1990 policy statement on protection of sea turtles.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, 8 August 1990 at the jointly sponsored Symposium on Declining Amphibian Diversity.

Protection of Mexican Sea Turtles (Joint)

WHEREAS Mexico has historically supported the highest species richness and abundance of sea turtles in the western hemisphere, with all but one of the worldwide species nesting on its shores; and,
WHEREAS the sea turtles of the world are an international resource that in the course of their lives travel in and out of sovereign waters of many nations and into international waters; and,
WHEREAS the olive ridley sea turtles are utilized as a sustainable resource for local communities in several Central American nations through a program which protects the long-lived adults and rationally exploits only eggs; and,
WHEREAS Mexico has allowed hundreds of thousands of adult olive ridleys to be harvested during the past two decades, but has recently ended the legal slaughter of 20,000 adults of this species, 99% of which had been identified as gravid females; and ,
WHEREAS a continued harvest of that sort was believed to be unsustainable, based on the fact that three of four major nesting populations of this species in Mexico have already collapsed from commercial over-exploitation; and,
WHEREAS Mexico remains the only nation in the western hemisphere which is not a signatory to the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); and,
WHEREAS there has been a call from many Mexican ecological and environmental organizations for Mexico to immediately assent to CITES, without reservations;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles (SSAR) and the Herpetologists' League (HL), professional scientific societies devoted to the study of amphibians and reptiles, applaud the 28 May1990 decree of Mexico's President Salinas de Gortari outlawing the killing of all sea turtles and the harvest of sea turtle eggs; and, be it further

RESOLVED that these societies strongly encourage Mexico's government to vigorously enforce this new decree, to join with all other nations of this region and the 105 countries worldwide as a signatory to the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), and to move ahead quickly to provide sustainable economic alternatives for Mexico's turtle fishermen.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, 8 August 1990 at the jointly sponsored Symposium on Declining Amphibian Diversity.

Goliath Frog

WHEREAS the Goliath frog (*Conraua goliath*) has unique anatomical, behavioral and physiological attributes and is the largest extant anuran; and,
WHEREAS the Goliath frog is limited to coastal rain forests in the Republic of Cameroon, Equatorial Guinea and Gabon; is further confined within these forests to riverine habitat; is even further limited to areas of waterfalls and rapids; and is always found in low concentrations within these areas; and,
WHEREAS the habitat of the Goliath frog is being rapidly destroyed by clearing of the rain forests and construction of dams on rivers, such as those already built on the Sanaga and planned on the Ntem; and,
WHEREAS the Goliath frog is listed as "vulnerable" in the most recent CITES official lists; and,
WHEREAS a British investor has received Cameroon government permission and international funding to open a Goliath frog farm for frog leg production, which will place further pressures on wild stocks with no scientific basis that such farming will be successful and no economic

evidence that such a venture is appropriate; and,

WHEREAS recent major media coverage in the United States of the use of this species in "frog jumping contests" and coverage of the importation of the animals have resulted in increased demand by private collectors and others; and,

WHEREAS live Goliath frogs are being advertised by animal dealers at prices ranging from about US$1500 to US$3000 each, and such value is an indication of their rarity and of the economic forces driving further exploitation; and,

WHEREAS this species is subject particularly to stress of capture, handling, shipping, and confinement with resultant high mortality levels, and has not been bred successfully in captivity;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles (SSAR) assembled at its annual meeting for 1990 in New Orleans, Louisiana, USA, respectfully urges all parties with appropriate regulatory jurisdiction over collection, trade, and conservation management take necessary actions to insure the survival of *Conraua goliath* in the wild; and, be it further

RESOLVED that copies of this resolution be sent to: the appropriate agencies within the governments of the Republic of Cameroon, Equatorial Guinea and Gabon; the World Wildlife Fund; TRAFFIC (USA); World Conservation Monitoring Centre (Cambridge, United Kingdom): IUCN (AFHERP Group), Trade Specialist Group); CITES (Secretariat, Lausanne); ISSCA Conservation Committee; U.S. Fish and Wildlife Service (Office of Management Authority); California Fish and Game Commission; and to any other organizations or agencies identified as having interest in the conservation of this species.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles, 8 August 1990 at its Annual Meeting.

Honoring Outgoing SSAR Officers and Editors

WHEREAS the following individuals have given freely of their time, insight, and knowledge to the Society for the Study of Amphibians and Reptiles in this past year in advancing its goals and furthering its development as an international society; and,

WHEREAS said Society is greatly indebted to these persons for their continual efforts in its behalf; and,

WHEREAS certain of these persons have, over the years, freely gives so extensively of themselves to SSAR that to enumerate all their individual contributions here would have the audience yelling for my head;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles offers its most sincere thanks to the following persons who have served in these capacities:

HENRI SEIBERT - Immediate Past-president
LYNNE D. HOUCK - Director
JAMES P. BOGART - Director
JIM VIAL - Managing Editor, Journal of Herpetology
CARL GANS - Chair, Nominating Committee

BE IT FURTHER RESOLVED that the SSAR urges these persons not to ride off into the sunset, but rather to, with or without official titles, continue to be available as resources to help those who follow better guide the Society

Adopted by the Society for the Study of Amphibians and Reptiles, 8 August 1990 at its Annual Business Meeting.

Thanking The Local Committee (Joint)

WHEREAS nearly 500 herpetologists trekked to the sunny south, braving the threats of excessive shrimp consumption, the French Quarter, untold encounters with crabs (marine ones), an abundance of drinking establishments, and the annual pleadings of the auctioneer; and,

WHEREAS Harold Dundee, Ernie Liner, Richard Seigel, and their numerous colleagues and assistants at Tulane University and the Audubon Zoo in a state which has nearly as many herpetologists as it has species of herps, performed a great service for the SSAR and the Herpetologists' League by agreeing to undertake the arduous task of housing a meeting of this size; and,

WHEREAS this meeting maintains a tradition of the joint SSAR and HL annual meeting providing an outstanding forum for the dissemination of ideas and information; and,

WHEREAS Tulane University has generously allowed the societies to use the conference facilities without charge; and,

WHEREAS all participants have had a fine time in a herpetologically and socially diverse setting;

THEREFORE, be it

RESOLVED that the Society for the Study of Amphibians and Reptiles and the Herpetologists' League offer their most sincere thanks to these persons who worked so hard to make this meeting a success; and, be it further

RESOLVED that these societies extend a special note of appreciation to our official host, the Biology Department of Tulane University, recently reorganized in part into the Department of Ecology, Evolution, and Organismal Biology, for inviting us to the Tulane Campus this year.

Adopted unanimously by the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, 8 August 1990 at their joint Annual Meeting.

COMMENTS ABOUT THE AMPHIBIAN DECLINE SYMPOSIUM

This writer, for one, drew the following conclusions after seven hours of presentations. It is very hard to be optimistic! Although there are *no solid data to support a hypothesis of wide-spread decline* of amphibian populations, there are also *no solid data to support a hypothesis of wide-spread stability*, either. Furthermore, several points are troubling.

In the first place, we have identified numerous reasons to *expect* declines. If amphibian populations are stable or only naturally fluctuating, in spite of the myriad assaults on their habitats, especially those that are destroyed outright, they are certainly different than many other organisms that are more visible if not better known. Most depressing in this regard is that it seems very unlikely that anything short of stopping population growth, improving the world economy by orders of magnitude, and converting the world citizenry to environmentalism, will significantly change these expectations.

SSAR Regional Societies Amphibian Monitoring Workshop; March 1991; Fort Collins, CO

Basic, ongoing amphibian population monitoring is necessary to assess changes in their status. Regional societies have the resources to make real contributions to scientific knowledge of the status of local amphibian populations. The SSAR Regional Societies Liaison Committee has developed a model database for this effort, and at the workshop will illustrate how your society can use this both to add fun to field trips and to collect/share data of importance to amphibian conservation efforts. The workshop is being held as part of the symposium *Biodiversity of the Rocky Mts.* (Colorado State Univ.). **For details and registration info, contact Steve Hammack (SSAR Regional Soc. Comm. Chair), Fort Worth Zoo, 2727 Zoological Park Drive, Fort Worth, TX 76110.**

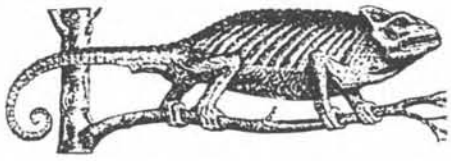
Second, accepting that the data are incomplete, anecdotal, sometimes inconsistent, and almost never long-term, why do so many field herpetologists *think* that they are witnessing declines in the species they are most familiar with? It seems to me that if our intuition were so often wrong, herpetology would not be advancing as it is. Therefore, it seems to me the bottom line is obvious: *we need survey data*; and we need them yesterday!

As herpetologists, we owe it to our animals to know more about their geographic distribution, habitat utilization, species assemblages, and population sizes. As conservation biology edges closer to the triage stage, we are going to have to be able to make such decisions about local habitats as what species are there, in what numbers, and how important is that association to the health of the meta-population. Until we can do that, we will never be able to make the best emergency management decisions. In reality, the uproar over the possibility of a global amphibian decline is the canary, and our data bases the mine. If the canary ain't dead, it sure is breathing irregularly! Let us all move forward in building data bases adequate to these questions. Is it the worst-case or best-case scenario that we will collect the data and find that amphibians have not yet declined?

J. Eric Juterbock ●

ADVERTISERS WANTED

Herpetological Review always is interested in alerting SSAR members to new books, equipment, or supply sources which are of use to the herpetological community. Many of our advertisers have been with us for years because the responses to their ads in *HR* were so positive. If you know of any distributors, publishers, or manufacturers who might benefit from an ad in *HR*, please let them know about us - or let us know about them so we can invite them to advertise in our publication. ●



SYMPOSIUM AND VOLUME TO HONOR ROGER CONANT

Symposium. During the 1991 joint SSAR-HL meeting at Pennsylvania State University (6-10 August), a special two-day symposium, entitled "Captive Management and Conservation of Amphibians and Reptiles" will be held. This will include 45 of the leading international authorities and is being organized by James B. Murphy (Dallas Zoo) and Joseph T. Collins (University of Kansas). The results will be published as a book.

This event will be dedicated to Roger Conant, who will celebrate his 82nd birthday in May. Dr. Conant's *Field Guide*, the most widely-used herpetological book of all time, has been extremely influential in the development of North American herpetology and the third edition will be published next spring.

Appreciation Volume. As part of the ceremony to honor Dr. Conant, a bound volume of letters from friends and colleagues will be presented to him. Ordinarily, these letters are solicited privately, but since Roger Conant's life's work has influenced so many persons far and wide—both professionals and amateurs alike—we issue this public solicitation so that all can contribute.

If you wish to include a letter in the volume, stating your own appreciation, simply write it on a piece of paper measuring 8 1/2 by 11 inches, leaving a margin for binding. Mail these unfolded and flat to: Dr. Joseph C. Mitchell, Department of Biology, University of Richmond, Richmond, Virginia 23173.

The deadline for receipt of letters is: 1 June 1991.

Contributors to Student Travel Fund

Last year, the Student Travel Fund Committee directed financial support for travel to eight doctoral students attending the First World Congress of Herpetology in Canterbury, England. These students were: Elisabeth Arevalo (Brigham Young University), Joseph Bernardo (Duke University), Ann Burke (Harvard University), Richard Cloutier (University of Kansas), Reginald Cocroft (University of Texas), Linda Ford (University of Kansas), Raphael O. De Sa (University of Texas), and Brent Palmer (University of Florida).

On behalf of these students, the Committee extends its sincere thanks to the following individuals for significant financial donations: Ronn Altig, Edmund D. Brodie, Jr., James R. Dixon, William E. Duellman, Victor Hutchison, David L. Jameson, Robert R. Miller, Sam Sweet, Linda Trueb, Marvalee Wake, and David Wake.

The Committee also thanks the following institutions, organizations, and commercial concerns for their generous support: Alan R. Liss, Inc.; American Society of Ichthyologists and Herpetologists: British Airways; Facts on File Publications; Donald E. Hahn; The Herpetologists' League; Holbrook Travel, Inc.; Milwaukee Public Museum; Museum of Comparative Zoology, Harvard University; Princeton University Press; Smithsonian Institution Press; Society for the Study of Amphibians and Reptiles; T. F. H. Publications, Inc.; University of California Press; University Presses of Florida; University of Pittsburgh Press; W. H. Freeman and Company; and Wildlife Materials, Inc.

David Cundall
Chair, HL, ASIH, SSAR
Student Travel Fund Committee ●

NEWSNOTES

TARANTULA SLIDES WANTED

Dr. Robert Raven, curator at the Queensland Museum, and Rick West, research associate at the Royal British

Columbia Museum, are gathering specimens, photoslides, and data on theraphosid spiders (tarantulas) for a planned book. Although tarantulas are not herps, it is fair to say that herps, herpers, and tarantulas often share the same microhabitat.

The assistance of SSAR members, and friends, is requested. Please send us photoslides and/or data on both Old World and New World tarantulas to aid our project. Photo credits would be given if any photoslides are used, and species names would be provided if determined from the photoslide.

Please forward slides or data to: Dr. Rick C. West, Toral B.C. Museum, 4034 Glanford Avenue, Victoria, B.C., Canada V8Z 3Z6. (604) 479-1533. ●

INFORMATION REQUEST

Information is currently being collected for a North American Regional Studbook on the Chinese crocodile lizard, *Shinisaurus crocodilurus*. If you have had specimens of this taxon in your collection at any time and would like your information published in the studbook, please contact Andy Snider, Reptile Department, Audubon Park and Zoological Gardens, P.O. Box 4327, New Orleans, LA 70178, USA, or call (504) 861-2537. ●

VOUCHER SPECIMENS SOUGHT BY USFWS

The U.S. Fish and Wildlife Service's Forensic Laboratory in Ashland, Oregon, USA, is in need of assistance. Colubrid snakes from Asia, along with crocodilians, sea turtles, boas, pythons, and varanid, iguanid, and tupinambid lizards from around the world are falling prey to the fashion industry in the form of tanned leather. The mission of the Forensic Laboratory is to provide law enforcement agents with accurate and court-defensible species-level identifications of such products.

I am calling upon the general herpetological community to assist in building our reference collection containing voucher specimens of all commercially valuable taxa. If you have materials (preserved specimens, frozen carcasses, raw or tanned hides, etc.) that we might use, please contact: Stephen D. Busack, National Fish and Wildlife Forensics Laboratory, 1490 East Main Street, Ashland, OR 97520, USA. Shipping will be paid for, and a fair market value for any donations will be determined so that donations can be deducted from Federal taxes. ●

AMNH VOLUNTEERS

Approximately 20 volunteer positions are open in 1991 at the American Museum of Natural History's Southwestern Research Station in Portal, Arizona. The volunteer program is run annually and offers students in biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging are provided to volunteers in exchange for four hours per day of routine chores, with the remaining time available for research activities.

The program is open to both undergraduate and graduate students - the latter may pursue their own research projects. *Faculty knowing of promising students should alert them to this opportunity* for professional experience toward, development of, and evaluation of, their career goals.

Volunteers are needed between 15 March and November. Appointments are for part of this period, with a minimum appointment of six weeks. Applicants for spring positions (March through May) should submit forms by 15 February., summer volunteers (June-August) by 1 April, and fall volunteers (September-November) may apply any time.

For application forms, write: Resident Director, Southwestern Research Station of the American Museum of Natural History, Portal, AZ 85632, USA. (602) 558-2396. ●

Clemmys PROTECTION RESOLUTION

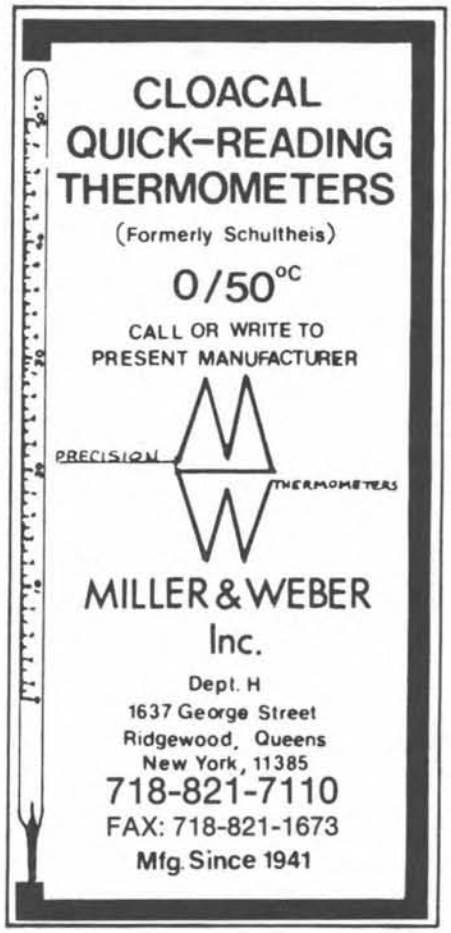
WHEREAS, it has become increasingly evident that the populations of eastern *Clemmys (C. guttata, C. insculpta, C. muhlenbergii)* face serious survival threats throughout most if not all of their ranges; and

WHEREAS it has become clear that collection from wild populations of *Clemmys* has substantially contributed to these threats; and

WHEREAS, the majority of these populations are protected by law, and thus many wild-caught specimens offered for sale are in fact illegal:

THEREFORE, BE IT RESOLVED, that all collection from wild populations of *Clemmys* be stopped; that purchase of *Clemmys* be limited solely to specimens with clear proof of captive-bred status; and that those who presently maintain *Clemmys* increase their efforts to reproduce them, thereby increasing the availability of captive-bred animals.

Submitted by: AAZPA Turtle and Tortoise Advisory Group Coordinators, Brett Stearns, Chairman, Dave Collins, Dennis Herman, Bern Tryon. ●



SEA TURTLE TAG CENTER OF THE PACIFIC

The Sea Turtle Tag Center of the Pacific is a cooperative program to make available tags, tag applicators, and technical assistance in the tagging of sea turtles for research purposes to government and other qualified organizations in the Pacific islands region of Polynesia, Micronesia, and Melanesia. The program

is jointly conducted by the Southwest Fisheries Center Honolulu Laboratory of the National Marine Fisheries Service, NOAA, and the University of Hawaii's Hawaii Institute of Marine Biology (HIMB). The program is designed in particular to aid those locations where small to moderate numbers of tags (i.e., 100-500) are needed, and local authorities or organizations might not otherwise order them from the manufacturer.

The Inconel tags are self-piercing, self-locking, and simple to use when applied with a special plier-like applicator to the trailing edge of a turtle's front flippers. All tags are imprinted consecutively with a letter-number combination to permanently identify individual turtles. The following inscription appears on each tag:

Write HIMB
University
Hawaii 96744

Persons who report the resighting of a tagged turtle to this address are sent a T-shirt bearing a sea turtle logo. The resighting information that is received is relayed to the tagging organization.

For more information about the availability of tags from the Sea Turtle Tag Center of the Pacific, write to: G.H. Balazs, Southwest Fisheries Center Honolulu Laboratory, National Marine Fisheries Service, 2570 Dole Street, Honolulu, HI 96822-2396. (FAX 808-942-2062) ●

AMPHIBIAN LARVAL BIOLOGY

A course on amphibian larval biology is being offered at the Highlands Biological Station, Highlands, North Carolina, 3-14 June 1991. It will be taught by Dr. Richard Wassersug of Dalhousie University with the assistance of several guest instructors. Credit for the course is available through either Western Carolina University or the University of North Carolina at Chapel Hill. For forther information and application forms, contact: Highlands Biological Station, PO Box 580, Highlands, NC 28741, USA. (704) 526-2692.●

THE ROGER CONANT RESEARCH FELLOWSHIP

The Roger Conant Research Fellowship was established in 1990 to honor the scientific contributions of Roger Conant, the Toledo Zoological Society's first Curator and Research Scientist. It is designed as a vehicle to promote career development in zoo research and management in outstanding undergraduate and graduate students.

Tenure of Fellowship: A flexible two-month period falling between 1 May and 31 August each year.
Stipend: $1,500 for the period of the fellowship. Lodging adjacent to Zoo grounds will be provided by the Society.

Eligibility: Junior, senior, or graduate students from an accredited four-year university majoring in animal husbandry, biology, wildlife management, veterinary science, zoology, or allied field.

Types of Projects: Emphasis will be on student participation in projects developed by Toledo Zoo staff and carried out in the animal departments of the Department of Conservation and Research. Exceptions for student generated research will be made for applicants with demonstrated research potential. All research will be directed or supervised by a Departmental Curator, Research Scientist, or Staff Veterinarian.

Mode of Selection: Selection of Conant Fellows will be made on the basis of merit. Grades, letters of recommendation, and relevant experience will all be considered in making the final selection.

Application: Application materials may be obtained from: Dr. Peter J. Tolson, Conservation Biologist/Research Coordinator, Toledo Zoological Society, P.O. Box 4010, Toledo, OH 43609, USA.

The closing date for applications is 1 April of each year. Awards will be made by 1 May. Two letters of recommendation from persons familiar with the collegiate performance or research potential of the applicant, including a letter from the student's most recent advisor or major professor, are required. A copy of the student's most recent college transcript is also required. No application will be processed until all supplementary materials are received. ●

AAZPA CHELONIAN ADVISORY GROUP FORMED

The Wildlife Conservation and Management Committee of the American Association of Zoological Parks and Aquariums (AAZPA) has approved the formation of a Chelonian Advisory Committee.

The group, initially convened as a Special Interest Group, commenced its activities at a Herpetology Species Survival Plan meeting held in Gainesville, Florida in April 1990.
At that meeting, 21 people, representing many zoos throughout the country, agreed to serve as the group's initial members. Of these, Dave Collins (Burnet Park Zoo, Syracuse, NY), Dennis Herman (Zoo Atlanta, Atlanta, GA), Brett Stearns (Institute for Herpetological Research, Stanford, CA), and Bern Tryon (Knoxville Zoo, Knoxville, TN) were selected as Group Coordinators.

The group's purposes include coordinating with and supporting other on-going chelonian conservation projects, such as the IUCN's Tortoise and Freshwater Turtle Action Plan. One of the group's first projects will be to enlist the cooperation of American zoos in streamlining their chelonian collections by pairing up breedable animals and in making more space available for chelonians most in need of captive management and breeding programs.

The coordinators encourage input from the private sector, as well as from academic and field researchers who are actively involved in conservation and management programs for chelonians.

Bern W. Tryon
Department of Herpetology
Knoxville Zoological Gardens
P.O. Box 6040
Knoxville, TN 37914, USA ●

MEETINGS

SECOND WORLD CONGRESS OF HERPETOLOGY

The Second World Congress of Herpetology will be held at the University of Adelaide, Adelaide, South Australia, 29 December 1993 - 5 January 1994. This international congress is the second of a series that started in 1989 in Canterbury. This meeting will enable all persons interested in herpetology to meet and exchange information to promote the advance of

knowledge and the conservation of the world's amphibians and reptiles. The congress will consist of topical symposia, plenary speakers, poster sessions, workshops, displays, excursions, and meetings of ancillary groups, and will offer visitors the opportunity to get acquainted with the unique and diverse Australian herpetofauna. Subjects and moderators will be announced well in advance so that potential participants can volunteer. The meeting will be open to all persons. Registration will begin 1 January 1992.

Further announcements about registration, travelling arrangements, accommodation, and program will be made in herpetological journals as soon as available. For further details and mail listing, write: Dr. M.J. Tyler, The University of Adelaide, Department of Zoology, Box 498, GPO, Adelaide, South Australia 5001, Australia.

Sponsoring organizations and individuals are welcome. For further details, write: Dr. R.L. Carroll, Treasurer WCH, Department of Biology, McGill University, 1205 Docteur Penfield Avenue, Montreal, PQ, Canada H3A 1B1. ●

1991 ASC ANNUAL MEETING

The Association of Systematics Collections will hold its 1991 annual meeting at Texas A &M University, College Station, Texas on 16-18 May 1991. The meeting will feature a workshop on "Biodiversity and Collections." Speakers from the U.S., Canada, and several Latin American countries will discuss the role of collections in biodiversity studies, international collaboration in biodiversity studies and collection development, and the status and needs of collections in developing countries. There will also be a workshop on Collections Policy issues. Participants are welcome. For further information, contact ASC at 730 11th Street NW, Second Floor, Washington, D.C. 20001. (202) 347-2850. ●

REPTILIAN CHEMICAL SENSES

A Conference on Reptilian Chemical Senses will be held 15-16 June 1991 at the Penn Towers Hotel, Philadelphia, Pennsylvania, just prior to the Chemical Signals in Vertebrates meeting scheduled for 16-22 June at the same location. For information concerning the conference, contact Dr. Mimi Halpern, Department of Anatomy and Cell Biology, Box 5, SUNY Health Science Center at Brooklyn, Brooklyn, NY 11203, USA. (718) 270-2958. FAX: (718) 270-3378. ●

BHS MEETINGS - 1991

Meetings of the British Herpetological Society are held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1, generally starting at 7.00 pm and ending at 9.00 pm. SSAR members and herpetologists from other countries are most welcome.

February 14: Dr Wolfgang Wuster (Department of Zoology, University of Aberdeen): Cobras and other herps in Southeast Asia.

March 23: A.G.M. (separate agenda). A special Saturday all-day event to be held at Birkbeck College, London (Malet Street, London WC1).

April 17: Dr Robert Bustard (Isle of Man): Sea Turtles on Australia's Great Barrier Reef.

May 23: Dr Robert Oldham (Department of Biology, Leicester Polytechnic): Nigerian Amphibia (postponed from 1990).

June 18: Mr Geoff Clarke (Bere Regis, Dorset): Amphibia and Reptilia Worldwide - Their Care and Breeding.

September: Date to be announced. Care and Breeding of Amphibians and Reptiles: An Open Meeting. Contributions from members; live animal & photographic displays; sales and exchanges; commercial displays of books & vivarium equipment. 2.00 to 5.30 pm. Lecture Theatre of the Soo Studies Centre, Zoological Society of London, Prince Albert Road, London NW1.

October 10: Dr Michael Lambert (BHS Chairman): Some African Herpetofauna and the Impact of Tsetse Control Insecticides on Lizards in Zimbabwe.

November 20: Mr Mark Day (Gambian Dwarf Crocodile Rescue Project, University of Bristol): Herpetofaunal Wading Through West Africa.

For further details, membership, information on publications and subscriptions to the Herpetological Journal and quarterly BHS Bulletin, contact: BHS, c/o Zoological Society of London, Regent's Park, London NW1 4RY, UK.

Michael R.K. Lambert Chairman, British Herpetological Society ●

HIGHLANDS CONFERENCE ON PLETHODONTID SALAMANDERS

The Highlands Conference on Plethodontid Salamanders will be held in early June 1992 at the Highlands Biological Station in Highlands, North Carolina. This meeting will follow the tradition of the first (1972) and second (1982) conferences in exploring new directions in plethodontid research. The conference features invited papers, an evening poster session, and a symposium. All interested parties are encouraged to participate.

Future announcements concerning conference dates, a call for papers, and registration information will be sent only to those on our mailing list. To receive these announcements, send your name, address, and phone number to: Dr. Robert Jaeger, Department of Biology, University of Southwestern Louisiana, Lafayette, LA 70504-2451, USA. (318) 231-5235. FAX (318) 231-5834. ●



LEGISLATIVE ALERT

This column is produced by the SSAR Conservation Committee to alert members of the herpetological community to recent and proposed regulatory changes involving amphibians and reptiles. We encourage SSAR members to notify us of any significant changes in state, national, or international conservation laws as they relate to these animals. For further details about any of the following, or to report additional changes, please contact Kurt A. Buhlmann, SSAR Conservation Committee, c/o Division of Natural Heritage, Virginia Department of Conservation and Recreation, 203 Governor Street, Suite 402, Richmond, VA 23219, USA.

The following final and/or proposed listings and regulations have been announced by governmental regulatory agencies. Pertinent *Federal Register* (FR) citations are given for U.S. notices.

U.S.: *Graptemys flavimaculata* (yellow-blotched map turtle); proposed as Threatened [FR 55(133): 28570-28573, 8/11/90]

This basking turtle is restricted to the Pascagoula River system in Mississippi, including the Leaf and Chickasawhat Rivers and other tributaries. It is threatened by habitat modification, wanton shooting, collecting, water quality degradation, and nest predation.

MEXICO: The government of Mexico has announced that it is prohibiting the take of sea turtles in its waters and the destruction of turtle nests. Accompanying this decision, the government is: initiating a program to study the magnitude of incidental take of sea turtles during fisheries activities; extending offshore and beach refuge zones; increasing scientific studies aimed at protection and conservation of sea turtles; and registering all existing stockpiles of sea turtle products (Endangered Species Technical Bulletin, Vol XV, No. 7, July 1990).

Florida: *Gopherus polyphemus* (gopher tortoise); incidental take, draft rule

In Florida, where gopher tortoises are listed as a Species of Special Concern, the combined forces of urbanization, residential development, agriculture, forestry, and mining are destroying hundreds of thousands of acres of tortoise habitat annually. Although the state extracts some mitigation for habitat lost to the largest developments, 95% of the loss is unmitigated. The Florida Game and Fresh Water Fish Commission is now drafting rules that would require some habitat mitigation or preservation for tortoise burrows that are destroyed during developmental and agricultural activities (i.e. incidental take). The draft rule will then be presented to the Commission for consideration, perhaps as early as November 1990. As expected, strong resistance to such a rule is being exerted by developmental and agricultural interests. For additional information, contact; Col. Robert M. Brantly, Executive Director, Florida Game and Fresh Water Fish Commission, 620 S. Meridian Street, Tallahassee, FL 32301, USA.

KURT A. BUHLMANN
SSAR Conservation Committee



FEATURES

A CONGENITAL LUNG DISORDER IN A JUVENILE HEAD-STARTED KEMP'S RIDLEY SEA TURTLE (*Lepidochelys kempi*)

Since 1978, the National Marine Fisheries Service (NMFS), Southeast Fisheries Center, Galveston Laboratory, Galveston, TX, has been involved in an effort to save from extinction the most endangered species of sea turtle, Kemp's ridley (*Lepidochelys kempi*). This conservation program is a cooperative venture among Mexico's Instituto Nacional de la Pesca, the U.S. Fish and Wildlife Service, the National Park Service, the Texas Parks and Wildlife Department, and the NMFS. The NMFS husbandry portion of the program is referred to as head starting.

Diseases encountered in the husbandry of the Kemp's ridley sea turtle have been documented by Clary and Leong (1984) and Leong et al. (1989). Leong et al. (1989) reported that some apparently healthy Kemp's ridleys die of no explainable cause during head starting. We report herein the death and necropsy of an outwardly healthy Kemp's ridley with congenital lung defects.

The turtle in question showed no external signs of illness or disease before its death. It apparently was feeding well and its growth appeared normal as compared to others from the same clutch (Table 1). At the time of death, the turtle was 4-1/2 months old, had a mass of 110.5 g, and had a straight-line carapace length of 8.6 cm and a straight-line carapace width of 7.9 cm. Though the turtle was examined for external marks, lesions, or deformaties, none was found.

The necropsy proceeded as recommended by Rainey (1981) and Wolke and George (1981). The turtle was placed on its back and the plastron removed by cutting along its margin through the skin and between the marginal and inframarginal scutes. The plastron was then pulled up, the pectoral and pelvic muscles severed, and the plastron removed. Initial examination showed that all major organs were present and appeared to be in the proper position. The lungs, however, were much smaller than expected for a Kemp's ridley sea turtle of this size. Whereas the lungs of a turtle of this size and age normally cover two-thirds of the dorsal body cavity, this turtle's lungs, although normal in length, did not extend more than a few mm beyond the spinal column. The right lung was smaller than the left, and on first observation was thought to be absent. The lungs, although vestigial, were pink in color and contained no fluid.

Kemp's ridley sea turtle hatchlings received for head starting have exhibited a variety of externally manifested congenital birth defects (Leong et al. 1989). It would be expected that corresponding internal defects would be present in such turtles as well. However, the congenital lung problem described herein occurred in a turtle with no outward signs of abnormalities. It seems likely that a reduced lung capacity could supply oxygen to a turtle's tissues only up to a certain size. Once the mass of such a turtle increased beyond this point, pulmonary dysfunction could occur and the turtle would die. We believe that the death in this case was related to the congenital lung defects.

Researchers performing necropsies on apparently healthy specimens of Kemp's ridleys that die in captivity should look closely for internal evidence of abnormalities.

LITERATURE CITED

Clary, J.C. III and J.K. Leong. 1984, Disease studies aid Kemp's ridley sea turtle head start project. Herp. Review 15(3):69-70.

Leong, J.K., D.L. Smith, D.B. Revera, J.C. Clary III, D.H. Lewis, J.L. Scott, and A.R. DiNuzzo. 1989. Health care and diseases of captive-reared loggerhead and Kemp's ridley sea surtles. *In*: Caillouet, C.W., Jr. and A.M. Landry, Jr. (eds), Proceedings of the First International Symposium in Kemp's Ridley Sea Turtle Biology, Conservation and Management, Texas A & M University Sea Grant College Program,

Table 1. Growth, survival, and health of one clutch[a] of head started Kemp's ridley sea turtles of the 1985 year-class, and growth of one specimen from the clutch with "sudden hatchling-death syndrome."

Date	"Sudden Hatchling-death" specimen Weight, g	Average Weight, g	Clutch Survival, %	Health, %[b]
8 July 1985	-	16.0	-	-
29 Aug.	47.0	-	-	-
26 Sept.	-	-	100.0	100.0
23 Oct.	-	120.8	100.0	98.9
1 Nov.	110.5	-	-	-
20 Nov.	-	171.7	97.8	98.9

a) All these turtles were from clutch 6 collected as eggs from the beach near Rancho Nuevo, Tamaulipas, Mexico.

b) Indicates the percentage of turtles in the clutch that were not being treated for a pathological problem. In most instances, the treatable pathological problmes are minor skin lesions of the flippers and neck.

College Station, TX.
Rainey, William E. 1981. Guide to Sea Turtle Visceral Anatomy. NOAA Technical Memorandum NMFS-SEFC-82.
Wolke, R.E. and A. George. 1981. Sea Turtle Necropsy Manual. NOAA Technical Memorandum, NMFS-SEFC-24.

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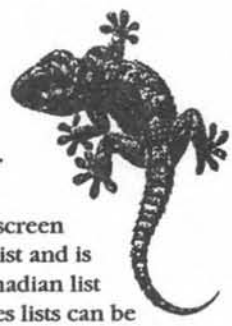
OBSERVATIONS ON THE LIZARD *Shinisaurus crocodilurus* IN CAPTIVITY

The Chinese crocodile lizard (*Shinisaurus crocodilurus* Ahl,1930) has been considered rare and enigmatic since its first description, with few specimens reaching western museums or zoos until 1984 (Wilke 1985). Most of our knowledge of this lizard was based on field notes of the original collector (Fan 1931) and on anatomical studies on very few specimens (cited in Hu et al. 1984). The taxonomic status of this lizard is uncertain with placement either in Xenosauridae (Mc-Dowell and Bogert 1954) or in Shinisauridae (Ahl 1930; Hu et al. 1984; Wu and Huang 1986).

Recently, Shen and Li (1982) described feeding, reproduction, and other behavior of this species in the wild. Wilke (1985) reported on captive specimens, especially housing conditions and feeding problems. Sprackland (1989) provided many observations on feeding, sexual dimorphism, behavior, and captive births. The present note provides additional observations on the Chi-nese crocodile lizard.

A female *Shinisaurus* (15 cm SVL) was purchased from a local petshop 25 July 1989. It was maintained in a commercial 55 gallon glass aquarium (91 x 43 x 30 cm). The tank was propped 2 cm from the horizontal at one end, such that tap water (allowed to stand at room temperature for 2-5 days) formed a pool (1-2 l) ca. 3 cm at the deep end. The dry floor area was ca.

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30 x 25 cm. A flat rock 14 x 16 cm was placed at the water-land interface. A smooth tree branch 60 x 2 cm was placed between the rock and the top of the tank. A cardboard hide box (20 x 20 x 15 cm) with a single opening was placed on the dry floor area, but was removed after several weeks when it was obviously not being used.

The tank was covered with wire screening. Air temperature ranged from 18 to 24° C, always cooler at night. Usually a 10 h light/14 h dark cycle was maintained in the room (standard fluorescent tubes). Vita-Lite illumination (Dura-Lite 40W) directly atop the tank was provided 3-8 h daily, averaging 5 times a week.

Feeding. The *Shinisaurus* fed well after an adjustment period of five days, during which time no food was offered. Food was offered during the day, since the lizard was not active at night. Crickets, sometimes dusted with bone meal powder, were accepted. Crickets tended to evade the lizard unless one or both jumping legs were removed. Immobile crickets were not attacked unless they had been tracked. Crickets were more readily caught on land, and the lizard would leave the water to chase them. Crickets swimming in the water were eaten, though the *Shinisaurus* had difficulty seizing the crickets, often missing or failing to grip them properly. Crickets taken on land were consumed there. Prey capture was done with the jaws alone, with no tongue protrusion. Use of the forelimbs in manipulating or dismembering prey was never observed.

Earthworms were also avidly eaten, both on land and with some difficulty in water. Swimming goldfish and bait minnows (2-3 cm) were ignored. When the fish were placed on the land surface, however, the lizard immediately left the water and readily devoured them. About six months after the first trials, goldfish (1-2 cm) were again offered. This time the lizard attempted to seize the fish but did not succeed. It attempted to catch the fish by lunging at them from above rather than approaching them at or below the water surface, although the water was deep enough for submergence. These observations do not agree with statements that this species feeds on tadpoles and fish in nature (Fan 1931). Shen and Li (1982) were told by natives that *Shinisaurus* fed on tadpoles and grasshoppers, but the only stomach examined by them contained other insects and grass seeds. Sprackland (1989) reported that his specimens ignored live guppies. Newborn laboratory mice were eagerly taken on land. The *Shinisaurus* would seize them and then retreat into the water, where it would consume the mice while standing in shallow (ca. 1-2 cm) water.

Seedless red grapes and strawberries were also accepted. Small pieces were placed on the rock, and the lizard would approach the rock and seize them. Some larger pieces were shaken, brushed against the rock, and torn into smaller pieces which were then swallowed. Pieces of these fruits on the end of a toothpick were also taken after a few attempts; pieces of banana offered in the same way were not. This is apparently the first record of *Shinisaurus* feeding on fruit. Canned dog food was not accepted. Defecation usually occurred in the water, infrequently on land.

Climbing behavior. A branch was always present in the cage, yet the lizard did not climb it every night as lizards of this species may do in the wild (Shen and Li 1982). When on the branch, the lizard laid with its limbs slightly wrapped around the branch, so that the feet approached each other under it. The tail was held off the branch to one side, or resting along its top, but would not be wrapped around it.

The lizard was once observed climbing onto the branch. It reached for the branch with its two forelimbs while standing in water. It pulled itself up using both forelimbs, then walked to near the top of the branch. While walking, the lizard held its tail against the side of the branch (and not loosely dangling) implying a balance role for the tail. Such "pressing" of the tail against the side of the branch was also observed when the lizard was at rest. No fully prehensile use was observed.

Despite the overall lethargic behavior of the lizard, it was capable of notable climbing activity. On one occasion, the lizard was observed clinging upside down to the screen cover of the tank ca. 70 cm from where the branch contacted the screen. The lizard hung by only two claws on each foot. The limbs extended laterally from the trunk and no other part of the body touched the screen. The tail extended horizontally from the body for about half its length, then arched gradually towards the floor. The lizard was observed in this position for about an hour. When observation resumed two hours later, the lizard had descended (perhaps fallen) to the floor of the tank.

Reproduction. This lizard was isolated from other *Shinisaurus* from the date of acquisition; the amount of previous intraspecific contact is unknown. On 15 March 1990, a dead, well formed crocodile lizard (55 mm SVL, 62 mm tail length) was discovered in the water. It was wrapped in fetal membranes, and was attached to its yolk sac. Its size agrees with those of eight live born young observed by Huang (1983) (total length 121-131 mm). However, the young observed by Huang all lacked yolk sacs at birth, as did the advanced embryos found within dissected females. Whether the present neonate was stillborn or died after birth is unknown. Huang reports (1983) that neonates may or may not be covered with membranes at birth, and if not, the young may walk directly out of the mother. It is also unknown if birth in this case occurred in water, although Huang (1983) reports this to be the case at least in captivity. Gestation in the present instance took a minimum of 234 days, similar to that reported by Shen and Li (1982), and Huang (1983).

Coloration and Ecdysis. Ahl (1930) reported on the basis of one male and female (fluid preserved), that the male was overall more reddish than the female, which was overall grayish. The underside and side of the neck of the male was more reddish or reddish brown than the female. The present female was red or reddish brown on the neck and shoulder region. This supports the statement of Fan (1931) that red coloration in this species varies between individuals and is not a sexual character. Sprackland (1989) states that both sexes are red along the neck, flanks, and throat and suggests males may be more intensely colored. This specimen did not shed until 21 May 1990, when large patches were observed peeling away. The pieces of skin remained floating in the water for three days, suggesting that the shed skin is not routinely eaten. Ecdysis occurred again on 20 July 1990.

Longevity. This specimen is still alive 8 August 1990; captive longevity of adults thus exceeds one year.

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Gekkonid Lizards as Prey of Invertebrates and Predators of Vertebrates

Gekkonid lizards are regarded as being chiefly insectivorous (Loveridge 1947; Kluge 1967; Bustard 1968a). In turn, their primary predators are larger vertebrates such as birds (Bustard 1968b; McKeown 1983) snakes (Pitman 1974), mammals (Whitaker 1973), and larger lizards (Pianka 1986; Auffenberg 1981; Bustard 1968a, b). However, the size range spanned by living geckos (approximately 20-250 mm SVL) is broad enough to encompass deviations from these generalizations at both ends of the scale. Larger geckos can and do eat other vertebrates, particularly other geckos, but also a variety of lizards, frogs, and even birds and mammals. Small geckos, on the other hand, are well within the size range of prey items of larger species of arthropod predators, such as arachnids.

Geckos as Prey of Invertebrates

Reports of attacks by arthropods on small vertebrates are numerous (McCormick and Polis 1982). Arachnids are the most frequently cited predators in these instances. Scorpions have been observed to capture mice (Kock 1969; Piasecki and Newlands 1985), leptotyphlopid snakes (Anderson 1956; Polis 1979) and a wide range of lizards (e.g. Banta 1957; Hadley & Williams 1968) (although some of the attacks on reptiles occurred in the unnatural conditions of a pit-trap). Spiders, too, are known to capture vertebrates, including rodents, birds, frogs, snakes, and lizards, both in webs (Groves and Groves 1978; Neill 1948; Anonymous 1985; Konig 1987; Cokendolpher 1978) and, in the case of terrestrial species, on the ground or in burrows (Caras 1974; Anonymous 1985).

A second group of predators on vertebrates are centipedes, especially members of the genus *Scolopendra* which have been implicated in attacks on toads (Carpenter and Gillingham 1984), rodents (Shugg 1961; Clark 1979), birds (Anonymous 1985), lizards (Lawrence 1953; Butler 1970) and snakes (Easterla 1975).

Although certain cases of insects as predators on lizards are primarily based on laboratory and pit-trap encounters (e.g. Banta 1962), at least some insects, such as belostomatids (giant water bugs) and mantids are quite capable of taking many smaller vertebrate taxa as prey (see McCormick and Polis 1982). Aquatic insects and insect larvae frequently attack and consume fish, and amphibian larvae and eggs, (Heyer et al. 1975; Caldwell et al. 1981; Young 1967; Neill 1968; Wager 1965; Kluge 1981; Villa et al. 1983).

Geckos as a group are particularly vulnerable to attack by arachnids and centipedes, first because of their generally small size (Russell and Bauer 1986) and second because they are chiefly nocturnal, as are these putative predators. The array of predators identified in attacks on geckos includes scorpions, solfugids, spiders, centipedes, mantids, and ants (see Table 1). The prey geckos include representatives of the subfamilies Gekkoninae, Diplodactylinae and Eublepharinae and range from very small forms (e.g. *Tropiocolotes*) to moderately large species (e.g. *Diplodactylus* and *Hemidactylus*). Species from all continents inhabited by geckos are represented. The majority of the geckos are terrestrial or rupicolous, although a number of arboreal species have also been attacked by each type of arthropod predator.

Although most instances of arthropod attacks on geckos are based on fortuitous observations of single events, certain spiders, scorpions, and insects derive a substantial portion of their energy input from vertebrates and in turn account for a sizeable percentage of small vertebrate mortality (McCormick and Polis 1982). Spiders have been implicated as major predators on *Garthia [=Homonota] dorbignyi* (Donoso-Barros 1966), *Phyllodactylus porphyreus* (pers. obs.), and *Diplodactylus* spp. (Minton 1983; Kluge and Schuett 1986). In the case of *Diplodactylus*, the evolution of a unique caudal defensive mechanism has been tentatively linked to predation attempts by lycosid spiders (Kluge and Schuett 1986). Unfortunately, the mechanism of ingestion of most arthropods, and especially arachnids, precludes facile analysis of gut contents, and quantitative estimates of the ubiquity and significance of geckos as prey of these arthropod predators is not possible. Nonetheless, it would appear that many geckos, for which no observed acts of predation by arthropods have been reported, may be especially susceptible to attack. In particular, small leaf-litter dwelling species, such as most of the sphaerodactyline geckos of the Neotropics, are within the size range of insects (hatchlings as small as 5 mm SVL) and are broadly ecologically comparable to syntopic insects, feeding largely on tiny collembolans (Gasc et al. 1983), and in turn providing food for predatory arthropods.

Geckos as Predators of Vertebrates

Many large lizards, such as varanids, are primarily carnivorous, feeding to a large extent on other vertebrates (Cowles 1930; King and Green 1979; Auffenberg 1981; Pianka 1982, 1986). Among gekkotons, only the pygopodid *Lialis* specializes almost exclusively on vertebrate prey, chiefly skinks (Patchell and

Table 1. Gekkonid lizards preyed upon by arthropods. (*) = potential predators. (sc) = scorpion, (sp) = spider, (su) = sulfugid, (m) = mantid, (c) = centipede.

Gekkonid prey	Predators	Source
Coleonyx variegatus	tenebrionid beetles	Banta (1962)
	Hadrurus sp. (sc)	Hadley & Williams (1968)
Cyrtodactylus fedtschenkoi	sulfugid	Szczerbak & Golubev (1986)
Cyrtodactylus russowi zarudnyi	*Lydocon striatus* (sp)	Szczerbak & Golubev (1986)
Cyrtodactylus spinicauda	*Lydocon striatus* (sp)	Szczerbak & Golubev (1986)
Diplodactylus spp.	spiders	Minton (1983)
Diplodactylus williamsi	lycosid spiders	Kluge & Schuett (1986)
Garthia dorbignyi	megalomorph spiders	Donoso-Barros (1966)
Hemidactylus frenatus	*Hierdula werneri* (m)	Wright (1982)
Hemidactylus gamotii	*Scolopendra subspinipes* (c)	La Rivers (1948)
	Achaearanea tepidariorum (sp)	Steiner (1983)
Hemidactylus mabouia	sulfugid	Loveridge (1947)
Homonota urugauyensis	spiders *	Gudynas & Gambarotta (1980)
Lepidodactylus lugubris	*Tenodera angustipennis* (m), *Metargiope trifasciata* (sp)	La Rivers (1948)
Lygodactylus capensis	*Palystes natalius* (sp)	Warren (1923)
Oedura reticulata	*Scolopendra morsitans* (c)	Butler (1970)
Pachydactylus sp.	*Scolopendra moristans* (c)	Lawrence (1953)
Pachydactylus capensis	*Opisthophthalmus carinatus* (sc)	Lamoral (1971)
Pachydactylus maculatus	*Palystes natalius* (sp)	W. Branch (pers. comm.)
Pachydactylus geitje	"Argentine ants"	Rose (1950)
Palmatogecko rangei	*Parabuthus villosus* (sc)	Lamoral (1971)
	Leucorchestris sp. (sp) *Orchestrella* sp. (sp)	
	Carparachne sp. (sp)	
Phyllodactylus (Christina) marmoratus	*Latrodectus mactans hasselti* (sp)	König (1987)
Phyllodactylus porphyreus	spiders	pers. obs.
Tropiocolotes depressus	*Androchtonus astralis* (sc)	Szczerback & Golubev (1986)
	Ruthus occitanus(sc), *Galeodes caspius* (su), *Scolopendra* sp. (c)	

Shine 1986). Geckos, on the other hand, have been regarded as "classic" insectivores. In reality, geckos as a group are rather catholic in their diets within the limitations of their body size. A number of taxa, especially insular forms, have become frugivorous or nectivorous (although not exclusively). These include *Rhacodactylus* in New Caledonia (Bavay 1989; Bauer 1985), *Gehyra* in Fiji (Gibbons & Clunie 1984), *Hoplodactylus* in New Zealand (Whitakerd 1968, 1982, 1987a, 1987b) and *Phelsuma* in the Mascarene Islands (Vinson 1949; Vinson & Vinson 1969) and the Seychelles (Gardner 1984). Another much more geographically and phylogenetically diverse group of geckos has adopted another "unorthodox" set of prey items, other vertebrates.

A minimum of 37 species of geckos (or about 3-4% of known species) have been implicated in vertebrate predation (see Table 2). Other geckos, including conspecifics (mostly juveniles and eggs) are the most frequent victims of predation (see Rösler 1984, 1988; Mitchell 1986). Geckos involved in these interactions span a wide range of sizes and again represent three subfamilial units. Predation on other lizards, specifically lacertids and skinks, has been reported in a variety of terrestrial geckos (Minton 1966; Pianka and Huey 1978; Bauer 1990) and in several arboreal forms (Salvador 1978, 1981; Rieppel 1981). Gecko predation on birds and mammals is reasonably rare and most instances represent feeding events under captive situations. Nonetheless there are a number of reports of gekkonids preying upon bats (Kluge 1967), small birds (Roux 1913) and rodents (Sumithran 1982) under natural conditions. A particularly interesting case is that of *Cyrtodactylus cavernicolus*, a Bornean cave-dwelling gecko that feeds upon baby swiftlets that fall from nests on the cave walls (Harrison 1961).

The gecko taxa that feed on vertebrates include many of the largest gecko species (Russell and Bauer 1986) which, as suggested by Loveridge (1947) probably opportunistically feed on any prey that can be subdued and ingested. *Gekko gecko* is particularly aggressive and has been said to be predatory on birds, mammals, lizards and even snakes (Smith 1935; Boulenger 1912), it has also been credited with fighting off attacking snakes, including *Elaphe* (Curran 1932) and *Chrysopelea* (Flower 1899).

Although the two genera *Hemidactylus* and *Nephrurus* are particularly well represented in the survey of predatory geckos, it is unlikely that this is of particular significance. The ecology of the latter genus has been unusually well studied (Pianka & Pianka 1976) while the former is extremely speciose and contains many taxa which are commensal with man and are thus particularly conspicuous to human observers.

DISCUSSION

Contrary to expectations, size alone does not appear to be the major factor in the occurrence of gecko species in either of the two groupings delineated above. Only the largest geckos are immune from arthropod attack while even the smallest may be cannibalistic. Likewise no phylogenetic grouping appears to have any predictive relations to the trophic interactions of geckos. Rather, terrestrial and rupicolous geckos, as well as commensal species appear to be more likely to succumb to invertebrate predators and to take vertebrate prey themselves. However, the trophic relations of so few geckos have been examined that it is likely that many or most gekko species are occasionally taken by invertebrate predators or feed on vertebrates.

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Table 2. Gekkonid lizards as predators of vertebrates.
(c) = under captive conditions, (*) = predation probable.

Gekkonid predator	Prey	Source
geckos (in general)	cannibalistic	Fitzsimons (1943)
geckos (unspecified)	bats	Kluge (1967)
Chondrodactylus angulifer	*Colopus wahlbergi*	Loveridge (1947), Haacke (1976), Pianka & Huey (1978)
	Ptenopus garrulus	Brain (1962), Pianka & Huey (1978)
C. a. namibensis	*Kaokogecko vanzyli, Pachydactylus kochyi, Pachydactylus punctatus amoenoides, Ptenopus carpi, Ptenopus garrulus maculatus* *	Haacke (1976)
Cyrtodactylus caspius	*Eremias velox*	Szczerbak (1981)
Cyrtodactylus cavernicolus	*Collocalia maximus*	Harrison (1961)
Eublepharis macularius	lizards	Prater (1922), Smith (1935), Minton (1966)
	mice (c)	Szczerbak & Golubev (1986)
	geckos	Daniel (1983)
Eublepharis turcmenicus	*Eremias strauchi*	Szczerbak & Golubev (1986)
Gehyra australis	cannibalistic	Bustard (1968a)
Gekko gecko	geckos, mice, birds, snakes	Boulenger (1912), Smith (1935), Rose (1950), Obst et al. (1984), Tikader & Das (1985)
Gekko gecko	cannibalistic	Dollinger, 1971
	Cossymbotus platyurus, Hemidactylus frenatus	Auffenberg (1980)
Hemidactylus sp.	*Anolis*. sp., *Eleutherodactylus* sp.	Rivero (1978)
Hemidactylus brookii	cannibalistic	Bustard (1957), Martinez Rica (1974)
	Bufo regularis tadpoles (c)	Richards (1982)
Hemidactylus fasciatus	*Lygodactylus fischeri* (c)	Dunger (1967)
Hemidactylus flaviviridis	cannibalistic	Gallagher (1971), Daniel (1983), Mahendra (1936)
Hemidactylus frenatus	*Phelsuma g. guimbeaui* *	McKeown (1983)
Hemidactylus leschenaulti	*Hemidactylus frenatus*	Dattatri (1984)
	Mus musculus	Sumithran (1982)
Hemidactylus mabouia	*Lygodactylus picturatus mombasicus*	Loveridge (1947)
	geckos, anoles, *Eleutherodactylus*	Rivero (1978)
Hemidactylus maculatus	geckos	Daniel (1983)
Hemidactylus turcicus	*Podarcis melisellensis fiumanus*	Hunt (1957), Salvador (1978, 1981)
Hoplodactylus duvaucelii	*Hoplodactylus maculatus*	Barwick (1982)
Lepidodactylus lugubris	cannibalistic	Miller (1979)
Lygodactylus a. angularis	cannibalistic	Loveridge (1947)
Nephrurus asper	skinks (c)	Gow (1979), Bauer (1990)
Nephrurus deleani	*Diplodactylus damaeus, Gehyra variegata, Rhynchoedura ornata*	Delean (1982), Harvey (1983)
Nephrurus laevissimus	*Rhynchoedura ornata*	Pianka & Pianka (1976)
Nephrurus levis	*Rhynchoedura ornata*	Pianka & Pianka (1976)
Nephrurus milii	small lizards, incl. skinks	McPhee (1979), Bauer (1990)
Nephrurus stellatus	geckos *	Bauer (1990)
Nephrurus vertebralis	*Diplodactylus conspicillatus, Rhynchoedura ornata*	Pianka & Pianka (1976)
Nephrurus wheeleri	geckos *	Pianka & Pianka (1976)
Oedura marmorata	*Heteronotia binoei* *	Cogger (1957), Bustard (1968b)
Oedura ocellata	*Gehyra variegata* *	Bustard (1968a)
Pseudothecadactylus lindneri	*Gehyra* spp.	Bauer (1990)
Ptychozoon kuhlii	cannibalistic	Mitchell (1986)
Rhacodactylus auriculatus	*Bavayia sauvagii*	Bauer & DeVaney (1987)
Rhacodactylus chahoua	small vertebrates *	Bauer (1985)
Rhacodactylus leachianus	*Lichmera incana*	Roux (1913)
	mice (c)	Bauer & DeVaney (1987)
	cannibalistic (c)	Mitchell (1986)
Rhacodactylus trachyrhynchus	lizards *	Bauer (1990)
Tarentola a annularis	hatchling chick (c)	Loveridge (1947)
Tarentola mauritanica	*Podarcis lilfordi, P. sicula, Hemidactylus turcicus, Podarcis hispanica*	Rieppel (1981) Barbadillo (1987) Franco (1980)
Teratoscincus przewalskii	*Eremias*, cannibalistic	T.J. Papenfuss (pers. comm.)
Teratoscincus scincus	*Eremias*, cannibalistic	T.J. Papenfuss (pers. comm.)
	small lizards	Minton (1966)

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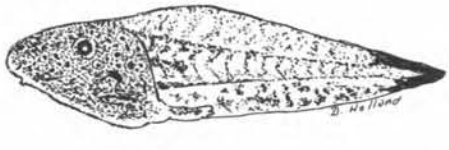
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TECHNIQUES

A REFINEMENT OF THE STOMACH-FLUSHING TECHNIQUE FOR SMALL SCINCID LIZARDS

Stomach flushing is a widely used technique for studies of the diets of animals when destructive sampling is undesirable and has been adapted for use on a variety of taxa (Randall and Davison 1981; Wilson 1984; Moll 1989; Lewis 1989). Since the description of a technique for stomach flushing turtles (Legler 1977), the procedure has been used on a variety of lizard taxa (e.g. Legler and Sullivan 1979; James et al. 1984; Shine 1986; Henle 1989a, 1989b). During a mark-recapture study of scincid lizards of the genus *Ctenotus* in central Australia, I desired to collect stomach contents without killing the lizards. Seven species ranging in adult body-mass from 3 to 15 g (45 to 100 mm snout-vent length) were stomach flushed. Early attempts at stomach flushing resulted in a number of deaths, principally from damaging the stomach wall, forcing water through the pyloric sphincter into the intestines or shock characterized by respiratory failure. The following note describes refinements made to the equipment and a method for dealing with shock and respiratory failure after stomach flushing.

The lizard's mouth was forced open by applying gentle pressure on the posterior end of the quadrate bone of the lower jaw. The mouth was held open during stomach flushing with a plastic cuff similar to that described by Legler and Sullivan (1979), which was held in place with a thin strip of masking tape wrapped around the snout. Plastic cuffs were cut from cross-sections of syringe tubes and ranged in diameter from 7 to 11 mm depending on the size of the lizard. A thin tube lubricated with K-Y Jelly®, attached to an automatic pipetting device (Legler and Sullivan 1979), was fed down the esophagus to a pre-determined depth. This depth was obtained by measuring the tube against the outside of the lizard to a point just posterior to the forelimbs which corresponded to the midpoint of the stomach. Measuring the depth of insertion of the esophageal tube helped to prevent damage to the posterior region of the stomach and reduced the incidence of water flushing into the intestines.

The lizard was held head-down over a

container and water was gently pumped into the stomach. When the stomach was full of water, pressure in a posterior-to-anterior direction was applied to the stomach to loosen the food bolus. The stomach was repeatedly filled with water and palped. Stomach contents were usually regurgitated on the third or fourth stomach-full of water. Large food boluses often lodged in the throat but were easily removed through the mouth cuff with forceps.

Esophageal tubes were adapted from thin, pliable venous cannulae used in veterinary science and ranged in diameter from 0.8 to 1.7 mm. To prevent water being forced through the pyloric sphincter, the end of the tube was closed with a bead of silicone rubber and two sub-terminal, lateral holes were made. Water emerged sideways from the tube and the smooth, rounded silicone bead in the end reduced damage to the stomach wall. During the initial attempts at stomach flushing *Ctenotus* I found that an open-ended tube frequently punctured the stomach wall. A closed tube with a silicone bead over the end reduced the incidence of stomach perforation.

After all prey items had been removed, the plastic ring was removed and the lizard was placed in a bucket to recover. Approximately half of the stomach-flushed lizards were alert immediately, or recovered within a minute. However, some lizards were virtually unconscious after flushing and sometimes ceased breathing. Left undisturbed in the bucket, some of these individuals resumed breathing without assistance; after 30 to 60 s they would take a large 'gulp' of air and breathe erratically over the next minute. After 1 or 2 min, regular breathing was re-established and the lizard was alert. A small percentage of these deeply shocked individuals would not commence breathing and would die unless aided. In such cases, brief immersion of the lizard in ice-cold water proved successful. A *Ctenotus* typically reacted to this treatment by gasping, followed by irregular breathing as described above. Ventilation of the lungs using a thin tube on a 1 ml syringe was also attempted but was not as simple nor effective as thermal-shock treatment.

ACKNOWLEDGMENTS

I thank Pat Whitaker for supplying me with a range of cannulae for use as esophageal tubes, and Klaus Henle and Rick Shine for discussing their methods of stomach flushing lizards with me. The Commonwealth Scientific and Industrial Research Organization (CSIRO), Central Australian Laboratory provided logistic support for the study.

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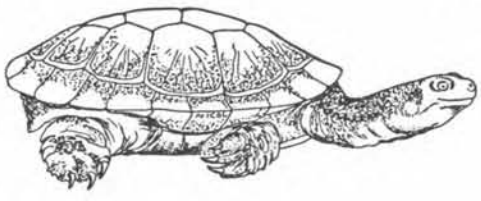
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A METHOD FOR TRACKING TORTOISES USING FLUORESCENT POWDER

Although there are many methods available for determining movement patterns of vertebrates, those most commonly used for terrestrial turtles include: spool and line (e.g. Scott and Dobie 1980), direct observation, mark-recapture (e.g. McRae et al. 1981), and radiotelemetry (e.g. McRae et al. 1981). All these methods have proven useful, but each has disadvantages. The spool and line method utilizes a length of line which is delivered from a spool attached to the carapace. This method is limited to the amount of thread that will fit on one spool and is subject to mechanical failure. Direct observation is labor intensive and human presence may influence behavior of the subject. Radiotelemetry is perhaps the most widely employed method for tracking turtles. This technique is both convenient and relatively long term, once the radio has been attached to the animal. However, it is expensive and lacks precision when determining movement patterns, especially for animals that have small home ranges.

The use of fluorescent powder in animal marking and tracking has gained much attention in recent years. Methods have been developed for marking fish (Jackson 1959) and salamanders (Ireland 1973). Tracking short-term movement patterns in small mammals was reported by Lemen and Freeman (1985). The use of fluorescent powder for tracking island night lizards, *Xantusia* (=*Klauberina*) *riversiana*, recently was reported by Fellers and Drost (1989).

While studying habitat utilization and activity patterns of the gopher tortoise (*Gopherus polyphemus*) at the Black Creek Seed Orchard, DeSoto National Forest, Mississippi, we developed a technique for following movement patterns of adult gopher tortoises using fluorescent powder. With this method we were able to determine the exact route followed by individual tortoises over several days.

The powder is not applied directly to the animal. Instead, a pouch is fashioned from fine nylon mesh; we used panty hose. The pouch should be large enough to contain ca. 5 cc of fluorescent powder. Once the pouch is filled with powder, it is tied closed with small diameter cottor twine. The cotton twine then is attached to the caudal edge of the carapace via a hole drilled through one of the marginal scutes It is important that the pouch be allowed to

drag on the ground as the tortoise moves. Depending on the size of the tortoise, the cotton twine is tied so that there is ca. 4 - 8 cm distance from the powder-filled pouch to the carapace.

We attached fluorescent powder pouches to eight adult tortoises. Tortoises were released at their burrows and their subsequent movement patterns were documented from 3 to 9 September 1989. The dragging pouch left a trail of powder which fluoresced brightly under UV light. A single day's activity was mapped by following the trail at night with a portable UV light source ("Woods Light," available from Henry Schein Inc., 5 Harbor Park Drive, Port Washington, NY 11050, USA (800) 872-4346). Flagging was used to mark the trail more permanently and to avoid confusing one day of activity from the next.

One tortoise either lost its pouch in its burrow or never reemerged during the six-day study period. No trail was observed leading from the burrow after attachment of the pouch. The other seven tortoises produced daily trails after application. Two tortoises produced visible trails for two days. Their subsequent trails were not visible by the third day. The other five tortoises produced daily trails that were easily detectable at the end of the observation period. The maximum distance travelled from a burrow was 22 m and the minimum was 8.2 m (straight line). Direction of movement often could be determined by noting the corresponding tracks left by the tortoise.

This method of documenting activity patterns in gopher tortoises proved to be reliable and accurate for two days or more after application. Although we did not test the pouch in rain, trails left by mammals in whose fur the powder had been applied were almost completely washed away by rain. However, light dew did not seem to affect the trackability of these trails (pers. obs.).

Manufacturer claims indicate that fluorescent powder is nontoxic (manufacturer, pers. comm.); furthermore, our technique does not require that the animal directly contact the powder. More information on toxicity can be acquired from the manufacturer. The trail produced by the powder is also inconspicuous in daylight and should not draw undue attention to the tortoise. The trail is easily visible at night, however, with a UV light source and tends to be more discernible with wear on the pouch as more powder sifts through tears in the nylon mesh.

The pouch is constructed easily and materials are inexpensive. The powder is sold in 1-pint containers which could yield 80 applications per container. The price at the time of the trial was $10.00 per container. The cost for all other materials should not exceed $5.00 per 80 applications. This results in a potential cost of $0.19 per application. The color used in this trial was radiant fluorescent pigment type JST-300, chartreuse 320 (JS-CH3020). However, other colors are available from the manufacturer (Radiant Color, 2800 Radiant Avenue, Richmond, CA 94804, USA, (415) 233-9119).

This technique has several disadvantages. It is necessary to capture the tortoise in order to apply the pouch, and the trails produced by some individuals were visible for only two days. Also, powder deposition and trail visibility depend on weather conditions. The drier the conditions, the better the results will be. Given the gopher tortoise's preferred habitat, this generally is not a problem. It is possible that a pouch might become tangled in vegetation. Though this may have occurred in one case in a burrow, this possibility could be reduced by using the shortest possible line from pouch to carapace.

This method of monitoring movement appears to be particularly suitable for home range studies. Other uses might be determination of nesting sites, burrow use, and dispersal patterns. This method could be used on several tortoises in the same area by using different colors, as has been shown using mice (pers. obs.).

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LIFE HISTORY NOTES

See Herp. Review 21(1) *for author's instructions.*

ANURA

PSEUDACRIS FERIARUM (Upland Chorus Frog). **Predation.** Predation of adult anurans by invertebrates is not well documented (Hinshaw and Sullivan 1990. J. Herpetol. 24:196-197). Fewer reports exist on predation by spiders. Goin (1943. Proc. Florida Acad. Sci. 6:143-153) noted that an adult *Acris gryllus* was caught and eaten by a large water spider (*Dolomedes*). On 17 March 1980 I found an adult 22 mm SVL male *P. feriarum* on the edge of a shallow, muddy rain pool 1 mi W Laurel, Henrico Co., Virginia. It was being eaten by a 14 mm (body length) fishing spider, *Dolomedes triton* (formerly *D. sexpunctatus*). The frog was dead and had apparently been envenomated by the spider. Examination of the frog revealed that there was one puncture wound 1.0 mm to the left of the middorsal line, 6.3 mm anterior to the cloaca. The puncture was surrounded by an area of dark pigment.

A large chorus was present on this date and most of the calling males were in the water with about one third of the head and body exposed above the surface. These conditions may have enhanced the probability of capture of this large prey by the smaller *Dolomedes*. I saw no other spider predation on the other anurans

calling at this location (*Bufo americanus*, *Pseudacris crucifer*, *Rana clamitans*, *R. palustris*), although on 8 April 1980 I found an adult *P. crucifer* that had been partially eaten by a crayfish.

Dolomedes triton is well known for its capture and consumption of small vertebrates, including fish (*Gambusia*) and tadpoles (Zahl 1971. Nat. Geogr. 140:190-219). It is a common coinhabitant of anurans in small bodies of water in Virginia. This is the first report of predation by this species on adult *P. feriarum*.

I thank Richard L. Hoffman for assisting with spider identification.

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RANA CATESBEIANA (Bullfrog). **Polymely.** The presence of supernumerary limbs (polymely) in anurans is not uncommon (Van Valen 1974. J. Herpetol. 8:109-121). Polymely of hind limbs is variable and is more common than that of forelimbs (Hamilton 1950. Nature 166:611-612). A six-legged frog with a double pair of hind legs accompanied by a doubling of the pelvic girdle was described (Pearson 1960. Copeia 1960(1):50-51). Perhaps the most extreme case reported to date is that of a twelve-legged bullfrog where the eight additional limbs were "growing from the right side of the upper trunk region" (Anon. 1962. Bull. Phil. Herp. Soc. 10(1):24). We report a young male *Rana catesbeiana* that was captured alive in June 1987 in a field pond in Ransome, Illinois (by the R. Stilwill family). This bullfrog had fourteen legs: two normal forelimbs, two normal hind limbs, and ten additional (apparent) hind limbs inserted ventrolaterally behind the forelimbs (Fig. 1A, B). The supernumerary hind limbs were neither functional nor complete in their anatomy. However, the frog did not appear inconvenienced by the extra limbs and was in apparently healthy condition. X-rays of the animal were taken at the Small Animal Clinic, Department of Veterinary Medicine, University of Illinois. Shortly after this (apparently stressful) exercise, the frog died. The animal was eviscerated, cleared using a KOH solution, stained with alizarin red dye, and preserved in glycerin.

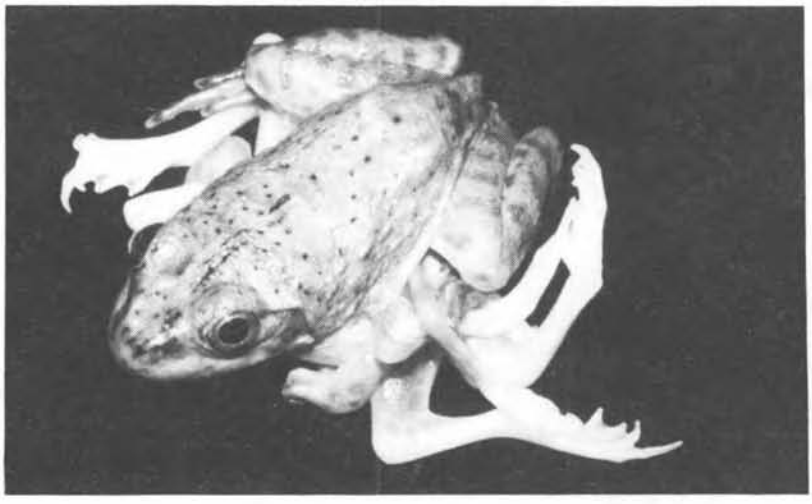
The extra legs are embedded in the abdominal wall of the frog and articulate with neither the pectoral nor pelvic girdles. Four limbs arise from right ventrolateral abdominal tissue and are directly inserted into this musculature via three bones (which have the appearance of vestigial and incomplete ossa coxae). Supernumerary limbs on the right side of the frog are not as complete as those on the left side. Of the four right-side limbs, only one has the complete set of bones which form a hind limb. Two other limbs lack phalanges and metatarsals, and the fourth limb has only a femur connected to one of the vestigial pelvis bones.



On the left side of the frog, six additional limbs are present. Many bones converge at the point of insertion of these limbs into the abdominal wall. There is a single bone on the left side (resembling a vestigial os coxa) from which six complete hind extremities arise. In addition, there is a bone resembling no particular structure which also extends out of the body wall from the same origin. Each femur originates from an articulation with an incomplete bone resembling the os coxa. There is no connection to the axial skeletal column via sternal, costal, or sacral articulation. The most distal parts of many medial digits on the left side tend to lack the last phalanx.

The polymelous condition of this specimen differs from other more commonly-occurring anomalies because of the high number of supernumerary legs and because of the ventrolateral insertion of the additional hind limbs. It is known that side-plate mesoderm is competent to induce supernumerary limbs in frogs (Needham 1942. Biochemistry and Morphogenesis. Cambridge Univ. Press, London. pp. 305-308). Induction of polymelous conditions in wild-caught specimens is often attributed to stimulation by injury (Colton 1922. Anat. Rec. 24:247-253) or exposure to chemical contaminants found in the environment (Anon. op. cit.) leading to interference with normal developmental pathways. In this instance, it appears likely that chemical treatment of agriculturally important croplands had some effect in the anomalous development of this bullfrog.

Figure 1. The supernumerary legs as viewed from dorsal (B) and ventral (A) aspects.



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RANA CATESBEIANA, RANA PALUSTRIS (Bullfrog, Pickerel Frog). **Predation.** *Rana catesbeiana* and *R. palustris* were observed being taken by a pair of Bald Eagles (*Haliaeetus leucocephalus*) nesting on Swan Island, Perkins Township, Maine, during the summer of 1988. The eagles were observed feeding upon frogs on six occasions during June and July in a pond located 100 m from their nest site along

the Kennebec River. Observations were made with 10 X 50 binoculars from a vehicle at a distance of 300 m from the pond. The eagles captured frogs by hopping after them along the shore of the pond and grasping them with their talons. They then flew to the nest. I observed no evidence of feeding the frogs to the eaglet that was in the nest.

Bald Eagles consume fish, mammals, and birds (Stalmaster 1987. The Bald Eagle. Universe Books, New York. pp. 92-95; Gerrard and Bortolotti 1988. The Bald Eagle: Haunts and Habits of a Wilderness Monarch. Smithsonian, Washington, D.C., p. 29; Todd et al. 1982. J. Wildl. Manage. 46:636-645). Reptiles are not a frequent food item (Clark 1982. J. Field Ornithol. 53:49-51; Stalmaster op. cit., pp. 95-96). Various invertebrates have also been reported but amphibians are uncommonly taken. McEwan and Hirth (1980. Condor 82:229-231) found trace quantities (n = 4) of the greater siren (*Siren intermedia*) in 16 eagle nests they examined in Florida.

To my knowledge, this constitutes the only direct evidence of frogs as a Bald Eagle food item. Amphibians, in general, are probably underrepresented in eagle food habits samples because no hard structures such as bones or hair remain after feeding as when birds or mammals are consumed.

Submitted by **ROGER D. APPLEGATE**, Wildlife Resources Assessment Section, Wildlife Division, Department of Inland Fisheries and Wildlife, P.O. Box 1298, Bangor, ME 04401-1298, USA ●

CAUDATA

HYDROMANTES PLATYCEPHALUS (Mount Lyell Salamander). **Toxicity.** Noxious or toxic skin secretions are widespread among salamanders, including plethodontids (Brodie 1977. Copeia 1977(3):523-535). This note reports a toxic reaction, including temporary blindness, in a human in response to the skin secretions of an adult Mount Lyell Salamander (*Hydromantes platycephalus*). The case history that follows was obtained by personal interview 21 November 1985 with the subject, Mr. Dale Mitchell. Mr. Mitchell is a biologist with the Region 4 Office of the California Department of Fish and Game in Fresno. He is well acquainted with *H. platycephalus*, having searched for it numerous times previously on backpacking trips in the Sierra Nevada. Several new locality records are the result of his field work.

During August 1984, Mr. Mitchell, in the company of his wife (a physician) undertook a backpacking trip in the high Sierra Nevada. The locality of the incident described below is as follows: Calif., Fresno Co., ca. 0.2 km below (S of) Bighorn Lake, along outflow creek (trib. to North Fork Mono Creek), T.5S., R.28E., Sec. 35, elev. ca. 3290 m (SE of Mt. Izaak Walton).

On the afternoon of the second day of their trip, they observed an adult *H. platycephalus* crawling from under a rock that Mr. Mitchell's wife had sat on. The salamander did not appear to be injured. During the next 10 min, the salamander was handled extensively by Mr. Mitchell in an effort to photograph it. The salamander exhibited various defensive behaviors (e.g., arched back, elevated tail, and immobility). During this time, Mr. Mitchell inadvertently rubbed his eyes with his fingers and experienced an immediate reaction—a burning sensation and tearing, whereupon he rubbed his eyes again (not having realized the source of the irritation). The burning sensation became more pronounced and he experienced considerable pain. At this point, he and his wife decided to quickly hike up the slope to the lake where he could rinse his eyes thoroughly. By the time they reached the lake edge (ca. 5 min later), his vision had deteriorated to the extent that he had difficulty distinguishing objects in his path. At the lake, he submerged his head in the water and rinsed his eyes thoroughly, and washed his hands. A short while later, his visual field had become all white; he described it as "milky." He was completely blind, unable to distinguish between light and dark.

The burning sensation continued for 10-12 h post-contact. Eyes were rinsed with water every 2 h. His eyes appeared bloodshot (according to his wife). He took aspirin to relieve the pain. He experienced considerable anxiety throughout the course of this incident. He slept little during the night, and by the next morning his vision had not returned, though the burning had subsided. Loss of vision continued through the day, but gradual recovery was evident late that evening (ca. 30 h post-contact).

By the following morning, he had partial vision. He experienced an aching in the eye musculature, particularly when the eyes were moved. Aspirin was again taken to relieve pain. A soreness in the orbits continued for ca. 14 days.

Mr. Mitchell estimates that complete visual recovery was realized ca. 4.5 days (108 h) post-contact. No medical treatment was sought due to the difficulty of leaving their remote location in the back country.

Submitted by **ROBERT W. HANSEN**, 16333 Deer Path Lane, Clovis, CA 93612, USA ●

TESTUDINES

APALONE SPINIFERA EMORYI (Texas Spiny Softshell). **Defensive Behavior.** Defensive posturing has been described in seven families of turtles (Hayes 1989. Herp. Review 20(1):4-5), but apparently has not been reported in the softshells (Trionychidae). We report on defensive behavior exhibited by adult specimens of *Apalone spinifera emoryi* collected in the Rio Grande and the Pecos River of New Mexico during 1989-90. Seven specimens (184-391 mm CL) taken in Sandoval Co. (3 females), Valencia Co. (1 male, 1 female), and Guadalupe Co. (1 male, 1 female) were tested for defensive responses within one to six days following capture. Testing methodology and descriptive terminology used follow Hayes (op. cit.).

Frontal stance. The two largest females (391 and 399 mm CL) responded to frontal tapping of the carapace by drawing in the head and forelimbs and by completely extending the hindlimbs. The tail was also extended and elevated firmly against the ventral surface of the rear margin of the carapace. Although similar to the stance reported for *Chelydra serpentina* (Dodd and Brodie 1975. Herpetologica 31(3):286-288), the plastron was not elevated above the substrate to the same degree, the forelimbs were not extended, and the tail was not used as a support. The posterior end of the plastron was elevated by ca. 2 cm. Duration of the behavior appeared to be dependent upon the stimulus; the posture was quickly abandoned when tapping was stopped.

Lateral stance. The same turtles that exhibited the frontal stance also displayed the lateral response which involved the extension of the hindlimb opposite the stimulus, but not the extension of the corresponding forelimb. The result was a somewhat oblique orientation of the carapace toward the perceived threat. Plastron elevation and display duration were as above.

Other responses. The primary de-

fensive response in all specimens was withdrawal of the head and limbs, and frontal stimuli (both tactile and visual) generally elicited a biting response (in more aggressive specimens) or further withdrawal of the head. Tapping the lateral or rear margins of the carapace generally resulted in no response or movement away from the stimulus in the non-posturing turtles. In at least three specimens, the posterior margin of the carapace was bent downward when tapped. The rear stance described by Hayes (op. cit.) was not elicited in any of the seven specimens. The most passive response (complete withdrawal of head and limbs; no attempt to escape or bite) was by a male (184 mm CL).

Hayes et al. (1988. Herpetologica 44(1):11-17) noted that intensity of defensive displays in some turtles are less distinctive and aggressive than the postures reported for *C. serpentina*, probably due to differences in morphology, shell protection, and ecology. *Apalone* are physically incapable of elevating the body above the substrate to the same degree as *Chelydra*, and the carapace and plastron in softshells afford relatively little protection against a predator. Escape and aggressive behavior that allows escape (e.g., biting) are therefore probably most important to these turtles when threatened. Also, the selective pressure for the development of stereotyped defensive displays on land may be limited in softshells by their highly aquatic habits. Our preliminary data suggest that defensive display behavior is used infrequently by *A. s. emoryi* and may be most common in large female specimens, possibly as an adaptation for extended activity away from water during egg-laying.

Specimens retained during this study will be deposited in the Museum of Southwestern Biology, University of New Mexico. We thank Norman J. Scott, Jr. for comments on the manuscript.

Submitted by **JAMES N. STUART** and **CRAIG S. CLARK**, Environmental Section, U.S. Army Corps of Engineers, Albuquerque, NM 87103-1580 (JNS, CSC) and Department of Biology, University of New Mexico, Albuquerque, NM 87131, USA (CSC, JNS) ●

CHELYDRA SERPENTINA (Common Snapping Turtle). **Fecundity.** We report here on the contents of a nest that we discovered 12 June 1990 on the Valentine National Wildlife Refuge, Cherry Co., Nebraska. The nest contained a clutch of 109 eggs. This value eclipses the previous record of 104 eggs produced by another female from the same population (Miller et al. 1989. Herp. Review 20:69). A subsample of 40 eggs that were weighed prior to being used in another study has an $\bar{X}$ mass of 12.42 g (range 9.95-13.25 g), which leads to an estimate of 1.354 kg for the mass of the entire clutch. This is an impressive value for parental investment by a snapping turtle, but still falls short of the estimate of 1.444 kg for the clutch reported earlier (Miller et al., op. cit.).

Submitted by **GARY C. PACKARD** and **MARY J. PACKARD**, Department of Biology, Colorado State University, Fort Collins, CO 80523, and **KIRK MILLER**, Department of Biology, Franklin and Marshall College, Lancaster, PA 17604, USA ●

DERMOCHELYS CORIACEA (Leatherback Sea Turtle). **Migration.** Leatherback turtles are the most widely distributed of all reptiles, ranging throughout tropical and temperate oceans of the world, into boreal waters. Individual records of long distance leatherback movements in the western north Atlantic currently consist of females tagged while nesting in the tropics, and subsequently recaptured or stranded in temperate latitudes (Boulon et al. 1988. Herp. Review 19(4):88; Lambie 1983. Marine Turtle Newsletter 24:17); Pritchard 1976. Copeia 1976(4):749-754). While these data support the belief that leatherbacks travel between tropical nesting grounds and northern feeding areas (Bleakney 1965. Can. Field Nat. 79(2):120-128; Lazell 1980. Copeia 1980(2):290-295; Rhodin and Schoelkopf 1982. Copeia 1982(1):181-183), there are no records of leatherbacks from northern waters subsequently found in their southerly nesting areas.

Many leatherbacks are observed on routine aerial surveys off the mouth of Chesapeake Bay, presumably feeding on the abundant jellyfish washing out of the Bay (Keinath et al. 1987. Virginia J. Sci. 38(4):329-336; Musick 1988. The Sea Turtles of Virginia. Virginia Inst. Mar. Sci., Virginia Sea Grant Ed. Ser. No. 24). Since the inception of the VIMS sea turtle research program in 1979, 28 stranded leatherbacks have been recorded from Chesapeake Bay and Virginia's Atlantic coast, and one live leatherback was tagged. On 30 May 1985 the live leatherback was captured in a pound net at the mouth of Mobjack Bay (within Chesapeake Bay), situated between Virginia's York and Rappahancock Rivers. The turtle measured 133.4 cm CL and was assumed to be an adult female. The turtle was tagged on the rear flippers with monel tags (Center for Sea Turtle Research, Univ. Florida) and released in the York River. On 22 July 1986 the turtle was captured and killed by local fishermen in the Gulf of Guacanayabo, off southern Cuba. Tags were sent to the Center for Sea Turtle Research, but no other data were reported.

This is the first record of a leatherback moving from temperate waters to tropical nesting grounds, a minimum distance of 2168 km. The data support Lazell's suggestion (op. cit.) that leatherbacks travel directly between temperate latitudes and nesting (and probable mating) areas.

The turtle was measured and tagged by S. Bellmund, R. A. Byles, and R. Klinger. The Cuban Fish Ministry and J. A. Ottenwalder were involved in returning the tags to the Center for Sea Turtle Research. We thank R. A. Byles and K. L. Eckert for comments.

Submitted by **JOHN A. KEINATH** and **JOHN A. MUSICK**, Virginia Institute of Marine Science (VIMS), College of William and Mary, Gloucester Point, VA 23062, USA ●

GRAPTEMYS CAGLEI (Cagle's Map Turtle). **Size.** Haynes and McKown (1974. Tulane Stud. Zool. Bot. 18:143-152) reported a maximum size of 161.1 mm CL for female *Graptemys caglei*. Killebrew and Porter (1989. Herp. Review 20:70) increased the previous record by 40.9 mm and noted substantial sexual dimorphism in size for this species. Recently, three females have been collected that exceed 202 mm CL, including two from the Guadalupe River above Canyon Lake in Comal Co., Texas and one from the Guadalupe River near Cuero, DeWitt Co., Texas. One of the Comal Co. specimens and the DeWitt Co. specimen were photographed and released. The other Comal Co. specimen, measuring 213 mm CL (mass = 1036 g), was deposited in the West Texas State University Museum of Natural History (WTSU 12535). These specimens were collected during a study funded by the Texas Advanced Research Program (Grant No. 1157) and a Research Enhancement Grant.

Submitted by **FLAVIUS C. KILLEBREW** and **DAN PORTER**, Department of Biology and Geosciences, West Texas State University, Canyon, TX 79016, USA ●

SAURIA

ANOLIS PORCATUS (Cuban Green Anole). **Behavior.** At 1100 h on 24 July 1990, agonistic behavior was observed between a large male *A. porcatus* (SVL ca. 65 mm) and a slightly smaller male *A. cybotes* near the eastern end of the Puente Duarte over the Río Ozama in Sto. Domingo, República Dominicana. This area has apparently only recently been colonized by *A. porcatus*. On a large tree trunk (ca. 35 cm diam), ca. 4 m above ground, the two lizards were situated ca. 20 cm apart, with the *A. porcatus* above. Both were perpendicular to the axis of the tree, but facing in opposite directions. Both animals were actively displaying with push-ups and extension of their dewlaps. As either moved, the other compensated in order to maintain the distance between them. At different times it appeared that both individuals initiated movement. This continued for over one minute before one or both lizards apparently became aware of the observer and both moved up the tree and out of sight.

Similar interactions between introduced *A. porcatus* and the ecologically similar Hispaniolan endemic *A. chlorocyanus* have been described by Arias C. (1975. Unpubl. thesis, Univ. Autonoma Sto. Domingo, 231 pp.) and Powell et al. (1990. Amphibia-Reptilia 11:*in press*), the latter suggesting that the presence of *A. chlorocyanus* may act as a constraint on the rate of range expansion by the larger and apparently more aggressive *A. porcatus*. Though the encounter with *A. cybotes* described here might well have been an unusual or isolated incident (no similar behavior has been observed at numerous other sites throughout Sto. Domingo where the species are sympatric), if potentially antagonistic behavior does occur between *A. porcatus* and *A. cybotes*, the presence of the latter might be an additional constraint on the rate of range expansion by *A. porcatus* in the Dominican Republic.

Submitted by **ROBERT POWELL**, Department of Natural Sciences, Avila College, Kansas City, MO 64145, USA ●

SERPENTES

ATHERIS NITSCHEI NITSCHEI (Sedge Viper). **Reproduction.** The sedge viper is an arboreal species found in the Lake Tanganyika region of equatorial Africa. Its range appears to extend from Uganda in the north to Zambia and Malawi in the south, and areas of western Tanzania and eastern Zaire. Published information concerning reproduction of this species has been scarce. Freed (1986. Herp. Review 17(2):47-48) reported on two litters of *A. chloroechis* from wild-caught females.

An adult group of 2.2 wild-caught specimens was received 2 November 1988 from a commercial source. Each snake was maintained individually in a 63 x 33 x 28 cm fiberglass unit provided with branches. On 24 May 1989, male A and female A were placed in a 61 x 45 x 41 cm fiberglass exhibit provided with live plants in addition to branches. Ambient temperature ranged from ca. 23° C to 27° C on a night/day cycle. Both precoital activity and copulation were noted during the first and second weeks of June. Copulation was again observed 1 August 1989. During at least one of these occasions, the temperature exceeded 32° C due to a mechanical malfunction. On 3 August 1989, female A was removed, and female B was introduced to male A; courtship behavior was noted almost immediately. Copulation was observed on 8 August 1989. Interestingly, female A had shed five weeks prior to her introduction to male A and did not experience ecdysis during her residence with male A. Two weeks after being isolated from male A, female A was again noted opaque.

By late November, female A was refusing food and was suspected of being gravid. On 9 January 1990, female A seemed listless and was found lying on the floor of the reserve. On 10 January 1990, female A was discovered with five live young and three undeveloped egg masses. Masses of neonates = 2.5 g, 4.4 g, 5.3 g, 5.7 g, and 6.3 g; X = 4.84 g. The smallest died within 24 h. Of the remaining four neonates, one shed within 24 h, two within 72 h, and the last one had to be assisted due to the shed becoming constricted at midbody.

The offspring apparently exhibit an ontogenetic color conversion, being almost black at birth with none of the bright green characteristic of adults. Like *A. chloroechis* (Freed op. cit.), the neonates have tail tips much lighter in color than the rest of the animal. When the juveniles shed at approximately ten weeks of age, their epidermal coloration abruptly resembled that of the adults.

I thank D. Herman for his comments.

Submitted by **BILL MCMAHAN**, Department of Reptiles and Amphibians, Louisville Zoo, 1100 Trevilian Way, Louisville, KY 40213, USA ●

CROTALUS SCUTULATUS (Mohave Rattlesnake). **Reproduction.** On 9 May 1984 a female Mohave rattlesnake was captured outside her individual den in western San Luis Potosí, Mexico, and removed due to the proximity to an agricultural operation. The habitat was a short shrub community composed mainly of *Haplopappus venetus*, with some *Sporobolus airoides*, *Distichlis spicata*, and *Bouteloua gracilis*. The site was located in rolling hill country, adjacent to a small dry-farmed plot. It was part of Rancho Las Joyas, Municipio de Villa de Ramos (22°6'30" Lat N; 101°44' Long W; 2120 m elev.).

On 31 August 1984 she delivered 17 young, four of which were stillborn. The young were measured and weighed at birth. X SVL = 211.6 ± 7.6 mm and X mass = 10.6 ± 0.9 g. The male:female sex ratio = 9:8. No intersex statistical differences were found.

Submitted by **ERIC MELLINK**, CICESE, P.O. Box 4844, San Ysidro, CA 92073, USA ●

THAMNOPHIS GIGAS (Giant Garter Snake). **Reproduction.** Virtually nothing is known concerning reproduction in *Thamnophis gigas*, a California Central Valley endemic recently elevated to specific status (Rossman and Stewart 1987. Occas. Pap. Mus. Zool. Louisiana State Univ. (63):1-25). *T. gigas* is the largest member of the genus, with a reported record TL of ca. 145 cm (Wright and Wright 1957. Handbook of Snakes of the United States and Canada. Comstock Publishing Associates. Ithaca, New York. 2 vols., 1106 pp.) and is listed as a Threatened Species by the State of California and a Category 2 Candidate Species for federal listing by the U.S. Fish and Wildlife Service.

During the course of recent and ongoing ecological and distributional studies of giant garter snakes (G. E. Hansen and Brode, 1980. California Dept. of Fish and Game, Inland Fisheries Endangered Species Program Spec. Publ. 80-5:1-14; R. W. Hansen 1980. Unpubl. M.A. thesis, California State Univ. Fresno. 78 pp.), eighteen gravid females were collected in Fresno and Sacramento counties and maintained alive in the laboratory for observation. All eighteen gave birth to live young, with relevant data shown in Table 1.

Cunningham (1959. Herpetologica 15(1):17-19) reported that a female collected July 24 (year not stated) from Buena Vista Lake, Kern Co., contained 24 eggs.

Table 1. Adult size, reproductive data, and size of neonates of *Thamnophis gigas*.

	Female SVL/TL (mm)	Collection Date	Parturition Date	Litter Size	Neonate $\bar{X}$ SVL (Range) (mm)
FRESNO CO.	---- /1070 (est.)	10 July 78	10 August 78	26	197.0 (177.5-208)
	720/920	11 July 78	03 August 78	15	194.4 (175-210.5)
	815/1040*	18 July 78	13 August 78	21	184.8 (171-193)
	---- / ----	18 July 78	21 August 78	14	192.6 (186-196)
	730/931*	18 July 78	-- August 78	10	184.4 (169-191)
	840/1080	24 July 78	10 August 78	12	183.7 (151.5-191)
SACRAMENTO CO.	1030/1300	14 May 87	15 July 87	46	-------- (----------)
	1020/1301*	21 July 87	26 July 87	29	206.3 (182-220)
	1002/1269*	17 May 89	13 July 89	32	209.2 (192-221)
	965/1222*	18 June 89	24 July 89	23	213.7 (202-224)
	1000/1252	10 July 90	27 July 90	22	212.5 (185-225)
	970/1225	28 June 90	27 July 90	25	218.7 (210-226)
	965/1222*	06 July 90	28 July 90	33	214.3 (181-232)
	895/1135*	04 July 90	31 July 90	23	206.8 (195-212)
	810/1010	04 July 90	02 August 90	14	212.1 (185-228)
	880/1020**	28 June 90	07 August 90	31	211.2 (183-223)
	1020/1292*	08 August 90	13 August 90	22	223.1 (212-232)
	905/1140	11 August 90	01 September 90	16	219.5 (195-231)

* Total length estimated due to incomplete tail
** Congenitally short tail

His record combined with our data yield a mean litter size of 23.1 (range 10-46). Mean SVL for 368 neonates is 206.4 mm.

Adult females and their offspring were released at original collection sites following parturition.

Submitted by **ROBERT W. HANSEN**, 16333 Deer Path Lane, Clovis, CA 93612, and **GEORGE E. HANSEN**, 3230 Brookwood Rd., Sacramento, CA 95821, USA ●

TROPIDOCLONION LINEATUM (Lined Snake). **Bird Attack.** Lined snakes are often observed in the yards of Richmond Heights, a suburb of St. Louis, Missouri. On 17 June 1960, a neighbor, Mr. George Heggs of the 7200 block of Arlington Dr., brought me an injured lined snake. At about 1600 h, he observed several blue jays (*Cyanocitta cristata*) pecking at this snake as it lay in the driveway. The pregnant female measured 27.3 cm SVL and 31.6 cm TL. The snake died.

Submitted by **OWEN J. SEXTON**, Department of Biology, Washington University, St. Louis, MO 63130, USA ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of a species' range, and thereby permit a more significant interpretation of its biology.

These geographic distribution records will be accepted in a **standard format** only, and all authors *must* adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in Collins, 1990, *Standard Common and Current Scientific Names for North American Amphibians and Reptiles, Third Edition*, Herp. Circ. 19: 1–41), LOCALITY (use metric for distances and give precise locality data), DATE (day-month-year), COLLECTOR, VERIFIED BY (*cannot* be verified by an author — curator at an institutional collection is preferred), PLACE OF DEPOSITION (where applicable, use standardized collection designations as they appear in Leviton et al., 1985, *Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology*, Copeia 3: 802–832) and CATALOG NUMBER (required), COMMENTS (brief), CITATIONS (brief), SUBMITTED BY (give name and address in full — spell out state names — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged; institutional collection records will receive precedence in case of conflict). A good quality color slide or photograph may substitute for a preserved specimen *only* when the live specimen could not be collected for the following reasons: it was a protected species, it was found in a protected area, or the logistics of preservation were prohibitive (such as large turtles or crocodilians). Color slides and photographs *must* be deposited in a university or museum collection along with complete locality data, and the color slide catalog number(s) must be included in the same manner as a preserved record. All specimen identifications *must* be verified by another authority (not one of the authors). Before you submit a manuscript to us, check Censky (1988, *Index to Geographic Distribution Records in Herpetological Review: 1967–1986*) to make sure you are not duplicating a previously published record.

Please submit any geographic distribution records in the **standard format only** to: Joseph T. Collins or Darrel Frost, Section Co-editors, Museum of Natural History — Dyche Hall, The University of Kansas, Lawrence, Kansas 66045–2454 USA. Short manuscripts are strongly discouraged, and are only acceptable when data cannot be presented adequately in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic Distribution: *Lampropeltis triangulum multistriata*. SSAR Herp. Review 25: 198.

CAUDATA

AMBYSTOMA JEFFERSONIANUM (Jefferson Salamander). USA: PENNSYLVANIA: Erie Co: 0.4 km N Pennsylvania State University-The Behrend College campus. 26 March 1987. Mark Lethaby. Verified by C. J. McCoy. CM 115197. New county record (McCoy 1982, Amphibians and Reptiles in Pennsylvania, Carnegie Mus. Nat. Hist. Spec. Pub. 6: 1–91).

Submitted by **MARK LETHABY**, 535 East 29th Street, Erie, Pennsylvania 16504. ●

AMBYSTOMA TALPOIDEUM (Mole Salamander). USA: NORTH CAROLINA: Guilford Co: 7.24 km WSW Brown Summit. 10 February 1990. Ann B. Somers & Noah Somers. Verified by Alvin L. Braswell. North Carolina State Museum of Natural Sciences (NCSM 30446). Male; 125mm TL, 71mm SVL. New county record and extends the range ca. 76 km ESE of nearest reported locality (Braswell & Murdock 1979, Brimleyana 1: 135–139). Specimen exceeds the previous North Carolina size record, and also exceeds the national size record (Conant 1975, A Field Guide to Reptiles & Amphibians of Eastern & Central North America, Houghton Mifflin Co., Boston).

Submitted by **ANN B. SOMERS**, Department of Biology, University of North Carolina at Greensboro, Fairview, Greensboro, North Carolina 27412. ●

AMBYSTOMA TEXANUM (Smallmouth Salamander). USA: ARKANSAS: Fulton Co: 7.1 & 7.6 km S Mammoth Spring (Sec. 11 & Sec. 12, T20N, R6W respectively). 2 February 1990. M. D. Fletcher, B. G. Cochran, R. Porter, & D. Evans. Verified by S. E. Trauth. Arkansas St. Univ. Mus. Zool. (ASUMZ 15336, 15337). New county record and range extension into Ozark Mtns; 60 km further west than any previous record (Dellinger & Black 1938, Occ. Pap. Arkansas Mus. 1: 1–47; Dowling 1957, Occ. Pap. Arkansas Mus. 3: 1–51; Johnson 1987, The Amphibians and Reptiles of Missouri, Missouri Dept. Conserv.).

Submitted by **M. DOUG FLETCHER** and **BETTY G. COCHRAN**, Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467. ●

AMBYSTOMA TIGRINUM TIGRINUM (Eastern Tiger Salamander). USA: ILLINOIS: Warren Co: Lenox Township (Sec. 19, T10N, R2W). 8 September 1990. Robert Sliwinski. Verified by G. R. Thurow. Western Illinois Univ. Collection (A14101). New county record; closest known locality is 40 km away (Smith 1961, Bull. Illinois Nat. Hist. Surv. 28(1): 37–39; Michael Morris, unpublished data).

Submitted by **ROBERT SLIWINSKI**, Department of Biological Sciences, Western Illinois University, Macomb, Illinois 61455. ●

PSEUDOTRITON MONTANUS DIASTICTUS (Midland Mud Salamander). USA: TENNESSEE: Wilson Co: intermittent stream E of Cedars Forest Road, 1.5 km S Evans Trail intersection. 21 April 1990. B. T. Miller (Tennessee Permit 418), M. G. Donovan, & D. Donovan. Verified by G. Murphy. Middle Tennessee State University (MTSU 21C, 22C). New county record, extends known distribution into cedar glade ecosystem of middle Tennessee (Martof 1975, *Pseudotriton montanus*. Cat. American Amph. Rept. 166.1–166.2).

Submitted by **BRIAN T. MILLER**, Department of Biology, Middle Tennessee State University, Murfreesboro, Tennessee 37132. ●

ANURA

ELEUTHERODACTYLUS JOHNSTONEI (Johnstone's Piping Frog). LESSER ANTILLES: Grenadine Islands: Bequia Island, Friendship Bay. 6 & 8 December 1989. T. Sinclair. Verified by Ernest E. Williams & José Rosado. MCZ 114051, 114063. First record for the island (Schwartz & Henderson 1988, Milwaukee Pub. Mus. Contrib. Biol. Geol. 74: 22).

Submitted by **JAMES LAZELL** and **THOMAS SINCLAIR**, The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835. ●

HYLA AVIVOCA (Bird-voiced Treefrog). USA: ARKANSAS: Grant Co: 3.8 km W Leola at Cox Creek Lake, Sec. 28, T6S, R15W. 4 June 1990. John W. Robinette & Jase Goins. Arkansas State University Museum of Zoology (ASUMZ 16409–11). Ouachita Co: 5.9 km SW Chidester at White Oak Lake & Ark. Rt. 57, Sec. 33, T12S, R19W. 25 May 1990. Stanley E. Trauth & John W. Robinette. ASUMZ 16003–06. Union Co: Calion Lake at Calion, Sec. 15, T16S, R14W. 24 May 1990. Stanley E. Trauth & John W. Robinette. ASUMZ 16007–15; 16080. All the above records verified by V. Rick McDaniel. New county records (Davis & Hollenback 1978, Southwest. Nat. 23: 161–162; Turnipseed 1976, Herp. Review 7: 178–179; Turnipseed 1980, Herp. Review 11: 14).

Submitted by **STANLEY E. TRAUTH** and **JOHN W. ROBINETTE**, Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467. ●

TESTUDINES

KINOSTERNON SUBRUBRUM (Eastern Mud Turtle). USA: NORTH CAROLINA: Wilkes Co: 10.6 km SE Wilkesboro. 5 June 1990. D. W. Herman & B. W. Tryon. Verified by A. L. Braswell. North Carolina State Museum of Natural Sciences (NCSM 30680). New county record. Extends range 60.8 km WSW nearest Surry County voucher (NCSM 15730), 21.1 km NW nearest Iredell County record (Herman & Weakley 1986, Herp. Review 17: 27), and 48 km NE nearest Burke County record (Herman & Short 1986, Herp. Review 17: 27).

Submitted by **DENNIS W. HERMAN**, Department of Herpetology, Zoo Atlanta, 800 Cherokee Avenue SE, Atlanta, Georgia 30315, and **BERN W. TRYON**, Department of Herpetology, Knoxville Zoological Garden, P. O. Box 6040, Knoxville, Tennessee 37914. ●

STERNOTHERUS MINOR (Loggerhead Musk Turtle). USA: FLORIDA: Highlands Co: Lake Huntley, Secs. 5 & 8, T37S, R30E. 11 May 1990. Walter Meshaka & Noreen Gallo. Verified by James Layne. Vertebrate Museum, Archbold Biological Station (ABS 1081). New county record extends range onto Lake Wales Ridge, 140 km S of Orange County localities (Iverson & Etchberger 1989, Florida Sci. 52: 119–144.

Submitted by **WALTER MESHAKA** and **NOREEN GALLO**, Archbold Biological Station, P. O. Box 2057, Lake Placid, Florida 33852. ●

TRACHEMYS SCRIPTA (Neotropical Slider). HONDURAS: ISLAS DE LA BAHIA: Isla de Roatán, West Bay. 24 November 1989. J. R. McCranie. KU 214779. Verified by Joseph T. Collins. Complete shell of recently deceased adult (carapace length 31.5 cm) collected alongside a small freshwater pond. First record for island. Reported previously from the Islas de la Bahía on the basis of a shell in possession of a resident of Isla de Utila (Wilson & Hahn 1973, Bull. Florida St. Mus. Biol. Sci. 17: 93–150). These authors also stated that "residents on Roatán ... report [that] no fresh water turtles occur ..." on the island. A live adult *Trachemys* was also seen on 23 November 1989 in the possession of a resident in Coxen Hole, Isla de Roatán. The turtle was reported to have been found on Isla de Roatán near Sandy Bay. I was shown two other small freshwater ponds on Roatán where turtles have been sighted. Apparently, *Trachemys* occurs in small numbers on Isla de Roatán, but is under pressure from the local people as a food source.

Submitted by **J. R. McCRANIE**, 10770 SW 164th Street, Miami, Florida 33157. ●

TRACHEMYS SCRIPTA ELEGANS (Red-eared Slider). USA: MISSOURI: Laclede Co: Interstate Rt. 44 just N

Webster County line near Conway (DOR). 23 May 1983. James N. Stuart. Verified by R. D. Jennings. MSB 39519. New county record (Johnson 1987, The Amphibians and Reptiles of Missouri, Missouri Dept. Conserv., 368 pp.).

Submitted by **JAMES N. STUART**, Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, and Environmental Section, U. S. Army Corps of Engineers, Albuquerque, New Mexico 87103–1580. ●

SAURIA

ANOLIS PORCATUS (Cuban Green Anole). DOMINICAN REPUBLIC: DISTRITO NACIONAL: Santo Domingo, E end of the Puente Duarte. 24 July 1990. R. Powell. Verified by J. S. Parmerlee, Jr. Bobby Witcher Memorial Collection (BWMC 4282), Avila College, Kansas City, Missouri 64145. This is the first record for the species east of the Río Ozama, which had been considered a barrier to further range expansion by this introduced species (Powell et al. 1990, Amphibia-Reptilia 11: in press).

Submitted by **ROBERT POWELL**, Department of Natural Sciences, Avila College, Kansas City, Missouri 64145. ●

ANOLIS SAGREI (Brown Anole). USA: FLORIDA: Bay Co: Panama City Beach, Barnacle Bay Mini-Golf, 11209 West Hgwy. 98. 13 May 1989, 5 May 1990. G. H. Means, R. C. Means & D. B. Means. Verified by David L. Auth. Florida Museum of Natural History (UF 78392–96). New county record and first record for Florida panhandle (W of Suwannee River); extends range ca. 205 km NW of closest published locality, Waccasassa Bay State Preserve in Levy County (Funk & Moll 1979, Herp. Review 10(3): 102). About 20 juvenile and adults were seen 13 May 1989 in 2 hours of casual observation, but in 3 hours of intensive searching one year later, only 8 were seen, indicating that low record temperatures in December 1989 may have killed many on the ca. 2000 m² habitat island surrounded by a large asphalt parking lot. Search of adjacent habitat (tourist beach strip) one block in all directions failed to turn up others. *Anolis carolinensis* (UF 78390–91) was present also, but less common. Information gained from the owner of the site indicates that *A. sagrei* probably was introduced in cabbage palms and dolomite boulders trucked in from central Florida when the site was constructed in 1985.

Submitted by **D. BRUCE MEANS**, Coastal Plains Institute, 1313 North Duval Street, Tallahassee, Florida 32303. ●

ANOLIS TRINITATUS (Vincentian Anole). LESSER ANTILLES: Saint Vincent: Young Island. 29 November 1989. J. Lazell & T. Sinclair. Verified by Ernest E. Williams & José Rosado. MCZ 175147–57. First record for island. In life these lizards closely resembled Kingstown specimens, with some yellow as described for examples from Chateau-belair Island (Lazell 1972, Bull. Mus. Comp. Zool. 143(1): 79).

Submitted by **JAMES LAZELL** and **THOMAS SINCLAIR**, The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835. ●

EUMECES FASCIATUS (Five-lined Skink). USA: PENNSYLVANIA: Erie Co: on abandoned Penn Central Railroad bridge crossing at East Branch Conneaut Creek, 0.5 km N U.S. Rt. 6N. 24 April 1990. Mark Lethaby & Judy Tucci. Verified by C. J. McCoy. Two specimens, CM 119167 & 119168. New county record; extends range 17 km N in state (McCoy 1982, Amphibians and Reptiles in Pennsylvania, Carnegie Mus. Nat. Hist. Spec. Pub. 6: 1–91).

Submitted by **MARK LETHABY** and **JUDY TUCCI**, Lake Erie Research Unit, Pennsylvania Fish Commission, 2000 Lohrer Road, Fairview, Pennsylvania 16415. ●

GYMNOPHTHALMUS SPECIOSUS (Antillean Lizard). LESSER ANTILLES: Grenada: no other locality data. 9 July 1971. J. D. Hardy, Jr. Verified by Charles J. Cole & Robert P. Reynolds. USNM 192965. First record for the genus from Grenada.

Submitted by **P. E. VANZOLINI**, Museu de Zoologia, Universidade de São Paulo, Caixa Postal 7172, 01051 São Paulo, São Paulo, Brasil. ●

GYMNOPHTHALMUS UNDERWOODI (Antillean Lizard). LESSER ANTILLES: Guadeloupe: Raizet, Abymes. Date unknown. G. Cornely. Verified by Ernest E. Williams. MCZ 122220–21. Previously identified as *G. p. pleei*. Basseterre. 12–15 July 1985. R. I. Crombie & J. D. Hardy, Jr. Verified by Charles J. Cole & Robert P. Reynolds. USNM 283176–83. Previously recorded from only a single locality in Grande-Terre (Schwartz & Henderson 1988, Milwaukee Pub. Mus. Contrib. Biol. Geol. 74: 130). Dominica: no other locality data. 19 September 1980. R. I. Crombie. Verified by Charles J. Cole & Robert P. Reynolds. USNM 218174–79. First record for Dominica. Reported by Brooks (1983 SSAR Herp. Review 14(1): 31–32) as *G. p. pleei*.

Submitted by **P. E. VANZOLINI**, Museu de Zoologia, Universidade de São Paulo, Caixa Postal 7172, 01051 São Paulo, São Paulo, Brasil. ●

GYMNOPHTHALMUS UNDERWOODI (Antillean Lizard). LESSER ANTILLES: Grenadine Islands: Bequia Island, Friendship Bay. 5–8 December 1989. T. Sinclair. Verified by Ernest E. Williams & José Rosado. MCZ 175130–35, CAS 173232–33. First record for the genus and species from the Granada Bank (Schwartz & Henderson 1988, Milwaukee Pub. Mus. Contrib. Biol. Geol. 74: 130).

Submitted by **JAMES LAZELL** and **THOMAS SINCLAIR**, The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835. ●

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). USA: FLORIDA: Leon Co: Tallahassee, exterior walls of Leon High School and on walls of apartment complex one block away at 417 East Virginia Street. September 1988. G. H. Means & R. C. Means. Verified by David L. Auth. Florida Museum of Natural History (UF 71520–25). New county record and first record for Florida panhandle (W of Suwannee River); extends range ca. 220 km ENE of Gainesville (McCoy 1970, Cat. American Amph. Rept. 87.1–87.2). Teachers at Leon High School indicate population has been present since at least 1980.

Submitted by **D. BRUCE MEANS**, Coastal Plains Institute, 1313 North Duval Street, Tallahassee, Florida 32303. ●

SCELOPORUS COUCHI (Spiny Lizard). MÉXICO: NUEVO LEON: Cañón Mireles, 2 km N Los Rayones. 29 April 1990. Manuel Nevares. Verified by Arturo Contreras-Arquieta. Universidad Autónoma de Nuevo León (UANL 3907–3911). Extends range ca. 40 km southeast of nearest known locality at Las Adjuntas, Santiago, Nuevo León (Benavides Ruiz 1987, Herpetofauna en el Centro-Sur del Municipio de Santiago, Nuevo León, México, Bachelor Thesis, FCB Universidad Autónoma de Nuevo León, 59 pp.).

Submitted by **MANUEL NEVARES**, Comité para la Investigación Herpetológica en el Norte de México, Apartado Postal 90 "F," Cd. Universitaria, San Nicolás de los Garza, Nuevo León, C. P. 66450, México. ●

SPHAERODACTYLUS cf. VINCENTI (Antillean Gecko). LESSER ANTILLES: Grenadine Islands: Bequia Island, Friendship Bay. 1–8 December 1989. T. Sinclair. Verified by Ernest E. Williams & José Rosado. MCZ 175141–46. First record for the genus from the Granada Bank; the *S. vincenti* complex is widespread to the north of this record (Schwartz 1965, Caribbean J. Sci. 4(2–3): 391–409). The Bequia series does not fit previously described taxa and is under study.

Submitted by **JAMES LAZELL** and **THOMAS SINCLAIR**, The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835. ●

XANTUSIA BOLSONAE (Bolsón Night Lizard). MÉXICO: DURANGO: Cañón de la Ojuela, cerca de Mapimí. 10 June 1984. Oscar Sanchez-Herrera. Verified by John Wright. Museo de Zoología, Facultad de Ciencias, Universidad Autónoma de México (MZFC 3358). Second known locality for the species; extends the range 75 km N of type locality (10 km NE Pedriceña, Durango; Webb 1970. Los Angeles Co. Nat. Hist. Mus. Contrib. Sci. 194: 1–10).

Submitted by **OSCAR FLORES-VILLELA**, Museo de Zoología, Facultad de Ciencias, Universidad Autónoma de México, A.P. 70–399, D.F. 04510, México, **OSCAR SANCHEZ-HERRERA**, Instituto de Biología, Universidad Autónoma de México, A.P. 70–153, D.F. 04510, México, and **ROBERT L. BEZY**, Section of Herpetology, Natural History Museum, 900 Exposition Boulevard, Los Angeles, California 90007. ●

SERPENTES

CROTALUS ATROX (Western Diamondback Rattlesnake). USA: TEXAS: Hall Co: 2.4 km NW Memphis off U.S. Rt 287. 18 August 1990. C. T. McAllister. Verified by Stanley E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 16778). New county record filling distributional gap between Briscoe and Childress counties (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **CHRIS T. MCALLISTER**, Renal-Metabolic Lab (151-G), Department of Veterans Affairs Medical Center, 4500 South Lancaster Road, Dallas, Texas 75216. ●

DIADOPHIS PUNCTATUS EDWARDSII (Northern Ringneck Snake). USA: ILLINOIS: Fulton Co: Isabel Township (Sec. 7, T4N, R3E). 13 September 1990. Christopher Becker & Robert Sliwinski. Verified by G. R. Thurow. Western Illinois Univ. Collection (A14102–103). New county record (Smith 1961, Bull. Illinois Nat. Hist. Surv. 28(1): 183–185; Michael Morris, unpublished data).

Submitted by **CHRISTOPHER BECKER** and **ROBERT SLIWINSKI**, Department of Biological Sciences, Western Illinois University, Macomb, Illinois 61455. ●

ELAPHE GUTTATA (Corn Snake). USA: NORTH CAROLINA: Stokes Co: Hanging Rock State Park, Danbury. 25 May 1990. Thomas H. Sutton. Verified by Joseph T. Collins. Virginia Museum of Natural History (VMNH R93, frozen blood sample & photograph, & KU Color Slide 8874). First record for Upper Piedmont of state.

Submitted by **JAYE C. DOW**, Hanging Rock State Park, P. O. Box 186, Danbury, North Carolina 27016, and **TERRY D. SCHWANER**, Virginia Museum of Natural History, Martinsville, Virginia 24112. ●

SONORA AEMULA (Filetail Ground Snake). MÉXICO: SONORA: Tónichi, 172 km SE Hermosillo. Collector & date of collection unknown. Verified by Arturo Contreras-Arquieta. Universidad Autónoma de Nuevo León (UANL 3860). Extends the range ca. 185 km NW of nearest known locality at Alamos, Sonora (Bogert & Oliver 1945, Bull. American Mus. Nat. Hist. 83: 301–425).

Submitted by **MANUEL NEVARES** and **IVAN E. PARRA-SALAZAR**, Comité para la Investigación Herpetológica en el Norte de México, Apartado Postal 90 "F," Cd. Universitaria, San Nicolás de los Garza, Nuevo León, C. P. 66450, México. ●

STORERIA DEKAYI (Brown Snake). USA: NEBRASKA: Thurston Co: 3.5 km ESE Macy near Blackbird Creek bridge, NW 1/4, SE 1/4, Sec. 29, T25N, R10E. 5 May 1990. A. T. Holycross, J. D. Lynch, J. F. Lokke, D. M. Ferraro & J. Young. Verified by John D. Lynch. University of Nebraska State Museum (UNSM 9944). New county record, extends Nebraska range ca. 32 km NNW of Sarpy County record (Lynch 1985, Trans. Nebraska Acad. Sci. 13: 33–57).

Submitted by **ANDREW T. HOLYCROSS**, Department of Biology, University of Nebraska at Omaha, Omaha, Nebraska 68182-0040. ●

STORERIA OCCIPITOMACULATA OCCIPITOMACULATA (Northern Redbelly Snake). USA: ILLINOIS: Knox Co: Green Oaks (Knox College Biological Field Station), 7 km S Victoria (Sec. 6, T11N, R4E). 7 October 1989. Robert Sliwinski. Verified by M. A. Romano. INHS 10877. New county record; this species has a spotty distribution statewide (Smith 1961, Bull. Illinois Nat. Hist. Surv. 28[1]).

Submitted by **ROBERT SLIWINSKI**, Department of Biological Sciences, Western Illinois University, Macomb, Illinois 61455. ●

BOOK REVIEWS

Australian Reptiles & Frogs, by Raymond T. Hoser, 1989. Pierson & Co., Sydney ix + 238 pp.$49.50.

Color photography of amphibians and reptiles just keeps getting better and better, and it is the best feature of this book on the Australian herpetofauna. Moreover on pp. 199-201 the author reveals some of his photographic techniques.

The book is divided into three sections, the first a conventional but well written introduction to biology and classification of amphibians and reptiles. There are numerous photos of snakes engaged in activities such as feeding, skin shedding, copulation, and birth of young but few of lizards and frogs and almost none of turtles. Pictures of such things as a turtle nesting, a frog egg film, a bearded dragon flattening its body to catch the sun, or the communal nest of *Lampropholis* would have improved this section. More could be said of the odd life cycles of Australian frogs. The gastric brooding of *Rheobatrachus* is barely mentioned, and nothing is said of the transport of tadpoles in inguinal brood pouches by male *Assa* or the highly specialized tadpoles of such torrent frogs as *Nyctimystes dayi*.

The largest section is devoted to descriptions of species most likely to be encountered in Australia, those of special interest, and those most often kept in captivity. This isn't a field guide but will help identify most species. For each species there is an excellent color photo, often several, illustrating ontogenic or geographic variation, a range map, and a brief account of identifying features, habitat, and habits. There are gaps in coverage. Microhylids aren't mentioned at all, and two snake families get poor treat-

ment. Australia's sea snakes are a distinctive and diverse group of ecological and medical importance, yet only two species are illustrated, one the cosmopolitan *Pelamis* and the other an *Aipysurus* misidentified as *Lapemis hardwickii*. Typhlopids also get short shrift, presumably because they all look much alike, little is known of their biology, and authorities can't agree on how many Australian species should be recognized.

The third section deals with a variety of topics including collecting techniques, husbandry, photography, and conservation. The author is highly critical of some Australian regulations governing collection and keeping of reptiles and amphibians. He says (p. 203): "Activities by corrupt and misdirected fauna authorities have almost wiped out the amateur herpetological community." He also gives examples of cases where critical habitat for rare species goes unprotected in australia. A unique section is devoted to scenes of a wide variety of Australian landscapes where herptiles occur with lists of characteristic species. But he omits one of the richest - the town rubbish dump.

There is a fairly adequate list of references and a good index. The book is attractive and well bound.

A biologist or naturalist going to Australia and interested in the native wildlife would do well to make room for this book in his luggage. Anyone fortunate enough to have legally obtained Australian reptiles or amphibians for his live collection will also find it useful. Reading this book is an easy way for the desk-bound herpetologist to appreciate the richness of the Australian fauna and landscape; if he has been there, he is almost sure to see a picture of something he missed. However, those who anticipate intensive research on some segment of the herpetofauna will need to consult additional publications.

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Fauna of Saudi Arabia, Volume 9, edited by W. Buttiker and F. Krupp. 1988. Pro Entomologia (Natural History Museum, Basel) and National Commission for Wildlife Conservation and Development, Riyadh, Saudi Arabia, 465 pp. SFr 153. Available from Karger Libri AG, CH-4009, Basel, Switzerland.

This attractive volume of the *Fauna of Saudi Arabia* is extremely useful to biologists, particularly those who are interested in the study of the fauna of the Arabian peninsula. It includes 18 papers in about 465 pages, treating different animal taxa from annelids to birds, and discussing different subjects of major concern to biologists.

It seems out of place to review publications on different taxa in *Herpetological Review*, however there are two important papers on the reptiles of Arabia. The first is a comprehensive review of the snakes of Arabia and represents the cornerstone of the volume. It occupies 282 pages, constituting more than half of the volume size. The second paper, six pages in length, presents some observations on lizards.

The volume starts with two papers on nature conservation in Arabia. The first, by Jungius, discusses the concept of national parks and protected areas. He emphasizes the necessity of formulating wildlife and nature conservation policies in the Gulf area, and gives several examples of applications in different countries. He suggests that establishing a system of nature conservation areas will rehabilitate disturbed ecosystems, provide various benefits to rural communities, and maintain values for future generations.

The second paper, by Buttiker, deals with nature conservation, particularly birds. Some methods are described for trapping turtle doves at three locations along the Red Sea coast of Saudi Arabia, and results of other investigations are discussed. The author concludes that the turtle dove has not attained the status of a rare or endangered species.

The paper by Erseus is the fourth in a series of contributions on marine Tubificidae from the Arabian Gulf. It describes a new species of annelid, *Heterodrilus maiusulus*, collected from hypersaline waters in the Gulf of Bahrain, NE Saudi Arabia. The paper contributes to baseline data on marine fauna of the Arabian Gulf.

The list of insects of Saudi Arabia includes an appendix of nine papers. Concerning the first paper by Matile-Ferrero, third by Jelink, fourth by Holzel, fifth by Wiltshire, sixth by Kamahwi et al., and seventh by Greathead, many species are described and illustrated in each paper. The list of keys is very useful. Photographs and diagrams are present in some papers, and those are most useful.

In the other three papers, by Jach and Guichard, diagrammatic illustrations and keys for the systematic list should be followed, as records only to species are insufficient.

In general, the authors have certainly done an excellent job in scanning the literature. This bibliography is extremely useful to entomologists.

The paper on the molluscs of the Red Sea, by N. Yonow, discusses the taxonomic status of the Phyllidiidae and describes the fourteen species of the genera *Phyllidia* and *Reyfria* occurring in the Red Sea. A key is given to enable identification using external morphological characters. A series of maps is also provided illustrating the distribution of each species within the Red Sea.

The most significant part of the paper by Al-Absy, on the goatfishes of the Red Sea, is the keys to the genera and species. These are simple and explanatory. The descriptions of the individual species follow the classical methodology adopted by ichthyologists at present. The morphometric characters embodied in the tables serve the purpose of distinguishing related species in general terms.

The part concerned with the reptiles of Arabia includes two parts, the first of which deals with the snakes of Arabia. This paper contains a large amount of information on diverse topics. The extensive data, the presentation of the results, and the review of the herpetological literature [about 440 references, from Linnaeus (1758) and Forskal (1775) to Gallagher (1971), Gasperetti (1977), Arnold (1986), and Leviton (1986)] indicate the highly intense and tireless efforts of John Gasperetti to produce this work which is really very rich and very thorough. I indeed acknowledge this with praise.

In Gasperetti's paper, 54 taxa are listed through 2136 records - 1291 provided by the author and 845 collected from the literature. A short note on the poisonous snakes and the comparative toxicity of their venoms is given. Ophidian senses, skeletal features and dentition, undulations and sidewinding locomotion, are all described. Similarly, pholidosis is discussed in relation to the numbers and arrangements of scales, scutes, or plates on the body.

Gasperetti presents in this comprehensive work a systematic list of the snakes of Arabia and identification keys to families, genera, and species. An illustrated description is given for each of the eight families, 38 genera, and 54 species recorded. An historical and chronological synopsis of the nomenclature, as well as a short note on the habitats, and special adaptations, is given for each species.

Seventeen tables clearly illustrate descriptive data and specific features. Scale patterns and distribution maps are presented in 135 sketches, and there are 20 plates of photgraphic pictures, one for fossil forms and 19 for common living species.

Gasperetti also provides physiographic descriptions of different areas in the Arabian peninsula. He reviews the last 9000 years, during which there was a possibility of exchange of flightless terrestrial faunal forms between Africa and Arabia. He also gives an account of the present zoogeography and snake distribution with the African, Asian, and European distributions.

The last part of the paper deals with conservation. In this part, the author directs attention to the importance of snakes in the food chains of various fauna, their role in rodent control, and the medicinal values of various snake venoms. He reports that 40 protected areas, both terrestrial and marine, have been established in Saudi Arabia for the protection of wildlife. He also adds that some neighboring countries have made considerable progress toward wildlife conservation and he hopes to instill this awareness in the governing bodies of other countries which are not yet so enlightened.

There are three appendices to Gasperetti's paper. In Appendix I, he writes an introduction to and presents the paper of Dr. H. Alistair Read on snakebites. This paper discusses the clinical features, first aid, and medical treatments of snakebites. In Appendix 2, he gives some geographic and collection data for each of the 54 recorded species. In Appendix 3, he summarizes the taxonomic data in table form, clearly illustrating the diagnostic features of the families, genera, and species.

William Ross provided the second paper on the reptiles of Arabia. He reports observations on three species of the lacertid genus *Mesalina* found in certain areas of eastern Saudi Arabia, though these species are probably common in other regions of the Arabian peninsula. A fourth species, *M. ayunensis*, may be common in some regions and is often sympatric with *M. adramitana*.

The author reports short notes on the distribution and habitats of the three lizard species, with special emphasis on their locations in different altitudes. A distribution map, three photgraphs,and a simple table illustrating some morphological differences are also provided. Unfortunately, the table lacks basic taxonomic criteria.

Only a single reference is cited in Ross's paper, though the cited work is an important contribution to the herpetological fauna of the area. Several references are available and should have been included. Nerertheless, Ross has provided a fairly good work, considering that he is not a professional herpetologist.

The article written by Jennings on the birds of the Farasan Islands, Saudi Arabia, is based on two days' observations on two of these islands, unpublished records of other observers, and a review of the literature. Special attention is given to breeding species. The author also presents notes on the topography and vegetations of the islands. He brings out some interesting points in his discussion, among them the low diversity of land birds and the importance of protecting the islands which are used by many migrant seabirds.

The last paper in the volume deals with medical zoology in Saudi Arabia. A.M. Ghandour reports on the diseases caused by imported livestock. Imported and indigenous livestock were examined for facioliasis, echinococcosis, cysticercosis, onchocerciasis, schistosomiasis, coenurosis, and naso-pharyngeal myiasis. The paper has four tables, three maps showing the distribution of parasitic, viral, and bacterial diseases, and a histogram showing the consumption of imported and indigenous livestock in Saudi Arabia. The author suggests measures to combat the possibility of disease importation, based on his own studies as well as those reported in the world literature.

This volume of Fauna of Saudi Arabia fills a major gap in the amount of information relating to many of the vertebrates and invertebrates found on the Arabian peninsula. It also contributes to the growing interest in the nature conservation concept and to the priority given for the preservation and development of wildlife populations in this region.

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Biochemical Evolution in the Slimy Salamanders of the *Plethodon glutinosus* Complex in the Eastern United States, by Richard Highton, George C. Maha, and Linda R. Maxson. 1989. Illinois Biological Monographs 57, University of Illinois Press, 54 E. Gregory Dr., Champaign, Illinois 61820. 153 pp. $18.95.

It used to be so easy. Big, white spotted, black salamanders, that covered your hands with goo when you picked them up, were *Plethodon glutinosus*, whether you found them in Texas, Florida, or New York. This comfortable picture started to get more complex when Highton and MacGregor (1983) and Highton (1984) showed that three species (*Plethodon aureolus*, *P. teyahalee*, and *P. kentucki*) had been masquerading as *glutinosus* while coexisting sympatrically with it. Now Highton, Maha, and Maxson use biochemical data to demonstrate that what remained of *the* slimy salamander is actually a mosaic of 13 parapatric "groups" that hover around the species level of divergence and that Highton, in the initial (and major) section of this two-part monograph, formally names as semispecies. In the second, much briefer part, Maha, Maxson, and Highton show that differentiation among at least some of the *glutinosus* semispecies is also reflected in serum albumin structure. Since only three antisera were available, they are unable to independently confirm Highton's much more extensive electrophoretic analyses.

Highton's methodology is straightforward. He constructs, on the basis of 22 presumed allozyme loci, a matrix of Nei genetic distances among 135 populations from throughout the range of the former *Plethodon glutinosus*. From this he derives a standard UPGMA phenogram indicating that at a Nei distance of about 0.15 the populations cleave into a series of 16 geographically cohesive "groups." Three of these (*aureolus*, *teyahalee*, and *kentucki*) are previously recognized species that occur sympatrically with at least one other *glutinosus*-like salamander; the remainder are recognized and named as subspecies. The large amounts of uninformative variation precluded cladistic analyses, but Wagner distance trees confirm the existence of several distinct groups of populations, while indicating somewhat different evolutionary relationships. The discrepancies between the UPGMA phenograms and the Wagnertrees are ascribed to variation in evolutionary rates, brought about at least in part to gene exchange between some of the groups.

This work convincingly demonstrates the power of biochemical data to reveal genetic sub-structuring, but may strike many "traditional" systematists as biochemistry run amuck. Highton enthusiastically confronts these apprehensions, particularly Wake's (1981) assertion that recognizing allopatric species solely on the basis of allozyme data will generate taxonomic "chaos." He argues convinc-

ingly that allozyme data reveal more about evolutionary relationships among morphologically conservative organisms than conventional taxonomic characters but his tone, and implication that reluctance to name taxa on the basis of biochemical characters owes to intellectual inertia, seems unnecessarily confrontational. In fact, the effort that Highton expends in justifying his approach seems a bit misplaced.

For one thing, this taxonomic subdivision of a widely-distributed salamander species shouldn't surprise students of plethodontid systematics. We've known for some time now that the morphological conservatism of the genus *Plethodon* often masks deep evolutionary divergence, that human sensory systems don't perceive the signals that salamanders themselves use to tell their species apart, and few of us believe that taxonomic arrangements should sacrifice accuracy for simplicity. More importantly, Wake's vision of taxonomic chaos (1981:262) pertained to uncritically applying "taxonomic consistency rules" based on biochemical data, i.e. defining species *solely* as groups of populations that cluster at some accepted, perhaps arbitrary level of genetic similarity.

Highton's objective in selecting a particular Nei D to discriminate between semispecies was to create taxa that represent parapatric, geographically cohesive, and (in at least several cases) reproductively isolated units. His analyses indicate that among- and within-group associations between D and geographic distance appear weak (but are never quantified). Thus the groups are portrayed as genetically homogeneous, apparently "natural" units. They certainly appear highly differentiated: only 7 of 120 between-group comparisons (and only 3 of 26 mean D's between parapatric forms) yield Nei distances below 0.20. The boundaries between the groups generally appear to be quite sharp, at least as Highton portrays them, with little evidence of hybridization (but genetic studies of contact zones are currently underway and only a few data on this critical point are presented here). There *are* body size and color pattern differences between some of the forms, and now that we know what the subdivisions are, careful morphological studies are likely to reveal more. The species complex that emerges from these studies is highly, fascinatingly structured, and certainly not chaotic. By revealing this structure Highton, Maha, and Maxson have made a major contribution to North American herpetology.

Given the staggering amount of work that this study represents (the collection and processing of nearly 4000 animals from 135 localities across the entire eastern U.S., 8 years spent running and rerunning countless gels), there are several points that warrant more rigorous treatment. Brief mention is made (p. 43) of the failure of the 16 forms (called "species" in this paragraph) of the *glutinosus* complex to form a monophyletic clade, but no cladograms or other details relating to this tantalizing finding are presented. The association between genetic distance and geographic distance, so critical to evaluating the vision of broadly distributed parapatric units, is never accorded a thorough quantitative treatment, via such tools as Mantel tests, hierarchical F statistics or spatial autocorrelation analysis.

Evidence for hybridization between *glutinosus* and parapatric semispecies is mentioned on p. 35, but no data are presented. Instances of gene exchange among semispecies are again mentioned on p. 53, without mention of which taxa are involved. The term "hybridization", in fact, isn't in the index. One is left wondering whether Highton's views derive as much from his "feel" for these animals as from quantitative analyses, and hoping that his studies on gene exchange between the semispecies will be published soon. Finally, it is difficult to find which forms occur in a particular geographic area, because the only figure (Fig. 5) displaying the ranges of all the forms shows neither scientific names nor political boundaries; none of the maps have scales or compasses, and dot maps are lacking for several forms.

Highton states that "...in this one complex...we find many of the problems that have troubled taxonomists in defining the limits of species." His taxonomic treatment attempts to deal with the familiar problem of parapatric populations that have evolved varying levels of differentiation and reproductive isolation. He admits that other authors might choose to recognize his semispecies as subspecies, if at all, but meanwhile we're faced with seven new (*chattahoochee*, *ocmulgee*, *kiamichi*, *mississippi*, *kisatchie*, *sequoyah*, *savannah*), and five resurrected (*chlorobryon*, *variolatus*, *grobmani*, *cylindraceus*, *albagula*) names, all with attendant synonymies, type descriptions, holotypes, allotypes, paratypes, etc. The epithet *glutinosus* now refers to a species group, a species complex, a species, and a semispecies.

All this new nomenclature emerges, not from the uncritical use of biochemical data, but from a deeply traditional approach to systematics. Thus the search for a Nei distance that provides the sorts of geographically cohesive, allopatric groups that incipient species are supposed to be. A traditional, "biological" species concept necessitates discussion of reproductive isolation, even though few data are available and some systematists regard them as irrelevant to defining species in the first place (Otte and Endler 1989). Evolutionary divergence is summarized largely by naming, describing and mapping taxa. One can deeply admire this work while wondering what all the nomenclature really adds to our understanding of these animals. Those "old fashioned systematists" willing to accept the utility of biochemical data will find much here that they like.

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01063

PUBLICATION RECEIVED

RAINFORESTS: A Guide to Research and Tourist Facilities at Selected Tropical Forest Sites in Central and South America, by James L. Castner. 1990. Feline Press, PO Box 7219, Gainesville, FL 32605, USA. ISBN 0-9625150-2-7, LC 89-81847. 416 pp, incl. 35 b&w photos, 32 line drawings, 9 maps. $21.95 + shipping.

This book deals with sites in seven New World tropical countries. Data are provided on location, logistics, seasonality, forest types, trail systems, and costs. Information is provided on books, maps, tourist information sources, conservation organizations, scientific organizations/institutions, lodge owners/field-station-directors. A bibliography of 200+ titles dealing with tropical jungles & the plant and animal life within them is included.

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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to rtteview herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology, and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations and photographs. Manuscripts submitted must be typed, double spaced, on 8.5X11 inch paper, and should be sent in duplicate. We encouregе submissions on Macintosh disks, though we can also work with TEXT (ASCII) files submitted on IBM and compatible floppies. **Herpetological Review** is composed on a Macintosh SE using Microsoft Word, which accepts files from several other word processor applications. Format your documents full-page width; we will fit to **HR** format. Unpublished photographs of an unusual nature or of uncommon amphibians or reptiles may also be submitted. These should be 8X10 inches black and white, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled lightly on the back of each print. Return of unsolicited photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs solicited by the Editor will be returned at our cost.

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HERPETOLOGICAL REVIEW

Volume 21 September 1990 Number 3

SSAR BUSINESS

SSAR GRANTS-IN-HERPETOLOGY

Proposals now are being accepted for the 1991 SSAR Grants-in-Herpetology Program. This program is designed to provide financial support for deserving individuals or organizations involved in herpetological research, education, or conservation. In keeping with the Society's goal of encouraging participation of the broadest possible community, preference may be given to individuals who might not have access to other funding sources. All applicants must be members of the SSAR, with the exception of those applying in the REGIONAL HERPETOLOGICAL SOCIETY category. Applicants are limited to submission of one proposal in one category per year. If proposals in any of the categories are not forthcoming, or judged not to be of sufficient quality, the funds in those categories may be transferred to other categories. Grant proposals will be considered in the following categories:

1. REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS. Proposals may address educational projects, speaker's fees, regional research, defrayment of one-time-only costs, or other purposes that would strengthen regional societies. Proposals may be submitted by regional herpetological societies or by individual members and must be accompanied by a letter of support from the current president of the regional society.

2. HERPETOLOGICAL RESEARCH OR EDUCATION IN ZOOS. Proposals may address any herpetological endeavor conducted in zoos, such as improvement of displays, husbandry, or behavioral research.

3. CONSERVATION OF AMPHIBIANS AND/OR REPTILES. Proposals should address research on species endangered or threatened at the state, national, or international level, or address research on potentially threatened habitats or species. Proposals must be from individuals only and must be accompanied by a letter of support from another member of the SSAR.

4. FIELD WORK. Proposals may address support for travel to ecological study sites or for survey collections. Proposals normally submitted in the CONSERVATION or GRADUATE STUDENT RESEARCH categories, but for travel (or field station) support, should be submitted here. Proposals for survey collecting are appropriate for this category. Proposals must be from individuals only and accompanied by a letter of support from another member of the SSAR.

5. GRADUATE STUDENT RESEARCH IN HERPETOLOGY. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only. Applications must be accompanied by a letter of support from the student's major advisor or committee chairperson.

Each proposal must include the following: (A) BACKGROUND AND OBJECTIVES of the proposed project. (B) METHODS of carrying out the project. (C) BUDGET, which should not exceed $400. (D) BRIEF RESUME of the applicant or project coordinator. (E) LETTER OF SUPPORT. The proposal must be typed, double spaced, and must not exceed five pages, excluding resume and budget.

Applicants must designate to which of the five categories their proposal is submitted (although the committee reserves the right to reassign categories). All proposals must be submitted in duplicate and postmarked no later than 31 January 1991. Failure to meet the guidelines may result in elimination of a proposal from consideration. The awards will be announced by 1 April 1991. Successful applicants will be expected to submit to the SSAR a written report of the result of this support within a reasonable amount of time after the project year is completed. They also are encouraged to submit the results of research projects for publication in the *Journal of Herpetology* or *Herpetological Review* or to present their findings at the annual meeting of the SSAR. Submit proposals or questions regard application procedures to:

Darrel Frost, Chair (212-769-5852)
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Committee
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Central Park West at 79th Street
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Financial contributions by SSAR members, institutions, and other benefactors support this program significantly and can increase the number of awards in this program. Your tax-deductible contribution to this program will benefit directly meritorious research and education in herpetology. Contact the President of the SSAR for additional information on contributing to the Grants-in-Herpetology Program. If you are employed by an organization that will match donations made to nonprofit organizations, please notify your employer that you have made a donation to the Grants-in-Herpetology Program. ●

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Committee: D. Belcher, T. Fritts, D. Frost (Chair), J. Johnson, M. Plummer, H. Quinn, E. Rundquist.

In 1990, the Grants-in-Herpetology Committee made six awards in four categories:

Graduate Student Research: (1) Cindy Taylor, Department of Biological Sciences, Mississippi State University. Proposal title: "The effect of oral-disc morphology of anuran tadpoles on grazing selectivity of algae." Award: $300.00; (2) Calvin Porter, Department of Biology, Texas Technological University. Proposal title: "Containment of transposable elements in unisexual lizards." Award: $300.00.

Fieldwork: (1) Philip Robakiewicz, Department of Ecology and Evolutionary Biology, University of Connecticut. Proposal title: "Physiological and behavioral correlates of aggression in the dart-poison frog, *Dendrobates pumilio* Schmidt." Award: $300.00; (2) Stephen M. Secor, Department of Biology, UCLA. Proposal title: "Foraging mode as a determinant of energy expenditure in desert snakes." Award: $300.00

Regional Society: Virginia Herpetological Society (Joseph C. Mitchell and Kurt Buhlmann). Proposal for support of a promotional poster for the Virginia Herpetological Society. Award: $300.00.

Conservation: Stephen Nyman, Department of Zoology, University of Rhode Island. Proposal title: "A comparative study of surface activity, movements, and microhabitats of the Larch Mountain Salamander, *Plethodon vehiculum*." Award: $300.00. ●

HR PERSONNEL CHANGES

There have been two changes in *Herp Review* staff during 1990. Alvin Braswell of the North Carolina State Museum of Natural Sciences resigned as Section Editor for Geographic Distribution, after ably serving in that position for almost three years. We thank Alvin for the outstanding job he has done as Section Editor, a job which requires abundant correspondence with authors, skillful editing, and, oftentimes, many hours in the library checking records. Geographic Distribution records now should be sent to either of the new Section Editors, Joseph T. Collins or Darrel Frost (see inside front cover).

In 1990, Raymond J. Stein, *HR* Advertising Manager for the past seven years, resigned from this position. During his tenure, Ray did an exceptional job of working with our advertisers, serving as liaison between advertisers and the editor, and maintaining the books for this very important aspect of our publication. All matters concerning advertisements in *HR* now should be sent to the new Ad Manager, Elizabeth Johnson, at the New Jersey Field Office of the Nature Conservancy (see inside front cover).

The Society (and the Editor!) extend their gratitude to Alvin and to Ray for their years of service and wish them well in their future endeavors. We also thank Joe Collins and Liz Johnson for assuming their respective duties. ●

DESK TOP UPDATE

This issue of *Herpetological Review* is the first to have been "typeset" and composed entirely by desk top publishing. The groundwork for this advance was laid by George Pisani, who experimented with the technology over the past few issues. Tom Tyning served as Desk Top Managing Editor for this issue, and Christine L. Dwyer, Robert W. Hansen, and Carole L. Hom converted typed copy to disk. Through the volunteer efforts of these SSAR members, a significant amount of money is being saved. This will enable us to publish a larger number of pages on a regular basis, thus reducing turnaround time for manuscripts.

NEEDS. **1**. The more volunteers keystroking manuscripts onto disks, the less tedious it is for each volunteer. If any readers have a Macintosh, can use Microsoft Word 4.0 (or similar software), are willing to keystroke a few pages per month onto disk, and are willing to give this a high priority (i.e., begin keystroking shortly after receiving a manuscript from the editor), please contact the editor [phone (216) 368-3558 (work) or (216) 354-1430 (home)]. **2**. Authors should make every effort to submit their manuscripts on Macintosh disks, preferably in Microsoft Word. Other formats may be acceptable; for specific information, call Desk Top Managing Editor Tom Tyning at (413) 443-9201 (work) or (413) 442-2165 (home). ●

CALL FOR STUDENT PROPOSALS

The **Gopher Tortoise Council** is seeking proposals from undergraduates and graduate students who are planning or actively conducting research on the gopher tortoise (*Gopherus polyphemus*), its habitat, or its burrow commensals. A maximum of $500.00 is available.

Proposals should be no more than four typed, double spaced pages and should include a description and justification for the research, a budget indicating how the money will be spent, and a brief biographical sketch.

Proposals should be submitted to Dr. Bob Herrington, Student Awards Coordinator, Department of Biology, Georgia Southwestern College, Americus, GA, 31709, USA. (912) 928-1617. ●

1991 SSAR MEETING

The 1991 meeting of the SSAR will take place 7-11 August at Pennsylvania State University, University Park, PA. Contact: Dr. Linda R. Maxson. Further information will appear in the December issue of *Herp Review*. ●

NEWSNOTES

COLLECTIONS TRANSFERRED TO FLORIDA MUSEUM OF NATURAL HISTORY

The Herpetology Division of the Florida Museum of Natural History in Gainesville, Florida has acquired part of the library of Archie F. Carr, consisting of nearly 4,400 reprints on herpetological subjects other than sea turtles (his sea turtle library is housed at the Archie Carr Center for Sea Turtle Research, Zoology Department, University of Florida). The division has also acquired the specimen collection and library of Lewis D. Ober, retired professor in the Department of Biology, Miami-Dade Community College North Campus (7,300 specimens; 1,850 reprints, journal numbers, and books). The major emphasis of the Ober Collection is the West Indies. ●

MEETINGS

WILDLIFE 2001: POPULATIONS

Wildlife 2001: Populations is an international conference intended for research workers and agency personnel whose interests are the science, conservation, and management of vertebrate populations (exclusive of fish and primates). Papers will assess the state of the art and set the agenda for applied wildlife population work on the verge of the 21st century. It is a followup of the highly successful Wildlife 2000, which emphasized habitat modelling, and a companion publication will be produced.

The conference will be held 29-31 July 1991, at the Oakland Airport Hilton Hotel

in Oakland, California. This hotel is a low-rise hotel with outside courtyards and gardens, and is away from the downtown area, within a mile of the Oakland Airport. Free parking and free shuttle buses to the airport and rapid transit (BART) give easy access to the greater San Francisco Bay Area.

Morning general sessions, with chairs, will be: Methods, Gary White; Modelling, Carl Walters; and Threatened Species, Kathy Ralls. Afternoon sessions include: Small Mammals, Lloyd Keith; Marine Mammals, Chuck Fowler; Waterfowl, Doug Johnson; Overabundant Populations, Fred Wagner; Herps, Norman Scott; Large Herbivores, Fred Bunnell; Game Birds, John Roseberry; Seabirds, David Nettleship; Passerine Birds, Barry Noon; Large Carnivores, Maurice Hornocker; Raptors, Stan Temple; and Furbearers, Bill Clark.

Initial sponsors include the Bay Area Chapter of The Wildlife Society, and Department of Forestry and Resource Management, University of California.

For further information contact the conference organizers, Dale McCullough (415) 642-8462 or Reg Barrett (415) 642-7261, Dept. of Forestry and Resource Management, 145 Mulford Hall, University of California, Berkeley, CA 94720, USA (Fax 415/643-5438). ●

CALL FOR PAPERS
1991 IHS

The 1991 International Herpetological Symposium on Captive Propagation and Husbandry (IHS) will be hosted by the Pacific Northwest Herpetological Society and will be held in Seattle, Washington. The meeting will be held 20-23 June, at a location to be announced.

Program Chair for this meeting is Dr. Richard Ross. Any herpetologist wishing to present a paper or lead a workshop at this meeting should contact Dr. Ross at: The Institute for Herpetological Research, PO Box 2227, Stanford, CA 94305, USA. Tel: (415) 941-4595 (day, Pacific Time). The deadline for submission of abstracts/titles is 1 January 1991. ●

CONFERENCE ANNOUNCEMENT

The 6th Annual Meeting of the Society for the Preservation of Natural History Collections will be hosted by the Canadian Museum of Nature in Ottawa, 6-11 May 1991. The program will include: council and committee meetings, technical sessions and tours (6 May), a three-day annual conference (7-9 May), and a two-day training workshop on "Practical Approaches to Preventive Conservation for Canadian Natural History Collections" given by the Canadian Conservation Institute (10-11 May).

For information, contact: G. R. Fitzgerald, Canadian Museum of Nature, Earth Sciences (Paleobiology), P. O. Box 3443, Station D, Ottawa, Ontario, KIP 6P4, CANADA. ●

REGIONAL SOCIETIES

ADDRESS CHANGES

The following new societies/address changes have been submitted since the list of herpetological societies was printed in the June 1989 issue of *Herpetological Review*:

Herpetological Association of
Zimbabwe
c/o Alice Lane
Avondale, Harare
Zimbabwe
AFRICA

Herpetological Society of Cyprus
P. O. Box 2133
Paphos, CYPRUS

Pacific Northwest Herpetological
Society
P. O. Box 70231
Bellevue, WA 98007, USA

Southwestern Herpetologists Society
P. O. Box 7469
Van Nuys, CA 91409, USA

Society officers are encouraged to forward to the SSAR Regional Society Liaison (see inside front cover of *HR*) any address changes for their society. Newly formed societies are invited to announce their existence in this column, and established societies are invited to submit short descriptions of their organization for publication in this column. ●

LEGISLATIVE ALERT

This column is produced by the SSAR Conservation Committee to alert members of the herpetological community to recent and proposed regulatory changes involving reptiles and amphibians. We encourage SSAR members to notify us of any significant changes in state, national, or international conservation laws as they relate to these animals. For further details about any of the following, or to report additional changes, please contact Kurt Buhlmann, SSAR Conservation Committee, c/o Virginia Natural Heritage Program, Department of Conservation, 203 Governor Street, Richmond, VA 23219, USA.

The following final and/or proposed listings and regulations have been announced by governmental regulatory agencies. Pertinent Federal Regisater 90 citations are given for U.S. notices.

U.S. ***Gopherus agassizii*** (desert tortoise), Mojave population only; final rule, Listed as Threatened [FR 55(63):12178-12191, 4/2/90]

The Mojave population covered by this rule includes all tortoises north and west of the Colorado River in CA, southern NV, southwestern UT, and northwestern AZ. Present status is chiefly the result of habitat destruction and degradation as a result of development, agricultural conversion, grazing and off-road vehicle use. The continued existence of this population also is threatened by illegal collection, an upper respiratory disease, excessive predation of juvenile tortoises by common ravens, and other factors.

U.S. ***Phrynops hogei*** (Brazilian = Hoge's sideneck turtle); proposed as Endangered [FR 55(80):17469-17473, 4/25/90]

This rare chelid is native to the Rio Paraiba and Rio Itapemirim drainages in southeastern Brazil. Extensive deforestation in the past 20 years has left the banks and marshes of both drainages unsuitable for freshwater turtle habitation and reproduction. Recent field collections have failed to find any juveniles.

U.S. ***Trachemys scripta callirostris*** (Colombian slider = South American red-lined turtle); proposed as Endangered [FR 55(80:17469-17473, 4/25/90]

This subspecies was once common in Caribbean drainages in northern Colombia and northwestern Venezuela, but

habitat destruction from burning, development, and conversion for petroleum facilities may have extirpated many populations. Adults, eggs and hatchlings are exploited for human consumption and the pet trade.

U.S. ***Trachemys stejnegeri malonei*** (Inagua Island turtle); proposed as Endangered [FR 55(80):17469-17473, 4/25/90]

This subspecies of central Antillian terrapin inhabits only Great Inagua Island. Threats to its freshwater habitat include consumption of fresh water by an expanding human population and the possible expansion of solar salt processing operations.

U.S. ***Trachemys terrapen felis*** (Cat Island turtle); proposed as Endangered FR 55(80):17469-17473, 4/25/90]

This emydid occurs only in freshwater ponds on Cat Island in the Bahamas. All but one known site have been degraded by agricultural burning or excessive human use, and the total population appears to have dwindled.

The SSAR Conservation Committee has notified the USFWS that Seidel (1988) formally sank this taxon, which he believed to represent an introduction of *T. terrapen* from Jamaica.

U.S. ***Cnemidophorus vanzoi*** (Maria Island ground lizard); proposed as Endangered [FR 55(80):17469-17473, 4/25/909]

Now restricted to the islets of Maria Major and Maria Minor, off St. Lucia, this teiid was probably extirpated by introduced rats and mongooses from the mainland of St. Lucia before specimens could be documented. Fewer than 1000 individuals are believed to remain on 30 acres of habitat.

U.S. ***Boiga irregularis*** (brown tree snake); importation or shipment prohibited without permit (4/25/90)

The USFWS has added this non-indigenous colubrid to its list of injurious live reptiles. Importation, acquisition or transportation of any live specimens or eggs between the continental U.S., the District of Columbia, Hawaii, Puerto Rico, the Northern Mariana Islands or any territory or possession of the U.S. is prohibited. Introduced brown tree snakes on Guam have resulted in a precipitous decline in the endemic avifauna of the island and also pose other detrimental effects to agriculture and human health and safety.

U.S. ***Liophus ornatus*** (Maria Island Snake); proposed as Endangered [FR 55(80):17469-17473, 4/25/90]

Extirpated from St. Lucia for most of the twentieth century, presumably by introduced rats and mongooses, this small snake is now restricted to the adjacent islet of Maria Major, where as few as 100 individuals may survive.

Florida Commercial Sale of native reptiles and amphibians or products thereof; permit required.

In an attempt to monitor the commercial trade in the state's native herpetofauna (both as pets and as consumptive products), the Florida Game and Fresh Water Fish Commission will require all dealers to obtain a no-cost permit and to prepare periodic reports documenting sales of native amphibians and reptiles and their parts.

Dale R. Jackson, Chair
SSAR Conservation Committee ●

FEATURES

THE STATUS AND DISTRIBUTION OF THE HELLBENDER, *Cryptobranchus alleganiensis* IN OHIO.

Barton (1812) provided the first account of the hellbender in Ohio when he reported it from the Muskingum, Miami, and Scioto Rivers. Kirtland (1838) correctly said that it "is found in all the tributaries of the Ohio but not in those of Lake Erie." By 1985 hellbenders had been reported from 48 localities in Ohio representing all the major systems draining into the Ohio River. These localities are represented by less than 70 specimens. Most of the records were obtained by fishermen or were collected incidentally to some other effort such as seining or bait collecting. Other than locality records, there is little information available on hellbenders in Ohio. In an effort to determine the status and distribution of hellbenders in Ohio, the Ohio Department of Natural Resources funded the present study so that an effective management plan could be prepared for this species.

METHODS AND MATERIALS

Microhabitat requirements of hellbenders were first determined by visiting localities where specimens had been most recently collected. All of the known localities within the state were subsequently explored, and a systematic study of all topographical maps was undertaken to identify suitable habitats. Every stream with a watershed of 260 square km (100 sq. mi) or greater was checked, except for the largest rivers where the silt load and depth made work impossible.

The most productive habitat included riffle areas 60 cm or less in depth with large, flat slabs of rock on a substrate of sand or gravel. No animals were found under any rocks that were less than ca. 50 cm in diameter nor were any animals found under objects other than rocks. We never found more than one hellbender under a single slab although on one occasion a hellbender and a mudpuppy were found in separate compartments under a 1 m diameter slab.

In unfamiliar watersheds we began in the headwater regions and worked our way down stream until sufficient flow and suitable habitat was found. One technique that was found to be particularly useful was studying topographical maps in search of places where a stream took a sharp turn against a hill. The logic that a stream cutting into a hill caused slabs to tumble into the stream bed proved useful as often this was the only place where rocks could be found in a particular stream.

An attempt was made to locate hellbenders utilizing electroshocking apparatus according to a method described by Williams, Gates and Hocutt (1985). However, we were unable to successfully reproduce their efforts and this technique was abandoned during the final year of the project.

Temperature, pH, and general stream conditions were noted at each locale. Slab rocks were systematically turned, beginning at the downstream end of an area. Slabs were turned into the current whenever possible so that silt would be carried away. Ordinary cotton work gloves allowed a better grip on larger rocks and hellbenders as well.

Total length (Fig. 1) and standard length were recorded for each animal using an

ordinary transparent plastic thistle seed bird feeder. This provided restraint without stressing the animal. During the breeding season (August to mid-October) the area surrounding the vent of the male becomes greatly enlarged. This was the only time when animals could be accurately sexed. The general condition of the animal was noted including distinctive scars and missing limbs and parts of limbs. Each animal was tagged with a numbered Floy T-tag through the dorsal fin of the tail. It was then released back into the stream usually next to the rock where it was captured.

RESULTS

One hundred twenty-one animals were tagged over the course of this study (Fig. 1). Eighty were captured or recaptured during the breeding season and could be reliably sexed. Sixty-two of the animals were males and 18 were females. This unbalanced ratio in favor of males is similar to other findings in the east. In Pennsylvania, for example, Smith (1912) reported a male : female ratio of 2:1 to 3:1, and Hillis and Bellis (1971) reported a 1.58:1 ratio. Males averaged 51.2 cm in total length while females averaged 51.7 cm.

Animals were found in streams where the water temperatures ranged between 0° C and 33° C. The pH was between 6.0 and 9.2 while water clarity ranged from opaque to clear to a depth of 1 m.

Most of the new populations (Fig 2) were discovered during 1988 subsequent to the preparation of *Salamanders of Ohio* (Pfingsten and Downs 1989). The 1988 discoveries were directly attributable to the effects of the drought that year. Not only were streams shallower and narrower as a result of the drought, but the silt reduction and clarity made it possible to work in streams where even brief summer showers ordinarily kept them too turbid to work. In addition, water temperatures were unusually high in 1988. A young male was found in water at 33° C. This is close to the upper limits of temperatures reported in nature for this species (Nickerson and Mays 1973) and close to the critical thermal maximum for the species (Hutchison et al. 1973).

In an attempt to estimate population density in the West Fork of Little Beaver Creek we tagged 54 animals in a 120 m long riffle during 16 visits to the area. Eight animals were recaptured and one of these was recaptured a second time. The interval between capture and recapture ranged from 40 days to 358 days. All recaptures were made in the immediate vicinity of the original capture. Because of the small number of recaptures, no estimate of population size was made.

On two visits in August 1987, this riffle was worked with a crew of 6 - 9 people. Almost every rock in that stretch of stream was turned and it was felt that nearly every animal in the riffle was captured. On the first visit we captured 11 animals and on the second we found 10. At least on these occasions the density was ca. one animal for every 350 sq. m of riffle.

There are no records or literature accounts of hellbenders being captured during the coldest part of winter in the northern part of their range. It was decided that if good weather occurred an attempt would be made to find some hellbenders. On 23 December 1986 it was sunny and calm and the air temperature was 7° C. Previous to this there had been several days of subfreezing temperatures. The West Fork of the Little Beaver Creek was low, clear and 0° C. Ice had formed along the shoreline and quiet areas of the stream and small chunks of ice and slush covered most of the flowing surface of the stream. A large male (TL=58 cm) was found curled under a rock slab in the center of the riffle. When removed from the water, he was so stiff that it took several minutes to straighten him out so that he would fit into the measuring tube.

The largest hellbender found was a male with a total length of 63 cm. When captured, on 27 September 1986, the animal was placed in a bucket. Within a few minutes it regurgitated a complete frog skeleton. The skeleton was in perfect condition an no flesh remained on the bones. Total length of the skeleton was 255 mm, and was most likely that of a bullfrog, *Rana catesbeiana*. Bullfrogs and the green frog, *Rana clamitans*, are common in the area. There are no literature accounts of frogs being eaten by hellbenders in the wild although they are known to take frogs in captivity (Smith 1907).

The only complete hellbender nest reported for Ohio was discovered on 21 September 1986 (photo in *Salamanders of Ohio*, Pfingsten and Downs 1989). The nest contained ca. 250 eggs, was found under a slab measuring 132 cm x 74 cm x 21 cm, and appeared to have an opening on the downstream side of the rock.. The rock was partly out of the water and within one meter of the shore. At that point the main flow of the stream was along the shoreline. The depth of the egg cavity under the slab was 38 cm and it was ca. 35 cm in diameter. A large male (TL=54 cm) was lying on the bottom of the cavity beneath the egg mass. When the male was captured and placed in the bucket, four eggs were expelled from the gill slits indicating that he had been cannibalizing the egg mass. Slightly more than half of the eggs were fertilized and had developing embryos. They appeared to be similar to the 18 day embryos shown by Smith (1907).

Twenty-five percent of all the animals we saw had some sort of injury. Eighty percent of the injuries involved missing toes, feet and limbs. Other injuries included scrapes to the top of the head, gashes to the flanks and tail and at least one had scars on the snout and face which looked like the bite from another hellbender.

Nickerson and Mays (1973) reported than many injuries may be caused by canoes as they strike rocks during periods of low flow. In Ohio, however, the injuries were apparent in all populations including those from streams which are too small for canoeing. Animals with fresh wounds were seen only during August and September and may have been the result of battles during the breeding season.

DISCUSSION

No animals were found west of the Scioto River except for Scioto-Brush Creek. Further, no animals were found in the Ohio River, a result that was not unexpected. The completion of the high dam projects in 1965 raised the level of the river ca. 3 m, eliminated all riffle areas, and changed the environment from that of a river to one resembling a lake.

No larvae were found during the study. The rather unusual population structure of hellbenders is weighted heavily towards old adults. Because of their longevity of 30 or more years (Taber et al. 1975), low population density, and lack of natural predators as adults, there are few replacement young needed in the population. The rarity of larvae has been reported by Swanson (1948), Hillis and Bellis (1971), and Taber et al. (1975). Larvae are either occupying some yet unknown microhabitat or more likely are so few in number that they remain virtually undetected.

There are fewer than 200 hellbenders recorded in Ohio. This is due in part to

their very secretive nature as well as to their low population density. Higher densities may have been common in Ohio before the land clearing and resulting siltation of streams by European settlers.

While the present study provides data on the Ohio distribution of hellbenders, little information exists about nests, eggs, larvae, population densities, and migration patterns within a stream. The Ohio Department of Natural Resources has recently revised its endangered species list. Ohio now joins Illinois, Indiana, and Maryland (Pisani 1976) in affording protection to the hellbender as an endangered species.

ACKNOWLEDGMENTS

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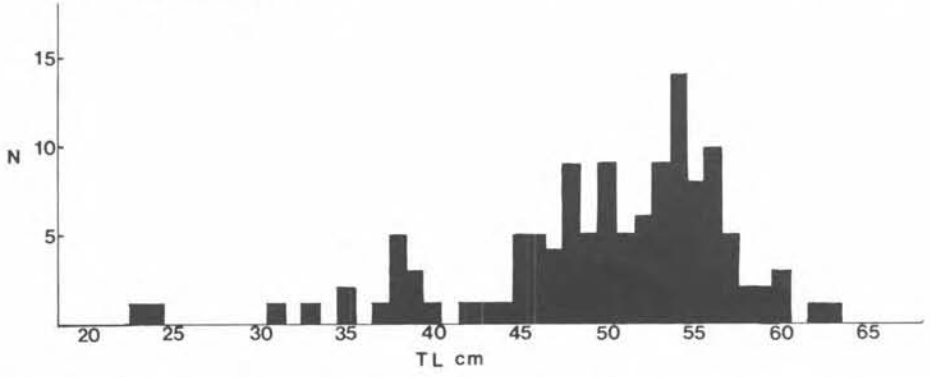


Figure 1. Total length of *Cryptobranchus alleganiensis* tagged in Ohio between 1 September 1985 and 1 November 1988 (N = 121).

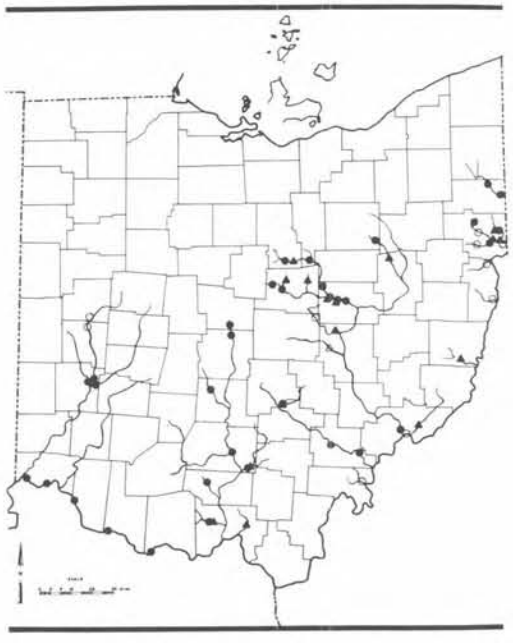


Figure 2. Distribution of *Cryptobranchus alleganiensis* in Ohio. Circles represent populations known prior to 1985. Solid circles indicate a voucher specimen is available whereas open circles indicate the lack of voucher specimens. Solid triangles indicate localities where animals were tagged during this study. Open triangles indicate a verified population but no animal was tagged.

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REPRODUCTIVE DATA ON THE CHELID TURTLE *Chelodina siebenrocki* FROM NEW GUINEA

Chelodina siebenrocki Werner 1901 is a poorly-known snakeneck chelid turtle that occurs only in the southern coastal swamps of the island of New Guinea. It is most closely related to the northern Australian species *Chelodina rugosa* (Rhodin and Mittermeier 1976). The only information available on the morphology, natural history, and reproduction of *C. siebenrocki* is presented in Rhodin and Mittermeier (1976). They document the only recorded data on clutch and egg size for the species. Data were reported from two egg clutches, comprising 4 and 17 eggs, with egg size averaging 36.1 x 28.9 mm in the smaller clutch, and 35.0 x 28.3 mm in the larger clutch. Since then, we have observed four more egg clutches laid in captivity by two female *C. siebenrocki*. These observations were made in our respective collections of turtles kept in indoor facilities in northeastern United States (see Table 1 for summary).

One female (carapace length 255 mm, body mass 2.5 kg) from the vicinity of Daru, Western Province, Papua New Guinea laid a single clutch of 11 eggs (see Table 1 - Clutch 1). These eggs had an average mass of 20.5 ± 0.47 gm (mean ± S.D.). The 11 eggs were deposited over 19 days and were laid at the following intervals (day number:eggs laid): 1:2, 2:2, 5:1, 8:1, 10:1, 11:1, 15:2, 19:1. Egg-laying occurred in late June through early July 1977, after obtaining the specimen from the wild in April 1977. No hatchlings resulted.

A second female (carapace length 261 mm) from the vicinity of Merauke, Irian Jaya, Indonesian New Guinea laid three clutches of 16, 19, and 14 eggs respectively (see Table 1 - Clutches 2, 3, and 4). The clutch of 16 was laid in April 1988, 2 eggs hatched 6 months later in October after incubation at 29°C in damp vermiculite. The clutch of 19 was laid in April 1989, of which 2 eggs hatched 5 months later (measurements of one hatchling at age ca. 1 month with egg caruncle still present: carapace length 37.5 mm, width 27.0, depth 13.7, head width 11.3). The clutch of 14 was laid in September 1989, suggesting the potential of a two-clutch laying season, and 10 hatchlings resulted only 3 months later.

Egg sizes of the various species of *Chelodina* have not previously been compared, except for the work by Legler (1985) where he compares *C. "expansa"* (a generic grouping including *C. expansa, C. rugosa,* and *C. oblonga)* with *C. "longicollis"* (a generic grouping including *C. longicollis, C. novaeguineae,* and *C. steindachneri).* We have compared our data on egg length and width for *C. siebenrocki* with data from the literature for other species of *Chelodina* (Table 2 and Figure 1). Of note is that *C. siebenrocki* eggs fall at the upper end of the size spectrum, most similar in size to the other large species *C. expansa* and *C. rugosa.* Also of interest is the separate clustering of smaller eggs in the smaller species *C. longicollis* and *C. steindachneri.* The eggs of *C. parkeri* and *C. oblonga* are somewhat intermediate-sized between Legler's two "generic" groupings, with *C. parkeri* also being differentiated by having slightly more spherical eggs than all the other *Chelodina* species.

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Table 1. Clutches of eggs laid by *Chelodina siebenrocki* in captivity. Sizes in mm - Mean ± Standard Deviation (Range).

Clutch	$Eggs_n$	Length	Width
1	11	37.7 ± 0.67 (36.3 - 38.3)	31.0 ± 0.29 (30.7 - 31.7)
2	16	——	——
3	19	35.6 ± 1.05 (33.8 - 37.4)	28.3 ± 0.52 (27.4 - 29.3)
4	14	32.9 ± 0.76 (31.6 - 34.3)	27.9 ± 0.47 (27.2 - 29.0)

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Table 2. Average length and width of eggs for various species of *Chelodina*. CL_{Max} = Maximum carapace length (mm). Values: Mean ± Standard Deviation (Range) (mm).

Species	CL_{Max}	$Eggs_n$	Length	Width	Reference
C. siebenrocki	290	64	35.2 ± 1.70 (31.6 - 38.3)	28.7 ± 1.10 (27.2 - 31.7)	Present Study, Rhodin and Mittermeier 1976
C. parkeri	267	13	28.7 ± 3.20 (25.5 - 32.0)	26.2 ± 0.80 (24.0 - 27.0)	Ewert 1985, Fritz and Jauch 1989
C. oblonga	247	80	33.0 ± 1.30 (30.8 - 35.7)	22.2 ± 1.57 (18.1 - 24.0)	Clay 1981, Kuchling 1988
C. rugosa	304	14	35.0	25.0	Cann 1978
C. expansa	375	46	38.3 ± 0.30 (33.5 - 41.9)	26.8 ± 0.40 (22.2 - 30.1)	Georges 1986
C. "expansa"	375	304	39.2 ± 3.40 (30.7 - 46.9)	27.6 ± 2.41 (19.5 - 31.0)	Legler 1985
C. steindachneri	193	30	29.0 ± 0.94 (27.5 - 31.0)	18.4 ± 0.80 (17.0 - 19.5)	Kuchling 1988
C. longicollis	240	154	30.3 ± 0.83 (21.0 - 33.8)	19.6 ± 0.27 (12.5 - 21.3)	Vestjens 1969, Legler and Cann 1980
C. "longicollis"	279	282	30.9 ± 2.88 (20.2 - 42.5)	20.0 ± 1.86 (15.8 - 29.1)	Legler 1985

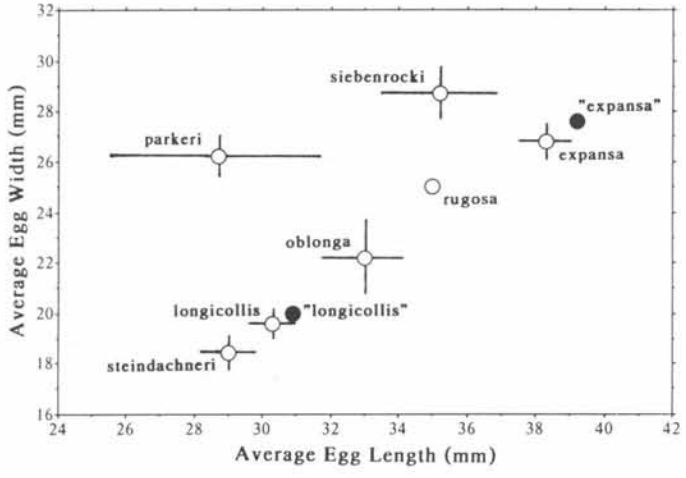


Figure 1. Scattergram based on data in Table 2, showing average egg length and width (bars represent 1 standard deviation) for seven species of *Chelodina*. Black dots represent "generic" groupings of Legler (1985).

The Diet of *Amphisbaena darwinii heterozonata* in Argentina

Amphisbaena darwinii heterozonata has a wide distribution in Argentina (Gans 1966; Cei 1986). However, locating individuals is difficult because they are secretive. As a result, our knowledge of its biology is limited. Information about the diet of *A. d. heterozonata* found near Buenos Aires was published by Gallarde (1967, 1977). The present report describes stomach contents for a population from near the northwestern distributional limit of the subspecies.

Amphisbaenids were captured during two days (26 specimens between 1100 and 1500 h on 5 May 1983, and 27 between 0900 and 1100 h on 6 May 1983) by walking behind a caterpillar tractor that cleared a section of dry woodland at Finca San Javier, Anta Department, Salta province, Argentina (25° 05' S; 54° 10' W). The sampled area totaled one hectare. While dragging grass and shrubs the machine also removed a ground layer of about 15 cm thickness. This activity disturbed the habitat of snakes, lizards, and amphisbaenids that rapidly fled or were captured. All specimens were formalin-fixed in the field. Snout-vent lengths ranged between 110 and 212 mm ($\bar{X}$= 174.2 mm; SD = 28.52). Their size homogeneity prevented division into age-class intervals. Sexes were not discriminated.

Dietary analysis through dissection was based upon the 39 specimens whose digestive tracts were not mutilated by the tractor. Food items were classified to family level whenever possible. The number and frequency of each food category was estimated. Volumetric data were excluded because the fragmentation of ingested organisms prevented direct measurement.

Stomachs ranged from nearly empty in two specimens to a maximum of 47 termites in another. The quantity of matter present in the intestines was also quite variable, and usually mud-like. Isoptera and Coleoptera in the hind gut were recognizable by the presence of their undigested mandibles; however, a more complete analysis of the intestinal contents was not possible, as only chitinous, digestion-resistant parts remained. Stomachs and intestines of 30 specimens contained grains of sand.

The main component of the diet was termites (Isoptera), by number as well as frequency (Table 1). The worker and soldier castes jointly accounted for 92.7% of discrete elements consumed; one specimen had also eaten a physogastric queen from the colony. Thus, the presence in the diet of alternative components was very low, even including the vegetable matter.

Gallardo (1967, 1977) identified Hymenoptera (ants), Orthoptera, and Coleoptera adults, and larvae of Lepidoptera in the diet of Amphisbaena darwinii heterozonata. Accordingly, Cei (1986) assigned it to a mainly insectivorous regime. Studies of prey selectivity and foraging mode for this species are unknown. Its strong dentition, typical of all amphisbaenids, suggests that it could also prey upon small vertebrates. A larger sympatric species, *A. camura*, ate lizards and rats in the laboratory, tearing them (Gans 1966).

The diet of this sample of *A. d. heterozonata* showed low diversity. Insects were the only arthropods eaten, with a clear preponderance of termites. The plant materials ingested were assumed to be accidentally consumed, because they were fragments of withered leaves and twigs, without much nutritional value.

The consumption of diverse food items (the "generalist" condition) characterizes a wide range of lizards (e. g., Pianka 1986; Armas et al. 1987; Duellman 1987; Vega et al. 1988). Published accounts on *Amphisbaena* are thus far too scarce for accurate comparisons. Available data on the diet of *A. d. heterozonata* in two different and distant geographic regions (Gallardo 1977; this paper), however, suggest the strategy of a generalist-opportunist. The high preponderance of termites found in our sample seems related to the social habits of these insects, allowing for the consumption of many individuals when the colony is discovered, rather than a specialization by this species of amphisbaenid. The nature of the food items, as well as the sand and the type of plant parts ingested, suggest that food was obtained in underground galleries or in the sub-stratum, under leaf litter or logs.

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Table 1. Stomach contents of *Amphisbaena darwinii heterozonata*. Total number of each food type eaten is given, as well as the mean per individual specimen. Absolute frequency indicates number of amphisbaenids that contained at least one individual of the respective category.

Categories	Number	$\bar{X}$ (N=39)	SD	Absolute Frequency
Insecta				
Isoptera (adults)	404	10.36	12.57	33
Coleoptera				
Scarabaeidae (larvae)	4	0.10	0.38	3
Elateridae (larvae)	1	0.03	0.16	1
Polyphaga (larvae)	2	0.05	0.22	2
Dermaptera (adults)	1	0.03	0.16	1
Diptera				
Brachycera (adults)	1	0.03	0.16	1
Lepidoptera (larvae)	1	0.03	0.16	1
Insecta unidentified (adults)	1	0.03	0.16	1
Pupae unidentified	1	0.03	0.16	1
Eggs unidentified	14	0.36	1.20	4
Plant Matter				
Root fragments	2	0.05	0.22	2
Little leaves	3	0.08	0.27	3
Pieces of twig	1	0.03	0.16	1
Total	436			

CANNIBALISM IN TWO SPECIES OF ARBOREAL PITVIPER, *Trimeresurus wagleri* AND *Bothriechis schlegelii*

Arboreal pitvipers of the genera *Trimeresurus* and *Bothriechis* occur in tropical southeastern Asia and tropical America, respectively. Although these genera are geographically isolated, they appear to have evolved similar feeding strategies. These snakes are ambush predators that often strike in response to tactile input from potential prey. Cannibalism has not been reported in these species.

Trimeresurus wagleri is a small (ca. 0.5 m), heavy-bodied arboreal pitviper from the Malaysian Peninsula, Sarawak, Indonesia, and the Philippines (De Rooij 1917; Taylor 1922; Tweedie 1953). In captivity, this snake normally drapes itself over branches with the head positioned at midbody. The highly prehensile tail is usually coiled tightly around a branch, and the snake remains motionless. When the snake is touched posterior to the head on the side of the body, it will often strike in the direction of the stimulus. We presume that individuals act similarly in the wild. Known prey items of *T. wagleri* include birds, lizards, and mammals (De Rooij 1917; Loveridge 1946; Tweedie 1953). We have also observed this species eating frogs (*Hyla* sp.) in captivity. It has not been reported to eat snakes.

In March 1988, three juvenile *T. wagleri* were maintained together in a 46 x 31 x 32 cm glass aquarium furnished with branches. Water standing in the bottom of the aquarium provided humidity and the snakes were periodically misted with water. Snakes 1 (unknown sex) and 3 (female) were of ca. the same size while snake 2 (male) was slightly smaller. Snakes 1 and 2 were fed newborn laboratory mice (*Mus musculus*) ca. every three weeks. Snake 3 was introduced on 8 February 1988. On 18 March, snakes 1 and 2 were fed one newborn *M. musculus* each. Snake 3 refused food.

The snakes were in typical resting positions on the evening of 24 March. The following morning, snake 3 was missing and it was apparent from the size of snake 1 that it had consumed snake 3. That afternoon a radiograph of snake 1 indicated that snake 3 had been consumed tail first. Snake 1 regurgitated snake 3 on 26 March at 2145 h. Snake 1 was misted on 27 March inducing a large defecation. On 28 March, snake 1 was seen alive at 1245 h and was found dead at about 2100 h. The snake was measured at that time (SVL = 280 mm, TL = 36 mm).

Bothriechis schlegelii is a relatively slender prehensile-tailed pitviper ranging from northern Chiapas, Mexico, southward into Colombia, western Venezuela, and northwestern Ecuador (Campbell and Lamar 1989). This species is found in a variety of habitats, including tropical moist forest, wet subtropical forest, and montane wet forest (Campbell and Lamar 1989). It is predominantly an ambush predator; however, it may not be as sedentary as *T. wagleri*. Prey of this species includes birds, lizards, frogs, and mammals (Do Amaral 1927; Alvarez del Toro 1982).

On 14 May 1989, an adult male (SVL ca. 400 mm, TL ca. 120 mm) was introduced into a 46 x 31 x 32 cm glass aquarium occupied by an adult female (SVL ca. 475 mm, TL ca. 150 mm). On 17 May at 2300 h both animals were coiled together on a branch above the cage floor. The following afternoon at 1300 h, the female was noticed on the cage floor in a loose coil, and had obviously consumed the male. The remains were digested posteriorly, indicating that the male had been swallowed tail first. The female was still alive and healthy in October 1989.

In these cases of cannibalism, we hypothesize that the conspecific snakes were moving about the cages in the darkness. The prey contacted the predators laterally on the body posterior to the head and a feeding response was initiated, terminating in the consumption of the conspecific that initiated contact. Snakes were consumed tail first, which seems unusual (Greene 1976).

Many other arboreal snakes appear to use the same feeding strategy as *T. wagleri* and *B. schlegelii;* examples are members of the genera *Atheris*, *Corallus*, *Ophryacus*, and *Chondropython* (personal observations). This "tactile" ambush style of prey capture probably evolved independently in these different groups, as Greene (1979) concluded for several types of antipredator behaviors. Behavioral experimenta-

tion on the tactile-ambush feeding strategy is needed to test the degree of convergence among these various forms as well as to design captive habitats that minimize cannibalism.

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MEETINGS OF THE INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE

What will doubtless be recorded as the most momentous meeting in the history of the International Commission on Zoological Nomenclature (ICZN) took place 4-5 July 1990, at the International Congress of Systematic and Evolutionary Biology, held at the University of Maryland, USA. At these sessions the Commission developed a series of fundamental principles to be adopted for the preparation of the forthcoming 4th edition of the International Code of Zoological Nomenclature that will revolutionize both the theory and practice of zoological nomenclature. Significantly, these principles were first enunciated as the result of an all-day session of the Commission held on America's celebration of the anniversary of the signing of its Declaration of Independence, July 4. Like the statements in that document, these historic changes in the code promise to free systematic biology from the tyranny of the past and provide sound and comprehensive guidance for the future.

Members of the ICZN in attendance at these meetings all contributed to a series of exciting and productive exchanges of ideas that led to overwhelming support for the fundamental and revolutionary revisions in the code described below. They included: O. Kraus (FR Germany, President), H.G. Cogger (Australia, Vice-president), W.J. Bock (USA), J.D. Corliss (USA), D. Heppell (UK), P.T. Lehtinen (Finland), A. Minelli (Italy), C. Nielsen (Denmark), W.D.L. Ride (Australia), J.M. Savage (USA), R. Schuster (Australia), and F.C. Thompson (USA). Clearly the Commission undertook the new initiatives for code revision in response to the changing needs of the user community and the burgeoning requirements for stable biodiversity data bases. Their goal was to retain the most essential features of previous codes while designing a foundation for the nomenclature of the future.

Underlying all of the Commission actions were three primary principles. First, that, as emphasized in the Preamble to the present Code (3rd ed.), the overriding purpose of the Code is "to promote stability and universality." The Commission agreed that this goal is best achieved by adopting procedures that validate names in current use rather than through following strict priority. Second, as succinctly stated by both Linnaeus and Strickland (the promulgator of the first Code of Zoological Nomenclature), that the names given to organisms are simply symbols representing taxa that enhance communication about them and allow development of information bases regarding them. Consequently the Commission decided that matters relating to details of orthography, transliteration, strict adherence to the rules of Latin grammar, determinations of gender and spelling are secondary to establishing and maintaining a unique, distinctive and stable name for each valid taxon. Third, that the provisions of the Code must be simplified and designed to insure easy and automatic application of them by practicing systematists, with minimum need to petition the Commission for use of its Plenary Powers.

In the following paragraphs I will mention the most important proposals for change adopted during the Commission's deliberations, including a meeting open to all members of the zoological community on 5 July. These matters will be presented below in what I perceive to be their order of significance, not in the order in which they were considered. It should be noted that the Commission reaffirmed throughout these meetings that the Linnean classification system, its hierarchy of taxa and the binomial system of nomenclature are fundamental and irreducible bulwarks of the Code.

Without question the most significant and revolutionary changes adopted at these meetings were those that will severely constrain the strict application of priority by giving heaviest weight to the criterion of current usage as the determinant for establishing the validity of names. The first and interim step in this process will be the bringing together of materials in Articles 23c, 79 and 80 of the Code making it mandatory that senior synonyms that have not been used in the 50 years prior to the date of publication of their rediscovery are to be rejected and are not to be used to upset a long accepted name. No application to the Commission will be necessary (contrary to the present Code) to maintain current usage.

Much more important than this improvement, in what might be called the statute of limitations for the resurrection of old names,

is a sequence of decisions that the Commission believes will provide a stable and universal zoological nomenclature for the 21st century. The first of these involves the early establishment by the commission of a List of Available Generic Names in Zoology. The list would be developed substantially from Neave's *Nomenclator Zoologicus* and the *Zoological Record* with additions and corrections. At the time of publication (e.g. 1996) the dates in the list (regardless of any subsequent findings) would be the final determinants of priority. In addition and most importantly, only the generic names on this list would be available for use! Any other name, subsequently discovered or not, would not exist for nomenclatural purposes. Obviously new names proposed after 1996 would be available from their date of publication.

A second step in this process will be to ask the appropriate specialist committees (e.g. Nomenclature Committees of the International Congress of various taxonomic groups) to prepare lists of family-group, genus-group and species-group names in current usage. These might be based on up-dated versions of the lists of living mammals and amphibians prepared by the Association for Systematic Collections, for example. After appropriate consideration the Commission would certify such a list as an Official List of Names in Current Use (LNCU). Names not on this list would not be available and would not exist for nomenclatural purposes. Obviously new names proposed for taxa after the publication of the LNCU would become available from their date of publication. This procedure means that for a particular group there will be no necessity to search for any names published prior to the appearance of the LNCU thus completely freeing the systematist from the past, Essentially each LNCU will be a new (although mini-) *Systema Naturae* and will serve as the new starting point for nomenclature in that particular major group. In poorly known groups it may be sometime before LNCU's will be prepared. For these taxa the revised Article 23c and the List of Available Generic Names in Zoology will provide maximum stability until LNCU's are available.

In another significant area the Commission recognized the inherent incongruity between the absence of knowledge of classical languages by most practicing systematists and the requirements of the Code. It was agreed that scientific names are only symbols for taxa in themselves carrying no special meaning and under the current Code may even be arbitrary combinations of letters. Consequently, while the Commission believes that names for taxa should continue to be based primarily on words of Latin and Greek derivation, the pertinent articles on name formation in the Code will be re-written without reference to the rules of Latin grammar. Specifically a simple and uniform method will be devised for forming family-group names for the future. The accepted spellings of older family-group names will be established by current usage, not Latin grammar!

Two other specific issues in the area of grammar were considered. It was agreed that in the case of species-group patronyms that terminate in *-ii* or *-i*, either spelling would be admissable regardless of the original spelling (e.g. *petersii* or *petersi*; *boylii* or *boyli*). Less clearly resolved was the matter of agreement in gender between generic and species-group names based on adjectives. The idea that generic names should be without gender received considerable support, however, there was no agreement on how to establish fixed spellings for the adjective-based species-group names. One alternative might be to make all generic names feminine for purposes of zoological nomenclature. Certainly it would be best if all members of a particular genus had the same adjectival terminations.

The areas of what constitutes publication and the criteria of availability were revisited. Clearly with development of new methods of electronic publication and printing, unintentional, accidental, personal or even mischievous proposals of new names for taxa are possible. The Commission favored the notion that to be published for purposes of zoological nomenclature a new name must appear in one of a substantial number of approved scientific journals or in books from an extensive list of publishers that were registered with the ICZN. Logistics for such a plan are complex and need further investigation but the aim is to insure publication in the primary scientific literature as opposed to privately printed and/or unedited sources. In the area of availability it is proposed that in order to be available (after a certain date) a new name must be accompanied by an abstract and/or diagnosis purporting to distinguish it from other similar taxa in a language using Latin letters, preferably "a language of the Code," language of the Code being any language so designated in the Code. Candidate languages are to be determined at a later date.

The Commission agreed that provisions should be added to the Code so that in cases where a type genus of a family-group name has been misidentified the first available name for the same taxon is to become the type genus and similarly a misidentified type species of a genus-group name should be replaced by the first available name for the same taxon. Another change would require all future species-group descriptions to include a designation of a holotype, syntypes or hapantotype or in certain cases of ephemeral organisms, an illustration that may be composite (some special designation will be required for these). Such types must be deposited in a museum or similar institution. After a stated date no new species-group name would be available if it does not meet these requirements.

Although the Code does not treat names of order-, class- or phyla-groups the commission is often thought to have authority in this area. There seems to be some advantage to the community if the ICZN could provide a list of such names in current use, with some indication of preference in usage. Consequently the ICZN will undertake the preparation of a list of recommended names in these categories in zoology. Hopefully this will encourage universality of usage of order-, class- and phyla-group names as key words, in titles and in abstracts.

An editorial committee chaired by F. Christian Thompson is in the process of drafting these dramatic changes into definitive form for action at the meetings of the International Union of Biological Sciences at Amsterdam, the Netherlands, in September 1991. It is important that systematists voice their support of these changes, which are based upon the Commission's response to the demands of both taxonomists and other members of the biodiversity community. Your comments may be directed to the Executive-Secretary, International Commission on Zoological Nomenclature, c/o Museum of Natural History, Cromwell Road, London SW 7 5BD, Great Britain. It is vital to the welfare and future of systematic biology that the progressive and exciting innovations in zoological nomenclature developed by the ICZN at Maryland become implemented. Your individual aid, through endorsement of the major principles described above, in bringing this great enterprise to fruition for the benefit of biologists and biology generally, is an essential ingredient in adoption of a Code of Zoological Nomenclature that emphasizes stability based on current usage and is designed for the needs of systematists in the 21st century.

I will conclude by noting specific actions by the Commission. Of particular interest to readers of this journal is the case of the three herpetological works on Australian and New Zealand taxa by Wells and Wellington (Case 2531). It was decided that each of the three titles would be considered individually. In addition before any further action is to be taken on these cases the Commission will seek the advice of the Nomenclature Committee of the World Congress of Herpetology for their opinion as to whether or not any or all of the three works in question pose a threat to the stability or universality of scientific nomenclature for the amphibians and reptiles of Australia and/or New Zealand. Of course until the Commission makes a final decision on this matter the nomenclature (existing usage) utilized prior to the Wells and Wellington publications should be followed.

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RECENT POPULATION CHANGES

RECENT POPULATION CHANGES provides an outlet for anecdotal or minimally documented information on local extinctions or regional population changes. These reports could be valuable historic indications that might enhance our understanding of very long term population trends (in excess of 20 years) and changes in distribution patterns.

Manuscripts should be submitted directly to the editor of this subsection: Ralph W. Axtell, Department of Biological Sciences, Southern Illinois University, Edwardsville, IL 62026, USA.

POPULATION STATUS OF *Bufo exsul* MYERS, 1942

Recent reports have raised concern that anuran populations may be in decline on a world-wide basis (Barinaga 1990). The black toad, *Bufo exsul*, an endangered taxon of the *Bufo boreas* complex, is restricted to Deep Springs Valley, Inyo County, California. This toad is found only in a small area watered by the run-off from springs in an isolated valley of the Great Basin Desert in eastern California (Schuierer 1962, 1963).

In order to carry out a brief, informal survey of its present population status, we visited the population at Corral Springs and Buckhorn Springs in the southeastern part of the valley. Small populations at Antelope Springs, 5 mi to the northwest (Schuierer 1962) and at Bog Mound Springs north of Deep Springs Lake (Sherman 1980) were not visited. Our visit, 12-14 April 1990, coincided with the breeding period for this species, which extends from about mid-March to late April. One of us (FWS) has studied this population since 1952, and we have visited the valley sporadically over the intervening years.

Subjective population estimates were made during most occasions and the numbers seen during springtime visits have appeared fairly constant. More accurate counts and population assessments were attempted by Schuierer (1962, 1972) and Sherman (1980). These estimates range from more than 10,000 individuals for Corral Springs plus Buckhorn Springs (Schuierer 1962) to more than 22,000 for Corral Springs (1980).

During our most recent visit, all size classes (<1 yr; <2 yrs; 2-3+ yrs) of toads were seen in all suitable habitats. Adult toads prefer habitats with short plant cover and unobstructed access to still or slowly flowing water. Breeding sites are easily entered shallow waters with sufficient plant cover that protect eggs and tadpoles. Only three freshly deposited egg masses were observed, but small tadpoles (stages 25-27) were found more widely dispersed in shallow, slowly moving or standing open water. No gravid females or amplexing pairs were encountered, although release/encounter "chuckles" were occasionally heard.

During a ten-hour perambulation over the entire springs area, we encountered at least 700 toads. A small number were collected, measured from snout to vent, and released. Males and females in the largest age-class (3 yrs +) were present in equal numbers and measured 45-57 mm ($\bar{X}$=48.6 mm), males 45-52 mm ($\bar{X}$=48.6 mm). These measurements correspond with measurements for adults seen in previous years (Schuierer 1962), but are significantly less than adult sizes reported by Sherman (1980) for the same area: males 49 - 76 mm, $\bar{X}$=60.4 mm in 1977, 64.2 mm 1978; females 52 - 75 mm, $\bar{X}$=62.0 in 1977, 64.4 in 1978.

The numbers and sizes of animals appeared similar to those of our past visits, made over a 38-year span. In our estimation, there have been no major changes in the population size of *Bufo exsul* over this period. We plan to continue monitoring this population, and with time and funds permitting, to complete a more accurate analysis of this toad's population size and structure.

If this unique population is to survive, care must be taken that this small and restricted biotope is not changed in ways that make it less suitable for toads. We noted considerable land-moving activity within one km of Corral Springs; also a large waterfowl pond (ca. four acres in extent) has been developed in a former toad-breeding area between the springs' sloughs and the alkaline Deep Springs Lake that occupies the southern end of the valley. Happily eggs and tadpoles have now been found on the shallow south side of this pond.

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LIFE HISTORY NOTES

See Herp. Review *21(1) for author's instructions.*

CAUDATA

AMBYSTOMA OPACUM (Marbled Salamander). **Size Maxima**. On 16 October 1989 at ca. 2200 h, a record size *Ambystoma opacum* was collected during a rain shower on a paved road at the town of Makanda, Jackson Co., Illinois (T.10S., R.1W., Sec. 27, NW1/4). The specimen as measured alive (chlorotone anesthetized) was: SVL = 78 mm; TL = 136 mm. This specimen thus surpasses Conant's (1975. A Field Guide to the Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Company, Boston. 429 pp.) species size maxima (TL = 127 mm) by 9 mm. Smith's (1961. The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28(1), 298 pp.) Illinois record *A. opacum* (TL = 121 mm) was surpassed by 15 mm. The specimen was deposited in the Herpetology Collection, Southern Illinois University at Carbondale (SIUC H-3815).

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ANURA

BUFO COGNATUS (Great Plains Toad). **Microhabitat Selection**. On 15 July 1989 between 2100 and 2135 h, I observed several (ca. 18-24) adult *Bufo cognatus* along a short distance of the west shore of the San Luis Lake (Alamosa Co., Colorado, ca. 2300 m elevation). A stiff wind was blowing from the east, forming a line of foam where the waves lapped the shoreline. The air temperature was 21° C, the water temperature 17° C, and the foam temperature 19.2° C (all temperatures measured with a Schulteis reptile thermometer). Most toads were first observed within the foam along the shoreline; all were found within the foam or on the land within a short distance of the water and foam (maximum observed distance was 30 cm), although some toads retreated into the water when disturbed. No calling was observed during the period of direct observation or later while we camped nearby.

Table 1 shows the locations and body temperatures of five of the toads. Duellman and Trueb (1986. Biology of Amphibians. McGraw-Hill Book Co., p. 216) suggest that in nocturnal amphibians, "regulation of body temperature, if it occurs at all, is restricted to those times when the animal is in its diurnal retreat." As moving air causes greater water loss through amphibian skin, selective utilization of the shoreline foam by the toads probably occurred because the foam provided a comparatively favorable microhabitat both in terms of water economy and possibly of temperature. I thank my son, Todd Wilcox, who assisted with these observations.

Table 1. Body temperatures and locations of *Bufo cognatus*.

Land	Water	Foam
19.4° C	17.0° C	18.8° C
16.8° C		17.8° C

Submitted by **LAUREN J. LIVO**, 1215 S. Osceola Street, Denver, CO 80219,USA ●

How to Dress Like a Herper



The Gray Treefrog, calling on a warm spring night, is printed in color on a black T-shirt. Artwork by Karl Johnson



The Wood Turtle, foraging in a patch of ferns, is printed in color on an ecru (off-white) shirt. Artwork by Sarina Brewer

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OSTEOCEPHALUS TAURINUS (Treefrog). **Predation.** Few species of birds of the family Cuculidae are known to feed on frogs, and only two records are for Neotropical cuculids: *Guira guira* (Schubart et al. 1965. Arq. Zool. Sec. Est. S. Paulo 12:95-249) and *Crotophaga ani* (Sick 1985. Ornitologia Brasileira Vol. 1, Ed. Univ. Brasília, Brasília. pp. 315-322). In neither case was the frog identified. In November, 1988 at Anavilhanas Archipelago, 100 km NW of Manaus on the Rio Negro, Brasil, we observed a Squirrel Cuckoo (*Piaya cayana*) capturing an *Osteocephalus taurinus* (10 cm TL). After capture the cuckoo flew to the ground with the frog held in its bill. Twice the frog escaped by jumping ca. 20 cm from the bird, and each time it was recaptured. The cuckoo held the frog by its head and beat it on the ground several times, and then beat it on a log. The cuckoo attempted to dismember the frog, but was unsuccessful. It then perched at a height of 1.5 m without the frog. The dead frog was subsequently found amongst the leaf litter under the perch, and we conclude that it was probably abandoned because it was too large. This observation suggests that the Squirrel Cuckoo may be an important predator of smaller tree frogs.

Submitted by **RENATO CINTRA** and **TANIA M. SANAIOTTI**, Departamento de Ecologia, Instituto Nacional de Pesquisas da Amazonia (INPA), CP 478, Manaus, 69000, AM. BRASIL ●

RANA PALUSTRIS (Pickerel Frog). **Predation.** Most accounts of *Rana palustris* make reference to its toxic skin secretions, even though the exact components of the toxins and the extent of their effects on would-be predators remain poorly known. Wright and Wright (1949. Handbook of Frogs and Toads of the United States and Canada. Comstock, Ithaca, NY. xii + 640 pp.) report the secretions as being irritating to dogs and fatal to other frogs placed in the same container. Dunn (1935. Copeia 1935(2):85-98.) and others have offered these frogs to captive snakes, nearly always with negative responses. However, few if any instances of natural predation have been reported.

Two adult *Rana palustris* were removed from the stomach of an adult male mink (*Mustela vison*) collected along the Broad River, between 6.8 and 9.2 km SW Rutherfordton, Rutherford Co., North Carolina in November, 1988. This appears to be the first record of natural predation on this frog known from North Carolina. The fact that the mink was a mature animal and had almost certainly encountered *R. palustris* before, and the fact that it ate (apparently in their entirety) not only one, but a second frog, suggests that the skin toxins of *Rana palustris* may be ineffective against minks.

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, P.O. Box 27647, Raleigh, NC 27611, USA ●

RANA SYLVATICA (Wood Frog). **Reproductive Mortality.** Wood frogs are explosive breeders, completing most of their reproductive activity in less than a week. Male-male competition for mates can be quite intense, with as many as ten males grasping and attempting to amplex with a single female (Phillips, pers. obs.; Berven 1981. Evolution 35:701). On 14 March 1990 an unusual cost of reproduction for female *R. sylvatica* was observed when two females were found that appeared to have been crushed to death by males. One female was found in a "mating-ball" of five males. Upon collection, the female was dead, with its tongue and other visceral parts protruding from its mouth. The other female was observed in amplexus with a single male. This female was also dead, with its intestine protruding from a hole in its side. These observations were taken at a small (10 m diam, 0.5 m deep), ephemeral pond located in the Indiana Dunes National Park, Porter Co., Indiana.

This is the first female mortality of its kind observed at this site in three years (collection of more than twenty mating-balls). The difference this year may be due to the much higher temperature (23° C) on that day, which was more than 10° C warmer than the average temperature during the mating season. Males are visibly more active on warm days, and may have simply overwhelmed these females on this very warm day.

Submitted by **PATRICK C. PHILLIPS** and **MICHAEL J. WADE**, Committee on Evolutionary Biology and Department of Ecology and Evolution, University of Chicago, 915 E. 57th Street, Chicago, IL 60637, USA ●

CROCODILIA

ALLIGATOR MISSISSIPPIENSIS (American Alligator). **Diet.** Incidental to our studies on Florida manatees, we observed alligators at the Merritt Island National Wildlife Refuge, Brevard Co, Florida, feeding on horseshoe crabs (*Limulus polyphemus*) on four occasions from 1987 through 1989. We estimated that the alligators were 2.5 - 3.5 m long and the horseshoe crabs 30 - 50 cm long. All observations occurred in the brackish, turbid waters of Banana Creek near State Highway 3. On one occasion we photographed a 2.5 m alligator moving 20 m to a horseshoe crab swimming upside down at the surface. The alligator grasped the crab in its mouth and returned to shallow water where it consumed the crab above water within about 4 min. In a recent review, Wolfe, Bradshaw, and Chabreck (1987. Northeast Gulf Sci. 9(1):1-8) noted a number of crabs, shrimp, and crayfish among a diverse array of alligator food items, but they did not list *Limulus*. The taking of horseshoe crabs by alligators appears to have been overlooked, and our observations suggest that horseshoe crabs may constitute an important component of the alligator's diet in certain coastal regions of Florida. Photographs documenting this feeding behavior have been placed on file at the Florida Museum of Natural History, Gainesville, Florida.

Submitted by **JAMES P. REID** and **ROBERT K. BONDE**, U.S. Fish and Wildlife Service, 412 N.E. 16th Avenue, Rm. 250, Gainesville, FL 32601, USA ●

ALLIGATOR MISSISSIPPIENSIS (American Alligator). **Behavior.** A tail wagging sequence that appeared to be related to feeding was observed in several adult alligators during spring 1988 at Brazos Bend State Park, Fort Bend Co., Texas, and in one individual in April, 1990 at Paynes Prairie State Preserve, Alachua Co., Florida. The alligators were in marshy, somewhat stagnant bodies of water with little or no current and varying water depths of 0.3 - 1.0 m. The posterior third of the tail rapidly swept through the water and mud in a 180° arc. Simultaneously, the head was moved from side to side in a 90° arc with the mouth held partially open. Occasionally the alligator would lunge at the turbid water and appear to swallow as if feeding. We noted little variation amongst alligators displaying this behavior.

The tail wagging greatly increased the turbidity of the water. We speculate that it made oxygen utilization extremely difficult except near the surface for potential prey such as amphibians, fish, and invertebrates, as well as physically dislodging them, thus increasing capture success by the alligator.

Submitted by **DENNIS JONES**, Brazos Bend State Park, 21901 FM 762, Needville, TX 77461, and **LOUISE HAYES-ODUM**, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX 77843, USA ●

TESTUDINES

CARETTA CARETTA (Loggerhead Sea Turtle). **Habitat.** On 1 October 1989, we identified a post-hatchling loggerhead (10-12 cm CL) captured at an artificial reef in the Gulf of Mexico, 15 km S of Pensacola, Florida (30°12'N, 87°14'W). The turtle may have followed a scuba diver to the surface from the 37 m deep reef, where it was repeatedly attacked, but not injured, by two sea gulls (*Larus atricilla*?) before its "rescue" (J. Ferguson, pers. comm.). We were unable to measure or weigh the animal, which was quickly released by the Florida Marine Patrol in Pensacola Pass (H. Gomez, pers. comm.). We found no evidence of tags or tag scars on the animal.

The usual habitat of post-hatchling loggerheads is in offshore oceanic waters (see Carr 1987. Conserv. Biol. 36(2):92-100). This is apparently the first report of a non-stranded, non-sargassum-associated post-hatchling in nearshore waters, and the first record of an "oceanic-stage" turtle associated with an artificial reef in the Gulf of Mexico. It is likely that this turtle was prematurely advected into coastal waters, and unlikely that it will survive seasonally cold water temperatures that occur in the northern Gulf.

In our opinion, post-hatchlings stranded or accidentally captured during late fall or winter in the northern Gulf of Mexico should be released offshore in or near boundary currents, such as the Gulf of Mexico Loop Current or its eddies, or held captive in appropriate facilities until juveniles (>20 cm CL) or the return of favorable surface water temperatures in March-April.

We thank N. Mrosovsky for editing a draft of the manuscript. Our thanks to G. Ferguson, and the Florida Marine Patrol for furnishing capture and release information.

Submitted by **SNEED B. COLLARD** and **THOMAS J. HANSKNECHT**, Biology Department, University of West Florida, Pensacola, FL 32514, USA ●

EMYDOIDEA BLANDINGI (Blanding's Turtle). **Parasites.** On 28 July 1988, an *Emydoidea blandingi* was collected by hand, at the southeast end of Big Clear Lake, Arden, Frontenac Co., Ontario. This specimen had a CL of 143.65 mm, a CW of 107.55 mm, and was host to seven leeches. The leeches were deposited at the National Museum of Canada (NMC). Three of the leeches were *Placobdella parasitica* (NMC A 1989-0009), a commonly encountered turtle leech. The remaining four leeches were *Placobdella ornata* (NMC A 1989-0008). This is believed to be the first confirmed report of parasitic interaction between *P. ornata* and *E. blandingi*.

The capture site was a wide, shallow, and densely vegetated stream that flowed into the lake. The bottom substrate consisted of several feet of detritus. The air temperature was 32° C, and the water temperature was 31° C at 50 mm at time of capture. The turtle was released as part of a mark-recapture study.

I thank Jaqueline Madill, Assistant Curator, Vermes Section (NMC), for identifying the leeches.

Submitted by **RAYMOND A. SAUMURE**, Herpetology Section, NMC, Ottawa, Ontario, K1A OM8, CANADA ●

GRAPTEMYS VERSA (Texas Map Turtle). **Size Maximum and Diet.** McKinney (1987. Herp. Review 18(1):17) reported a maximum size of 171 mm CL for *Graptemys versa* and listed measurements for eight specimens all greater than the 127 mm CL reported by Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 2nd ed. Houghton Mifflin Co., Boston. 429 pp.). Vogt (1981. Cat. Amer. Amphib. Rept. 280.1-280.2), however, previously had reported a maximum size of 183 mm CL.

On 3 July 1984 we collected a female *Graptemys versa* (TCWC 62676) in the San Saba River at the Schleicher-Menard county line, Texas, larger than any previously published record. From this turtle the following straight-line measurements were recorded: carapace length = 214 mm; carapace width = 154 mm; plastron length = 188 mm; plastron width = 125 mm; head length = 67 mm; head width = 40 mm. Head measurements are reported because this individual exhibits megacephaly, possibly associated with a diet of gastropods, shells of which were present in feces. This is the first report of diet for wild individuals of this species. The project for which this specimen was collected was funded by the Texas Agricultural Extension Station.

Submitted by **DAVID A. KIZIRIAN**, Museum of Natural History and Department of Systematics and Ecology, The University of Kansas, Lawrence, KS 66045, **W. KEN KING**, 621 S. Missouri, Weslaco, TX 78596, and **JAMES R. DIXON**, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX 77843, USA ●

MALACOCHERSUS TORNIERI (Pancake Tortoise). **BEHAVIOR.** The power used in the righting movements of pleurodiran and most cryptodiran chelonians is transmitted by the head and neck. None of the testudinines with a convex carapace can right themselves without the head touching the substrate. *Malacochersus tornieri* differs from most testudinines in that it has the least convex carapace; this species can right itself without using the head. It also differs from other chelonians in that the power for righting activity is transmitted by the forelimb. This behavior was observed in eight specimens imported from Tanzania. It is speculated that *Malacochersus* was derived from ancestral testudinines which possessed a convex carapace, and the ability to right using the forelimb is a secondarily derived characteristic.

Submitted by **RIOSUKE AOKI**, Uwamachi 4-59, Yokosuka 238, JAPAN ●

SAURIA

LEIOCEPHALUS SEMILINEATUS (NCN). **Parasitism.** Greve and Powell (1989. J. Parasitol. 75:677-679) and Powell et al. (1990. J. Helminthol. Soc. Washington 57:75-77) described the nematode parasite *Skrjabinoptera leiocephalorum* (Spirurida: Physalopteridae) and discussed its occurrence in *Leiocephalus schreibersi* and *L. barahonensis* from Hispaniola. Stomachs of sympatric lizards, including *L. semilineatus*, were also

examined, but no nematodes were found. In the course of subsequent investigations into the food habits of Hispaniolan *Leiocephalus*, we have found an occurrence of *S. leiocephalorum* in *L. semilineatus*. This represents a new host record.

A female *L. semilineatus* (SVL 44 mm), collected along the Río Tábara near Highway 44 (130 m elev.), Provincia de Azua, República Dominica on 20 May 1989, was found to be infected with 4 physalopterid nematodes subsequently identified as *S. leiocephalorum*. The collecting site represents a new locality record for the parasite. Three nonoviferous females (4.77-5.19 mm) and one male (5.19 mm) were found free in the stomach lumen, admixed with ingesta. This was the only one of 53 *L. semilineatus* found to be infected. The lizard is on deposit in the Bobby Witcher Memorial Collection (BWMC 04010) at Avila College. Nematodes are in the parasitological collection at Avila College (no numbers assigned).

We wish to thank Jaime Villa, Scott A. Maxey, S. Scott Duer, and Kimberly L. Jurd for their assistance in the field and lab. José A. Ottenwalder of the Parque Zoológico Nacional facilitated opportunities for field work. Permits were graciously provided by Emilio A. Bautista M., Director, Departamento de Vida Silvestre, República Dominica.

Submitted by **ROBERT POWELL, DEBORAH J. PFLANZ**, Department of Natural Sciences, Avila College, Kansas City, MO 64145, **JOHN H. GREVE**, Department of Veterinary Pathology, Iowa State University, Ames, IA 50011, and **DONALD D. SMITH**, Department of Medicine, University of Kansas, Kansas City, KS 66103, USA ●

SCELOPORUS JARROVI (Mountain Spiny Lizard). **Behavior**. Sexual interference refers to behavior in which an animal (usually a male) decreases the fitness of a conspecific without increasing its own fitness by preventing the conspecific from mating. Numerous examples of this are known from a variety of taxa (Alcock 1984. Animal Behavior: An Evolutionary Approach. 3rd ed. Sinauer Assoc., Sunderland, MA. Pp. 376-378). On 17 September 1989 sexual interference was observed in *S. jarrovi* in a high elevation (2600 m) population in the Chiricahua Mountains, Cochise Co., Arizona. This observation was made during a focal sampling period (1346 - 1416 h) of a large male *S. jarrovi* (93 mm SVL, 37 g mass) made as part of an ongoing study of the population.

The lizard was observed to move about its home range displaying for a period of 1 min, then rapidly move a distance of 10 m to a point well outside of its home range where it had never been observed previously and then (1356 h) physically attack a pair of lizards that I had not observed until that time. The pair consisted of another large male (89 mm SVL, 29 g mass) and a small unidentified female who appeared to have been involved in courtship. The period of physical contact was less than one second. After the initial attack the first male remained within 5 cm of the pair. The second male maintained his grip on the neck of the female for roughly five seconds and then released her. The female rapidly left the area and was not resighted. The two males remained motionless and adjacent to one another for a period of three minutes. During this time both males laterally compressed their bodies and held them high off the ground but did not display. At 1359 h the first (attacking) male moved off about 1 m and then moved an additional 5 m at 1401 h and temporarily moved out of sight. At 1402 h the first male had returned to his own home range and resumed an activity pattern of basking alternating with periods of display. The second male started displaying periodically after the first male moved away but did not pursue him.

Submitted by **KEVIN A. DIXON**, Department of Ecology and Evolution, University of Chicago, 915 E. 57th St., Chicago, IL 60637, USA ●

UTA STANSBURIANA (Side-blotched Lizard). **Cannibalism**. Intra-species predation is a more widespread and consequential phenomenon than is usually recognized (Polis 1981. Ann. Rev. Ecol. Syst. 12:225-251). Among lizards for example, the consumption of juveniles by adult individuals may be a fairly common occurrence (see Hews 1989. Herp. Review 20(3):71; Polis and Myers 1985. J. Herpetol. 19:99-107; and included references).

In the course of removing the digestive tracts of ca. 600 adult *U. stansburiana*, I found the remains of juvenile *Uta* in the stomachs of three individuals. The actual incidence of cannibalism was undoubtedly higher than indicated by this sample, because only around half of these lizards were collected when hatchlings were present, and I only opened stomachs when a suspect prey item was visible through the stomach lining.

On 28 June 1987 I collected an adult male *U. stansburiana* (46 mm SVL) in Inyo Co., California, whose stomach contained a juvenile male Uta (ca. 25-30 mm SVL). On 23 July 1987 I collected two adult males (48 and 49 mm SVL) in Grant Co., Washington, both of which contained the partially digested remains of juvenile *Uta*.

In two previous reports of cannibalism in this genus for which the sex of the cannibal was noted, adult males were also the perpetrators (Hews op. cit.; B. Sinervo, pers. comm.). Taken together, these observations indicate that cannibalism is significantly more common by males than by females ($P = 0.031$, $N = 5$, one-tailed binomial test). The reason for this apparent sexual difference in the frequency of cannibalism is presently unknown, but could be related to the larger size of males, or to a suppression of cannibalism among females whose home ranges would likely overlap those of their offspring (see Tinkle 1967. Misc. Publ. 132, Mus. Zool., Univ. Michigan). It would be instructive to examine other reports of cannibalism in sceloporine lizards to determine whether this pattern is typical of the group. I also encourage other workers to report the sex of cannibals in future communications.

Although I overlooked many potential instances of cannibalism (see above), evidence suggests that intra-specific predation may have been fairly common, at least in the Grant Co., Washington population. Specifically, 2 of the 12 large males (>47 mm SVL) collected on 23 July 1987 contained conspicuous, undigested remains of juvenile *Uta*. Therefore, at least 17% of the large males in this population had fed recently on juvenile lizards. Because *U. stansburiana* is the only lizard that occurs on this site, this observation lends support to the notion that an absence of competitors may facilitate the expression or evolution of cannibalism (Polis op. cit.).

A variety of benefits might accrue to cannibalistic individuals. The instances of cannibalism reported here however, were probably manifestations of normal foraging behavior (Polis and Myers 1985. J. Herpetol. 19:99-107). Indeed, the summer period (when these samples were collected) is a time of peak *Uta* abundance (primarily hatchlings) and potentially low resource levels; hence, this is the time when conditions might favor cannibalism as an alternate means of energy acquisition (see Polis op. cit.).

I thank Landin Boring for help collecting

lizards, Raymond B. Huey for comments which improved the manuscript, and Bill Fulleton for allowing me to study *Uta* on his property near Vantage, Washington.

Submitted by **BYRON S. WILSON**, Department of Zoology, NJ-15, University of Washington, Seattle, WA 98195, USA ●

WETMORENA HAITIANA (NCN). **Food Habits**. *Wetmorena haitiana* is a semi-fossorial anguid whose range is restricted to the Massif de la Selle and the Sierra de Baoruco on Hispaniola (Schwartz 1965. Proc. Biol. Soc. Washington 78:39-48; Schwartz and Henderson 1984. Milwaukee Publ. Mus. Spec. Publ. Biol. Geol. No. 4:1-70).

Twenty-seven *W. haitiana* (M:F 12:15; SVL 33-95 mm, $\bar{X}$ = 68.4 + 17.6 mm) were taken from two localities in the Sierra de Baoruco, República Dominica in March, 1986, 1988, and 1990. Collection sites were in mesic upland forest 47 km N Cabo Rojo, Pedernales Province, elev. ca. 1000 m, and near Monteanada Nueva, 12 km S Cabral, elev. >1100 m. Stomach contents were analyzed and arthropods identified to order. Volumes of food items were determined using methods of Milstead (1957. Texas J. Sci. 9:410-447).

Thirty-eight prey items representing 3 phyla, 5 classes, and 10 orders were identified. In addition, shed lizard skin was found in one animal, grit in another, and plant materials in six specimens. Ingestion of grit and plant material is assumed to have been adventitious. Relative numbers, volumes, and frequencies of occurrence for all food items are presented in Fig. 1. Sample sizes were too small to determine if food habits varied by sex. There was no correlation between SVL of lizards and the volume of prey items consumed (r = 0.37, N = 22, P = 0.05). Specimens were deposited in the Bobby Witcher Memorial Collection at Avila College (BWMC 02739-02740, 03390-03400, 04236-04249).

Few data dealing with food habits of neotropical anguid lizards have been reported. Incháustequi et al. (1985. Amph.-Rept. 6:195-201) and Vitt (1985. Paps. Avulsos Zool. Mus. Zool. Univ. S. Paulo 36:69-76) characterized gut contents of *Diploglossus warreni* from Hispaniola and *D. lessonae* from northeast Brazil, respectively, as being indicative of opportunistic foraging. *W. haitiana* appears to be similarly willing to feed on any food item it encounters.

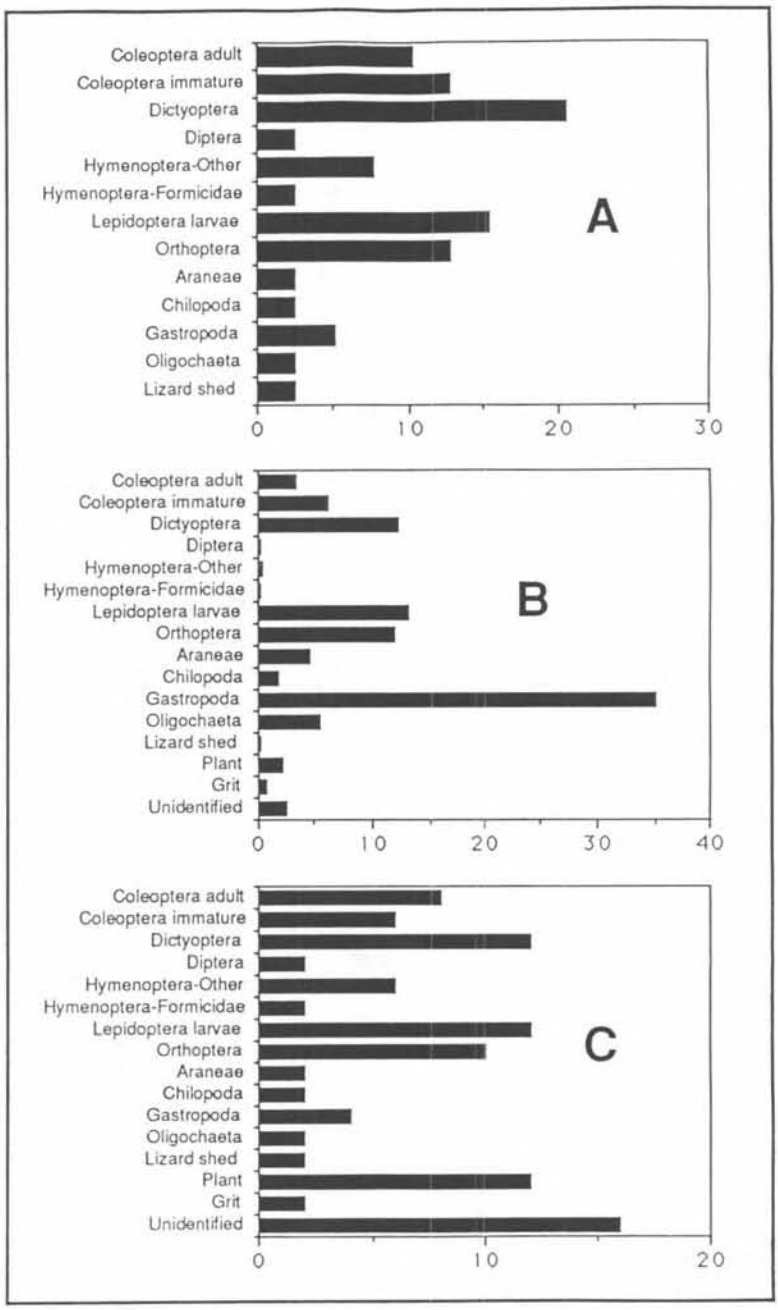


Figure 1. Relative numbers (A), volumes (B), and frequencies of occurrence (C) (expressed as percentages) of stomach contents in *Wetmorena haitiana*.

We wish to thank Donald D. Smith, John S. Parmalee, Jr., Denise Rector, and members of the Avila College Field Biology Classes of 1986, 1988, and 1990 for their assistance in the field and lab. José A. Ottenwalder of the Parque Zoológico Nacional facilitated opportunities for field work. Permits were graciously provided by Emilio A. Bautista M., Director, Departamento de Vida Silvestre, República Dominica.

Submitted by **JANINE M. CISEK, CAROL. A. CUNNINGHAM, RICHARD A. DUPUIS, ROBERT P. SEIBOLT**, and **ROBERT POWELL**, Department of Natural Sciences, Avila College, Kansas City, MO 64145, USA ●

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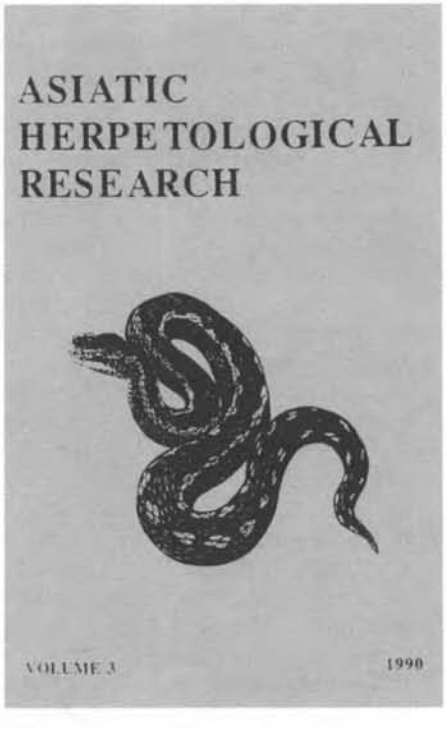
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"Karyotypes of Some Species of *Bungarus*," by Michihisa Toriba (Japan).
"Intergradation Between *Melanochelys trijuga trijuga* and *M. t. coronata* (Testudines)," by Indraneil Das (India) and Peter C. H. Pritchard (USA).
"Mating Call Structure of the Chinese Frog, *Rana nigromaculata*," by Yong Mu and Ermi Zhao (both China–Beijing).
"Studies on the Early Embryonic Development of *Rana rugulosa* Wiegmann," by Jionghua Pan and Danyu Liang (both China–Beijing).



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SERPENTES

THAMNOPHIS ORDINOIDES (Northwestern Garter Snake). **Reproduction.** Previous accounts of this species from the mid- and northern portions of its range indicate that clutch size ranges from 3 to 20 young with 8 to 12 being most common. The few records of clutch sizes above 15 have included both unfertilized ova and births of dead snakes in the counts. Mature females range in size from ca. 300 to 695 mm SVL though rarely exceed 600 mm SVL (Nussbaum, Brodie, and Storm 1983. Amphibians and Reptiles of the Pacific Northwest. Univ. Press of Idaho. Moscow. 322 pp.; Stewart 1968. J. Herpetol. 2(3-4):71-86). We know of only one study that provides information on clutch size for *T. ordinoides* from the southern portion of its range. The average clutch size for 11 medium-sized females from southwestern Oregon was 5.2 (SE = 0.9) (Brodie 1989. Amer. Natur. 134(2):225-238).

On 23 August 1988 a gravid female *T. ordinoides* was captured at the edge of Hurdygurdy Creek (a tributary to the south fork of the Smith River), Del Norte Co., California. The snake measured 663 mm SVL and 784 mm TL; mass = 200 g. Sixteen ova were palpated in the field. The snake was brought to our laboratory, kept at normal (late summer, northern California) photoperiod and temperature conditions and provided with a "hot rock." She fed readily on large banana slugs (*Ariolimax* sp.) and shed once during her eight weeks in captivity. On 1 October 18 young were born - 17 live and one dead. Eleven of the live young were males and 6 were females. Neonates were measured shortly after their first shed and SVLs ranged from 136 to 148 mm ($\bar{X}$ = 142.9 mm); TLs ranged from 179 to 200 mm ($\bar{X}$ = 189.5 mm); masses ranged from 2.0 to 2.5 g ($\bar{X}$ = 2.09 g). These lengths and the sex ratio are similar to those observed for young of large females (>500 mm SVL) in the Willamette Valley, northern Oregon (Stewart op. cit.).

Submitted by **AMY J. LIND** and **HARTWELL H. WELSH, JR.**, USDA Forest Service, Pacific Southwest Forest and Range Experiment Station, Redwood Sciences Laboratory, 1700 Bayview Drive, Arcata, CA 95521, USA ●

TRIMERESURUS ALBOLABRIS (White-lipped Pit Viper). **Reproduction.** On 6 September 1989 a female *Trimeresurus albolabris albolabris* was captured in a mango tree in Bangkok, Thailand. She was housed in a large cage with two males previously captured at the same locality. Copulation was never observed but on 26 March 1990 she gave birth to 16 neonates. Five were stillborn, four more died on the second day, and on 29 March a deformed specimen was found dead. With the exception of the deformed neonate, each of the dead specimens was measured and the following SVLs recorded (mm): 155, 152, 157, 160, 161, 157, 164, 132, 165, and 163. Shedding began 1 April 1990, six days after birth, and by 6 April all but one of the five survivors had completed their first shed. On 6 April, eleven days after birth, the five surviving specimens were weighed. The masses (g) = 4.5, 4.5, 4.9, 3.85, and 3.7.

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BOOK REVIEWS

Current Herpetology in East Asia, edited by Masafumi Matsui, Tsutomu Hikida, and Richard C. Goris. 1989. ix + 521 pp. Herpetological Society of Japan, Kyoto. Hardbound. Available from Dr. Richard C. Goris, Hatsuyama 1-7-13, Miyamae-ku, Kawasaki-shi 213, Japan for US $44.00, or from Dr. Tsutomu Hikida, Department of Zoology, Faculty of Science, Kyoto University, Kita-Shirakawa Oiwake-cho, Sakyo-ku, Kyoto-shi 606, Japan, for ¥5,500. Readers in Europe can pay in yen via International Giro addressed to Japan-China Herpetological Symposium Kyoto 8-57373, Japan.

This volume contains the proceedings of the Japan-China Herpetological Symposium, which was held in Kyoto, Japan, in July 1988. The 75 papers are organized in nine chapters and range from brief reports to detailed studies of ecology and systematics. Contributions from amateur and professional herpetologists are represented. Asian species, some of which are not widely known, are the primary focus of these studies, and they provide intriguing information about a herpetofauna that is little known by most Westerners.

The initial chapter, "Morphology," opens with two papers on neuroanatomy, a description of cranial nerves of the boa *Eryx miliaris* and of the innervation of the pit organs of pit viper *Agkistrodon blomhoffi*. These are followed by R. Aoki's description of the globular posterior teeth of the Chinese alligator and of two species of the crocodylid genus *Osteolaemus*. Brief descriptions of melanosomes in the skin of squamates and of the embryonic development of gonads of *Takydromus tachydromoides* complete the morphology chapter. Additional morphological topics are included in the chapter on "Systematics," including descriptions of the larvae of hynobiid salamanders.

The second chapter, "Embryology and Physiology," includes an assortment of topics. A description of captive rearing of the larvae of the Chinese giant slamander, *Andrias davidanus*, by G. Liu and H. Tang begins the chapter. A paper by M. Huang et al. describes general features of the embryonic development of the viviparous pit viper *Agkistrodon blomhoffi*. Photographs of most of the stages provide an impression of changes in body form, but they do not show details of structures such as the pit organs. The rate of embryonic development of *Gekko japonicus* at different temperatures is described by S. Tokunaga. Physiological studies are represented by descriptions of rates of oxygen consumption by eggs and hatchlings of the lizard *Takydromus septentrionalis* and by the Chinese alligator, as well as by descriptions of the effect of temperature on the viscosity of blood of cobras.

Phylogenetic studies are found in two chapters: A dozen papers grouped under the heading "Systematics" extend from a method of counting costal grooves of *Hynobius* to a study by T. Hayashi and M. Matsui of the family Salamandridae that employs allozyme data. "Karyology" receives a chapter of its own that includes an analysis of the phylogenetic relationships of species of *Hynobius* and descriptions of the karyotypes of Chinese and Japanese species of salamanders, frogs, and snakes.

Ecological topics are covered under several headings. "Biogeography and Faunistics" provides descriptions of the herpetofaunas of regions extending in size from single provinces through the Ryukyu Archipelago to "East Asia." Most of these papers are short, and several lack references to other studies.

Papers in the chapter on "Breeding Biology" describe the reproductive habits of individual species, providing useful information about their natural history. A few papers in this section address larger

questions, such as the treatment of sexual size dimorphism of the rhacophorid frog *Buergeria buergeria* by K. Fukuyama and T. Kusano. Additional information about reproduction appears in the chapter "Behavioral Biology," and includes a description of choice of nest sites by the pit viper *Trimeresurus flavoviridis* in enclosures and an interesting study of the mating strategy of male *Hynobius nebulosus*. This salamander breeds in small bodies of water, and fertilization is external. Territorial males defend egg-laying sites, and the largest males arrive at the breeding pools first and obtain the best territories. Nonterritorial males behave as sneakers, rushing toward ovipositing females and attempting to fertilize their eggs. Other behavioral topics include learned avoidance of an apparently unpalatable frog, *Rana rugosa*, by newborn *Elaphe quadrivirgata*.

Food habits of Okinawan frogs are described in a chapter on "Population and Community Ecology," and several papers consider the diets of snakes. In the most thorough of these, M. Hasegawa and H. Moriguchi compare the diets and food habits of two species of *Elaphe* on a series of islands off the eastern coast of Japan. *Elaphe quadrivirgata* is the most widespread of the six species included. On islands where it is sympatric with several other species of snakes, *E. quadrivirgata* is small and feeds exclusively on skinks, whereas on islands where it occurs alone or with *E. climacophora* it is large and eats a variety of prey including mammals and birds. Clutch size and egg size varied slightly in parallel with the island-to-island variation in body size.

A chapter on "Snake Venom and Snake Bite" concludes the symposium; papers in this section focus on the epidemiology and clinical treatment of snakebite, protective clothing, and the preparation of antivenom. An index includes both species and topics.

Clearly, herpetology is an active discipline in East Asia that is growing on many fronts. The region contains an assortment of fascinating animals, and this vloume provides an intriguing view of their biology.

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Middle American Herpetology. A Bibliographic Checklist, by Jaime Villa, Larry David Wilson, and Jerry D. Johnson. 1988. i - xxxiii + three unnumbered pages + 131 pp., 91 color photographs arranged on 16 plates, 23 figures (two unnumbered), and one table. University of Missouri Press, Columbia. Hardbound US $35.

The passage from a manufacturing to a hurried, information-processing society has made the task of keeping abreast of herpetological literature formidable (not to mention costly). Indeed, the pleasure wrought by the arrival of a new publication is counterbalanced frequently by a feeling of anxiety at the prospect of its assimilation. Checklists, depending upon their accuracy, pose either a help or a hindrance to this process. They are best evaluated as tools rather than literature, and to adequately review one would entail as much work as its creation. This will not be an adequate review, but it will explore the reliability of a reasonably priced new checklist: *Middle American Herpetology* (MAH).

There are two types of checklists: those that treat unknown assemblages and comprise mostly novel data, and summary lists drawn from literature covering large regions. Although sometimes disdained for lacking originality, summary checklists should neither be published nor judged under this pretense; in fact, new data can be obscured when presented in this fashion. What these lists lack in invention is offset by the convenience they afford; their simple summaries are the object of heavy user-reliance.

Compilation of checklists is tedious and exacting, and these are the standards by which they should be judged. Properly done, and with timely geographic coverage, a checklist serves as an excellent jumping-off point for researchers, conservation and governmental agencies, students, hobbyists, and zoological park personnel. Moreover, the belated international environmental interest in biodiversity has resulted in a scramble for data in summary form.

Middle American Herpetology begins with a brief foreword by Henry Fitch followed by the color plates (an organizational novelty). The photographic quality is varied, as might be expected given the rarity of many taxa depicted; however, the photo of *Bothrops [sensu lato] lateralis* is the only one with serious color imbalance. Picture credits (nos. 51,64,72,74, and 77 were actually taken by J.A. Campbell) and usage (I was surprised to encounter one of my photographs in-print) seem to have been treated casually. There are several misidentifications (46 is *Amphisbaena fuliginosa*; 48 is *Chironius exoletus*; 58 is *Erythrolamprus mimus*). More importantly, the captions are an opportunity lost; instead of providing pertinent information (museum numbers, total length, specific locality data, etc.) they read like the text of a poorly prepared slideshow, containing a rambling admixture of local and English vernacular names. Statements like "this is the first published photo of a living specimen" are gratuitous rather than useful. Following the photos and table of contents, the authors outline their methods in the introduction. Each species citation is followed by: an indication of whether (and how) that species is listed in the Catalogue of the Neotropical Squamata (squamates), or the Catalogue of American Amphibians and Reptiles (nonsquamates); a section listing key literature pertaining to that taxon; references containing illustrations; and a distribution section which lists pertinent literature by country or region. When the status of an included species is uncertain, a note is added. Inasmuch as the book does not contain identification keys, a list by region of published keys is provided, and a table includes some other taxonomic works.

The introduction and authors' comments are in bilingual format which will be appreciated by hispanic users. The methods seem for the most part to be well considered. A problem with the "catalogue" entry is that it fails to include all species listed in the CNS but subsequently synonymized; thus the reader might confront a taxon in the CNS but be unable to locate it in MAH. Also, where no taxonomic change has occurred, the entry is supposedly deleted, but this has been done inconsistently. An update of changes since the CNS might best have been provided in tabular form, as researchers will use both books.

The "key" and "distributional" literature sections include theses, dissertations, other checklists, and numerous titles in preparation. The questions of their appropriateness aside, many are cited arbitrarily and erratically. For instance, Campbell (1982) contains a motherlode of distributional information, yet it is mentioned in passing. Key literature entries for many species include peripheral works in lieu of significant contributions; subspecies descriptions are usually excluded. Information provided on references containing illustrations is not encouraging in that frequent use of "none?" gives the impression the authors are uncertain about their literature search. The idea of providing

distributional references is a good one, but the selection suffers from inconsistencies, and the choice of citations could have been more rigorous. The transient nature of our distributional knowledge notwithstanding, I find the comments in CNS, Frost (1985), and Iverson (1986) to be of great help, and a similar approach (especially with regard to peripheral elements) would have benefitted the present work.

The authors provide useful remarks when the status of a species is uncertain, but many more should have been included. The list of keys and ancillary publications (Introduction and Table 1) is not complete, omitting basic works (among them: Uzzell 1973; Uzzell and Barry 1971; Pérez-Higareda and Smith 1986; Pérez-Higareda et al. 1985; Smith et al. 1986; McDiarmid and DeWeese 1977), and omitting many genera altogether. At least one work cited ("King et al. 1988") does not exist. Paradoxically, numerous titles mentioned nowhere in the text can be found in the Literature Cited. Perhaps, as implied in the title, the authors meant to include a bibliography.

What's in a name? A lot, if it appears in a checklist, where scientific names, correctly spelled and cited, are the acid-test. The number of nomenclatorial mistakes in *Middle American Herpetology* warrants this summary (errors in parentheses): misspelled family name (1), misspelled species name (26), misspelled author name (5), misused parentheses (51!), no author listed (13), wrong author (3). The issue of gender is always controversial, but *Bothrops* and *Sibon* are demonstrably masculine. Species are listed in their respective orders and alphabetized by family, and with the exception of the unused Alligatoridae, the authors explain controversial familial inclusions or deletions.

Middle American Herpetology treats 782 species of amphibians and reptiles, and the list is remarkably complete. A few exceptions are worthy of mention, however. Based on the literature the following species should have been included: *Eleutherodactylus antillensis* (Panama-introduced), *Rana brownorum* (Tobasco and Chiapas, Mexico), *Basiliscus galeritus* (Panama)., *Norops poecilopus* (Panama), *Sceloporus prezygus* (Chiapas, Mexico and Guatemala), *Hydromorphus dunni* and *Rhinoclemmys melanosterna* (Panama), and *Micrurus ancoralis* (Panama). The inclusion of *Siphophis longicaudatus* is inappropriate in that it is based on a personal communication; the fact that its putative presence in Panama represents a 6000-kilometer range extension is another matter. Extralimital species included erroneously are *Dendrobates fulguritus*, *Gonatodes annularis*, and *Norops sulcifrons*. The book would have benefitted from an *incertae sedis* so that excluded taxa (*Hyla bocourti*) or those included tenuously (*Norops rhombifera*, *Siphlophis longicaudatus*, among others), and other controversies could have been placed in perspective.

The occurrence of *Gastrotheca cornuta* in Costa Rica has yet to be established (Lamar and Porras, submitted); the authors include it based on a misinterpretation of Stejneger (1911). The gecko *Sphaerodactylus pacificus* is endemic to Isla Cocos, and the wideranging skink *Mabuya mabouia* should not be characterized as "an Antillean form." The type localities of *Norops intermedius* (Panama), and *Senticolis triaspis* (Belize) were excluded from their respective distributions.

Based on the literature, distributional errors abound; several sources and even the CNS have been misquoted more than once. Species known to occur in but not cited for Panama include: *Gastrotheca cornuta*, *Hyla pictipes*, *Coleonyx mitratus*, *Hemidactylus frenatus*, *Basiliscus plumifrons*, *B. vittatus*, *Norops pachypus*, *N. polylepis*, *Ameiva quadrilineata*, *Gymnophthalmus speciosus*, and probably *Lepidochelys kempi*. Neither *Bolitoglossa robusta* nor *Ninia sebae* has been reported from Panama. The authors excluded appropriately *Chironius fuscus* from Panama, but without comment. The lizard *Cnemidophorus lemniscatus* occurs in Costa Rica. The frog *Smilisca sordida* occurs in Nicaragua. The turtle *Lepidochelys olivacea* is found along the west coast of El Salvador, but the snake *Bothrops atrox* (=*B. asper*) does not occur in that country. The Guatemalan herpetofauna includes *Plectrohyla hartwegi*, *Sceloporus taeniocnemis*, *Geophis cancellatus*, *Rhinobothryum bovallii*, *Thamnophis cyrtopsis*, and *T. marcianus*, but does not include *Smilisca phaeota*, *Norops tropidogaster*, or *Pliocercus eu-*

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ryzonus. Additionally, *Chelydra serpentina* and *Thamnophis cyrtopsis* are found in Belize. The lizards *Norops limifrons* and *Sceloporus prezygus* occur in southern Mexico.

The puzzling inclusion of *Conophis pulcher*, which was synonymized (albeit inadequately) with *C. lineatus* by one of the authors (Wilson and Meyer 1982), makes one wonder how recently the text was revised...the synonymy was cited as being in preparation. The authors prudently placed in doubt the occurrence of *Bothrops [sensu lato] lateralis* in Nicaragua, owing to absence of verifiable specimens; one wonders why a similar stance was not taken with regard to *Laticauda colubrina*, and *Lachesis muta* from the same region (see also previous remarks about *Siphlophis longicaudatus*). Treatment of *Bachia blairi* and *B. pallidiceps* is confusing. The "key literature" cited for each (Dixon 1973) actually synonymized them. The resurrection of *B. blairi* occured in 1977 (McDiarmid and DeWeese), an unmentioned work. The *Scolecosaurus* cited by Dunn (1940) from Laguna de Pita, Panama, is probably referable to *B. pallidiceps*, as suggested by Dixon (1973). The authors request that unpublished material be sent for periodic updates which are planned, yet personal communications (used liberally throughout the present volume) were handled in a particularly cavalier fashion. In light of the aforementioned dangers of including new data in summary checklists, it would seem prudent to publish first.

The *Catalogue of the Neotropical Squamata* was a veritable state-of-the-union address for the region at the time of its first publication. Because it remains an important reference, and because of the rambling introductory critique of CNS in *Middle American Herpetology*, it is inevitable that they be compared. The modern situation admittedly is more complex, and the authors have negotiated a vast amount of literature during their compilation; this is offset by the much narrower scope of MAH. Technology has rendered simple what was recently arduous: the mechanics of writing and publishing. In that light, it is ironic that MAH is plagued with inconsistencies and poor editing. I found *Middle American Herpetology* to be more current, more detailed but less reliable than the Catalogue of the Neotropical Squamata, the stated shortcomings of which remain largely uneclipsed by this volume.

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* these are included in the Index to Geographic Distribution Records in Herpetological Review: 1967-1986 by E. J. Censky, 1988.

Crocodiles, by Rodney Steel. 1989. Christopher Helm, London. Distributed by David and Charles, Inc. North Pomfert, VT 05053, USA ISBN 0-7470-3008-3.

Rodney Steel's new book is an updated version of Neill's flawed, yet classic work, *Last of the Ruling Reptiles*. This book is divided into chapters that consider some of the dominant themes in crocodilian biology, including anatomy, systematics, paleontology, and conservation. The book is illustrated with line drawings and photographs, and geographic distribution maps for the extant species are provided.

The book is riddled with trivia and amusing anecdotes about crocodilians - for instance Steel (p. 9) points out that "The aborigines of northern Australia believe that the spirits of their forbears lived on in the crocodiles of the region (commonly the highly dangerous saltwater crocodile), and believed that in the past their ancestors had turned themselves into crocodiles by pushing a firestick up their rectums."

In general there is much to be critical of in this book, even though the targeted audience is not the professional herpetologist. To begin with, an arrangement that was more clearly systematic would be of benefit but instead Steel discusses the taxa in a mishmash of subjects and taxonomic groups. Many inexcusable mistakes include the premise that crocodilians are the only extant species of archosaurs. Even the Victorians considered the extant Archosauria to be composed of birds and crocodilians. In fact there are more extant species of avian archosaurs than all other groups of living and fossil archosaurs combined.

My own expertise is in crocodilian paleontology and evolution. Here, probably because of my knowledge about the subject, I find the omissions and the errors most troublesome. I am surprised by this because, if Steel is an expert on any subject contained in this book, crocodilian paleontology would be it. After all he compiled one of the most-used treatises on the subject (see Steel 1973). His depiction of crocodilian orgins (p. 3) is virtually identical to those proposed decades ago by a variety of workers and contains no phylogenetic information. Several resolved phylogenies have been proposed recently (i.e. Clark 1986; Benton and Clark 1988; Norell 1988; Densmore 1983), that depict the phylogeny of these taxa and give evidence for these relationships. His use of the grade levels of Protosuchia, Archeosuchia and Mesosuchia is a real blast from the past.

Steel also perpetuates the myth that crocodilians are living fossils and are essentially unchanged over the last 200 million years, yet further on he argues that the extant crocodilians are much more advanced than their Mesozoic relatives. I find it interesting that no extant genus can be identified farther back than the Oligocene, and even this should probably be revised to Miocene.

Several glaring errors concern specific fossils. On p. 38 Steel states that "The oldest eusuchian so far discovered appears to be *Hylaeochampsa*, which comes from the Hastings Sand of Sussex . . . The specimen was found by the famous 19th century physician Gideon Mantell . . . Unfortunately, the remains of *Hylaeochampsa*, contained in a nodule of ironstone, comprise only a dozen or so vertebrae that seem to be of characteristic eusuchian procoelus type, together with what looks like a cranium. It is not certain that the vertebrae and the fragmentary skull belong to the same animal, and the palatal structure cannot be elucidated to find out if the pterygoid bones contribute to the formation of the secondary palate."

Steel seems to have confused the type specimen of *Hylaeochampsa* with the poorly known *Heterosuchus*. These specimens were collected about 100 kilometers apart and in some literature have been synonomized (Romer 1956). The cranium of *Hylaeochampsa* is actually a very fine specimen (collected by Fox not Mantell), preserved in a fine clay (not ironstone), and from the Wealden Formation of the Isle of Wight (not the Hastings Sand near Hastings). The type specimen of *Hylaeochampsa* has been figured repeatedly for the past 115 years. The remarkable character of the palate makes this specimen a true eusuchian with unambiguous pterygoid contribution to the secondary palate.

Steel also cites that "of Lower Cretaceous age is a single procoelous vertebral centrum . . . which is probably crocodilian and hence eusuchian." This logic does not follow, because procoelus vertebrae are not unique to the Eusuchia (Norell and Clark, in press), they also occur in some Goniopholidids, atoposaurs (Steel 1973), and in the caudal vertebrae of *Bernissartia*, all taxa that Steel considers to be "mesosuchians." On p. 150, Steel figures a well-preserved skull with the caption "The fossil skull of a teleosaur *Steneosaurus bollensis*, from the Lower Jurassic of Holzmaden, Wurttemburg." In reality, this skull is a British Museum specimen of *Pelagosaurus typus* from Caen, France originally described and figured by Eudes Deslongchamps in a classic monograph.

These errors and the archaic systematics and format of the book render it of little use to the professional herpetologist or even informed amateur from my perspective. It should join the ranks of the not-too-scientific coffee table stack. One wonders, considering all of the errors, spurious interpretations, omissions, and dated material whether such a book does more harm than good.

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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to rteview herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology, and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations and photographs. Manuscripts submitted must be typed, double spaced, on 8.5X11 inch paper, and should be sent in duplicate. We encouerege submissions on Macintosh disks, though we can also work with TEXT (ASCII) files submitted on IBM and compatible floppies. **Herpetological Review** is composed on a Macintosh SE using Microsoft Word, which accepts files from several other word processor applications. Format your documents full-page width; we will fit to **HR** format. Unpublished photographs of an unusual nature or of uncommon amphibians or reptiles may also be submitted. These should be 8X10 inches black and white, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled lightly on the back of each print. Return of unsolicited photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs solicited by the Editor will be returned at our cost.

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Herpetological Review

Volume 21 June 1990 Number 2

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SSAR wishes to recognize the following members who have contributed to the financial resources of the Society for the year 1989. These contributions make it possible for the Society to provide benefits to the membership that otherwise would be impossible. Many thanks. Douglas H. Taylor, Treasurer.

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NEWSNOTES

ANATOMICAL RECONSTRUCTION PROGRAMME

A computer programme is currently being developed which will enable researchers to produce 3-dimensional reconstructions of solids from the outlines of sections. ANATRECON (= Anatomical Reconstructions) permits separation of parts by color, and the programme will work on all computers compatible with IBM PCs. English, Swedish, and German versions will be available. Anybody who is able to work with any standard word processor will be able to use this programme. The price of the programme is DM 2000.

For further information, contact Dr. Zbynek Rocek, Department of Paleontology, Charles University, Albertov 6, Prague 2, 12843 Czechoslovakia. ●

GOPHERUS LIBRARY ESTABLISHED

A library has been established at Archbold Biological Station near Lake Placid, Florida, for the purpose of accumulating, indexing, and disseminating information on all aspects of the biology of tortoises of the genus *Gopherus*. It is hoped that the new *Gopherus* Library will become a comprehensive repository for information on all four living species in this genus.

The nucleus of the literature collection thus far consists of all of the references cited in an earlier bibliography and supplement on the genus (Douglass 1975, 1977), totaling 644 entries. A detailed subject code is available for these references.

Mailings of reprints and of informal research reports are solicited. Photocopies of difficult-to-obtain articles will be made available to participants at a nominal fee (i.e., at cost). Mailings should be directed to: *Gopherus* Library, c/o Mr. F. E Lohrer, Librarian, Archbold Biological Station, Lake Placid, FL 33852, USA.

Should participation and interest be sufficient, preparation of a second bibliographic supplement may be considered at some time in the future. This would include a detailed subject index to the contents of material appearing since the 1975 and 1977 installments. ●

PELOBATIDAE RESEARCH GROUP

A Pelobatidae Research Group is forming for facilitating exchange of information via workshops and newsletter. The purpose of the group is to encourage comparative research on different species of Pelobatidae and to improve and develop methodologies. A list of "who's who" in Pelobatidae research is being prepared and will be distributed among PRG members. For further information contact: Sarig Gafny, Institute for Nature Conservation Research, Tel-Aviv University, Ramat-Aviv 69978, Israel (Fax. No. 972-3-5413752) ●

WILDLIFE REHAB GRANTS

The National Wildlife Rehabilitators Association announces its small grants program. This program makes available two $1,000 research grants in the field of wildlife rehabilitation. Each may be applied to one large project or several smaller research projects each totaling less than $1,000.00. Applicants must demonstrate financial need and submit a typewritten proposal that includes: name(s) and resume of personnel involved, objectives of the project, a brief description of how the project will be carried out, a brief literature review and an itemized budget.

An annual report on progress is required. It is expected that those receiving NWRA support will present the results of their projects at an NWRA national meeting within 2 years of receipt of the grant.

The deadline for submitting proposals for research grants is **December 15** of each year. Recipients will be announced at the NWRA annual meeting in February and in writing.

Proposals should be submitted to: Mark Pokras, DVM, Tufts University School of Veterinary Medicine, Wildlife Clinic, 200 Westboro Road, North Grafton, MA 01536, USA. ●

MEETINGS

ASZ ANNUAL MEETING

The 1990 Annual Meeting of the American Society of Zoologists with the American Microscopical Society, Animal Behavior Society, The Crustacean Society, International Association of Astacology, and Society of Systematic Zoology will be held at the Marriott Rivercenter Hotel in San Antonio, Texas, during the traditional post-Christmas period, 27-30 December.

An *August 1* deadline for receipt of abstracts of papers (oral or poster presentations) has been set. Posters are particularly encouraged.

Symposia and workshops presently scheduled are: (1) Mechanisms of Mate Choice, (2) Neural Aspects of Reproductive Endocrinology: Old Questions, New Approaches, (3) Neuroendocrine Strategies in a Tropical Environment, (4) Animal Immunity: Bio-

markers for Assessment of Risks from Environmental Xenobiotics, (4) Amphibian Metamorphosis, (5) The Complete Crab: Physiological Ecology of Everyday Life and Special Events, (6) The Evolution of Viviparity in Vertebrates, (7) Life History and Evolution in Uncertain Environments, (8) New Perspectives in Marine Soft-bottom Ecology, (9) Amphibian Relationships: Phylogenetic Analysis of Morphology and Molecules, (10) Ecological Morphology: Integrative Approaches in Organismal Biology, (11) Development and Macroevolution, (12) Computational Approaches to Comparative Neurobiology (ASZ), (13) "Aschelminthes" Revisited: A Refresher Course (AMS), (14) Animal Care and Use Committees in Zoological Research Departments (ASZ), and (15) History of Carcinology (TCS).

Meeting plans include an art exhibit, films and special programs on (1) Biologists and the Media, (2) The Process of Publishing Papers, and (3) Improving Visual Communications in Science: Posters, Slide Presentations and Quantitative Data Displays. Several socials, commercial exhibits, a Job Placement Service and a Babysitting Service will be arranged. The Housing and Registration deadline is November 15; forms will be available in early October.

This meeting is hosted by Trinity University and University of Texas Health Science Center with Thomas L. Koppenheffer and Mary K. Vaughan co-chairing the Local Arrangements Committee.

For more information contact: Mary Adams-Wiley, Executive Officer, American Society of Zoologists, 104 Sirius Circle, Thousand Oaks, CA 91360; FAX (805) 492-0370, telephone (805) 492-3585. ●

S. E. H. MEETING
BUDAPEST • 1991
First Announcement

According to the decision of the 5th Ordinary General Meeting held in Canterbury, UK, the 6th meeting of the Societas Europaea Herpetologica is to be held in Budapest in 1991.

Meeting Place: House of Agricultural Societies ("Hotel Agro"), Budapest, Hungary.

Date: 19-23 August 1991.

All previous S.E.H. traditions will be followed, i.e., four days of two concurrent scientific sessions, one day of field excursions, poster sessions, roundtables and workshops, technical facilities, etc. Room accomodations will be offered on three different price levels, according to demand.

A circular will be sent to those who wish to participate in the meeting. Request before 1 September 1990, at this address: Dr. Zoltán Korsós, Zoological Department, Hungarian Natural History Museum, H-1088 Budapest, Baross u. 13, Hungary.

NEW ZEALAND HERPETOLOGY MEETING

The Society of Research on Amphibians and Reptiles in New Zealand (SRARNZ) will hold an AGM and Conference in Whitianga, New Zealand, 24-27 November 1990. Field trips are planned to sites where two species of native frogs (*Leiopelma*) occur and to the Mercury Islands, where the tuatara and ten lizard species occur.

Contact Dr. David Towns, Conservation Sciences Centre, Department of Conservation, Box 10-420, Wellington, New Zealand ●

REGIONAL SOCIETIES

SIXTH ANNUAL MIDWEST HERPETOLOGICAL CONFERENCE

The Sixth Annual Midwest Herpetological Conference, hosted by the Minnesota Herpetological Society, will be held in Minneapolis, Minnesota at the J.F. Bell Museum of Natural History on 12-14 October 1990.

The planning committee has worked with the University's Bell Museum and the Nongame Wildlife Program to develop an exciting program. The program includes talks and displays on the conservation, propagation, and natural history of amphibians and reptiles that are of interest to persons in the Midwest.

For registration information please write to: 1990 Midwest Conference, Minnesota Herpetological Society, Bell Museum of Natural History, 10 Church St. S.E., Minneapolis, MN 55455, USA. ●

CHICAGO HERPETOLOGICAL SOCIETY $2000 PRIZE COMPETITION

The Chicago Herpetological Society is looking for high quality, original material not elsewhere published that deals with various aspects of herpetology. Towards this end the Society is offering cash prizes for the best material to appear in Volume 25 (1990) of the CHS *Bulletin*, a monthly publication. The following four prizes will be awarded:

$1000 for the best article
$500 for the second place article
$250 for the third place article
$250 for the best black & white photograph or drawing

Article topics could be, but are not limited to: captive breeding and husbandry; a faunistic survey or other field work; an historical account of herpetologists or the animals they studied; or an exciting personal adventure in herpetology. Articles must be typed double spaced, have adequate margins, and be submitted in duplicate. Articles submitted in the form of an ASCII file on a floppy disk would be greatly appreciated. Photographs submitted with or without articles must be 5x7 inches (or larger), glossy, black & white prints. Data on the subject must accompany the photograph in a typed caption of less than 100 words.

Submission of articles and photographs gives the CHS the right to publish the material. Awards will be announced in the February 1991 *Bulletin*. All material should be submitted to: Publications Secretary, Chicago Herpetological Society, 2001 N. Clark Street, Chicago, IL 60614. ●

FEATURES

ON THE LEGAL STATUS CONCERNING THE PROTECTION OF AMPHIBIANS AND REPTILES IN GREECE

It is a well known fact that human populations can greatly influence the populations of amphibians and reptiles. For the last 15 years European research has verified that there has been a dramatic decline in amphibian populations, which varies in different ecosystems (Honegger 1978). According to Stumpel & Podloucky (1984) the amphibians and reptiles have a small radius of action, and accordingly, a smaller habitat. This implies that even small-scale human activities can influence these habitats on a large scale.

Amphibians and reptiles are exposed to a wide variety of threats, such as modern agriculture, drainage and flooding and road construction. In addition, chemical pollution of water and soil have negatively affected many species (Heusser 1974; Wermuth 1975; Berger 1987). In response to this, a series of laws and international treaties has been developed to protect certain amphibians and reptiles. This paper presents the legal status of amphibians and reptiles in Greece. Some proposals concerning the improvement and more effective applicability of the existing laws are also presented.

The Greek fauna includes 16 amphibian and 52 reptilian species (Sofianidou 1980, 1988) (Table 1). Greece is considered to have one of the richer herpetofaunal assemblies in Europe due to the large number of species as well as the large populations. However, the destruction of biotopes, as well as the uncontrolled collection and trade of some species, have created many problems (Asimakopoulos 1989).

For the last 15 years, the Greek government has tried to renew the legal status concerning the protection of the environment. The main law for the protection of nature is the N.1650/86. According to it, protected species can be designated by competent ministers. However, amphibians and reptiles are not protected under this law. More comprehensive protection is given by the presidential order 67/80 (ΦE.K. A/23/30-1-81) "for the Protection of the Indigenous Flora and Wild Fauna." It includes 10 amphibians and 38 reptiles (Table 1). Special care is given to marine turtles. Presidential order 617/80 (Φ.E.K. Α΄ 163/18-7-80) gives protection to three species: *Caretta caretta, Chelonia mydas* and *Dermochelys coriacea*. Two ministerial orders concerning *Caretta caretta* were also published as a result of public pressure: 88208/3723 (Φ.E.K. Δ΄37/29-1-87) and 18670/777/29-2-88 (Φ.E.K. Β΄137/10-3-88). These decisions protect the egg-laying beaches in Zakynthos Island.

In addition to these national laws, the Berne Convention (Convention on the Conservation of European Wildlife and Natural Habitats, 19-9-83) was signed by Greece and has the power of law after 1-10-83 [law N.1335 (Φ.E.K. A' 32/14-3-83)]. European Parliament has also published two rules enforced in Greece, as well as in the other countries of European Economic Community (E. E. C.) Rule 3626/82 is for the international trade of endangered species, while rule 3418/83 establishes some procedural matters concerning the application of the former rule. In the appendices of these two rules 9 species are included, which belong to Greek herpetofauna: 3 tortoises, 1 lizard, 3 marine turtles and 1 snake (Table 1).

It is worth mentioning the Ramsar Convention (Convention on Wetlands of International Imporance) held at Ramsar, Iran on 2-2-71. In Greece, it is in power, since 1974, with the law N.191/19-11-74 (Φ.E.K. 350/A/74). According to this law 13 Greek wetlands of international interest are protected. This represents an additional, indirect but essential legal protection to the populations of amphibians and reptiles inhabiting these wetlands.

A notable point is that, with the exception of the ministerial decisions for *Caretta caretta*, the laws are much too general. They also do not cover an important part of the Greek herpetofauna. Species that have been classified by the Conservation Committee of S.E.H. as "threatened" (Stumpel & Podloucky 1984) are not included in the appendices of the laws. But the most serious problem is that the laws are not enforced except on some occasions concerning *Caretta caretta* when the laws worked only under the pressure of public opinion. *Caretta caretta* is the most famous reptile species in Greece today and its conservational problems are well known, thanks to the members of "Sea Turtle Protection Society" (Margaritoulis D. 1982, Veniselou E.L. 1987, Arianoutsou M. 1988).

The main reason for this ineffectuality of laws comes from the lack of information among people, state services and civil authorities. So, the collection of all species for scientific purposes is completely uncontrolled. This happens even in areas with special protection status, such as the national parks and the wetlands included in the Ramsar Convention. It is also a very common phenomenon that tourists collect tortoises for pets or for human consumption and that frogs are taken for the delicatessen trade.

It is also worth mentioning the remarkable and profitable trade in frogs for food in Greece. Every year large quantities of frog legs, fresh or canned, are exported to Western Europe. The collection concerns the species *Rana ridibunda, Rana epeirotica* and their hybrids and takes place by agreement of the ministers of Agriculture and commerce. For example, in 1988 the E4/2597/91 3/23-5-88 decision was published which allowed the collection and exportation of 70 tonnes of frogs during the period 1-6-88—31-10-88. The mass of each collected specimen was supposed to be at least 80 g. But the restrictions were very difficult to enforce because of the poor control by the services of Ministry of Agriculture.

From time to time, licences have been also given for collection of small numbers of the tortoises *Testudo graeca* and *Testudo hermani*. Two cases of illegal collection and exportation of these species have been reported. These specimens were returned to Greece thanks to the efforts of customs of Holland.

In view of the above, it follows that there is a need to improve the legal protection of additional amphibians and reptiles in Greece, particularly those species which are included in the appendix of the Conservation Committee of S.E.H. (Stumpel & Podloucky 1984). To be more concrete, a special ministerial order with a complete list of protected amphibians and reptiles must be developed and the N.1650/86 must be activated. That ministerial order must prohibit the collection, trade and destruction of habitats of the species (except on specified occasions) and must also provide penalties for the transgressors.

There is also a strong need to inform all the relevant services (Ministries of Environment, Agriculture, Commerce and Navigation) and the civil authorities about the present laws concerning the protection of amphibians and reptiles. It is also important to alert all involved in the vacation trade that there are laws in force which protect native amphibians and reptiles and that it is illegal to take or export certain taxa.

Yet the real need remains: to make the public sensitive to these matters because public opinion is the only way to achieve strict laws and then to enforce them.

AMPHIBIA		
Salamandridae		
Salamandra salamandra	*	
Mertensiella luscani	*	
Triturus alpestris	*	
Triturus cristatus		
Triturus vulgaris	*	
Discoglossidae		
Bombina variegata		
Bombina bombina		
Pelobatidae		
Pelobates syriacus	*	
Bufonidae		
Bufo viridis	*	
Bufo bufo	*	
Hylidae		
Hyla arborea	*	
Ranidae		
Rana dalmatina	*	
Rana graeca	*	
Rana temporaria		
Rana ridibunda		
Rana epeirotica		
REPTILIA		
Testudines		
Testudinidae		
Testudo graeca	*	**
Testudo hermani	*	**
Testudo marginata	*	**
Emydidae		
Emys orbicularis	*	
Mauremys caspica	*	
Cheloniidae		
Caretta caretta	*	**
Chelonia mydas	*	**
Dermochelidae		
Dermochelys coriacea		**
Squamata		
Lacertilia		
Gekkonidae		
Cyrtodactylus kotschyi	*	
Hemidactylus turcicus	*	
Tarentola mauretanica	*	
Agamidae		
Stellio stellio	*	
Chamaeleonidae		
Chamaeleo chamaeleon	*	**
Anguidae		
Anguis fragilis	*	
Ophisaurus apodus		
Lacertidae		
Algyroides moreoticus	*	
Algyroides nigropunctatus	*	
Lacerta trilineata	*	
Lacerta viridis	*	
Lacerta danfordi		
Lacerta graeca	*	
Lacerta praticola		
Ophisops elegans	*	
Podarcis erhardii	*	
Podarcis milensis	*	
Podarcis muralis	*	
Podarcis peloponnesiaca	*	
Podarcis taurica	*	
Scincidae		
Ablepharus kitaibeli		
Chalcides ocellatus	*	
Mabuya aurata		
Ophiomorus punctatissimus	*	
Amphis		
Amphisbaenidae		
Blanus strauchi		
Serpentes		
Typhlopidae		
Typhlops vermicularis		
Boidae		
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Colubridae		
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Coluber najadum	*	
Coluber ravergieri		
Coluber austriaca	*	
Eirenis modestus		
Elaphe quatuorlineata	*	
Elaphe longissima	*	
Elaphe situla	*	
Malpolon monspessulanus	*	
Telescopus falax	*	
Natrix natrix	*	
Natrix tesselata	*	
Viperidae		
Vipera ammodytes		
Vipera lebetina	*	
Vipera xanthina		
Vipera berus		

Table 1. List of the amphibian and reptilian species of Greece. The mark (*) shows the species included in presidential order 67/80, while the mark (**) shows those protected by E.E.C. rules.

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HELMINTH PARASITES INDICATE PREDATOR-PREY RELATIONSHIPS IN DESMOGNATHINE SALAMANDERS

Many ecologists overlook the potential for using the presence or absence of helminth parasites as biological indicators of trophic interactions between free-living animals. Many helminth species have complex life cycles and commonly exploit food web relationships, particularly predator-prey interactions, to effect their transmission. Consequently, the presence of certain parasites can provide valuable information on the feeding habits and patterns of habitat use of their hosts. In this report I review information on larval helminth parasitism that indicates predator-prey relationships involving desmognathine salamanders in mountain streams of the southeastern United States. In addition, new data are presented relating parasite transmission dynamics to features of desmognathine ecology.

Leurognathus marmoratus, Desmognathus quadramaculatus, D. monticola and *D. ochrophaeus* form a series, inhabiting an ecological gradient spanning aquatic to terrestrial habitats (Dunn 1926; Hairston 1949, 1986; Martof 1962). Progressive reductions in body sizes and duration of larval period accompany increasing terrestrialism. *Leurognathus marmoratus* is the most aquatic of the four species. Within the genus *Desmognathus*, there is an evolutionary trend towards terrestrialism. *Desmognathus quadramaculatus* is the largest and most aquatic of the three congeners; *D. ochrophaeus* is the smallest and most terrestrial, and *D. monticola* is intermediate in body size and degree of terrestrialism. Tilley (1968) and Hairston (1980, 1986) stress the importance of predation as the predominant force underlying the evolutionary trend of terrestrialism in *Desmognathus*. They argue that predators of salamanders are more common in streams than in the forest. Accordingly, there has been strong selective pressure on salamanders to become more terrestrial, thus reducing the effect of predation by large aquatic salamanders and fish. Hairston (1986) demonstrated that *D. ochrophaeus* is an important prey species for larger congeners. However, few investigators have commented on the presence of other vertebrate predators of salamanders (but see Forester 1978; Hairston 1980).

Goater et al. (1987) studied the helminth parasites of desmognathine salamanders from southern Appalachian mountain streams in the Nantahala National Forest (Macon County, NC). They demonstrated that parasite distributions in these four salamander species could be correlated with host size (age), diet and habitat preferences. In their study, three larval parasite species were recovered from metamorphosed salamanders. Included were two trematodes, *Didelphodiplostomum desmognathi* (Rankin) (=*Diplostomulum desmognathi*) and *Metagonimoides oregonensis* Price, and larvae of an unidentified ascaridoid nematode. *Didelphodiplostomum desmognathi* is an intestinal fluke which uses the opossum, *Didelphis virginiana*, as its definitive host (Miller and Harkema 1970), while *M. oregonensis* matures in raccoons, *Procyon lotor*, and mink, *Mustela vison*, in North Carolina (Harkema and Miller 1964; Miller and Harkema 1964). The larval nematode is believed to mature in reptiles (Fischthal 1955), possibly ringneck snakes, *Diadophis punctatus*, which were observed around streams and seepages in the areas sampled and have been implicated as potential predators of desmognathine salamanders (e.g. Forester 1978).

The prevalence of nematode larvae in *D. quadramaculatus, D. monticola* and *D. ochrophaeus* was 7.8, 11.2 and 1.9% respectively. Metacercariae of both trematode species were recovered from >70% of the *L. marmoratus* and *D. quadramaculatus* collected from Curtis Creek, a stream containing their first intermediate host, the gastropod, *Goniobasis proxima*. Host specificity was evident since none of the *D. monticola* (n = 125) and *D. ochrophaeus* (n = 107) harbored trematode larvae. The short, 9-10 month larval periods of these latter two salamander species (Bruce 1989) may facilitate host specificity by preventing long-term exposure to penetration by trematode cercariae. Moreover, the larvae and adults of *D. ochrophaeus* and *D. monticola* are found mostly in seepages and springs and so are not in ecological overlap with the cercariae released from *G. proxima* found in strongly rheocolous microhabitats in streams. When Curtis Creek was resampled during the summer of 1988, 100% of the larvae of *L. marmoratus* (n = 6) and *D. quadramaculatus* (n =8), harbored metacercariae of both trematodes. Thus, cercariae of these trematodes are shed from snails in streams and accumulate as metacercariae during the prolonged three or four year larval periods (Bruce 1985, 1988) of these two primarily aquatic species. Prevalence and density of the parasites are high because of this long-term feature of transmission dynamics.

This study emphasizes the importance of understanding host biology and parasite specificity before interpreting data as evidence of predator-prey interactions. For example, errors in larval selection often lead into "dead-ends." That is, some hosts may be physiologically appropriate for the development of a parasite but do not present the ecological circumstances to make the parasite available to the next host. Since neither parasite has been reported from fish and none was recovered during necropsy of two fish species (*Cottus bairdi, Salmo gairdneri*) in Curtis Creek, this is not a likely transmission route.

Larvae of several anuran and salamander species are capable of acting as second intermediate hosts for *M. oregonensis*, under laboratory conditions (e.g. Lang and Gleason 1967). However, in Appalachian streams anurans are rarely found and only those salamander species which are in ecological overlap with *G. proxima* can be infected. Thus, salamanders are not "dead-ends" for these trematodes; infecting aquatic salamanders is the only mode of transmission to infect mammals and account for the observation of infected snails in streams.

Host-parasite interactions may represent a long-standing coevolutionary relationship (Price 1980). The evolution of complex life cycles in helminth parasites often implies an intimate coevolutionary history between predator and prey. Since the larval helminths described herein use salamanders as intermediate hosts, it is clear that desmognathine salamanders are currently a prey source for certain mammalian predators (and possibly snakes) along mountain streams of the southeastern United States. Moreover, it is evident that transmission dynamics of the parasite species are closely linked to aquatic habitats. This observation is significant for it supports Hairston's (1980, 1986) notion that predation pressure is greater in streams than in adjacent terrestrial habitats.

I suggest that investigators incorporate knowledge of the biology of helminth parasites as an additional basis for understanding the evolutionary ecology of vertebrates. Information provided by parasites is particularly valuable for vertebrates which are secretive, nocturnal or fossorial (certainly the majority of amphibians and reptiles) as field observations are not easily made. Even in such a well-studied group as the desmognathine salamanders, the presence of larval parasites has provided an effective means for tracing current food web relationships.

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AN EARLY REPORT OF ENVIRONMENTAL TEMPERATURE CONTROL

Reviews of environmental temperature control of "ectotherms" suggest that this phenomenon was discovered through the efforts of R.B. Coles and C.M. Bogert and first reported in a series of seminal papers in 1938 and 1939. Some time later, it was noted that Sergeyev had published on the issue two years earlier; however, the paper remained unknown to non-Russian speaking scholars.

As part of a literature search on an unrelated topic, I stumbled across a German paper by Paul Krüger (1929). It reports on experiments mainly carried out in the early 1920s and apparently unknown to and uncited by the authors of the more recent studies.

Krüger documented (1) that poikilotherm "skin" absorbed various wave lengths (of light) differentially and (2) that the depth of penetration of the energy involved differed with wave length. He (3) noted numerous cases in which pigmentation patterns reflected absorptivity and (4) showed that the pigmentation changes occurred in animals apparently as part of an adaptive regime. Measurements of wave length and absorption proceeded with the appropriate physical techniques, although description of the equipment documents how much easier many of these measurements have now become. Issues such as the lag time of thermometers were discussed.

The studies also (5) document the (negligible) effect of the heat storage within the animal, and of conduction and convection, and (6) the substantial potential for heating of the animal due to reradiation from the surface. Animals were exposed to sources of heat throughout the day and their body temperatures correlated with details of the rapidly changing radiation regimen, measured by thermocouples.

Krüger is known for the "discovery" that amphibian muscle contained both fast and slow fibers, a discovery that was ignored for many years, although it is now unquestioned. I suspect that it was this second discovery that led him to depart from further analyses that would inevitably have convinced him of the generality of the preferred temperature phenomenon, which is alluded to here but not stated explicitly.

The point of reviewing the paper this late is not just to note the priority of discovery; this can hardly be important to any of the people involved. Rather it seems useful to note again that the careful observations and experiments reported in the older literature retain the potential for providing insights into significant, and sometimes overlooked, natural phenomena.

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FEEDING ECOLOGY OF THE SIX-LINED RACERUNNER (*Cnemidophorus sexlineatus*) IN SOUTHERN FLORIDA

Although information is available on the feeding ecology and dietary preferences of many species of North American teiid lizards (Milstead 1957; Mitchell 1979; Best and Polechla 1983; Pianka 1986; Smith 1989), there are relatively little data available for the six-lined racerunner, *Cnemidophorus sexlineatus,* in southern and central Florida (Wilson and Porras 1983). Previous studies have focused on the natural history of populations from the central and western boundaries of its range (Fitch 1958; Hardy 1962; Clark 1976) as well as from South Carolina (Bellis 1964). Mushinsky (1985) provided information concerning the effects of fire on population densities of *C. sexlineatus* from the Tampa area. This study provides information on stomach content analyses for *C. sexlineatus* from Hillsborough County, Florida.

All animals were collected during June through August, 1988-1989, by noosing or though the use of pitfall traps as described previously by Punzo (1974a, b) and Mushinsky (1985). Pitfall traps were checked daily. The lizards studied were adult males and females (54.1 - 61.1 mm SVL). The study site was located near Lettuce Lake Park, Hillsborough County, Florida (28° 06'N, 82° 21'W) and consisted of a well-drained sandy substrate which supported xerophytic vegetation including turkey oak (*Quercus laevis*), live oak (*Q. geminata*), slash pine (*Pinus palustris*), saw palmetto (*Serenoa repens*), grasses (*Andropogon* spp., *Aristida stricta*), legumes (*Baptista lecontei*) and composites (*Aster* spp.).

Following capture, lizards were taken to the laboratory where they were measured, weighed and sexed. Stomach contents were collected using the stomach-flushing technique described in detail by Legler and Sullivan (1979). Following this procedure, most lizards were given individual identification numbers by toe clipping and released at the original site of capture for future demographic studies. Voucher specimens were deposited in the Vertebrate Collection at the University of Tampa (UTMC 1127-1143). Only lizards captured for the first time were used in stomach analyses. Prey items were identified to Order and Family wherever possible.

The results (number of prey, proportion of total sample, percent volume and frequency) are listed in Table 1. There were no significant differences between sexes (Chi Square, $p > 0.25$) or between the years and months during which sampling was conducted (Two Sample Means Test, assuming unequal variance, $p > 0.15$; Sokal and Rohlf 1981). About 96% of all arthropod prey items are associated with a terrestrial or fossorial habitat whereas only about 4% represents arthropods commonly found above the ground. This suggests a strong preference for terrestrial foraging in this species, at least from this study area.

Individuals consumed a wide variety of ter-

restrial arthropods. Termites (Isoptera) alone accounted for ca. 49% of the total number of prey items and were found in 97.8% of all stomachs examined. Although termites are frequently abundant over very short time intervals due to species-specific emergent patterns of reproductives, no significant seasonal differences were found in the percent composition of any prey items during the course of this study. Thus, termites represent an important component of the diet for *C. sexlineatus* during summer months in southern Florida.

Over 50% of the stomachs examined contained carabid, scarabaeid and tenebrionid beetles, lepidopteran larvae, orthopterans such as gryllids and tettigoniids, and spiders. The majority of prey biomass (expressed as percent volume) was contributed by carabid and scarabaeid beetles, termites, crickets and other unidentified Orthoptera, and spiders. Although Isoptera have been found to be a major dietary component in other populations of *C. sexlineatus* over shorter seasonal periods (Fitch 1958; Hardy 1962) as well as in other North American teiids, the degree of representation of other insect and arthropod taxa can vary (Best et al. 1983; Anderson and Karasov 1988). This may reflect differences in arthropod species diversity between different geographical regions. The larvae of elaterid, scarabaeid and carabid beetles are generally found just beneath the ground surface, under rocks or beneath leaf litter and yet were readily found and consumed. Most of the spiders found in the stomachs of *C. sexlineatus* were ground-dwelling, wandering types such as diurnal lycosids and oxyopids (Punzo 1989). Spiders which are associated with flowers or found above ground, such as thomisids, orbweavers, salticids and theridiids, which were observed to be very common in the study area, were not found in any of the stomachs examined. In addition, commonly occurring ground-dwelling insects and other arthropods with well-known chemical defenses such as blister beetles (Meloidae), velvet ants (Mutillidae) and millipedes, were also excluded.

Table 1. Analysis of stomach-flush samples from *Cnemidophorus sexlineatus*. A total of 92 stomach samples from different lizards were analyzed, all containing food. The results are expressed as number of prey, proportion of total sample, percent volume and frequency (percent of lizard stomachs containing a particular prey item). There were no significant differences in dietary composition as a function of season, year or sex.

Prey Category[1]	Number of prey	Percent total number	Percent by volume	Percent frequency
Coleoptera				
Carabidae (L)	8	0.07	3.2	7.6
(A)	28	2.6	27.1	92.3
Cicindelidae (A)	16	1.5	1.7	6.5
Elateridae (L)	12	1.1	1.1	2.1
Scarabaeidae (L, A)	11	1.0	7.8	63.0
Silphidae (A)	2	0.01	0.1	2.1
Tenebrionidae (A)	5	0.04	0.1	4.3
Unidentified (L, A)	50	4.7	9.3	77.1
Diptera (A)	6	0.05	0.5	6.5
Hemiptera				
Coreidae (N)	3	0.02	0.4	5.4
Membracidae (N, A)	4	0.03	0.1	4.3
Reduviidae (N, A)	2	0.01	0.1	2.1
Homoptera				
Cicadellidae (N)	3	0.02	0.1	3.2
Cicadidae (N)	8	0.07	0.3	8.6
Hymenoptera				
Apoidea (A)	2	0.01	0.1	2.1
Formicidae (A)	29	2.7	3.3	43.4
Isoptera (A)	512	48.8	9.2	97.8
Lepidoptera (A)	8	0.07	2.5	8.6
(L)	57	5.4	3.1	55.4
Neuroptera				
Myrmeleontidae (L)	4	0.03	0.1	4.3
Orthoptera				
Acrididae (N, A)	28	2.6	3.4	20.6
Blattidae (N)	4	0.03	0.7	4.3
Gryllidae (N, A)	30	2.8	4.5	47.8
Gryllotalpidae (N)	12	1.1	0.5	13.0
Tettigoniidae (N, A)	3	0.02	0.1	3.2
Unidentified (N, A)	72	6.8	10.4	76.0
Araneae	84	8.0	9.4	95.6
Acarina	45	4.2	0.8	31.5
Total:	1048			

[1]Prey categories: L (larvae), N (nymphs), A (adults)

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TECHNIQUE

MAGNETIC LABEL HOLDERS FOR METAL SHELVES

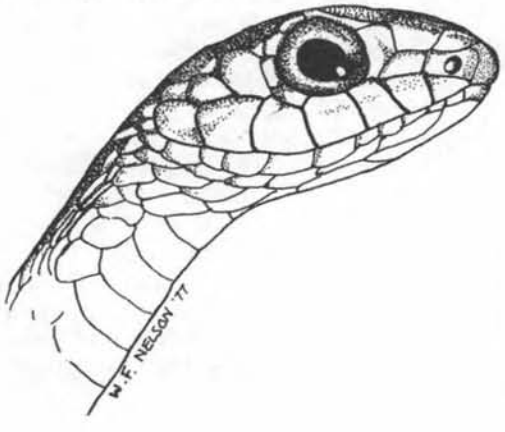
Metal shelves are widely used for storing jars containing specimens preserved in fluid. This note describes a label system that allows the shelf labels to be moved easily to allow for growth and expansion.

Clear, plastic-tube label holders, six in. long, from ½ to 1½ in. high, and with adhesive strips for mounting, are available from several library supply catalogs (I used those from Highsmith Co., P.O. Box 800, Fort Atkinson WI 53538). Thin, flexible sheets of rubberized magnetic material are available locally from businesses specializing in automobile and truck door signs. Strips from this sheet-magnet can be cut easily and stuck to the adhesive strip of the label holders. The label holders can be cut to required length with scissors or a paper cutter.

Paper labels in large type (18, 24, 30 point or larger) can be printed with a laser-jet printer, and slipped in the label holders. Using the thick paper label stock supplied with the label holders provides bulk inside the label holders and prevents the thin, printed labels from falling out. It is efficient to first prepare the label holders with magnetic strip and paper insert at their full length before trimming them for the printed labels.

The result is a magnetic label that can be read at a distance and moved as the collection is rearranged. These magnetic label holders are useful wherever metal shelves or metal cabinets are used except in collections accessible to the general public where the temptation to rearrange or remove the label holders might be great.

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GEOGRAPHIC DISTRIBUTION

HERPETOLOGICAL REVIEW publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of a species' range, and thereby permit a more significant interpretation of its biology.

These geographic distribution records will be accepted in a **standard format** only, and all authors *must* adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in Collins, 1990, *Standard Common and Current Scientific Names for North American Amphibians and Reptiles, Third Edition*, Herp. Circ. 19: 1–41), LOCALITY (use metric for distances), DATE (day-month-year), COLLECTOR, VERIFIED BY (cannot be verified by an author — curator at an institutional collection is preferred), PLACE OF DEPOSITION (where applicable, use standardized collection designations as they appear in Leviton et al., 1985, *Standard Symbolic Codes for Institutional Resource Collections in Herpetology and Ichthyology*, Copeia 3: 802–832) AND CATALOG NUMBER (required), COMMENTS (brief), CITATIONS (brief), SUBMITTED BY (give name and address in full — spell out state names — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged; institutional collection records will receive precedence in case of conflict). A good quality color slide or photograph may substitute for a preserved specimen only when the live specimen could not be collected (e. g. it was a protected species, it was found in a protected area, or the logistics of preservation were prohibitive such as large turtles or crocodilians). Color slides and photographs *must* be deposited in a university or museum collection along with complete locality data, and the catalog number(s) must be included in the same manner as a preserved record. All specimen identifications must be verified by another authority (not one of the authors).

Please submit any geographic distribution records in the **standard format only** to: Joseph T. Collins or Darrel Frost, Section Co-editors, Museum of Natural History — Dyche Hall, The University of Kansas, Lawrence, Kansas 66045-2454 USA. Short manuscripts are strongly discouraged, and are only acceptable when data cannot be presented adequately in the standard format.

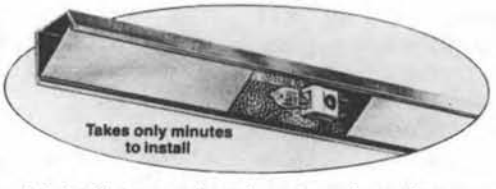
Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic Distribution: *Lampropeltis triangulum multistriata*. SSAR Herp. Review 19: 100.

CAUDATA

AMBYSTOMA JEFFERSONIANUM (Jefferson Salamander). USA: OHIO: Ashtabula Co: Trumbull Twp. (41° 42' 33 "N, 80° 53' 03" W). 28 March 1989. T. O. Matson. Verified by



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R. A. Pfingsten. Cleveland Museum of Natural History (CMNH 4776). New county record (Pfingsten & Downs, Eds. 1989, The Salamanders of Ohio).

Submitted by **TIMOTHY O. MATSON**, Department of Vertebrate Zoology, Cleveland Museum of Natural History, Wade Oval, University Circle, Cleveland, Ohio 44106.

AMBYSTOMA PLATINEUM (Silvery Salamander). USA: OHIO: Lake Co: Concord Twp. (41° 39' 57' N, 81° 11' 57" W). 4 April 1989. T. O. Matson & M. J. Rosenberg. Verified by R. A. Pfingsten. Cleveland Museum of Natural History (CMNH 4774). New county record (Pfingsten & Downs, Eds. 1989, The Salamanders of Ohio).

Submitted by **TIMOTHY O. MATSON**, Department of Vertebrate Zoology, Cleveland Museum of Natural History, Wade Oval, University Circle, Cleveland, Ohio 44106.

AMBYSTOMA TALPOIDEUM (Mole Salamander). USA: NORTH CAROLINA: Montgomery Co: 6.8 km S Troy & 8.2 km SW Troy. 11 June 1987. A. L. Braswell. Verified by W. M. Palmer. NCSM 28660 (6 larvae), NCSM 28664 (3 larvae), respectively. New county record, and extends range ca. 47 km ENE of the nearest recorded locality (Braswell & Murdock 1979, Brimleyana 1: 135–139). This species was first found at the site 8.2 km SW Troy by H. M. Wilbur and A. S. Weakley on 18 April 1985. Both sites are natural upland pools on clay hardpans.

Submitted by **ALVIN L. BRASWELL**, North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, North Carolina 27611, **HENRY M. WILBUR**, Department of Zoology, Duke University, Durham, North Carolina 27706, & **ALAN S. WEAKLEY**, North Carolina Natural Heritage Program, P. O. Box 27687, Raleigh, North Carolina 27611.

AMBYSTOMA TALPOIDEUM (Mole Salamander). USA: NORTH CAROLINA: Richmond Co: 21.7 km WNW Ellerbe. 27 April 1988. A. L. Braswell. Verified by W. M. Palmer. NCSM 29190, larva. New county record; extends range ca. 34 km ESE from a Union County site (Braswell & Murdock 1979, Brimleyana 1: 135–139), and about 26 km SSW from a Montgomery County site (Braswell, et al. 1990, SSAR Herp. Review—this issue). Five breeding sites, all located in the Yadkin/Pee Dee River drainage, are currently known for this species in the Piedmont of North Carolina. Curiously, in North Carolina, *A. talpoideum* continues to be known only from the Mountains and Piedmont, where it appears to occur in widely separated, disjunct populations.

Submitted by **ALVIN L. BRASWELL**, North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, North Carolina 27611.

AMBYSTOMA TALPOIDEUM (Mole Salamander). USA: SOUTH CAROLINA: Greenville Co: 11.6 km NNW Greenville. 17 March 1982. Kevin P. Quinlan. Verified by Raymond D. Semlitsch. Furman University Zoological Collections (FUZC 545). Second reported population in county and first for Armstrong Creek drainage; 8 km NNW Greenville. 5 February 1989. William R. Teska. Verified by Trip Lamb. Furman University Zoological Collections (FUZC 11088). Same location as that of Murdock & Braswell (1985, SSAR Herp. Review 16: 31) and documents established population at that site.

Submitted by **WILLIAM R. TESKA**, Department of Biology, Furman University, Greenville, South Carolina 29613.

AMBYSTOMA TIGRINUM TIGRINUM (Eastern Tiger Salamander). USA: VIRGINIA: Augusta Co: George Washington National Forest, ca. 18 km SW Waynesboro. 12 May 1987. R. L. Hoffman & K. A. Buhlmann. Verified by J. C. Mitchell & C. A. Pague. CM 118612. New county record (ca. 161 km WNW of the nearest previous locality) and first record outside the Coastal Plain in Virginia; first record for the species in the Ridge and Valley Physiographic Province. Larvae were obtained by dipnetting in breeding ponds on 12 May 1987; some were preserved immediately, three others were maintained alive until metamorphosis occurred (10 July 1987). Breeding adults were photographed (KAB collection), toeclipped, and released at the same ponds on 8 March 1988 and additional adults were observed there on 5 March 1989. Although "out of range" localities for *A. tigrinum* may on occasion result from accidental or intentional introductions (e.g., as discarded fish bait), the probability that the Augusta County population is indigenous is enhanced by the syntopic occurrence of numerous kinds of Coastal Plain plants (Carr 1938, Proc. Va. Acad. Sci. 16: 44; 1940, The New Phytologist 39: 129–132). Occupation of the Shenandoah Valley by *A. tigrinum* during the Pleistocene has been documented for a fossil site ca. 44 km from our locality (Holman 1986, Virginia. Div. Mineral Res. Publ. 75: 39–40).

Submitted by **KURT A. BUHLMANN**, Virginia Natural Heritage Program, 203 Governor Street, Suite 402, Richmond, Virginia 23219, & **RICHARD L. HOFFMAN**, Virginia Museum of Natural History, Martinsville, Virginia 24112.

ANEIDES FERREUS (Clouded Salamander). USA: CALIFORNIA: Humboldt Co: 7.4 km S, 1.6 km W Salyer, 792 m. 3 April 1983. MVZ 181841. 10.5 km E Hoopa, 792 m. 13 December 1982. Department of Forestry & Resource Management, University of California, Berkeley (MGR 253), 6.8 km N, 2.6 km E Salyer, 914 m. 8 April 1983. MVZ 181839. 5.6 km N, 2.9 km E Salyer, 933 m. 6 April 1983. MVZ 181836. 1.8 km S, 13.7 km E Hoopa, 975 m. 1 April 1983. MVZ 181835. 5.5 km S, 3.9 km W Salyer, 884 m. 5 April 1983. MVZ 181840. Siskiyou Co: 14.9 km N, 2.3 km E Somes Bar, 975 m. 19 April 1983. MVZ 181846. Trinity Co: 7.2 km N, 6.4 mm W Big Bar, 1066 m. 11 April 1983. MVZ 181849–50. 1.0 km N, 5.6 km E Salyer, 949 m. 4 April 1983. MVZ 181847. 4.8 km E Salyer, 548 m, 17 October 1982. MGR 175. 9.3 km N, 5.3 km W Big Bar, 1158 m. 16 November 1982. MGR 193–194. 2.4 km S, 195. km E Salyer, 670 m. 19 November 1982. MGR 243–244. 4.2 km N, 8.9 km E burnt Ranch, 1066 m. 5 November 1982. MVZ 181189–95. All specimens collected by M. G. Rahael, L. L. C. Jones, & field crews. All verified by D. Wake & S. Busack. *A. ferreus* had previously been documented from only one locality in Trinity County (Bury 1970, J. Herpetol. 4: 165–178). These records indicate that the species is widespread in eastern Humboldt and west-central Trinity counties and extend the known range 20 km to the east.

Submitted by **LAWRENCE L. C. JONES & MARTIN G. RAPHAEL**, Department of Forestry & Resource Management, University of California, Berkeley, California 94720 (*Present addresses:* (LLCJ) USDA Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, 3625 93rd Avenue SW, Olympia, Washington 98502; (MGR) USDA Forest Service, Rocky Mountain Forest & Range Experiment Station, 222 South 22nd Street, Laramie, Wyoming 82070).

EURYCEA BISLINEATA BISLINEATA (Northern Two-lined Salamander). CANADA: QUEBEC: (1) Temiscouata Co: 2 km S of St-Louis-de-Ha-Ha, Petite Riviere a la Savane, 47° 39' N, 68° 59' W, 29 May 1976, NMC 18469. (2) Riviere-du-Loup Co: just NW of Notre-Dame-du Portage exit of Rt. 20, drainage ditch, 47° 45' N, 69° 36' W, 29 May 1976, NMC 18468. New Brunswick: (1) Kings Co: 3 km SW of Browns Flats on Rt. 102, Lobster Brooks, 45° 27' N, 66° 10' W, 24 April 1976, NMC 18430. (2) Northumberland Co: 8 km ESE of McGraw Brook, North Branch, Renous River, 46° 47' N, 66° 12' W, 26 May 1976, NMC 18462. (3) Victoria Co: Three Brooks, Tobique River, 46° 55' N, 67° 29' W, 27 May 1976, NMC 18466. (4) Madawaska Co: 5 km WSW of St-Andre on Rt. 2, small brook, 47° 5' N, 67° 49' W, 28 May 1976, NMC 18464. (5) Madawaska Co: 2 km SE of St-Leonard on Rt. 2, brook, 47° 9' N, 67° 55' W, 28 May 1976, NMC 18464. (6) Queens Co: Wasson Brook at Rt. 10 S of Cumberland Bay, 46° 2' N, 65° 52' W, NMC 6785. (7) York Co: Rt. 2 near Dumfries, 45° 58' N, 67° 9' W, NMC 10068. (8) Charlotte Co: Wa-weig, 45° 14' N, 67° 8' W, NMC 4959. (9) Charlotte Co: SE end of Lake Utopia, 45° 9' N, 66° 47' W, NMC 13894. (10) Gloucester Co: 10.5 km SW of Point Verte, 47° 51' N, 65° 50' W, NMC 10895. (11)

Gloucester Co: Bass River 9 km S of Bathurst, 47° 27' N, 65° 44' W, NMC 16247. (12) Northumberland Co: Tributary of Burnt Church River, Lavillette, 47° 17' N, 65° 16' W, NMC 16248. (13) Kent Co: Molus River, 46° 35' N, 65° 5' W, NBM 624. (14) Carleton Co: Centersville, 46° 25' N, 67° 42' W, NBM 230. (15) Queens Co: Coles Island, 45° 55' N, 65° 47' W, NBM 443. (16) St. John Co: Mispec, 45° 13' N, 65° 57' W, NBM 275. (17) Charlotte Co: St. Stephen, 45° 17' N, 67° 16' W, NBM 760. USA: MAINE: (1) Piscataquis Co: 5 km NW of Greenville Junction, stream on Squaw Mt, 45° 49' N, 69° 40' W, 3 July 1985, NMC 28164. (2) Piscataquis Co: Baxter State Park, North Branch of Trout Brook, 46° 7' N, 68° 55' W, 4 July 1985, NMC 28165. (3) Aroostook Co: 2 km N of Ashland, confluence of Machias River and Aroostook River at bridge on Rt. 11, 46° 38' N, 68° 18' W, 4 July 1985, NMC 28166. (4) Aroostook Co: 10 km S of Fort Kent, Wallagrass Stream at bridge on Rt. 11, 47° 10' N, 68° 45' W., 5 July 1985, NMC 28167. (5) Washington Co: Wesley, 44° 56' N, 67° 40' W, September 1972, NMC 14556. (6) Hancock Co: 13.5 km E of Rt. 180 on Rt. 9, 44 47' N, 68° 23' W, September 1971, NMC 14559. (7) Somerset Co: 4.8 km E of Skowhegan on Rt. 2, 44° 47' N, 69° 37' W, September 1972, NMC 14560. (8) Franklin Co: Bigelow, 45° 5' N, 70° 20' W, September 1972, NMC 14558. (9) Franklin co: 27.8 km S of Canadian border on Rt. 27, 45° 17' N, 70° 33' W, NMC 14565.

Some recent field guides follow Bishop (1947, Handbook of salamanders, Comstock) in showing a large gap in the range in New Brunswick, Quebec, and Maine. The above records fill the gap.

Submitted by **NORRIS S. DENMAN**, Redpath Museum, McGill University, 859 Sherbrooke Street W., Montreal, Quebec, Canada, H3A 2K6, **FREDERICK W. SCHUELER**, National Museum of Natural Sciences, Box 3443 Station D, Ottawa, Ontario, Canada, K1P 6P4, & **WAYNE F. WELLER**, 9 Mississauga Road N., Mississauga, Ontario, Canada, L5H 2H5

NECTURUS MACULOSUS (Mudpuppy). USA: WISCONSIN: Columbia Co: Wisconsin River along east shoreline just below Prairie du Sac dam (Sec.25, T10N, R6E). 18 July 1989. P. A. Cochran, J. D. Lyons, & R. Olson. Verified by Robert Henderson. MPM Color Slide P 253. Large juvenile captured off pile of rocks by electrofishing. First published record for county (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Pub. Mus., 205 pp.), although Vogt plotted what he considered a reliable record from upstream in the Wisconsin River on the Sauk County side.

Submitted by **P. A. COCHRAN**, Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115, & **J. D. LYONS**, Wisconsin Department of Natural Resources, South District Headquarters, 3911 Fish Hatchery Road, Fitchburg, Wisconsin 54115.

PLETHODON ELONGATUS (Del Norte Salamander): USA: CALIFORNIA: Humboldt Co: 7.4 km S, 1.6 km W Salyer, 792 m, 8 November 1982, Department of Forestry & Resource Management, University of California, Berkeley (MGR 154); 1.8 km S, 13.7 km E Hoopa, 975 m, 18 October 1982, MVZ 181600–609; 1.6 km S, 6.4 km W Salyer, 843 m, 8 November 1982, MGR 186; 5.6 km N, 2.9 km E Salyer, 933 m, 14 April 1983, MVZ 181793–794; 1.6 km N, 8.0 km E Willow Creek, 670 m, 6 April 1983, MVZ 181806–811. Siskiyou Co: 21.7 km N Somes Bar, 914 m, 18 April 1983, MVZ 181578–582; 14.4 km N, 0.8 km E Somes Bar, 975 m, 2 November 1982, MGR 160; 18.5 km N, 2.6 km E Somes Bar, 1097 m, 28 October 1982, MGR 184; 3.5 km N, 2.1 km W Somes Bar, 732 m, 11 November 1982, MGR 181, 197; 1 km N, 1.6 km E Somes Bar, 427 m, 4 November 1982, MVZ 185940–944; 13.7 km NM, 1.9 km E Somes Bar, 975 m, 2 November 1982, MVZ 185937–939; 19.8 km N, 0.5 km E Somes Bar, 792 m, 4 November 1982, MVZ 185891–893. Trinity Co: 2.4 km S, 1.5 km E Salyer, 670 m, MVZ 181818–821; 1.6 km S, 8.0 km E Willow Creek, 702 m, MVZ 181822–834. All specimens collected by M. G. Rahael, L. L. C. Jones, & field crews. All verified by D. Wake & S. Busack. MGR 154 represents the southernmost record for the species, extending the known range (Brodie 1970, Herpetologica 26: 468–516) 6 km S along the S Fork of the Trinity River Gorge.

Submitted by **LAWRENCE L. C. JONES & MARTIN G. RAPHAEL**, Department of Forestry & Resource Management, University of California, Berkeley, California 94720 (*Present addresses:* (LLCJ) USDA Forest Service, Pacific Northwest Research Station, Forestry Sciences Laboratory, 3625 93rd Avenue SW, Olympia, Washington 98502; (MGR) USDA Forest Service, Rocky Mountain Forest & Range Experiment Station, 222 South 22nd Street, Laramie, Wyoming 82070). ●

ANURA

ELEUTHERODACTYLUS JOHNSTONEI (NCN). PANAMA: PROVINCIA DE PANAMA: Distrito de Panamá: Ciudad de Panamá: Correguimiento de San Francisco: Avenida 3C Sur, No. 14. 27 June 1989. R. Ibáñez D. Specimen and sonogram verified by R. I. Crombie. USNM 292592. New country record; an exotic species; probably introduced from the southern part its range (R. I. Crombie, pers. comm.). According to Hardy & Harris (1979, Bull. Maryland Herp. Soc. 15: 124–133), *E. johnstonei* originated somewhere in the eastern Caribbean, and it has been introduced into several Caribbean Islands and Bermuda, as well as mainland Guyana and Venezuela. This frog is common in gardens of Altos del Golf and Loma Alegre, residential areas of the Ciudad de Panamá, and probably was introduced along with exotic plants between the years 1984–1987.

Submitted by **ROBERTO IBÁÑEZ D.**, Círculo Herpetológico de Panamá, Apdo. 10762, Estafeta Universitaria, Panamá, Rep. Panamá (*Present address:* University of Connecticut, Box U-43, 75 North Eagleville Road, Storrs, Connecticut 06268), & **A. STANLEY RAND**, Smithsonian Tropical Research Institute, P.O. Box 2072, Balboa, Panamá.

HYLA CINEREA (Green Treefrog). USA: KENTUCKY: Henderson Co: unnamed slough on Ohio River floodplain, 0.5 km ENE jct Ky. Rt. 414 & U.S. Rt. 41 in a swamp immediately north of boundaries of John James Audubon State Park. 9 June 1989. T. L. Grannan & M. J. Lodato. Verified by G. Schneider. UMMZ 189654, 189655. "Cypress slough" on Green River floodplain, ca. 3 km N Baskett. 9 June 1989. Voice records only. T. L. Grannan & M. J. Lodato. First records for Henderson County and extends Kentucky range ca. 150 km NE from nearest known locality in Ballard County (John MacGregor, pers. comm.—unpublished distribution records) and Barbour (1956, Trans. Kentucky Acad. Sci. 17:81–86).

Submitted by **MICHAEL J. LODATO**, 925 Park Plaza Drive, Evansville, Indiana 47715, & **TED L. GRANNAN, JR.**, 921 West Iowa Street, Evansville, Indiana 47710.

HYLA CINEREA (Green Treefrog). USA: NORTH CAROLINA: Anson Co: 5.8 km ENE McFarlan. 30 July 1989. J. C. Beane & S. L. Alford. Verified by W. M. Palmer. NCSM 30070. New county record; extends range ca. 4 km NW of nearest record in Richmond County (NCSM files). Choruses were heard on 13 August 1988 and 27 May 1989 in several other areas of county, including 11.6 km ESE Ansonville and 12.7 km NNE Lilesville.

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Raleigh, North Carolina 27611.

HYLA FEMORALIS (Pine Woods Treefrog). USA: NORTH CAROLINA: Randolph Co: 9.8 km SSW Coleridge. 22 July 1989. J. C. Beane, S. L. Alford, & T. J. Thorp. Verified by W. M. Palmer. NCSM 30049. New county record; extends range ca. 42 km W of nearest record in Lee County (NCSM files).

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Raleigh, North Carolina 27611.

PHYLLOMEDUSA SAUVAGII (NCN). ARGENTINA: PROVINCIA DE SAN LUIS: Departamento La Capital: Potrero de los Funes (33° 13' S, 66° 14' W). September 1982. Students at Colegio Normal de San Luis. Herpetological collection of Escuela de Ciencias Biológicas, Universidad Nacional de San Luis (UNSL-0026); San Luis City (33° 17' S, 66° 20' W). 18 February 1988. C. Villarroel. (UNSL-0103). First records for the province (Gallardo, 1987, Anfibios Argentinos, Librería Agropecuaria, Buenos Aires, x + 98 pp). Extends the range, as portrayed by Cei (1980, Amphibians of Argentina, Monitore Zool. Ital. (N.S.) Monogr. 2: xii + 609 pp.) ca. 290 km to the southwest.

Submitted by **MARIO R. CABRERA**, Departamento de Zoología, Universidad Nacional de Córdoba, Casilla de Correo 395, 5000-Córdoba, Argentina.

PSEUDOPALUDICOLA BOLIVIANA. (NCN). ARGENTINA: PROVINCIA DEL CHACO: Las Palmas (27° 04' S, 58° 42' W), MACN 3428; La Sardina (26° 04' S, 60° 17' W), MACN 3768; General Vedia (26° 56' S, 58° 40' W), MACN-CENAI 924146; Castelli (25° 57' S, 60° 37' W), FML 3670; Roque Sáenz Peña (26° 47' S, 60° 27' W), FML 4337; and Reserva Benítez (27° 20' S, 58° 56' W), FML 2665. PROVINCIA DE SANTA FE: Reconquista (29° 09' S, 59° 39' W), MACN 31453–63, and Cayastá (31° 12' S, 60° 10' W), MACN 4999. First records for Argentina; previously known from Bolivia, Colombia, Guyana, Paraguay, and Surinam.

Submitted by **FERNANDO LOBO**, Instituto de Herpetología, Fundación Miguel Lillo, Miguel Lillo 251, 4000- Tucumán, Argentina.

RANA PRETIOSA (Spotted Frog) USA: IDAHO: Boundary Co: roadside backwater of Long Canyon Creek (Sec. 25, T65N, R2W). 7 May 1989. P. V. Lindeman. Verified by R. L. Wallace. University of Idaho Lower Vertebrate Collection (IA 646–1 & IA 646–2). New county record (Nussbaum et al. 1983, Amphibians and Reptiles of the Pacific Northwest, Univ. Press Idaho, 332 pp.).

Submitted by **PETER V. LINDEMAN**, Division of Biological Sciences & Related Technologies, Madisonville Community College, College Drive, Madisonville, Kentucky 42431.

SMILISCA BAUDINII (Mexican Treefrog). MEXICO: NAYARIT: Isla María Madre, El Zacatal (Tres Marias Islands). 20 October 1986. G. Casas-Andreu. (IBH 6338–1 to 6338–2, adults; IBH 6347 tadpoles). First record of this species from Tres Marias Islands (Zweifel 1960, Bull. American Mus. Nat. Hist. 199: 77–128; McDiarmid et al. 1976, Los Angeles Co. Nat. Hist. Mus. Contr. Sci. 275: 1–17).

Submitted by **GUSTAVO CASAS-ANDREU**, Colección Herpetológica, Instituto de Biología, UNAM, Apartado 70–153, México, D. F. 04510, México. ●

TESTUDINES

CHELYDRA SERPENTINA (Snapping Turtle). USA: WISCONSIN: Door Co: Nasewaupee Township near Potawatomi State Park (Sec. 22, T28N, R25E). 11 August 1989. Dreux J. Watermolen. Verified by P. A. Cochran. University of Wisconsin Green Bay Richter Collection (UWGB 393). Two unhatched eggs, one egg that was cut open, one hatchling turtle. New county record (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Pub. Mus. 205 pp.).

Submitted by **DREUX J. WATERMOLEN**, Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115.

CHELYDRA SERPENTINA (Snapping Turtle). USA: WISCONSIN: Manitowoc Co: East Twin River, down-stream from spillway in Mishicot (Sec. 5, T20N, R24E). 22 May 1989. P. A. Cochran & J. Marks. Verified by Robert Henderson. MPM Color Slide P 234. First published county record (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Pub. Mus. 205 pp.), although a novel set in Manitowoc County (Vukelich, 1962, Fisherman's Beach, St. Martin's Press, New York, 186 pp.) includes an encounter with this species.

Submitted by **P. A. COCHRAN & J. MARKS**, Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115.

CHRYSEMYS PICTA BELLII (Western Painted Turtle) USA: IDAHO: Boundary Co: near backwater of Deep Creek, adjacent to southern boundary of Kootenai National Wildlife Refuge (Sec. 36, T62N, R1W). 6 May 1989. P.V. Lindeman. University of Idaho Lower Vertebrate Collection (IR 439–1). Shell fragments comprising approximately 75% of the carapace and plastron of a large adult found, and several individuals seen basking on a log nearby. Kootenai Co: Rainy Hill Road, near Medicine Lake (Sec. 27, T48N, R2W). 11 October 1987. P.V. Lindeman. IR 386–1. Both verified by R. L.

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Wallace. Both new county records (Nussbaum et al. 1983, Amphibians and Reptiles of the Pacific Northwest, Univ. Press Idaho, 332 pp.).

Submitted by **PETER V. LINDEMAN**, Division of Biological Sciences & Related Technologies, Madisonville Community College, College Drive, Madisonville, Kentucky 42431.

CLEMMYS GUTTATA (Spotted Turtle). USA: GEORGIA: Sumter Co: 6 km S Americus. 6 March 1989. Bob Herrington. Georgia Southwestern College Vertebrate Collection (#1651). New county record that extends the range 37 km NW in the Muckalee Creek drainage, and substantiates the presence of a small population in this drainage (Camp & Powder, 1980, SSAR Herp. Review 11: 80).

Submitted by **BOB HERRINGTON**, Department of Biology, Georgia Southwestern College, Americus, Georgia 31709.

CLEMMYS INSCULPTA (Wood Turtle). USA: MICHIGAN: Baraga Co: below Prickett Dam on Sturgeon River (Sec. 14, T50N, R34W). 21 August 1986. Jeff S. Davis. Northern Michigan University Zoological Collection (NMZ 50). Adult male shell and skeletal remains. New county record. Extends range ca. 40 km east of nearest record in Ontonagon County (NMZ 51; Flintsteel River, Sec. 18, T51N, R39N) and Ontonagon County record reported by Johnson (1965, A Zoogeographical Analysis of the Herpetofauna in Northern Michigan and Adjacent Isle Royale, Master's Thesis, Michigan State University, 90 pp.); Houghton Co: Sturgeon River SW U. S. Rt. 41 (Sec. 16, T53N, R33W). 20 June 1987. Jeff S. Davis. Northern Michigan University Zoological Collection (NMZ 52, NMZ 53; photographs only). These two individuals were weighed, measured, blood sampled, marked, photographed and are currently being used in a captive breeding project under the direction of J. S. Davis. New county record. Extends range ca. 56 km NE of nearest record in Baraga County reported above.

Submitted by **JEFFREY S. DAVIS & J. KIRWIN WERNER**, Department of Biology, Northern Michigan University, Marquette, Michigan 49855.

GRAPTEMYS KOHNII (Mississippi Map Turtle). USA: TEXAS: Parker Co: ca. 0.4 km S Interstate 20 bridge over Brazos River. 16 September 1989. Michael B. Harvey & Michael E. Dorcas. Verified by J. A. Campbell. UTA R-25948. Better defines northwest extension of range. (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **MICHAEL E. DORCAS & MICHAEL B. HARVEY**, Department of Biology, University of Texas at Arlington, Texas 76109.

GRAPTEMYS PULCHRA (Alabama Map Turtle). USA: GEORGIA: Murray Co: Conasauga River at St. Rt. 2 (34° 55' 17" N, 84° 50' 30" W). 15 August 1989. S. Santhuff & S. Lay. Fernbank Science Center (FSC R89–101). Whitfield/Murray Co. line: Conasauga River (34° 40' 27" N, 84° 56' 34" W). 14 July 1989. S. Santhuff & D. Wasson. FSC R89–103. Whitfield Co: 8.5 km. S. of St. Rt. 52 on Conasauga River (34° 44' 19" N, 84° 52' 39" W). 4 August 1989. S. Santhuff & D. Ryan. FSC 39–102. Gordon Co: two localities, one on the Conasauga River (34° 32' 35" N, 84° 54' 07" W) and one on the Oostanaula River (34° 33' 08" N, 84° 54' 59" W). S. Santhuff & M. Smith. FSC R89–104–5. Previously there was only one known specimen from Georgia (Harris et al. 1982, SSAR Herp. Review 13: 24). These specimens verify the species in the state and establish two new county records (Gordon & Murray) for *G. pulchra*. The specimens extend the turtle's known range northeast 12.6 km on the Conasauga River to within 7.5 km of the Tennessee state line.

Submitted by **STEVEN D. SANTHUFF**, 6531 Gray Hawk Way, Stone Mountain, Georgia 30087 & **LAWRENCE A. WILSON**, Fernbank Science Center, 156 Heaton Park Drive, Atlanta, Georgia 30307.

HYDROMEDUSA TECTIFERA (South American Snakeneck Turtle). ARGENTINA: MISIONES: Departamento L.N. Alem: Colonia Taranco, Cerro Azul (27° 38' S, 55° 29' W). 12 June 1987. A. Morgenstern & E. Richard. FML Chelonii 027. First record for the Department. The species was previously recorded from Misiones departments Iguazú and General Manuel Belgreano (Waller & Chebez, 1987, Hist. Nat. 7(5): 53–59).

Submitted by **ENRIQUE RICHARD**, Instituto de Herpetología, Fundación Miguel Lillo, Miguel Lillo 251, 4000-Tucumán, Argentina, & **ARMANDO MORGENSTERN**, Facultad de Ciencias Naturales, Instituto Miguel Lillo, Miguel Lillo 201, 4000-Tucumán, Argentina.

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KINOSTERNON FLAVESCENS FLAVESCENS (Yellow Mud Turtle). USA: MISSOURI: Ray Co: Hardin, DOR on Mo. Rt. 10, 0.3 km E of Co. Road DD (Sec. 33, T52N, R26W). 16 July 1989. F. E. Blake & D. D. Smith. Verified by R. Powell. KU 211303. This is the first recorded locality in west-central Missouri, and is ca. 218 km from the Lewis County record and 236 km from the Jasper County record in the NE and SW corners of the state, respectively (Johnson 1987, The Amphibians and Reptiles of Missouri, Missouri Dept. Conserv. Publ., 368 pp.).

Submitted by **DONALD D. SMITH**, Division of Allergy & Rheumatology, University of Kansas Medical Center, 39th Street & Rainbow Boulevard, Kansas City, Kansas 66103, & **FRANCIS E. BLAKE**, 1815 North Kendall Road, Independence, Missouri 64058.

PHRYNOPS GEOFFROANUS TUBEROSUS (Geoffroy's Sideneck Turtle). GUYANA: POTARO-SIPA-RUNI (REGION 8): Kato, 0.5 km N airstrip, 760 m. 16 March 1989. Robert P. Reynolds. Verified by Carl H. Ernst. USNM 291154–56. Two juveniles and one adult collected in 2x3 m sedge-filled pool at spring-head that ultimately flows ca. 0.5 km north to the Chiung River. First unequivocal Guyana records of *P. geoffroanus* (Pritchard & Trebbau, 1984, Turtles of Venezuela, SSAR Contrib. Herp. 2: 375 pp. + 2 appendices). Peters (1870, Ueber *Platemys tuberosa*, eine neue Art von Schildkroten aus British-Guiana, Monatsber. Akad. Wiss. Berlin, 1870: 313) reported the type locality as "Cotingaflusse am Roraimagebirge in Britishguiana." Pritchard & Trebbau (1984) noted that the Cotinga River drains south from mount Roraima entirely within Brazilian territory, and suggested that the type may not constitute a valid Guyanese record. Present records extend range ca. 120 km SE of the type locality at the Cotinga River near Mount Roraima (Brazil).

Submitted by **ROBERT P. REYNOLDS**, U.S. Fish and Wildlife Service, Biological Survey Section, National Museum of Natural History, Washington, D.C. 20560. ●

LACERTILIA

CRYPTOBLEPHARUS POECILOPLEURUS (Snake-eyed Skink). FRENCH POLYNESIA: Tuamotu Archipelago, Nukutipipi Atoll. November 1988. B. & F. Salvat. MNHN 1989–29 & 1989–36. First record for Nukutipipi Atoll. Known before from the Archipelago (Ineich & Blanc 1988, Atoll Res. Bull. 318: 1–75).

Submitted by **IVAN INEICH**, Centre de l'Environnement, Antenne Muséum/E.P.H.E., B.P. 1013, Papetoai, Moorea, French Polynesia, & Muséum National d'Histoire Naturelle, Laboratoire des Reptiles et Amphibiens, 25 Rue Cuvier, 75005 Paris, France.

EMOIA PHEONURA (NCN). FRENCH POLYNESIA: Tuamotu Archipelago, Nukutipipi Atoll. November 1988 & July 1989. B. & F. Salvat, J. A. Madec. MNHN 1989–27 & 28, 1989–32 to 35, 1989–3041 to 3043. First record for Nukutipipi Atoll. Known before from the Archipelago (Ineich & Blanc 1988, Atoll Res. Bull. 318: 1–75).

Submitted by **IVAN INEICH**, Centre de l'Environnement, Antenne Muséum/E.P.H.E., B.P. 1013, Papetoai, Moorea, French Polynesia & Muséum National d'Histoire Naturelle, Laboratoire des Reptiles et Amphibiens, 25 rue Cuvier, 75005 Paris, France.

EUMECES EGREGIUS (Mole Skink) USA: GEORGIA: Columbia Co: vacant lot in Augusta. 19 April 1987. Tony Mills. Verified by J. Whitfield Gibbons. SSM 12400. Specimen was discovered under roofing metal the collector had placed several years before as a refuge for small vertebrates. On 17 March 1988 another *E. egregius* was collected under the same piece of roofing material and later released by Tony Mills and Matt Whiles. The Mole Skink has been collected in adjacent Richmond County (Neill 1940, Copeia 4: 266), but these specimens represent a new county record. Over the years the collecting area has received a great deal of developmental pressure, reducing it into an isolated vacant lot. Since the latest specimen was collected, this island of habitat has been totally cleared and no suitable substitute seems to be available nearby. The habitat was ca. two hectares and was characterized by vegetation similar to that described by Mount (1963, Amer. Midl. Nat. 70: 356–385.) These specimens represent the most northeasterly record for this species.

Submitted by **TONY MILLS**, Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29801.

EUMECES GILBERTI RUBRICAUDATUS (Western Redtail Skink). USA: NEVADA: Nye Co: Nevada Test Site: southern foothills of Pahute Mesa on the eastern edge of Forty-mile Canyon, ca. 1525 m. 30 May 1979. O. L. Haworth. Verified by W. W. Tanner. BYU 37051. Two additional specimens have been collected on top of Pahute Mesa: Nevada Test Site: Trail Ridge, 1600 m NNE of junction of Pahute Mesa & 20–03 roads, 1806 m. 2 June 1982. M. Sauls. E. G. & G. Energy Measurements Inc. (E.G. & G. 82–1). Nevada Test Site: 0.3 km N jct. of Pahute Mesa Road & Buckboard Mesa Road, 1914 m. 13 September 1988. P. A. Medica. Verified by W. W. Tanner. BYU 39708. The above three records are the first reported specimens for the Nevada Test Site. They extend the range ca. 130 km WNW of the Sheep Range (Hardy 1948, Herpetologica 4: 165); ca. 135 km NW of Lee Canyon, Spring Range, (Banta 1962, Herpetologica 18: 129–130); and 65 km NE of Grapevine Peak (Rogers & Fitch 1947, Univ. Calif. Publ. Zool. 48: 169–200).

Submitted by **PHILIP A. MEDICA & ORIN L. HAWORTH**, Reynolds Electrical & Engineering Co., Inc., P. O. Box 495, Mercury, Nevada 89023, & **MARY SAULS KELLY**, E. G. & G. Energy Measurements Inc., Santa Barbara Operations, 130 Robin Hill Road, Goleta, California 93117.

GEHYRA OCEANICA (Oceanic Gecko). FRENCH POLYNESIA: Tuamotu Archipelago, Nukutipipi Atoll. July 1989. B. Salvat & J. A. Madec. MNHN 1989–3034 to 3036. First record for Nukutipipi Atoll. Known before from the Archipelago (Ineich & Blanc, 1988, Atoll Res. Bull. 318: 1–75).

Submitted by **IVAN INEICH**, Centre de l'Environnement, Antenne Muséum/E.P.H.E., B.P. 1013, Papetoai, Moorea, French Polynesia, & Muséum National d'Histoire Naturelle, Laboratoire des Reptiles et Amphibiens, 25 Rue Cuvier, 75005 Paris, France.

HEMIDACTYLUS TURCICUS (Mediterranean Gecko) USA: GEORGIA: Richmond Co: Augusta. 13 November 1989. Rennie Wolfe & Ed Carey. Verified by J. Whitfield Gibbons. Savannah River Ecology Lab (SREL 3340). Approximately twenty animals were discovered beneath debris next to cement loading dock during demolition of the former Mulherin Lumber Company on 13th Street. Juveniles and adults were collected. Eggshell fragments found at the same locality. Collection area completely exposed to outside conditions. The geckos apparently used an area under the cement dock to avoid winter freezing temperatures. It is doubtful that geckos will continue to inhabit this site after demolition since the entire area will be cleared. However, others have been observed ca. 200 meters away at a nearby hospital. Steve Cox (head of building maintenance) noted the lizards' presence since the building's construction in 1987. Juveniles and adults have been observed inside the hospital. The closest recorded locality for *H. turcicus* to Augusta is Lowndes County, Georgia, the first record for the the state (Bechtel 1983, SSAR Herp. Review 14: 27–28). Another population has apparently been established for some time in Eufala, Alabama, just west of the Alabama-Georgia border (T. Lamb, pers. comm.). These localities are ca. 405 and 435 km SW of the Augusta site.

Submitted by **TONY MILLS**, Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29801.

LEPIDODACTYLUS LUGUBRIS (Mourning Gecko). FRENCH POLYNESIA: Tuamotu Archipelago, Nukutipipi Atoll. July 1989. B. Salvat & J. A. Madec. MNHN 1989–3033. First record for Nukutipipi Atoll. Known before from

the Archipelago (Ineich & Blanc 1988, Atoll Res. Bull. 318: 1–75).

Submitted by **IVAN INEICH**, Centre de l'Environnement, Antenne Muséum/E.P.H.E., B.P. 1013 Papetoai, Moorea, French Polynesia & Muséum national d'Histoire naturelle, Laboratoire des Reptiles et Amphibiens, 25 Rue Cuvier, 75005 Paris, France.

LIPINIA NOCTUA (Moth Skink). FRENCH POLYNESIA: Tuamotu Archipelago, Nukutipipi Atoll. November 1988 & July 1989. B. & F. Salvat, J. A. Madec. MNHN 1989–30 & 31, 1989–3037 to 3040. First record from Nukutipipi Atoll. Known before from the Archipelago (Ineich & Blanc, 1988, Atoll Res. Bull. 318: 1–75).

Submitted by **IVAN INEICH**, Centre de l'Environnement, Antenne Muséum/E.P.H.E., B.P. 1013, Papetoai, Moorea, French Polynesia, & Muséum National d'Histoire Naturelle, Laboratoire des Reptiles et Amphibiens, 25 Rue Cuvier, 75005 Paris, France.

MABUYA WRIGHTII (NCN). SEYCHELLES ISLANDS: Bird Island, Bird Island Lodge Hotel. Collected one meter from bungalow number four. 4 July 1989. Michéle & Ivan Ineich. MNHN 1989.2566. Only known previously from the granitic Seychelles Islands with large bird colonies. Bird Island is a sandcay with a very large bird colony. Despite search no other specimen of this species was found.

Submitted by **IVAN INEICH**, Centre de l'Environnement, Antenne Muséum/E.P.H.E., B.P. 1013, Papetoai, Moorea, French Polynesia, & Muséum National d'Histoire Naturelle, Laboratoire des Reptiles et Amphibiens, 25 Rue Cuvier, 75005 Paris, France. ●

SERPENTES

ARIZONA ELEGANS (Glossy Snake). USA: NEBRASKA: Thomas Co: US Rt. 83, 4.3 km S Neb. Rt. 2 (Sec. 16, R26W T22N). 9 September 1988. Joseph A. Gubanyi & James Novy. Verified by John D. Lynch. UN 9823. New county record; new species for Sandhills region; extends current range 240 km NNW (Lynch 1985, Trans. Nebraska Acad. Sci. 13: 33–57).

Submitted by **JOSEPH A. GUBANYI**, Department of Biology, Concordia College, Seward, Nebraska 68434.

DRYMARCHON CORAIS RUBIDUS (Mexican Indigo Snake). MÉXICO: SONORA: Tónichi, 172 km SE Hermosillo. 1 May 1989. Adrian Quijada, Valerio Parra, & Reyna Castillo. UANL 3705. Extends distribution 185 km NE of Alamos, Sonora (McCranie, 1980, Cat. American Amph. Rept. 267.1–267.3).

Submitted by **ADRIAN QUIJADA-MASCAREÑAS, VALERIO PARRA, & REYNA CASTILLO**, Escuela Superior de Ecología, CESUES, A. P. A-112, Hermosillo, Sonora, México.

ELAPHE VULPINA (Fox Snake). USA: WISCONSIN: Manitowoc Co: St. Rt. 147, 2 km NW Mishicot (Sec. 35, T21N, R23E). 29 May 1989. P. A. Cochran & A. G. Cochran. Verified by Robert Henderson. MPM 23448. One of two roadkilled examples observed that day in Manitowoc County. First published county record (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Pub. Mus., 205 pp.).

Submitted by **P. A. COCHRAN**, Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115.

GERARDA PREVOSTIANA (Gerard's Water Snake). PHILIPPINES: Palawan Island, 35 km NE Brooke's Point at town of Labog (09° 03' N, 118° 3' E). 1 April 1987. David K. Dorman. UF 69099. MALAYSIA: SARAWAK: First Division, 15 km N Kuching, Kampong Santubong (01° 43' N, 110° 19' E). 10 March 1988. Kurt Auffenberg. UF 72991. Verified by Walter Auffenberg. Type locality is "Manila" (Eydoux, F. & P. Gervais 1837. Mag. Zool. Guerin, Paris 3: 1–10) but holotype is missing. A specimen from the Philippines exists (ANSP 5090), but this record has been questioned (Gyi, 1970, Univ. Kansas Publ. Mus. Nat. Hist. 20: 47–223). Known from coasts of India, Sri Lanka, Burma, Thailand, and peninsular Malaysia (Perak). These two new coastal records increase the likelihood that the original type locality was correct and extend the verified range eastward over 1000 miles (Thailand to Palawan).

Submitted by **DAVID L. AUTH, KURT AUFFENBERG, & DAVID K. DORMAN**, Department of Natural Sciences, Florida Museum of Natural History, University of Florida, Gainesville, Florida 32611.

NERODIA RHOMBIFER (Diamondback Water Snake). USA: TEXAS: Rains Co: 13 km W Emory on FM Road 35. 26 August 1989. Tony Dunn & Ira Couch. Verified by J. A. Campbell. UTA R-25947. Fills gap between Van Zandt and Hopkins counties. (Dixon 1987, Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, Texas, 434 pp.).

Submitted by **MICHAEL E. DORCAS & MICHAEL B. HARVEY**, Department of Biology, University of Texas at Arlington, Texas 76109.

PELAMIS PLATURUS (Yellowbelly Sea Snake). MEXICO: NAYARIT: 9.2 km NE of Isabela Island, Peñascos Las Monas. 28 May 1981. Omar Calvcario. IBH 4328. This record fits within the general distribution of the species in the Pacific of the Americas. Nevertheless, it is the first record from the surroundings of Isabela Island (Pickwell & Culotta. 1980. Cat American Amphib. Rept. 255.1–255.4).

Submitted by **GUSTAVO CASAS-ANDREU**, Colección Herpetológica, Instituto de Biología, UNAM, A. P. 70–153, México, D.F. 04510, Mexico.

PITUOPHIS MELANOLEUCUS DESERTICOLA (Great Basin Gopher Snake). USA: COLORADO: Routt Co: 13 km N Steamboat Springs. June 1983. J. J. Roth. UCM 56041; 1.5 km N Milner. September 1987. J. J. Roth. UCM 56044. New county records extending known range ca. 135 km E of nearest previous record in northwestern Colorado (Hammerson 1982, Amphibians and Reptiles in Colorado, Colorado Div. of Wildlife).

Submitted by **JAN J. ROTH**, Rimrock Taxidermy, 552 Russell Street, Craig, Colorado 81625, & **HOBART M. SMITH**, Department of EPO Biology, University of Colorado, Boulder, Colorado 80309.

RAMPHOTYPHLOPS BRAMINUS (Brahminy Blind Snake). USA: FLORIDA: Monroe Co: Old Town, Key West. 7 September 1987. R. W. Ehrig. Verified by J. Rosado & V. Wallach. MCZ 172619. New county record (Wilson & Porras 1983, The Ecological Impact of Man on the South Florida Herpetofauna, Univ. Kansas Mus. Nat. Hist. Spec. Pub. No. 9, 89 pp.). Additional individuals seen; one now in captivity with author.

Submitted by **ROBERT W. EHRIG**, Route 3, Box 328, Big Pine Key, Florida 33043.

REGINA GRAHAMII (Graham's Crayfish Snake). USA: ARKANSAS: Woodruff Co: 4.2 km SW Hunter (Sec. 22, T5N, R1W). 3 June 1986. W. W. Byrd, E. L. Hanebrink & Charles Files. Arkansas State University Museum of Zoology (ASUMZ 10742 & 10743). New county record (Dowling 1957, Occ. Pap. Univ. Arkansas Mus. 3: 1–51).

Submitted by **WILLIAM W. BYRD, EARL L. HANEBRINK, & CHARLES FILES**, Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467.

RHADINAEA FLAVILATA (Pine Woods Snake). USA: NORTH CAROLINA: Beaufort Co: 4.5 km WNW Pamlico Beach. 2 May 1990. J. C. Beane & S. L. Alford. Verified by W. M. Palmer. NCSM 30165. Adult male taken under board at trash dump. New county record; extends range on mainland north of Pamlico River and ca. 35 km ENE of nearest record in Craven County (Palmer & Stephan 1972, SSAR Herp. Review 4: 171). Fills part of gap between

northern-most mainland populations and presumed disjunct populations on Outer Banks of Dare County (Braswell 1989, ASB Bull. 35: 199–217).

Submitted by **JEFFREY C. BEANE**, North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, North Carolina 27611.

SISTRURUS CATENATUS EDWARDSII (Desert Massasauga). USA: ARIZONA: Cochise Co: Rt. 666, 13.5 km north of U. S. Rt. 30 near Douglas. 22 August 1988. T. Sinclair & T. Snell. Verified by Harry W. Greene. MVZ 209129. First record from this far west of the Chiricahua Mountains since 30 August 1957, when a single specimen (AMNH 81799) was collected by Carl Alimonti. An earlier specimen was collected by William Woodin on 9 August 1950.

Submitted by **TOM SINCLAIR**, 549 Dowling Blvd, San Leandro, California 94577, & **TONY SNELL**, P. O. Box 136, Portal, Arizona 85632.

STORERIA OCCIPITOMACULATA (Redbelly Snake). USA: WISCONSIN: Waushara Co: Twin Lakes Boy Scout Camp near Big Twin Lake (Sec.1, T20N, R11E). 15 October 1988. Dreux J. Watermolen. Verified by P. A. Cochran. University of Wisconsin Green Bay Richter Collection (UWGB 394). New county record (Vogt 1981, Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Pub. Mus., 205 pp.).

Submitted by **DREUX J. WATERMOLEN**, Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115.

TANTILLA GRACILIS (Flathead Snake). USA: TEXAS: Rockwall Co: Rockwall, 0.25 mi. N jct. Tex. Rt. 205N & U. S. Rt. 66, near jct. Tex. Rt. 205N & Quail Run Road. 14 April 1988. B. E. Smith. Verified by J. A. Campbell. UTA 25667. Fills in distributional gap for Rockwall County (Dixon 1987, Amphibians and Reptiles of Texas, Texas A & M University Press, College Station, Texas, 434 pp.).

Submitted by **BRIAN E. SMITH**, Department of Herpetology, Dallas Zoo, 621 East Clarendon Drive, Dallas, Texas 75203 & Department of Biology, UTA Box 19498, University of Texas at Arlington, Arlington, Texas 76019, **AMY S. BRIDEGAM**, Department of Biology, UTA Box 19498, University of Texas at Arlington, Arlington, Texas 76019, & **CLAY M. GARRETT**, Department of Herpetology, Dallas Zoo, 621 East Clarendon Drive, Dallas, Texas 75203.

THAMNOPHIS BRACHYSTOMA (Shorthead Garter Snake) USA: OHIO: Mahoning Co: grounds of Choffin Career Center, 200 East Wood Street, Youngstown, Ohio. 10 October 1989. R. J. Novotny. Verified by C. J. McCoy. CM 118975. Not native to Ohio; this introduced population is the first record for the state.

Submitted by **RAYMOND J. NOVOTNY**, Ford Nature Education Center, Mill Creek Metropolitan Park District, 816 Glenwood Avenue, Youngstown, Ohio 44502.

THAMNOPHIS CYRTOPSIS PULCHRILATUS (NCN). MEXICO: NUEVO LEON: 28.3 km S jct Rts. 68 & 51. 2 August 1978. Jack W. Sites. TCWC 57970; 5 km N Crucitas. 19 June 1981. Billy Webb. SRSU 5111; Puerto de Peña Nevada, 19.6 km NE San Antonio de Peño Nevada, 2743 m. 23 July 1981. Ernest A. liner, Richard M. Johnson & Allan H. Chaney. E. A. liner private collection (EAL 4831, 2 specimens); 18.5 mi NE San Antonio de Peña Nevada, 2743 m. 23 July 1983. Ernest A. Liner & Allan H. Chaney. EAL 4970. All verified by Douglas A. Rossman. Webb (1966, Tulane Stud. Zool. 13: 55–70) gives the range of this subspecies as high elevations in Durango, Guanajuato, México, Michoacan, Morelos, Nayarit, Puebla, and Veracruz. Extends the range to the high elevations of southern Nuevo León.

Submitted by **ERNEST A. LINER**, 310 Malibou Boulevard, Houma, Louisiana 70364-2598, **ALLAN H. CHANEY**, Department of Biology, Texas A & I University, Kingsville, Texas 78363, **JAMES R. DIXON**, Department of Wildlife Sciences, Texas A & M University, College Station, Texas 77843, & **JAMES F. SCUDDAY**, Department of Biology, Sul Ross State University, Alpine, Texas 79832.

THAMNOPHIS SIRTALIS (Common Garter Snake) USA: IDAHO: Boundary Co: near backwater of Deep Creek, adjacent to southern boundary of Kootenai National Wildlife Refuge (Sec. 36, T62N, R1W). 6 May 1989. P.V. Lindeman. Verified by R. L. Wallace. University of Idaho Lower Vertebrate Collection (IR 438–1). New county record (Nussbaum et al. 1983, Amphibians and Reptiles of the Pacific Northwest, Univ. Press Idaho, 332 pp.).

Submitted by **PETER V. LINDEMAN**, Division of Biological Sciences & Related Technologies, Madisonville Community College, College Drive, Madisonville, Kentucky 42431.

THAMNOPHIS SIRTALIS SIRTALIS (Eastern Garter Snake) USA: PENNSYLVANIA: Erie Co: Presque Isle State Park, ENE of Misery Bay. 22 September 1988. Harold E. Donachy. Verified by C. J. McCoy. CM Acc. 34, 211, photographs). New record for melanistic variant along Pennsylvania Lake Erie shoreline (King 1988, Herpetologica 44:451–458). Collected during studies under Contract SPC 16930 between the Wild Resource Conservation Fund, Harrisburg, Pennsylvania, and Pennsylvania State University.

Submitted by **DONALD M. MCKINSTRY, MARK A. LETHABY, HAROLD E. DONACHY, & JAMES D. WESTER**, Pennsylvania State University at Erie, Behrend College, Station Road, Erie, Pennsylvania 16563-1200.

TROPIDOCLONION LINEATUM (Lined Snake). USA: NEBRASKA: Douglas Co: Omaha, jct. of 156th & F Streets (NE corner Sec. 3, T14N, R11E). 3 June 1980. J. J. Krupa. UNO 102–03680. Adult killed by lawnmower (J. Krupa, pers. comm.) at relict tallgrass prairie site (Beottcher 1981, Master's Thesis, University of Nebraska at Omaha), ca. 82.5 km SE of record in Cuming County and 75 km NE of record in Lancaster County (Lynch 1985, Trans. Nebraska Acad. Sci. 13: 33–57). Fills gap between easternmost records in central Nebraska and westernmost records in Iowa (Christiansen 1981, Proc. Iowa Acad. Sci. 88: 24–26; Christiansen & Bailey, no date, The Snakes of Iowa, Iowa Conserv. Comm., Des Moines).

Submitted by **LOUIS A. SOMMA**, Department of Zoology, University of Florida, Gainesville, Florida 32611, & **JAMES D. FAWCETT**, Department of Biology, University of Nebraska at Omaha, Omaha, Nebraska 68182-0040. ●

BOOK REVIEWS

Salamanders of Ohio, edited by Ralph A. Pfingsten and Floyd L. Downs. 1989. College of Biological Sciences, The Ohio State University, Columbus, Ohio, USA. i-xx + 315 pp. + 29 plates. $30.00.

When I arrived in early January, 1974, at the Museum of Zoology, The University of Michigan to assume the curatorial position long held by Charles F. Walker, I was surprised and mildly amused to learn that Charles had not yet cleared his office and moved into his emeritus headquarters down the hallway. This was of interest to me as I had been assigned his office space. The solution to the problem was to pile my boxes of books and other paraphernalia in the hallway and spend the next few days helping Charles move into his new office. This proved to be a pleasant way to get to know Charles, and it was my first introduction to the then pending volume on the "Salamanders of Ohio."

Charles had earlier published the "Frogs of Ohio" and had been working on the companion salamander volume for some time. The office I was soon to occupy was crammed full of bottles of salamanders from Ohio, most of which were on loan from various Ohio museums. As we moved these salamanders Charles would occasionally point out some "difficult" specimens. Of particular concern to Charles were numerous specimens of *Ambystoma* from northern Ohio, including some of the Lake Erie Islands, which he believed to be hybrids. He also suspected that some of them might be triploid and that some might represent all-female species. Such problems had

delayed completion of the "Salamanders of Ohio," but Charles was optimistic that retirement would free him to finish his two pet projects. The first was the salamander book and the second a revised edition of James Peters' (1952) list of types in the herpetology collections of the Museum of Zoology.

Within a few years, however, it became painfully obvious that Charles would not be able to finish the salamander book. Being a careful, methodical worker, Charles was haunted by the lack of answers to various questions concerning the salamander fauna of Ohio, and, by his own admisison, writing was a very slow and vexatious process for him. Charles had mixed feelings, but mostly a sense of relief when a committee of salamander specialists headed by Ralph Pfingsten and Floyd L. Downs was formed to produce the "Salamanders of Ohio." Relieved of this burden, Charles turned his attention to the UMMZ type lists and had nearly completed this work when he died in 1979. The amphibian and reptile type lists were later published by Arnold Kluge. Thus, although Charles never saw his two "retirement projects" come to fruition, both tasks have been completed by others.

The "Salamanders of Ohio," appropriately dedicated to Charles Walker, is an outstanding, scholarly volume, and one of which I am sure Charles would have approved. It was published as the second issue of Volume 7 of the Bulletin of the Ohio Biological Survey, New Series. The soft-cover book has an attractive white cover with a painting by David Dennis of two spotted salamanders among a field of spermatophores deposited on maple leaves on a pond bottom. Fifteen authors contributed to the book, which, aside from dedication and introductory pages, includes sections on the geology and physiography of Ohio, illustrated keys to both the larval and adult salamanders of Ohio, species accounts, a glossary, an extensive bibliography, and a subject and species index. At the end of the book there are 29 color plates consisting of both photographs and paintings.

The authors recognize 25 species in five families and ten genera occurring within the state of Ohio. The species accounts are arranged by family, and a brief family account is provided; there are no generic accounts. Each species account begins with the scientific name followed by the name of the original describer; synonymies are not given. The common name, taken from Collins et al. (1982) and Banks et al. (1987), is then listed, and this is followed by a black and white photograph. The text of the species accounts is arranged in the following order of headings: Description, Size and Sexual Dimorphism, Distribution, Habits and Life History, Behavior, Remarks, and Locality Records.

Each account contains a pair of distribution maps. Localities within Ohio are indicated by symbols placed on a map of Ohio showing counties and major rivers. Pre-1950 and post-1950 records are indicated with different symbols. A few maps include enlarged sections of the Lake Erie Islands to show species that occur on some of these islands. On the same page is a smaller map of the United States, parts of Canada, and northern Mexico (state, department, and province boundaries not indicated) showing the total range of the species by shading. The list of locality records is arranged by county, and the museum acronym for each record is given. More than 40,000 specimens were used to compile the distribution maps, and the editors wisely chose not to list the specimen identification numbers.

The species accounts are well written, highly detailed, and surprisingly uniform in style, considering that they were written by various authors. The account of the small-mouthed salamander, *Ambystoma texanum*, written by Floyd Downs, is particularly informative. Downs skillfully summarizes what is known about this species and cogently analyzes various problems. One of these is the hybrid complex of *Ambystoma* in northern Ohio, which in some cases includes *A. texanum* as one of the two or three parental species. Another is the existence of a stream-breeding type of *A. texanum* that occurs in southwestern Ohio, southeastern Indiana, and central Kentucky. This form subsequently was named *Ambystoma barbouri* by Kraus and Petranka (1989), and it is the only member of the Ohio salamander fauna not specifically listed in the book.

The authors give reasons for excluding *Eurycea cirrigera* and *Plethodon dorsalis* from the state list, and they follow Bogart et al. (1987) in not recognizing *Ambystoma nothagenes* as a valid species. The problem concerning the number of species of the *Plethodon glutinosus* complex in Ohio is understandably left unresolved, although it is suggested that *P. kentucki* may occur in southern Ohio.

The black and white photographs are of variable quality, some being too dark or with backgrounds that obscure the outline and pattern of the salamander. But the color plates, which include photographs of general habitats and salamanders and paintings of salamanders, are of uniformly high quality. Of particular value are the numerous color photographs of larve and metamorphosing individuals.

The "Salamanders of Ohio" is an outstanding contribution to American herpetology. Above all it must be emphasized that the book is much more than just a guide to the identification of the salamanders of Ohio. The species accounts are full of information on ecology, distribution, variation, and life history that will be of interest to both amateur and professional herpetologists as well as to conservationists and wildlife managers. Not only is previous literature thoroughly reviewed, but much new information is presented so that the book is a primary source of information on salamanders. Considering the subject matter, outstanding quality, and depth of coverage, the "Salamanders of Ohio" can be compared only to Sherman C. Bishop's (1941) classic study of "The Salamanders of New York." These two books set the standards for which others should strive.

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Digest for the Successful Terrarium, by Richard D. Bartlett. 1989. Tetra Press, Tetra Sales, USA, Morris Plains, NJ. 79 pp. ISBN: 3-89356-035-1. Available from: Lewis Books, P.O. Box 41137, Sharonville, OH 45241. $4.99 + $2.00 shipping and handling.

The title of this book is very descriptive of its contents. It is a condensed, digested summary of the vast knowledge and personal experience that its author, Richard Bartlett, has had with the captive maintanance of reptiles and amphibians. He has squeezed an enormous amount of basic care information into a mere 79 pages.

The book begins with a short introduction which is more informative and useful than the introductions of many other books. It is the only place that captive propagation is mentioned to any extent, in the whole publication. The introduction is followed by a one-page glossary of terms which is quite adequate for a book of this nature.

Following the glossary are the five major chapters which collectively make up the heart of the book and which contain its real substance. These chapters are organized, not on the basis of the taxonomic relationships of the terrarium inhabitants, but on the conditions of life in the terraria. Thus, there is a chapter on aquatic terraria, one on turtle aquaria, one on semi-aquatic terraria, one on dry-land terraria, and a chapter entitled "Homes for Herptiles," which deals with the maintenance of reptiles in cages as opposed to true terraria. The chapter on dry-land terraria is sub-divided into a section on woodland terraria and a section on desert terraria.

Each of these five chapters is organized in a similar fashion. Each one begins with an introductory section that explains how to set up an aquarium or terrarium of the type to which that chapter is devoted. It includes such information as the kinds of enclosures that can be used, choice of substrate, extent and depth of water, ratio of water area to land area, quality and intensity of lighting, and even some suggestions as to the kinds of

plants to be included, where applicable.

After this introductory section, each chapter (except for the one on turtle aquaria), discusses, under separate headings, those taxa of common reptiles and amphibians that are adapted to living in a terrarium of that type. Frequently, several species or even several genera are discussed together because their requirements are identical or similar. This was obviously necessary to conserve space in a book of such restricted size. The discussions include all of the basic maintenance requirements such as, but not restricted to, food preferences, temperature range, maximum size to be anticipated, space needs, and special information about certain groups, such as pointing out those with particularly nasty temperaments. The discussions vary in length, apparently based on what the author felt was the minimum amount of information needed for successful husbandry of that group or individual species.

Following these main chapters, there is a very short chapter on outdoor pools or "ferneries," and a slightly longer chapter on diet supplements, health aids, and other products produced by Tetra-Terrafauna®, the publishers of the book. Since they published it, it is only natural that they should want to feature their products in the book, but numerous color photographs of bottles, cans, and packages of their products seems excessive.

There is also a table entitled: "Care Guide to 25 Common Reptiles." This is a fact-filled table which lists the requirements of 25 species of lizards, snakes, and turtles. For each species it lists terrarium specifications, heat, diet and care, diet supplements, and special comments. Again, understandably, products of the publisher are mentioned prominently, but the table is still an invaluable guide for the beginning terrarist. It is unfortunate that space did not allow for expansion of this table and the inclusion of a similar table for amphibians. The table is followed by a list of publications for additional reading, and the book ends with a comprehensive index.

The book is beautifully illustrated throughout with color photographs, most by the author, but with some by John Tashjian. There are also line drawings, all but two of which were done by Patricia Bartlett.

To whom would I recommend this book? Certainly to any beginning terrarists, be they child or adult. They should read it from cover to cover before acquiring any of the equipment or appointments for their proposed terrarium, and certainly before acquiring any living animals. The book will be a great help in selecting the proper herps for their particular conditions. The book will also be a great help to terrarists who have concentrated on one group of herps but who are thinking of expanding into another group with which they are less familiar. For example, a turtle specialist would do well to read this book before expanding into lizards or salamanders. It could well prevent disappointments and unpleasant surprises for both the terrarist and the herp.

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Oklahoma Herpetology: An Annotated Bibliography, by Charles C. Carpenter and James J. Krupa. University of Oklahoma Press, Norman, 1989. vii + 258 pp., $21.95.

With the advent of greatly decreased natural habitat, increased environmental concerns and non-game species funding the publication of a state or regional bibliography is usually anxiously awaited.

This book is divided into a Preface, Introduction, Checklist of Extant Oklahoma Amphibians and Reptiles, Annotated Bibliography, Genus and Key Word Index, and English Name Index.

The Introduction indicates the substantial thought and effort directed toward efficient access to the literature. Each citation is assigned a unique sequence number. If the title of the article fails to convey the article's pertinence, a brief description is typically provided. This is followed by one or more of the following key words: archeology, behavior, bibliography, development, distribution, ecology, economics, evolution, general reference, genetics, health, historical, husbandry, lore, management, morphology, natural history, paleontology, parasitology, physiology, popular, taxonomy, and techniques. The annotation ends with a list of genera appearing in the article.

The systematic annotation may be reduced by the use of collective phrases such as All Caudata when all genera of Oklahoma's salamanders are discussed.

The Annotated Bibliography contains 1,536 citations published between 1823 and 1987 and is an attempt to be all inclusive. It covers extinct and extant forms.

The Genus and Key Word Index coupled with the English Name Index make this contribution extremely useful to both laymen and professionals.

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RECENT PUBLICATIONS RECEIVED

Amphibians and Reptiles in the Diets of North American Raptors, by David A. Ross. 1989. Published by the Bureau of Endangered Resources, Wisconsin Department of Natural Resources, P.O. Box 7921, Madison, WI 53707, USA.

This 33-page paper-cover brochure is an annotated bibliography providing references and tables illustrating the occurrence and importance of herptiles to raptors (Falconiformes, Strigiformes, the northern raven, and the loggerhead shrike). Data were compiled from a computer search of over 200 journals and from a review of previous compilations and reviews.

Conversion Factors - SI Units and Many Others, by C.J. Pennycuick. 1988. The University of Chicago Press, 5801 S. Ellis Avenue, Chicago, IL 60637 (originally published by Wiley in 1974). Paper. $5.95. 39 pp. + index.

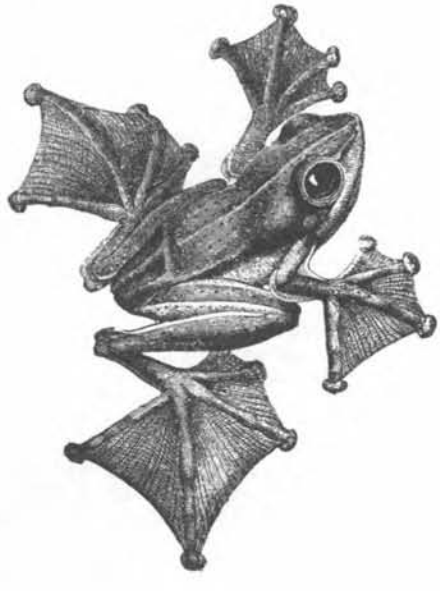
This book is essentially a reprint of *Handy Matrices,* first published by Edward Arnold in 1974. It provides tables of conversion factors to convert a variety of units into Systeme Internationale units (and some others). Over 2100 factors are listed to convert 21 different physical quantities including energy content, dynamic viscosity, kinematic viscosity, energy flux, metabolic rate, power, work, membrane tension, biomass density, as well as the more common units of time, speed, and length.

Herpetopathologia. Volume 1, No. 1. Editor-in-Chief: G. Matz. This 125-page issue contains papers presented at the Second International Colloquium on the Pathology of Reptiles and Amphibians, held in Nottingham, G.B., on 16-19 September 1984. For subscriptions and information, write to: Presses de l'Université, 5, Boulevard Lavoisier, 49045 ANGERS Cedex, France.

Management of Amphibians, Reptiles, and Small Mammals in North America, Proceedings of the Symposium, July 19-21, 1988, Flagstaff, Arizona. The first 253 pp. of this volume contain 27 articles on various aspects of the management and ecology of amphibians and reptiles, while the following 185 pp. cover the management and ecology of small mammals in 26 articles. Free copies are available (while the supply lasts) from Richard Schneider, USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, 3825 E. Mulberry Street, Craddock Building, Fort Collins, CO 80524. Request Gen. Tech. Rep. RM-166.

Organization of Biological Field Stations—Directory of Members 1989, edited by Joseph F. Merritt and Arlynn K. Adamerovich. 143 pp. Powdermill Biological Station, The Carnegie Museum of Natural History, Rector, PA 15677.

This directory provides information on the 96 biological field stations in North America which are members of the OBFS. Descriptions (1-2 pp. each) are arranged according to geographic regions. Each description gives: Access, Environment, Facilities, Research, Education, and Contact. A Table for the field stations in each region provides information on: Affiliation, Season, Area, Biotic Communities, Facilities, Emphasis.



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This long-awaited third edition lists the scientific names of all currently recognized genera, species, and subspecies of native North American salamanders, frogs & toads, turtles, crocodilians, worm-lizards, lizards, and snakes, as well as the standardized common names for each. Thanks to the previous two editions, over 85% of the state and regional books published about these creatures since 1978 have adopted the standard common names. Common names are now stable for North America, and provide for accuracy of use across the continent by non-biologists. New features in this edition are the inclusion of an appendix of alien (non-native, introduced) species, and the addition of the publication date of description for all taxa. The latter, in conjunction with the name(s) of the describer(s), makes this an invaluable and required reference for every herpetologist interested in the 496 species of amphibians and reptiles found in North America (north of Mexico). An appendix to Hawaiian taxa is included. iv + 41 pages. ISBN 0–916984–21–4

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Orders may be sent to Douglas H. Taylor, Department of Zoology, Miami University, Oxford, Ohio 45056 USA.

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1944	8	+	15	20	1974	+	+	+	+
1945	0	+	0	13	1975	15	+	+	+
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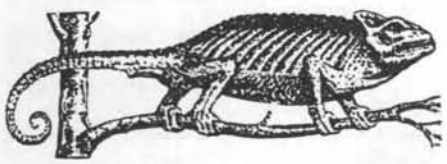
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SSAR BUSINESS



SSAR MEETS AT FIRST WORLD CONGRESS OF HERPETOLOGY

The 32nd Annual Meeting of the Society for the Study of Amphibians and Reptiles was held jointly with the First World Congress of Herpetology (FWCH), 11-19 September 1989, on the campus of the University of Kent in Canterbury, United Kingdom. Nearly 1400 persons, representing some 61 countries (see chart), attended this largest and most diverse meeting of herpetologists ever held. The Herpetologists' League and Societas Europaea Herpetologica also met officially at the congress, which was co-hosted by the British Herpetological Society, Fauna and Flora Preservation Society, and the Zoological Society of London. Thirty leading national and international herpetological societies supported the congress as Affiliated Organizations.

The complexities of such a large meeting were enormous—with nearly 50 symposia, workshops, roundtables, exhibits, and other events and with numerous nationalities and languages represented—yet all was effectively managed by Ian R. Swingland, Conference Director, and the UK National Executive. Kraig Adler served as chairman of the Scientific Program Committee. Many features of the congress were familiar to regular attendees of SSAR meetings in North America, since several of the Society's traditional events were incorporated into the program.

World Congress of Herpetology (WCH), the parent organization which initiated and coordinated the First Congress, had its genesis in 1982, on the occasion of SSAR's 25th Annual Meeting in Raleigh, North Carolina, USA (see *Herp Review*, 13:103, 1982). At that anniversary meeting, an *ad hoc* committee made the proposal and representatives of the world's major herpetological societies decided to establish the WCH and elected Kraig Adler, then the President of SSAR, as Secretary-General.

Since that time, the WCH organization has been firmly established, operating funds raised, a constitution written, and meeting plans laid which culminated in the historic inaugural congress last September. Because of the enormous enthusiasm displayed at Canterbury, a Second Congress is now being planned, to be held in four or five years.

Canterbury and the University of Kent

The cathedral city of Canterbury, renowned the world over, is one of Europe's most ancient cities and a settlement has existed on the site since the Stone Age. In 43 A.D. the Romans founded a village of wooden huts there and called it "Durovernum," remains of which can still be seen in the city. The ancient Norman fortress walls, gate towers, and timbered buildings—all clustered around the magnificent cathedral, the Mother Church of England—preserve much of a medieval atmosphere, and congress delegates were able to stroll through the city's narrow, sometimes still cobbled streets. Canterbury also has rich literary associations, being the city of Chaucer, Christopher Marlowe, Charles Dickens, and Somerset Maugham, and it is one of the most visited places in the UK.

The University of Kent, on the other hand, is one of England's newest institutions, founded by Royal Charter in 1965. It occupies a 300-acre campus on a magnificent hillside overlooking the city from the north. Except for the plenary lectures, which were presented at the Marlowe Theater in the city, all other congress events were held on campus. Herpetological activities totally occupied the campus and the official WCH logo was everywhere to be seen. The logo (above) is from Conrad Gessner's *Historia Animalium* (Zürich, 1554), a chameleon perched precariously "out on a limb," as indeed the WCH felt itself to be in its early years!

Registration was conducted in the Senate, a centrally-located building, and most delegates roomed in one of two

Final summary of FWCH delegates, by country. Total attendance included 900 delegates, 316 accompanying persons, and 152 others (honorary officers, special guests, press officials, and others involved in the congress).

Argentina	8	France	45	Panama	1
Australia	32	German Dem. Rep.	5	Papua New Guinea	1
Austria	17	Germany, Fed. Rep. of	47	Peru	3
Bangladesh	1	Greece	4	Poland	1
Barbados	1	Hungary	7	Portugal	4
Belgium	10	India	10	Saudi Arabia	1
Belize	1	Indonesia	1	South Africa	10
Botswana	1	Ireland	5	Spain	39
Brazil	11	Israel	11	Sri Lanka	1
Bulgaria	1	Italy	31	Suriname	1
Canada	15	Japan	12	Swaziland	1
Cayman Islands	1	Kenya	1	Sweden	10
Chile	1	Luxembourg	1	Switzerland	25
China–Beijing	10	Mauritius	1	Tanzania	1
China–Taipei	2	Mexico	11	U.K.	153
Costa Rica	5	Netherlands	18	U.S.A.	269
Czechoslovakia	7	New Zealand	7	U.S.S.R.	24
Denmark	4	Nigeria	1	Venezuela	1
Dominican Republic	1	Norway	1	Zimbabwe	2
Egypt	1	Oman	1	TOTAL DELEGATES	900
Finland	1	Pakistan	1	(Total Persons	1368)

residential colleges (Eliot and Rutherford), each a confusing stereoisomeric image of the other. Each college had a dining hall for meals as well as a bar, in which many lively discussions took place each evening. Two unique brands of beer—"Herpetology Ale" and "Tortoise Bitters"—were brewed specially for the congress, with souvenir bottles conveniently placed in each delegate's room! The self-contained nature of the campus and its pleasant surroundings led to good interactions and camaraderie.

Meeting of SSAR Board of Directors

The SSAR Board met from 1000 to 1630 h on 11 September in the Grimond Lecture Theater (this being one of the shortest board meetings in recent memory!). President Henri Seibert opened the meeting by announcing that Eric Juterbock had agreed to serve as Secretary since James Jacob had to resign the post. Ernest Liner agreed to serve out Juterbock's unexpired board term, since one individual cannot hold two voting positions on the Board of Directors.

Treasurer Douglas Taylor announced that membership was down slightly from last year, probably a result of the dues increase, but SSAR is in better financial shape. Publications Secretary Robert Aldridge announced that more than 60,000 pounds of SSAR publications are now in storage at St. Louis University. Discussion centered on membership drives and publication sales (both anticipated in 1990).

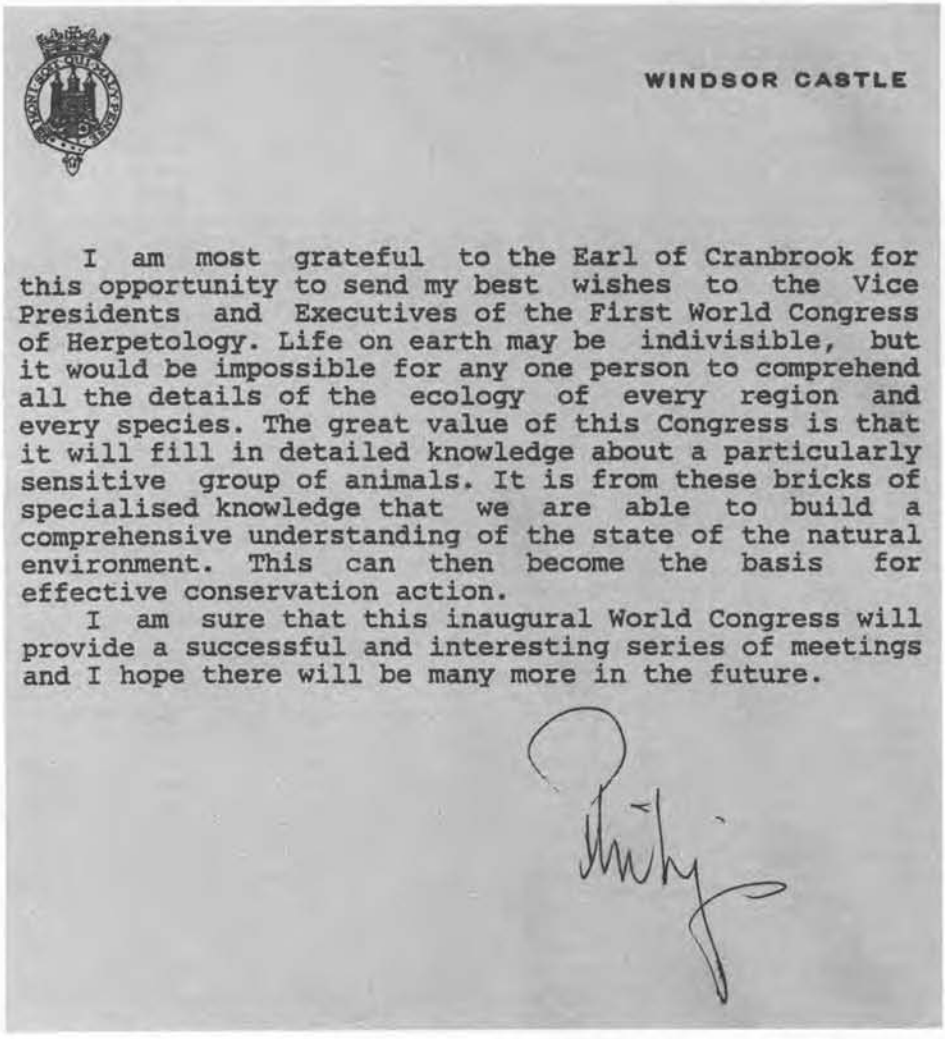
Committee reports were mostly uneventful, although there was some discussion about the role of the Conservation Committee and the current paucity of future meeting sites. After significant and sometimes spirited discussion, a budget of $126,000 was approved for 1990; this included the establishment of an Emergency and Special Projects Fund.

SSAR Business Meeting

President Seibert called the meeting to order at 1930 h on 14 September in Grimond Lecture Theater. Secretary Juterbock reported the highlights of the Board meeting of three days before and Treasurer Taylor reported financial matters (see above). Chairperson James Murphy presented the slate of nominees for the autumn election on behalf of the Nominating Committee. The slate was accepted by unanimous vote. Harold Dundee reported on the 1990 meeting in New Orleans, leaving many to wonder if there would be time for business in between all of the eating and partying!

Martin Rosenberg, on behalf of the Resolutions Committee, presented the following resolutions:

- *"Whereas, James S. Jacob has served as Secretary of SSAR for the past eight years; and*
  Whereas, he has performed said secretarial duties with great efficiency; and
  Whereas, his efforts have greatly enhanced communication between and among officers, committees, and members,
  Therefore, be it resolved that the Society extend its deepest gratitude to James S. Jacob for his many years of service to the Society.
- *"Whereas, Rodolfo Ruibal has served most ably as editor of the Society's scientific journal for seven years; and,*
  Whereas, the Journal of Herpetology *has achieved a high level of preeminence during his tenure as editor; and,*
  Whereas, his efforts have promoted the distribution and sharing of knowledge and discovery among colleagues throughout the world,
  Therefore, be it resolved that the Society recognize Rodolfo Ruibal's invaluable and excellent service to the Society as Editor of the Journal.
- *"Whereas,* Herpetological Circulars *are major publications of the Society; and,*
  Whereas, these publications are highly valued by the herpetological community; and,
  Whereas, Neil Ford has ably served as editor of this series for the past six years;
  Therefore, be it resolved that the SSAR express its gratitude to Neil Ford for bringing six Herpetological Circulars *to publication during his tenure as Editor.*
- *"Whereas, WCH Secretary-General Kraig Adler, FWCH Conference Director Ian R. Swingland, and WCH Treasurer Marinus S. Hoogmoed have devoted thousands of hours over the past half decade toward the organization of this meeting; and,*
  Whereas, this First Congress represents an historic gathering of scientists from 61 countries; and,
  Whereas, this congress has set a high standard of excellence in all respects;
  Therefore, be it resolved that Kraig Adler, Ian R. Swingland and Marinus S. Hoogmoed be duly thanked for their successful efforts.



WINDSOR CASTLE

I am most grateful to the Earl of Cranbrook for this opportunity to send my best wishes to the Vice Presidents and Executives of the First World Congress of Herpetology. Life on earth may be indivisible, but it would be impossible for any one person to comprehend all the details of the ecology of every region and every species. The great value of this Congress is that it will fill in detailed knowledge about a particularly sensitive group of animals. It is from these bricks of specialised knowledge that we are able to build a comprehensive understanding of the state of the natural environment. This can then become the basis for effective conservation action.

I am sure that this inaugural World Congress will provide a successful and interesting series of meetings and I hope there will be many more in the future.

Letter of greetings from His Royal Highness Prince Philip, Duke of Edinburgh, K.G., K.T., the official Patron of the First World Congress of Herpetology.

• *"Whereas, the FWCH has been successfully conducted within the beautiful and historic city of Canterbury; and,*
Whereas, the excellent performances by the English and Scottish dancers and the bagpipe music at the Westgate Gardens provided delegates and guests with an appreciation for the long history and great traditions of the United Kingdom; and,
Whereas, the University of Kent at Canterbury has provided outstanding facilities for the exchange of scientific information; and,
Whereas, the organizers of the FWCH have worked for many years in planning this inaugural world congress;
Therefore, be it resolved that SSAR acknowledge the support and contributions of the following: His Royal Highness Prince Philip; Councillor A. G. Porter, Lord Mayor of the City of Canterbury; David J. E. Ingram, Vice-Chancellor, University of Kent; and the dozens of additional individuals who worked tirelessly to make this meeting a pleasant and effective one."

The resolutions were overwhelmingly accepted by an animated vote of the membership.

Finally, Henri Seibert passed the SSAR gavel, richly carved with herpetological motifs, to President-elect William Brown, who adjourned the meeting at 2020 h.

Student Travel Committee

Several years ago, SSAR, together with the Herpetologists' League and the American Society of Ichthyologists and Herpetologists, established a committee to raise funds to send North American graduate students to the congress. Auctions and other events were conducted to collect funds, including a raffle organized by Ronald Altig and Linda Trueb. The committee (David Cundall, chair; Ronald Altig, John E. Cadle, George C. Gorman, Dale R. Jackson, Linda Trueb, and R. Wayne Van Devender) eventually provided substantial travel grants totalling $4500 to eight persons. SSAR is grateful to the people who successfully organized this program.

Opening Ceremonies

In plenary session at the Marlowe Theater, the First Congress was formally opened by the Secretary-General, Kraig Adler. He noted the historic occasion of herpetology's first truly international congress with its dual themes of science and conservation, and he greeted the delegates on behalf of the WCH Executive Committee.

Ian R. Swingland, Conference Director, extended a welcome on behalf of the Secretariat and the UK National Executive, followed by remarks from David J. E. Ingram, Vice-Chancellor and administrative head of the University of Kent, our official host institution. A group photograph of the delegates was taken that morning on the steps of the Marlowe.

Honorary Officers

At the request of the Secretary-General, the Earl of Cranbrook, a prominent British zoologist, invited a distinguished group of the United Kingdom's leading naturalists and public figures to serve as honorary officers for the First Congress, to demonstrate the widespread support for the congress in Great Britain and to make its planning activities more visible.

H.R.H. Prince Philip, Duke of Edinburgh, K.G., K.T., President of the World Wide Fund for Nature (WWF; formerly called World Wildlife Fund) and a leader in international conservation, consented to be the official Patron of the First Congress. Prof. Angus d'A. Bellairs, the eminent British anatomist and herpetologist, served as Honorary President.

Among the 23 Honorary Vice Presidents were the Most Rev. Robert Runcie, Lord Archbishop of Canterbury and Primate of the Anglican Church; the President of the Zoological Society of London, Sir William Henderson; several leading naturalists and conservationists including, in addition to Lord Cranbrook himself, Sir David Attenborough, Prof. J. L. Cloudsley-Thompson, Mr. Gerald Durrell, Dr. J. F. Deryk Frazer, the Countess of Huntingdon, the Viscount Massereene and Ferrard, the Baroness Nicol, the Hon. Miriam Rothschild, the late Sir Peter Scott, and Sir William Wilkinson; the Director of the British Museum (Nat. Hist.), Dr. R. H. Hedley; Prof. Sir Richard Southwood, Vice-Chancellor of the University of Oxford; Prof. R. J. Berry, President of the Linnean Society of London; and the Rt. Hon. Robin Leigh-Pemberton, Governor of the Bank of England and Lord-Lieutenant of Kent, in which county the congress was held.

Plenary Speakers

In order to highlight some of the most important current areas of research and conservation of amphibians and reptiles, several individuals were invited to present 50-minute plenary lectures at the Marlowe Theater, on the first and last days of the congress. They were introduced by noted personages associated with the congress:

• Carl Gans (USA): *The State of Herpetology.* Introduced by Angus d'A. Bellairs, Honorary President of the First Congress.

• Ilya S. Darevsky (USSR): *Evolution and Ecology of Parthenogenesis.* Introduced by Harold G. Cogger, Chairman of the WCH Constitution Committee.

• Linda R. Maxson (USA): *Molecular Perspectives on Tempo and Pattern in Amphibian Evolution.* Introduced by Marinus Hoogmoed, Treasurer of WCH.

• Russell A. Mittermeier (presenter; USA) and Ian R. Swingland (UK): *International Conservation.* Introduced by the Rt. Hon. the Earl of Cranbrook, Convener of Honorary Officers for the First Congress and President, British Herpetological Society.

• Gerald Durrell (UK): *Conservation and Captivity.* Introduced by Ian R. Swingland, Conference Director of the First Congress.

• Timothy R. Halliday (UK): *Sexual Selection in Amphibians and Reptiles.* Introduced by Richard Fitter, Vice-President, Fauna and Flora Preservation Society.

• Ermi Zhao (China): *Biogeography of the Amphibians and Reptiles of the Islands Along the Chinese Coast.* Introduced by R. J. Berry, President, Linnean Society of London.

• Armand de Ricqlès (France): *Paleoherpetology.* Introduced by Ulrich Joger, General Secretary of Societas Europaea Herpetologica.

• S. Donald Bradshaw (Australia): *Ecophysiology of Desert Reptiles.* Introduced by Roger A. Avery, Chairman, UK National Executive for the First Congress.

• Eric R. Pianka (USA): *Community Ecology.* Introduced by Henri C. Seibert, President of SSAR.

• David B. Wake (USA): *Evolutionary Biology of Salamanders.* Introduced by James R. Dixon, President of Herpetologists' League.

All of these lectures and the Opening and Closing ceremonies were recorded by Q.E.D. Recording Services Ltd. (45



Commemorative poster donated by SSAR to all congress delegates. Copies of this full-color drawing of a box turtle (*Terrapene carolina*) by David M. Dennis are available for purchase from the SSAR Publications Secretary, Robert D. Aldridge (address inside front cover of this issue) at a cost of $8 each postpaid ($5 each for orders of 10 or more). Only about 500 copies of this limited-edition print remain for sale.

Birley Road, London N20 0HB, UK). Complete sets of the 11 tapes are available from Q.E.D. for £60 (approximately $100) postpaid worldwide; payments can be made by VISA, MasterCard, or Amex. Individual cassettes are also available; address inquiries to Q.E.D. The plenary lectures will be published as a single volume; details to be announced later in *Herp Review*. It is also planned to produce a videotape summary of the congress; details will be announced later.

Symposia

A main feature of the congress were 27 symposia, covering an extremely broad range of topics; several symposia will be published. Roger Thorpe served as Symposia Manager. Each event was arranged by two conveners who usually also served as moderators; additional moderators occasionally participated. Most were half-day events, but a few (marked *) covered a full day. In the following listing, all authors of a given paper are given; this list differs from the Program in some instances, but reflects the papers actually presented in Canterbury.

• *Conservation and Management of Species**. Emilio Balletto and Brian Groombridge, conveners. E. H. W. Baard; B. Banks, J. S. Denton, R. J. Flower, and T. J. C. Beebee; Q. M. C. Bloxam and S. J. Tonge; J. A. Campbell; K. Corbett; L. A. Fitzgerald, J. M. Chani, and O. E. Donadio; N. B. Frazer; A. Georges; M. P. Hayes and M. R. Jennings; D. R. Jackson; M. A. R. Khan; E. D. McCoy and H. R. Mushinsky; E. O. Moll; P. Sjögren; D. M. J. Spratt; D. R. Towns.

• *Effects of Environmental Pollution on Herpetofauna*. Arnold S. Cooke and Claes Andrén, conveners. C. Andrén and G. Nilson; R. Beattie; A. S. Cooke; C. P. Cummins; R. J. Hall; M. R. K. Lambert; P. Mohanty-Hejmadi and S. K. Dutta; B. A. Pierce; R. Tyler-Jones, R. C. Beattie, and R. J. Aston.

• *Captive Management of Amphibians and Reptiles*. René E. Honegger and Romulus Whitaker, conveners; Walter Sachsse, moderator. J. L. Behler; L. Durrell, D. Reid, and I. R. Swingland; B. Johnson; H. Rosier; W. Sachsse; D. I. Werner; F. E. Wood and J. R. Wood; E. Zimmermann and H. Zimmermann.

• *Health and Disease*. John E. Cooper and Fredric L. Frye, conveners. P. C. Arena, K. C. Richardson, and L. K. Cullen; J. E. Cooper; F. L. Frye; F. L. Frye and C. Calvert; F. L. Frye and R. S. Funk; T. M. Környei; C. McAllister and S. J. Upton; G. A. Rubël and W. Kuoni; S. E. Solomon and R. Tippett; C. Warwick; R. A. Yates, D. J. Morafka, and J. P. Flanagan; P. Zwart, J. E. Cooper, and R. Ippen. Elkan Memorial Lecturer: F. L. Frye.

• *Sexual Selection and Communication in Amphibians and Reptiles.** Murray J. Littlejohn and Stevan J. Arnold, conveners. A. Arak; D. Crews; M. L. Dyson; H. C. Gerhardt; L. D. Houck; P. M. Narins; N. I. Passmore, P. J. Bishop, and M. L. Dyson; M. J. Ryan, A. S. Rand, and W. Wilczynski; P. Verrell; K. D. Wells and T. L. Taigen; B. D. Woodward.

• *Environmental Sex Determination*. Claude Pieau and Nicholas Mrosovsky, conveners. J. W. Bickham; C. Dournon; M. W. J. Ferguson, D. C. Deeming, P. T. Sharpe, E. Vallely, and A.



The First World Congress of Herpetology was attended by 1368 persons from 61 countries, the largest and most geographically diverse meeting of herpetologists ever held. Delegates assembled at the Marlowe Theater in Canterbury for the plenary sessions.

Watts; N. Mrosovsky; C. Pieau, M. Dorizzi, and G. Desvages; I. R. Swingland.

• *Sensory Processing in Amphibians and Reptiles.* Hans Schneider and John B. Phillips, conveners. A. Elepfandt; G. A. Engbretson; F. Gaillard; T. E. Hetherington; J. B. Phillips; G. H. Rodda; U. Sinsch; D. Vanderstighelen and R. F. Verheyen; W. Walkowiak; W. Wilcyznski.

• *Long Term Studies of Amphibians and Reptiles.* J. Whitfield Gibbons and Henk Strijbosch, conveners. C. Andrén and G. Nilson; K. A. Bjorndal and A. B. Bolten; C. M. Bull; J. D. Congdon; R. C. M. Creemers and H. Strijbosch; A. C. Dunham and K. Overall; J. J. van Gelder; M. Martin; R. S. Oldham; C. J. Reading; J. Reid; M. R. Warburg.

• *Ecology and Behavior of Snakes.** Hubert Saint-Girons and Richard Shine, conveners; R. Duguy, J. W. Gibbons, and P. T. Gregory, moderators. S. J. Arnold; J. P. Baron; A. Bea and F. Brana; W. S. Brown and W. H. Martin; M. B. Charland, A. R. Gibson, P. T. Gregory, and C. R. Peterson; D. Duvall, D. Chiszar, and G. Schuett; N. B. Ford; F. R. Gehlbach; H. W. Greene; H. Heatwole; H. B. Lillywhite and R. W. Henderson; J. M. Macartney, M. B. Charland, and P. T. Gregory; T. Madsen; G. Nilson and C. Andrén; H. Saint Girons, R. Duguy, and G. Naulleau; R. A. Seigel and R. Shine; R. Shine and R. A. Seigel; R. Shine.

• *Ecology and Adaptations in Extreme Environments.* Donald Bradshaw and Leo J. Borkin, conveners. L. J. Borkin, V. A. Cherlin, A. M. Bassarukin, and M. Yu. Maymin; C. James; M. Lemire, R. Vernet, C. Grenot, and J. M. Francaz; H. Mendelssohn and A. Bouskila; K. A. Nagy; H. Saint Girons and S. D. Bradshaw; V. H. Shoemaker; G. K. Snyder and J. R. Nestler; P. C. Withers.

• *Amphibian Community Ecology.* Robert Barbault and Masafumi Matsui, conveners. R. C. Bruce; C. Díaz-Paniagua; N. G. Hairston; R. G. Jaeger; R. F. Inger and H. K. Voris; P. J. Morin; C. A. Toft; H. M. Wilbur.

• *Herpetofaunas: Explorations and Studies.* Ermi Zhao and Donald G. Broadley, conveners. T. C. S. Avila-Pires, F. P. Nascimento, and O. R. da Cunha; J. M. Cei; H. G. Cogger; M. Henzl; M. S. Hoogmoed; R. F. Inger; U. Joger; K. Y. Lue and S. L. Chen; M. Matsui; T. J. Papenfuss and J. R. Macey; J. C. Poynton; C. J. Raxworthy.

• *Evolution and Phylogeny of Frogs.* Raymond F. Laurent and Michael J. Tyler, conveners. R. M. A. Blommers-Schlösser; D. C. Cannatella; A. J. Cardoso; L. S. Ford; D. M. Green; Z. Rocék; B. Sanchíz and C. Martín; G. Wei.

• *The Inter-Relationships of Primitive Tetrapods: The Fossil Evidence.* Leonid P. Tatarinov and Robert Carroll, conveners. J. R. Bolt; J. A. Clack; M. Laurin; A. C. Milner and W. Lindsay; A. R. Milner; A. Panchen and T. Smithson; T. Smithson and A. Panchen; L. P. Tatarinov; D. M. Walsh.

• *Paleoherpetology: Impact on Neoherpetology.* Richard Estes and Borja Sanchíz, conveners; Andrew Milner, moderator. D. C. Cannatella and K. de Queiroz; J. M. Clark; R. Cloutier and L. Trueb; J. A. Holman; P. A. Meylan and E. S. Gaffney; M. A. Norell; G. K. Pregill; J.-C. Rage; Z. Szyndlar and J.-C. Rage.

• *Evolution and Ecology of Island Herpetofaunas.** Thomas Schoener and Ronald Nussbaum, conveners. A. M. Bauer; C. P. Blanc; R. P. Brown and R. S. Thorpe; T. J. Case and D. Bolger; A. S. Gardner; H. Heatwole; I. Ineich; R. B. King; J. B. Losos; A. Malhotra; C. Moritz, T. Case, and D. Bolger; G. K. Pregill; T. W. Schoener; R. S. Thorpe, R. P. Brown, and M. Baez; D. R. Towns; J. W. Wright; W. Wüster and R. S. Thorpe; G. R. Zug.

• *Evolution and Life Histories of Turtles.* Justin D. Congdon and Colin Limpus, conveners. R. J. Brooks, D. A. Galbraith, and M. L. Bobyn; J. D. Congdon; N. B. Frazer; D. A. Galbraith; A. Georges and R. Kennett; J. W. Gibbons; R. Kiester.

• *Molecular Systematics.* Herbert Dessauer and Eviatar Nevo, conveners. B. W. Bowen, A. Meylan, and J. C. Avise; J. E. Cadle; L. D. Densmore, P. S. White, and S. J. Kain; H. C. Dessauer and C. J. Cole; A. Georges and M. Adams; G. Gollmann; U. Joger; R. Lawson; R. W. Marlow; E. Nevo; R. S. Thorpe and A. M. Cumming.

• *Cytogenetics of Amphibians and Reptiles.* Ettore Olmo and Midori Nishioka, conveners; W. Böhme, moderator. E. Arevalo-M., C. A. Porter, and J. W. Sites; M. King; S. Kohno, C. Ikebe, and M. Kuro-o; H. C. Macgregor; G. Mancino; A. Morescalchi; C. Moritz; E. Olmo, E. Odierna, and T. Capriglione; M. Schmid; L. Singh.

• *Modified Sexual Systems: Parthenogenesis and Hybridogenesis.* John W. Wright and Rainer Günther, conveners. R. L. Bezy; L. J. Borkin, R. Günther, Yu. M. Rozanov, and A. E. Vinogradov; W. M. Brown, L. D. Densmore, C. C. Moritz, D. Peccinini-Seale, V. Singh, D. K. Vyas, and J. W. Wright; I. A. Caune and L. J. Borkin; F. D. Danielyan; I. S. Darevsky and T. M. Sokolova; L. D. Densmore, C. C. Moritz, J. W. Wright, and W. M. Brown; J.-D. Graf and M. Polls-Pelaz; R. Günther; R. Günther and J. Plotner; H. Hotz and P. Beerli; F. Kraus and M. M. Miyamoto; L. A. Kupriyanova; B. E. Leuck; L. A. Lowcock; C. Moritz, C. Spolsky, H. Hotz, I. S. Darevsky, L. Kupriyanova, and T. Uzzell; M. Polls-Pelaz and J.-D. Graf; H. G. Tunner and S. Heppich; J. W. Wright, D. Peccinini-Seale, C. Moritz, J. Sites, D. Vyas, and W. Brown.

• *Modern Approaches to Systematics and Phylogeny of Amphibians and Reptiles.** William E. Duellman and Olivier Rieppel, conveners. J. W. Bickham; W. Böhme; W. R. Branch; R. B. Cocroft and M. J. Ryan; W. E. Duellman; U. Joger; A. G. Kluge; J. M. Legler; J. B. Rasmussen; A. G. J. Rhodin; O. Rieppel; L. Trueb and D. C. Cannatella; J. W. Wright.

• *The Biology of the Pipidae.* Richard C. Tinsley and Linda Trueb, conveners. A. M. Báez; H. R. Kobel; R. O. de Sá and D. M. Hillis; R. C. Tinsley; L. Trueb.

• *Energetics of Amphibians and Reptiles.* Warren P. Porter and Raymond B. Huey, conveners. R. A. Avery; A. F. Bennett, B. C. Jayne, and T. Garland, Jr.; K. A. Bjorndal and A. B. Bolten; B. Green; C. Grenot and B. Heulin; K. A. Nagy; J. W. Patterson; W. P. Porter, A. E. Dunham, and J.-P. Chavaz; T. L. Taigen and K. D. Wells; C. R. Tracy.

• *Determinants of Organismal Function.** F. Harvey Pough and Roger S. Seymour, conveners; Robin M. Andrews, Alison Cree, and Dennis R. King, moderators. R. M. Andrews; A. Arillo and E. Balletto; D. Bauwens and R. Van Damme; T. Garland, Jr.; R. G. Jaeger; A. Hailey; D. R. King; K. L. Overall and A. E. Dunham; M. J. Packard and G. C. Packard; J. R. Spotila and M. P. O'Connor.

• *Functional Morphology.* Carl Gans and Jean-Pierre Gasc, conveners. V. Bels; D. Cannatella; C. Gans; J.-P. Gasc; W. Hödl; E. Kochva; J. M. Legler; S. K. Saraswat and C. Gans; B. Shaffer; F. de Vree; P. C. Wainwright; D. Weishample.

• *Reproductive Endocrinology of Amphibians and Reptiles.* Paul Licht and Louis J. Guillette, conveners. J. Gavaud; L. J. Guillette; P. Licht; F. L. Moore; M. C. Moore; R. Pierantoni.

• *Developmental Processes.* Angus d'A. Bellairs and James Hanken, conveners. P. Alberch; S. V. Bryant and D. M. Gardiner; A. C. Burke; P. Collins and F. S. Billett; M. W. J. Ferguson and B. Westergaard; J. Hanken, D. W. Seufert, and C. H. Summers.

Roundtables and Workshops

In order to provide a variety of formats for participation in the congress, roundtables and workshops were arranged to complement symposia and posters. Roundtables allowed informally-organized discussions among experts on given topics, with audience participation, whereas workshops were practical demonstrations and lectures on the latest techniques, sometimes involving hands-on laboratory sessions. Trevor Beebee served as manager. As for symposia, most of these events had two conveners; multiple authorship refers to the form of abstracts published in the Abstracts volume, although only one author may have participated in the event.

roundtables

• *Conservation Needs Achieved.* Keith Corbett, convener. S. Lyster; D. Newman; S. Stewart; D. Stubbs; R. Whitaker.

• *Conservation Biology: The New "Modern Synthesis" and Its Relation to Herpetology.* C. Kenneth Dodd, Jr., Romulus Whitaker, and Gustavo Aguirre, conveners and moderators. K. Berry; C. K. Dodd, Jr.; A. Hailey; B. Magnusson; J. P. Ross; R. Seigel; R. Whitaker and C. K. Dodd, Jr.

• *Optimal Sizes of Eggs and Clutches.* Henry M. Wilbur and Laurie J. Vitt,

conveners. N. B. Ananjeva and S. Shammakov; J. Bernardo; C. M. Bull and I. Williamson; J. D. Congdon; C. P. Cummins; M. L. Crump; K. Y. Lue and K. S. Chuang; L. Schwarzkopf; R. Seigel, R. Shine and L. J. Vitt; B. Sinervo; P. Sjögren; J. Travis.

• *Antipredator Mechanisms.* Edmund D. Brodie, Jr. and Harry W. Greene, conveners. E. D. Brodie, Jr.; J. P. Caldwell; B. E. Dial; C. Edelstam; H. W. Greene.

• *Ecology and Conservation of the Tuatara.* Michael B. Thompson and Donald G. Newman, conveners; Marie-Charlotte Saint Girons, moderator. C. Carmichael; A. Cree; C. H. Daugherty; J. C. Gillingham; B. Green; L. J. Guillette and A. Cree; M. McIntyre; D. G. Newman; G. C. Packard, M. B. Thompson, and M. J. Packard; M. B. Thompson.

• *Herpetofaunas: A Biogeographic Review of the Continents.* Charles P. Blanc and Jay M. Savage, conveners. S. C. Anderson and A. E. Leviton; C. P. Blanc; D. G. Broadley; J. M. Savage; M. J. Tyler; P. E. Vanzolini.

• *Caecilian Biology and Evolution.* Michael Delsol and Marvalee H. Wake, conveners. J.-M. Exbrayat and M. Delsol; H. Greven; E. Gudynas; W. Himstedt; R. Laurent; J. Lescure and S. Renous; S. Renous, J.-P. Gasc, and J. Lescure; A. Smits; K. Schwenk; B. R. Seshachar; D. M. Walsh; M. Wilkinson; L. Zylberberg.

• *Snake Systematics and Phylogeny.* Herndon G. Dowling, Gregory A. Mengden, and Olivier Rieppel, conveners. H. G. Dowling; G. A. Mengden; J.-C. Rage; O. Rieppel; G. Underwood.

• *Laws, Research, and Conservation: A Conundrum.* Harold G. Cogger and Stephen R. Edwards, conveners.

• *Amateur Contributions to Herpetology.* Wolfgang Böhme, convener. H.-G. Horn; R. Guyétant; W. Sachsse; H. Zimmermann.

• *Medical and Herpetological Aspects of Venoms and Skin Toxins.* José M. Cei and Sherman A. Minton, conveners. G. De Caro; D. L. Hardy; E. Kochva; D. Mebs; H. Rosenberg; D. A. Warrell; J. White.

workshops

• *Skeletochronology and Aging Methods.* Jacques Castanet and Ella Smirina, conveners. R. Leclair, moderator. M. H. Caetano; J. Castanet and E. Smirina; M. Esteban, P. Herrero, and B. Arano; M. W. J. Ferguson and T. Joanen; R. Leclair; A. Montori; M. Sander; G. R. Zug.

• *Field Methods and Biotelemetry.* Jan van Gelder and R. Stuart Mackay, conveners. J.-P. Gasc; J. J. van Gelder; K. Grossenbacher; R. S. Mackay; J. P. Martínez-Rica; G. Naulleau, J. J. Ducamp, and A. Mariani; T. Pilorge and J. Clobert; R. Podloucky; M. Stanner.

• *Molecular Techniques.* David M. Hillis and Craig Moritz, conveners. L. D. Densmore, F. L. Rose, S. J. Kain, and R. T. Purkiss; D. M. Hillis; L. R. Maxson; C. Moritz; R. Murphy; J. Sites and R. Murphy.

• *Amphibian Larvae.* Barry D. Valentine and Richard Wassersug, conveners and presenters.

• *Quantitative and Phylogenetic Analysis.* Roger S. Thorpe and Garth Underwood, conveners. U. Joger; G. Mengden; M. Miyamoto; R. S. Thorpe; G. Underwood; J. W. Wright.

• *Photographic Techniques.* David Curl and David M. Dennis, conveners and presenters.

Posters

Many delegates participated in the congress by bringing posters describing their research. 370 posters were erected. Special times were set aside when authors were present at their posters to conduct discussions. Richard Tinsley served as Posters Manager.

• *Conservation and Management of Species.* K. H. Berry; L. A. Brandt; D. Corke; S. K. Dutta and P. Mohanty-Hejmadi; S. J. Incháustegui and Y. Arias; F. C. Killebrew; G. Kuchling; G. Kuchling and A. A. Burbidge; A. Muth; R. J. Rao; S. Shammackov; M. P. Simbotwe; M. Vyas, T. P. Vyas, and A. K. Pandey; T. Waller, P. A. Micucci, and E. Richard.

• *Effects of Environmental Pollution on Herpetofauna.* S. K. Bhatti and U. S. Bhatti; U. S. Bhatti and S. K. Bhatti; R. B. Bury and P. S. Corn; D. Dolmen and I. Blakar; M. Puky and N. Oertel; D. H. Taylor, S. Strickler-Shaw and C. W. Steele; R. Tzannetatou-Polymeni and A. A. Haritos.



Seal engraved by Hajime Fukada, Past President of Herpetological Society of Japan, to commemorate the First Congress. The Chinese characters read (right to left) "snake" and "propensity"—or "snake mania"—in allusion to herpetologists' devotion to their discipline and to the fact that the congress was held, appropriately enough, in the Chinese Year of the Snake. The seal is written in the Japanese *Ten* style of 1000-500 B.C.

• *Captive Management.* R. A. Acuña-Mesen; U. S. Bhatti and S. K. Bhatti; T. Boylan; L. G. Brown; J. F. Iaderosa; K.-H. Jungfer, W. Holmstrom, and J. L. Behler; S. V. Kudrjavtsev; V. K. Uteshev, O. I. Shubravy, I. A. Serbinova, and B. F. Goncharov; C. Warwick; H. Zimmerman.

• *Health and Disease.* B. Bannert; J. E. Cooper, R. Ewbank, C. Platt, and C. Warwick; M. E. Cooper; N. J. Millichamp, J. Dziezyc, and J. P. Flanagan; G. R. Pisani and B. R. Stephenson; I. Rácz and A. Kósa; V. Roca and M. J. Hornero; C. C. C. Samora, H. E. Coelho, R. E. C. Maitin, and R. C. Paulino; R. C. Sinha and R. P. Singh; J. C. Troiano.

• *Sexual Selection and Communication.* P. R. Y. Backwell and N. I. Passmore; U. S. Bhatti, S. K. Bhatti, and R. S. Sidhu; P. J. Bishop and N. I. Passmore; G. R. Bourne; M. Cherry and T. R. Halliday; F. M. Clarke and C. A. Hosie; L. Edsman; R. Günther and J. Plotner; T. R. Halliday and C. Giacoma; W. Hödl; C. A. Hosie; A. J. in den Bosch; R. W. Krohmer and D. Crews; R. M. M. de Orense; K. Ovaska; R. Pawley and V. H. Hutchison; C. J. Raxworthy; J. J. Schwartz; D. M. Sever; K. Summers; M. Tejedo; A. Zuiderwijk.

• *Environmental Sex Determination.* M. T. Dimond; M. A. Ewert and C. E. Nelson; J. L. Harry, K. L. Williams, and D. A. Briscoe; B. Jones, III and J. A. Musick; H. Merchant-Larios and F. I. Villalpando; S. Tokunaga; R. C. Vogt.

• *Orientation, Navigation, Nervous System and Senses.* A. Elepfandt, B. Schanz, B. Traub, M. Hainich, E. Günther, and A. Fleig; J. A. Keinath and J. A. Musick; Y.-P. Mou.

• *Egg Games: Optimal Size and Clutch Size.* C. K. Beachy; M. V. Subba Rao and M. Ratnakumari; Y. L. Werner and E. Frankenberg.

• *Long-Term Studies.* C. M. Bull; J. Burger and R. T. Zappalorti; A. Chandola-Saklani and V. D. Joshi; C. P. Cummins; J. Elmberg; K. Fog; F. J. Mazzotti, L. A. Brandt, and J. R. Wilcox; C. J. Reading.

• *Snake Behavior and Ecology.* A. L. Aghasian; A. Bea and J. P. Martínez Rica; A. Bouskila; P. R. Brown; K. Claus and R. F. Verheyen; J. A. Butler; H. S. Fitch and G. R. Pisani; A. Forsman; M. J. Gaywood and I. F. Spellerberg; M. Hasegawa; W. H. Martin; J.-C. Monney; A. Mori; A. Moser; K. J. Nelson and P. T. Gregory; G. Naulleau, J. J. Ducamp, and A. Mariani; G. R. Pisani and B. R. Stephenson; B. A. Savitzky; A. Solórzano López; B. R. Stephenson and G. R. Pisani; M.-C. Tu, C. M. S. Tsoi, S. H. Fong, and S. C. Lee; P. Vozenilek; K.-N. Xie; M. Zuffi.

• *Ecology and Adaptations in Extreme Environments.* M. R. Warburg.

• *Community Ecology.* A. Channing; I. de la Riva de la Viña; C. K. Dodd, Jr.; G. Moreira and A. P. Lima; I. Pavignano and C. Giacoma; D. Sanders, D. Bauwens, and R. F. Verheyen; P. Walker.

• *Herpetofaunas: Explorations and*

Studies. D. E. Barnard, J. A. Keinath, and J. A. Musick; L. Bodson; D. G. Broadley; M. A. Carretero; M. A. Carretero, X. Fontanet, G. A. Llorente, A. Montori, X. Pascual, X. Santos, E. Filella, S. Gimenez, L. Jover, C. Llorente, and N. Horta; N. Carrillo de Espinoza; J. Castanet and R. Guyetant; J. Dorda Dorda; A. Dubois and A. Ohler; J. R. Formas; J.-P. Gasc; I. V. Ghira and B. Stugren; M. L. Golubev; R. M. Gomez Prieto; H. Grillitsch and F. Tiedemann; U. Gruber; W. D. Haacke, R. Loutit, and S. G. Braine; T. I. Kotenko; Z.-T. Kou; R. C. Longmore; M. T. O'Shea; C. Pérez-Santos and A. G. Moreno; T. S. Sattarov; M. V. Subba Rao and B. Nageswara Rao; N. N. Szczerbak; J. Terhivuo; H.-P. Ting and J. Zheng; B. S. Tuniyev; J. Zheng.

• *The Ecology of Tuatara.* J. F. Cockrem, B. T. Firth, A. Cree, and G. R. Eynon; M. E. McIntyre.

• *Skeletochronology.* S. C. Buchholz; M. H. Caetano; P. Campolongo, H. Francillon-Vieillot, C. Giacoma, F. Rossi, and S. Tripepi; J. Castanet, M. Baez, and A. de Ricqlès; M. Esteban, P. Herrero, and B. Arano; V. G. Ishchenko; A. Juarranz, D. Patón, and A. Morales; G. R. Zug.

• *Field Methods and Biotelemetry.* E. Ferrandis, E. Seva, and P. Gracia; P. E. Ouboter; S. A. Sharygin; G. Sorci.

• *Origin of the Amphibia and Reptilia: Paleontological Evidence.* M. F. Ivakhnenko; R. R. Reisz and M. Laurin; R. Werneburg.

• *Paleoherpetology: Impact on Neoherpetology.* S. C. Anderson and A. E. Leviton; V. M. Ckhikvadze; R. Hernández-R., F. Soberón-M., and M. A. Cabral; G. A. Zerova.

• *Island Herpetofaunas.* M. Gaulke; A. Malhotra and R. S. Thorpe; M. Mylonas and E. D. Valakos; H. Ota; V. Pérez-Mellado and M. P. Galindo Villardón; R. M. Polymeni; G. H. Rodda and T. H. Fritts.

• *Caecilian Biology and Evolution.* J. M. Exbrayat and M. Delsol; W. Himstedt.

• *Molecular Systematics.* B. Arano, M. Esteban, and P. Herrero; C. Corti, M. Capula, and G. Nascetti; L. D. Densmore, F. L. Rose, S. J. Kain, and R. T. Purkiss; M. Garcia-Paris and B. Arano; T. Hayashi and M. Matsui; H.-W. Herrmann, U. Joger, and G. Nilson; F. R. Méndez-de la Cruz and G. Casas-Andreu; A. H. Price and D. M. Hillis; P. S. White and L. D. Densmore; C. W. Zeyl.

• *Cytogenetics.* R. G. Belcheva and Th. S. Sofianidou; B. D. Bell; T. Capriglione, A. Cardone, G. Odierna, and E. Olmo; M. Capula, F. Andreone, G. Nascetti, and L. Bullini; M. Capula, G. Nascetti, and L. Bullini; A. Cardone, T. Capriglione, G. Odierna, and E. Olmo; C. Chang and A. S. Rand; B. Fritz, W. Ulrich, and J. P. Fritz; E. H. Gadsden; P. Herrero, B. Arano, and M. Esteban; L. A. Kupriyanova; Z.-P. Lin, Z.-X. Wang, and K.-Q. Pan; S. G. Stewart and D. J. Morafka; M. Toriba; G. Wei and X. Ning; G. Wei, X. Ning, and D.-J. Li.

• *Parthenogenesis and Hybridogenesis.* R. L. Bezy; L. J. Borkin, R. Günther, Yu. M. Rozanov, and A. E. Vinogradov; W. M. Brown, L. D. Densmore, C. Moritz, and D. Peccinini-Seale; I. A. Caune and L. J. Borkin; F. D. Danielyan; I. S. Darevsky and T. M. Sokolova; L. D. Densmore, C. C. Moritz, J. W. Wright, and W. M. Brown; J.-D. Graf and M. Pols Pelaz; R. Günther; R. Günther and J. Plotner; H. Hotz and P. Beerli; N. Kamezaki; M. W. Klemens; F. Kraus and M. M. Miyamoto; L. A. Kupriyanova; B. E. Leuck; L. A. Lowcock; C. Moritz, C. Spolsky, H. Hotz, and I. Darevsky; M. E. Oliveira, M. Paillette, H. Rosa, and E. G. Crespo; D. Peccinini-Seale, C. Moritz, J. Sites, and D. Vyas; M. Polis-Pelaz and J.-D. Graf; H. G. Tunner and S. Heppich; J. W. Wright; J. W. Wright, D. Peccinini-Seale, C. Moritz, and J. Sites.



Official congress badge—a metal base painted in gold and blue—donated by Ilya S. Darevsky and his Soviet colleagues and presented to congress delegates.

• *Systematics and Phylogeny.* L. Bauer; D. P. S. Bhati; R. P. Brown and R. S. Thorpe; H. Griffith; H. J. Herrmann; A. V. Koroljov, S. M. Moody and M. M. White; A. Ohler; A. G. J. Rhodin; H. Sisniegas; W. Wüster and R. S. Thorpe; A. Young-Downey and J. Moreno.

• *Snake Systematics and Phylogeny.* R. A. Knight, L. D. Densmore, and E. D. Rael; I. Rehák; L. M. Reyes, E. Habacon, R. Tansiel, and D. Morafka; J. B. Slowinski; A. A. Tokar; G. Underwood.

• *Phylogenetic Analysis.* U. Caramaschi; D. R. Frost and R. Etheridge; A. Gubányi and Z. Korsós; T. Hikida; R. S. Thorpe.

• *Energetics.* Y.-K. Bai; R. A. Coulson, T. D. Coulson, and J. D. Herbert; T. Dellinger; B. E. Dial; N. M. Grimmond; F. V. Paladino, M. P. O'Connor, and J. R. Spotila; R. Vernet.

• *Ecological Physiology.* M. Alcobendas; M. E. Allen and O. T. Oftedal; D. J. Baer, O. T. Oftedal, and C. L. Kirk; N. G. Basso and J. D. Williams; C. Carey and J. R. Hazel; C. B. Daniels, P. J. Hayball, H. A. Barr, P. B. Frappell, and T. E. Nicholas; H. Ditrich and H. Splechtna; A. S. Gardner; W. Geise; L. E. Hunt; A. I. Kehr; G. Perry and R. Dmi'el; C. F. D. Rocha; M. G. Rovedatti, P. M. Castañé, and A. Salibián; R. Ruibal and E. J. Carroll, Jr.; A. Salibián; G. Sarig and G. Avital; R. C. Sinha and S. K. Singh; E. D. Valakos; R. Van Damme, D. Bauwens, M. A. Castilla, and R. F. Verheyen; B. Viertel; P.-C. Wang, X. Ji, and W. Ma; R.-M. Wu; R. L. Wyman and M. P. Frisbie.

• *Functional Morphology.* P. C. Arena and K. C. Richardson; L. J. Barbadillo; V. L. Bels; J. Cleuren, G. De Gueldre, and F. De Vree; J. Cleuren, V. Timmerman, and G. De Gueldre; J.-P. Gasc and S. Renous; V. Goosse and V. L. Bels; J. Klembara; T. M. Környei; D. B. Miles; J. L. Putnam; S. Renous, V. Bels, and J. P. Gasc; N. Salomatina; J. P. N. Singh; L. A. Somma; J. Weisgram and H. Splechtna.

• *Reproductive Physiology.* D. G. Brust; R. L. Burke; J. M. Cei, N. Ibanez, M. Zerani, and A. Polzonetti-Magni; H. Y. Cheng; C. Gascon; T. U. Grafe; S. Jacobs and J. H. Van Wyk; E. Limatola, F. Angelini, E. Restucci, and A. Boccia; K. Y. Lue and K. S. Chuang; T. M. Martínez; J. Matter; R. C. Noble, D. C. Deeming, and M. W. J. Ferguson; V. K. Uteshev, V. I. Popov, V. N. Parfenov, and B. D. Vassiliev; T. P. Vyas and M. Vyas.

• *Developmental Processes.* L. Alibardi and V. B. Meyer-Rochow; M. Auber-Thomay; F. S. Billet, D. A. Goulding, and P. Collins; F. Braña, F. Gonzalez, M. J. Arrayago, and A. Bea; P. Collins and F. S. Billet; M. R. El-Toubi; A. Goncharenko; C. Martín, M. García-París, and B. Sanchíz; J. O. Ogunranti; B. D. Palmer; R. Putti, L. Varano, A. Cavagnuolo, and V. Laforgia; S. Richter; A. H. Savitzky; R. R. Talavera; J. P. Teixeira and E. G. Crespo; H.-P. Ting.

• *Medical and Research Aspects of Venoms.* D. Kh. Khamidov, M. Sh. Akramov, M. G. Khafizova, L. Ja. Jukelson, S. Tjurin, and R. S. Salikhov; K.-N. Xie; K.-N. Xie and P.-N. Yu; P.-N. Yu; P.-N. Yu and K.-N. Xie; L. Ya. Yukelson, N. S. Auybova, S. M. Leigerman, and N. Sultanalieva; X.-C. Zhang, C.-X. Pang, Y.-G. Li, B. Wang, X.-F. Zhu, J.-J. Li, and S.-J. Li; X.-C. Zhang, C.-X. Pang, A. Hong, Y.-G. Li, B. Wang, X.-F. Zhu, J.-J. Li, and S.-J. Li.

• *Anuran and Urodele Ecology and Behavior.* N. Ancona; J. M. R. Baker; J. A. Díaz and L. M. Carrascal; R. A. Duff; S. E. Endel; X. Fontanet and N. Horta; S. Gafny and A. Gasith; L. García-Hidalgo and C. M. González; H. S. R. Glaser; R. A. Griffiths and P. de Wijer; K. Kabisch and S. Bauch; M. S. Khan; M. Lizana, F. Guerrero, and M. Gil Costa; W. E. Magnusson; R. Mittmann and D. Neumann; J. C. Ortiz and H. Ibarra-Vidal; S. K. Raut; R. Schabetsberger; I. Schlupp and R. Podloucky; B. Seidel; M.-T. Song.

• *Lizard Ecology and Behavior.* D. B. Carter; A. M. Castilla and D. Bauwens; S. C. Castillo; A. Chandola-Saklani and V. D. Joshi; A. Foà, A. Nieri, and G. Tosini; S. J. Incháustegui and Y. Arias; L. S. Melkumian; C. J. Pollo and V. Pérez-Mellado; S. R. Singh, U. S. Bhatti, and S. K. Bhatti; S. R. Singh and B. S. Kaur.

• *Chelonian Ecology and Behavior.* P. Crucitti, A. Campese, and M. Malori; V. E. Frolov; D. Margaritoulis; I. N. S. Nuitja; J. M. Sutherland and R. Woods; D. S. Wilson.

Other Events and Presentations

In addition to the main scientific program described above, there were numerous other events. The IUCN Species Survival Commission, chaired by George B. Rabb, met at the congress, as did several of its specialist groups concerning reptiles. A meeting of the African Amphibian Group was arranged by Jay M. Savage. A Herpetological Quiz, covering world herpetology and including laboratory displays, was organized by Martha Crump and assisted by Garth Underwood.

An auction of donated herpetological materials (books, prints, original artwork, paraphernalia), organized by Michael Lambert, was held one evening before a large, "spirited" audience. About $4000 was raised by Joseph T. Collins, the auctioneer, and his assistants, Ruth Zantzinger and Ellin Beltz; the proceeds will support worthy amphibian and reptilian conservation projects, worldwide.

A two-hour-long Herpetological Audiovisual Extravaganza was held, consisting of three sound-and-slide programs which required six computer-controlled slide projectors and a 4-by-10-m screen. "Herpetology Past and Present," an hour-long presentation by David M. Dennis and Kraig Adler, featured photos of herpetologists, their institutions, and illustrations of amphibians and reptiles from earliest times to the present, accompanied by classical and modern music, and was international in coverage.

Two shorter AV programs by Dennis and J. Eric Juterbock, "Amphibians of the Appalachians" and "Herpetology of the American West," comprised photos of animals and their habitats, accompanied respectively by the music of Aaron Copeland and Igor Stravinsky, and included breathtaking full-screen panoramas of some of the most famous herpetological localities and North American scenery. These three programs, officially sponsored by SSAR, were shown a total of seven times, by popular demand, and were described by members of the French contingent as "formidable!"

There were a large number of commercial exhibits, arranged by Thomas E. S. Langton, including book and print dealers, publishers, conservation displays, and herpetological society membership booths. In addition, numerous congress memorabilia were produced for sale, such as men's ties, crystal paperweights, medallions, and T-shirts decorated with the congress chameleon logo.

The congress Press Office, staffed by two persons, provided regular reports to television and print media of the most important research and conservation news from the congress.

Publications

Each delegate received several congress publications, including a 110-page Program. The 334-page Abstracts volume, containing half-page summaries of each oral and poster presentation, was organized by Tim Halliday. (Unfortunately, no extra copies are available for sale.) Delegates also received a specially-bound congress edition of SSAR's latest book, *Contributions to the History of Herpetology*, by Kraig Adler, John S. Applegarth, and Ronald Altig, as a gift from the Society.

WCH Executive and Business Meetings

The Executive Committee of the World Congress met four times during the congress and the Business Meeting attracted about 200 delegates. Business included ratification of the WCH Constitution, endorsement of WCH's continuing editorial responsibility for the series *Amphibian and Reptilian Species of the World*, establishment of a Committee on Nomenclature to respond to requests from the International Commission on Zoological Nomenclature, election of new members to the Executive and International Herpetological Committees (EC and IHC) of WCH, passage of resolutions, and discussion of a venue for the Second Congress.

After discussion at the Business Meeting, the new Constitution was approved unanimously. Among other provisions, this affords a mechanism for election of new EC and IHC members



The Executive Committee of the World Congress of Herpetology, in session at Canterbury. Left to right, seated: Michael R. K. Lambert (UK), Marinus S. Hoogmoed (*Treasurer*; Netherlands), P. E. Vanzolini (Brazil); standing: Gustavo Casas-Andreu (Mexico), Robert L. Carroll (Canada), Ermi Zhao (China), Ilya S. Darevsky (USSR), Rainer Günther (German D.R.), Donald G. Broadley (Zimbabwe), Harold G. Cogger (Australia), Kraig Adler (*Secretary-General*; USA), Ian R. Swingland (*Ex officio*; UK), and Hubert Saint Girons (France). Also present but not pictured: José M. Cei (Argentina/Portugal) and David B. Wake (USA).

(who will serve for two inter-congress terms, with half of both committees being replaced at each congress to provide for continuity and renewal) and future congresses at intervals of 3-5 years.

The Secretary-General and some other members of the EC declined renomination and ten persons were thus newly elected to the EC, which now consists of (new members*): Roger A. Avery*, Wolfgang Böhme*, Donald G. Broadley, Robert L. Carroll, Gustavo Casas-Andreu, Harold G. Cogger, J. C. Daniel, Ilya S. Darevsky, William E. Duellman*, Tim R. Halliday*, Marinus S. Hoogmoed, Konrad Klemmer*, Michael R. K. Lambert, Jean Lescure*, Jay M. Savage*, P. E. Vanzolini, Marvalee H. Wake*, Yehudah Werner*, Romulus Whitaker*, and Ermi Zhao.

The 50-person IHC is now comprised of (new*): Rafael A. Acuña Mesen*, Pere Alberch*, Jean-Louis Amiet, Natalia B. Ananjeva*, Claes Andrén*, E. Nicholas Arnold, Ana Maria Báez*, İbrahim Baran, Willy Beçak, Ben D. Bell, Leo Borkin*, S. D. Bradshaw*, William R. Branch, E. R. Brygoo, Jacques Castanet*, Charles H. Daugherty*, Alain Dubois*, J. Ramón Formas, Darrell Frost*, Carl Gans, David M. Green*, Harold Heatwole, René E. Honegger, Robert F. Inger, Ulrich Joger*, Raymond F. Laurent*, Murray J. Littlejohn*, Shou-hsian Mao, Linda R. Maxson*, Roy W. McDiarmid*, Göran Nilson*, Georges Pasteur, Eric Pianka*, Jens B. Rasmussen*, Armand de Ricqlès, Olivier Rieppel*, Zbyněk Roček*, Borja Sanchíz*, Yoshio Sawai, Richard Shine*, Malumo P. Simbotwe*, Zdeněk V. Špinar, Ian R. Swingland*, Leonid P. Tatarinov, Franz Tiedemann, Richard C. Tinsley*, Linda Trueb*, Michael J. Tyler, Richard Wassersug*, and George R. Zug.

Three resolutions were introduced and discussed. The first, concerning the use of turtle-excluder devices (TEDs) on nets of shrimp boats in the Gulf of Mexico, to reduce the killing of sea turtles, was passed. This resolution subsequently was sent to the Hon. George H. W. Bush, President of the USA. The second resolution concerned the conservation of European herpetofauna and asks for governmental attention to various aspects of conservation. This statement was also passed and copies were sent to the European Parliament and other European governmental bodies. A third resolution, intended to recognize the important contributions of amateur herpetologists to captive husbandry, was, after lengthy discussion, defeated. The delegates, although sympathetic with the intention, felt that such a statement could be misused by some dealers and unscrupulous amateurs.

Formal invitations to hold the next congress in Adelaide (Australia), San José (Costa Rica), or Singapore were discussed. Further invitations are being solicited, but the EC expects to make a final decision early in 1990.

Social Activities

Social activities were held every evening during the conference, to give relief from the intensive daytime scientific sessions and to provide other opportunities for interaction and discussion. The Lord Mayor of Canterbury and the City Council hosted an elaborate reception at the old Westgate Gardens in the city, at which we were entertained by the Canterbury Pipe Band, a highland bagpipe band dressed in full Scottish regalia, and two local troupes, including Morris dancers, demonstrating traditional English country dances. Other evenings featured a discothèque, receptions (the wine was excellent), and film programs.

The WCH banquet was a formal affair, with music by Dixieland and jazz bands, at which the congress hosted the Lord Mayor, the Sheriff of Canterbury, the university's Vice-Chancellor, and other Canterbury and university dignitaries. As was fitting for an occasion of this nature in the United Kingdom, the Secretary-General, on behalf of the delegates, led the formal tribute—called the "loyal toast"—to Her Majesty Queen Elizabeth II.

One day midway through the meeting was free of all scientific sessions, allowing delegates and families to relax or participate in guided tours to London, Paris, and other places, although tours were also conducted on other days. Some delegates visited Down House, home of Charles Darwin, now a museum just a short distance west of Canterbury.

On the final evening of the congress there was an enormous outdoor barbeque on a hill overlooking the city, where delegates and their families ate pork ribs and chicken *ad libitum*, washed down with another special congress brew, "Snake Bitters." The 70-member Regimental Band of the Royal Green Jackets, a regular British Army unit stationed near Canterbury, displayed the famed pagentry of the British military by playing martial music while marching in several drill formations to entertain the audience.

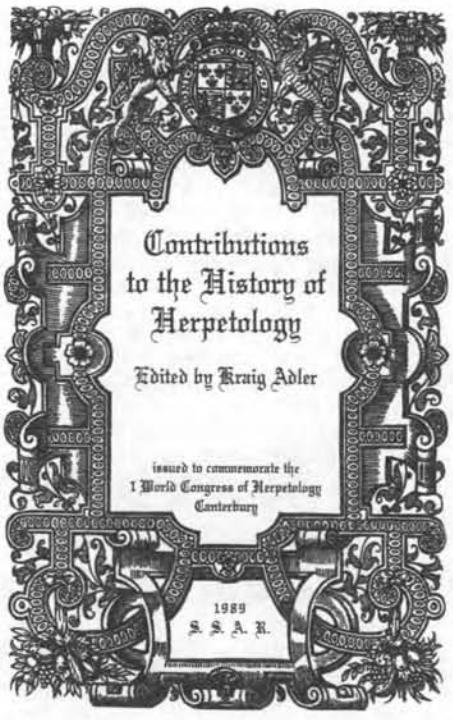
On other evenings there were numerous informal gatherings of groups of herpetologists, some of which had never met before as a group (for example, herpetologists from the Soviet Union and China, who met for the first time, and another group from throughout Latin America) and, in other cases, national groups (Canada, New Zealand, etc.) and groups with taxonomic or functional areas in common.

Closing Ceremonies

On the last day, following the final plenary lectures at the Marlowe Theater downtown, the First Congress was brought to a formal close by Kraig Adler. He noted the intensity of the week's activities, the evident enthusiasm for the next congress, and the presence in the audience of numerous senior colleagues from around the world as well as many young herpetologists, the youngest of whom was a 15-year-old amateur from Ohio in the USA.

As examples of the eagerness to attend this congress, Adler mentioned one delegate who sold his automobile to obtain the necessary funds, and another who borrowed from friends and relatives overseas and who expects that it will take 10 years to repay the loans. He then called on Michael Lambert, authorized by the WCH Executive Committee to read out the following resolution of appreciation:

• *"Recognizing the contribution made in convening the two World Congress committees (the Executive Committee and International Herpetological Committee) and by integrating the interests of the entire herpetological community with those in the United Kingdom for the First World Congress of Herpetology, and the dedication and personal commitment of the Secretary-General on behalf of herpetology and herpetologists worldwide, the profound thanks of the Congress participants are due to Kraig Adler.*



Contributions to the History of Herpetology, a book published by SSAR to commemorate the First Congress, was issued in a special edition at Canterbury. The book includes biographies of 152 leading herpetologists (with their portraits and signatures), an index to 2500 authors in taxonomic herpetology, and academic lineages of 1300 herpetologists, worldwide. The regular cloth-bound edition is available for $20 postpaid from the Publications Secretary, Robert D. Aldridge (address inside front cover of this issue); see full description in the March 1989 issue of *Herp Review* (centerfold).

• *"Acknowledging the assistance in the development and functions of the World Congress of Herpetology, the Executive Committee, on behalf of the world's herpetologists, wish to express their gratitude to:*

"1. William Duellman, David Wake, and John Wright, members of an original ad hoc *committee which initiated the founding of the World Congress and put the proposal to American and foreign representatives attending the Silver Anniversary Meeting of the Society for the Study of Amphibians and Reptiles and of the Herpetologists' League in Raleigh, North Carolina, August 1982.*

"2. Members of the World Congress Constitution Committee: Harold Cogger (Chairman), Natalia Ananjeva, Richard Goris, René Honegger, Jay Savage, and P. E. Vanzolini.

"3. Members of the First World Congress Subsidy Panel: Marinus Hoogmoed (Chairman), Roger Avery, Wolfgang Böhme, John Burton, Carl Gans, Harold Cogger, Michael Lambert, Raymond Laurent, and Jay Savage.

• *"Recognizing the value of the work put into developing and maintaining the smooth running of the First Congress, the Executive Committee, on behalf of the participants, have very great pleasure in expressing their deepest gratitude to all those people in the United Kingdom involved with administering the First World Congress of Herpetology, especially: Ian Swingland (Conference Director), together with Fiona Lawson, alias Mrs. Ian Swingland (Records Manager), without whose phenomenal and stalwart efforts the First World Congress of Herpetology might not have happened at all, as well as the following persons:*

"David Bateman (Database Manager), Richard Griffiths (Stewards Manager), the Earl of Cranbrook (Convener of Honorary Officers), Roger Avery (Chairman, UK National Executive), Roger Thorpe (Symposia Manager), Richard Tinsley (Posters Manager), Timothy Halliday (Abstracts Manager), Henry Arnold (Films Manager), Trevor Beebee (Workshops and Roundtables Manager), Michael Lambert (Auction Manager), Garth Underwood (Quiz Manager), and the Senior Stewards: Quentin Bloxam, Arnold Cooke, John Cooper, Keith Corbett, Peter Davies, Brian Groombridge, Thomas Langton, Robert Oldham, Peter Olney and David Stubbs.

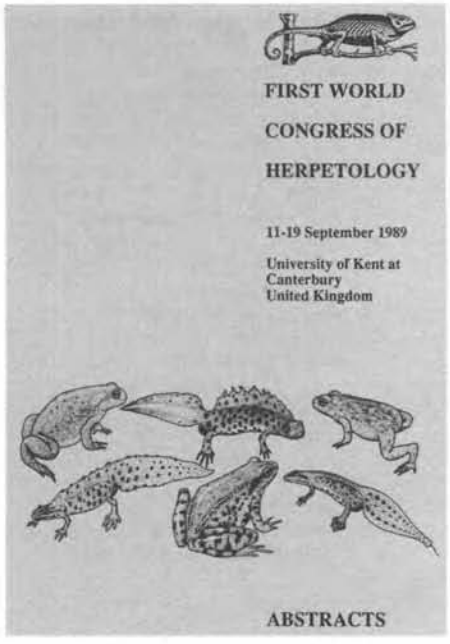
"At the University of Kent: David Ingram (Vice-Chancellor), Peter Jordan (Conference Officer), Elizabeth Cable (Deputy Conference Officer), Neville Holloway (Catering Manager), and John Pell (Audio-Visual Aids Manager). In the City of Canterbury: Arthur G. Porter (Lord Mayor of Canterbury) and William Preston (Secretary, Canterbury City Council).

"Richard Griffith's team of Congress stewards, especially Margaret Bray, David Curl, David Galbraith, Adrian Hailey, Hinrich Kaiser, Michael Klemens, Mark O'Shea and Ralph Wycherley, and including Begona Arano, Paul Beckwith, Joseph Bernardo, David Bird, Lee Brady, Anne-Marie Brennan, Richard Brown, Angela Buckley, Rob Colby, Will Crampton, Jenny Daltry, Paul Edgar, James Foster, Luis García-Hidalgo, Rosa Gómez-Prieto, Andras Gubányi, Olive Lindstrand, Anita Malhotra, Tricha Murphy, Miklós Puky, Sheik Rashid, S. K. Raut, Julie Roberts, Zbyněk Roček, Antonio Salas Jaramillo, Robert Schabetsberger, Birgit Stangl, Mary Swann, Verina Waight, Gang Wei, Rona Williams, Jaclyn Wolfheim, Pieter de Wijer, Galina Zerova, and Robert Macey.

• *"Some accompanying persons, to assist needy overseas delegates, became booksellers, namely Dolores Adler and Patricia Zug.*



Scheduled intermissions allowed speakers and their audience—here, from the symposium on "Health and Disease"—to talk informally, in lounges near the meeting rooms.



The 334-page Abstracts volume contained half-page summaries of all oral and poster presentations. The drawings, by Tim Halliday, depict the six British amphibians. Britain's reptiles appeared on the cover of the Program.

• *"Numerous other individuals and organizations have contributed towards the organization of the First World Congress of Herpetology in a variety of ways, and the Executive Committee take this opportunity to thank them also. These include: Martha Crump (Herpetology Quiz originator), Joseph Collins (auctioneer), assisted by Ruth Zantzinger and Ellin Beltz, David M. Dennis (originator and organizer of the Audio-Visual Extravaganza) and his collaborators, J. Eric Juterbock and Kraig Adler; the Society for the Study of Amphibians and Reptiles for donating the Congress Poster (painted by David Dennis) and the book* Contributions to the History of Herpetology *(edited by Kraig Adler); and Ilya Darevsky and his colleagues in Leningrad for the official congress badge.*

• *"And for being everywhere at the same time (besides Ian Swingland): Kraig Adler."*

After the names of persons newly elected to the Executive and International Herpetological Committees of the World Congress were reported, Kraig Adler announced the results of the Executive Committee's election of senior officers earlier in the day. Robert L. Carroll (Canada) was elected Treasurer and Marinus S. Hoogmoed (Netherlands) as the new Secretary-General. Marinus Hoogmoed then assumed his new office and, after some brief remarks, declared the First Congress closed.

J. ERIC JUTERBOCK
SSAR Secretary •

SSAR ELECTION RESULTS

The results of the 1989 SSAR election are as follows:

President-elect ..... Linda E.R. Maxson
Secretary ..... J. Eric Juterbock
Treasurer ..... Douglas H. Taylor
Board - Regular ..... Henry R. Mushinsky
Board - Zoological Parks .....Gustavo Casas-Andreu

A total of 658 members voted in this election.

The Society extends its gratitude to the Nominating Committee (James B. Murphy, Chair) and to the SSAR Elector (Ruth M. Zantzinger) for their hard work, and to the outgoing president and board members for their service during their terms.

NEWSNOTES

LONGEVITY SURVEY

The deadline for submitting data to the new edition of *Longevity Survey of Reptiles and Amphibians in North American Collections* is 31 May 1990. Please submit data to Kevin Bowler or Andy Snider, Audubon Zoo, 6500 Magazine Street, New Orleans, LA 70178, USA ●

CROCODILIAN SYMPOSIUM PROCEEDINGS

A separately bound reprint of the symposium *Biology of the Crocodilia* that appeared in Volume 29, number 3 of the American Zoologist, September 1989, is available from Valentine Lance, Center for Reproduction of Endangered Species, San Diego Zoo, P.O. Box 551, San Diego, CA. 92112, USA. The reprint is soft-bound, 232 pages in length and consists of 15 major papers, a brief biography of Professor Roland Coulson, to whom the symposium was dedicated, and an afterword by Professor Carl Gans. Copies may be purchased for $10 U.S., including postage. Make checks payable to the Zoological Society of San Diego, include a notation on the check "account #3-2022-875/972-Lance," and mail to V. Lance. Prepaid orders only please in U.S. dollars. ●

DALLAS ZOO SEEKS ZOOLOGIST

The City of Dallas Park and Recreation Department is seeking qualified applicants for the position of Zoologist 12 in the Reptile Department of the Dallas Zoo. Responsibilities include research program development and coordination as well as assisting department curators.

Qualified applicants must have a bachelor's degree in zoology or a related field and two years of research experience. Knowledge of the behavior, ecology and physiology of reptiles is highly desirable, as is a degree beyond the bacheolor's level.

Salary range is $22,344-27,132, depending upon education and experience. Applicants should state they are applying for the Zoologist 12/Reptile Department position in the Park and Recreation Department, and submit applications/resumes by 15 May 1990 to: Staffing Manager, Personnel Department, 1500 Marilla, City Hall Room 6AM, Dallas, TX 75201, USA ●

SOCIETIES

ADDRESS CHANGES

The following address changes have been submitted since the list of herpetological societies was printed in the September 1989 issue of *Herpetological Review:*

American Society of Ichthyologists and Herpetologists
Florida State Museum
University of Florida
Gainesville, FL 32611, USA

Herpetologists' League
Texas Natural Heritage Program
Texas Parks & Wildlife Department
4200 Smith School Road
Austin, TX 78744, USA

Nordisk Herpetologisk Forening
Mr. Henrik Bringsoe, Chairman
Esthersvej 7
DK-4600 Koge
Denmark

Oklahoma Herpetological Society
c/o Bob Ball, Newsletter Editor
Route 1, Box 59
Goodwell, OK 73939, USA

Terrariengemeinschaft Berlin E. V.
Mr. Peter Grossman
Lepsiusstrasse 53
D-1000 Berlin 41
Federal Republic of Germany

Society officers are encouraged to forward to the SSAR Regional Society Liaison (see inside front cover of *HR*) any address changes for their society. Newly formed societies are invited to announce their existence in this column. ●

FEATURES

SEXUAL SELETION AND COMMUNICATION IN AMPHIBIANS AND REPTILES

The First World Congress of Herpetology was held at the University of Canterbury in England from 11-19 September 1989. In attendance were over 1,000 amphibian and reptile biologists from over 60 countries. Included in the Congress program were six workshops, 11 roundtables and 27 symposia. One of the latter, the subject of this article, was devoted to studies of sexual selection and communication in amphibians and reptiles (17 September). It was convened and moderated by Murray Littlejohn (University of Melbourne, Australia) and Stevan Arnold (University of Chicago, USA).

Darwin (1871) developed the theory of sexual selection in order to account for the evolution of behavioral and morphological characters (usually exhibited by males) that function solely in the acquisition of mates. The symposium largely was focused on one aspect of sexual selection, intersexual selection or mate choice. This can be defined operationally as any pattern of behavior that leads to members of one sex (usually females) being more likely to mate with certain members of the opposite sex than with others (Halliday 1983a). The second aspect of sexual selection, competition among members of one sex (usually males) for access to members of the opposite sex, also received some attention.

Intersexual selection implies that information is being sent by certain individuals and is

HOLBROOK PORTRAIT



John Edwards Holbrook (1794-1871), the Father of North American Herpetology, was a physician living in Charleston, South Carolina. His two classic books, "North American Herpetology" (first edition, 1836-1840; second edition, 1842) were the first comprehensive surveys of the North American herpetofauna. In 1856-1857, Daniel Huntington painted an oil portrait of Holbrook, which has now been reproduced in full color as a poster measuring 8 3/4 x 11 1/4 inches and printed on heavy, acid-free stock suitable for framing. Copies are available for $6.00 each or $4.00 in quantities of 10 or more, postpaid, from SSAR Publications Secretary, Robert D. Aldridge, Department of Biology, St. Louis University, St. Louis, Missouri 63103, U.S.A. (Copies of SSAR's 1976 reprint of Holbrook's "North American Herpetology," 1032 pages, 147 plates with 20 in color, clothbound, are also available from Dr. Aldridge, at $60.00 postpaid.)

being received by others. In other words, there is communication between sender and receiver, with some aspect of the behavior of the former influencing the behavior of the latter (Slater 1983). The functions of communication during intersexual encounters include the following (Tinbergen 1953; Halliday 1983b): (1) orientation or attraction of partners, often over a considerable distance; (2) "persuasion," whereby one partner increases the sexual motivation of the other in order to elicit a positive sexual response; (3) synchronization of the activities between partners to ensure the highest probability of successful reproduction; (4) species identification, and (5) assessment of some aspect of the "quality" of an individual as a mating partner.

The symposium reported studies of intersexual communication in the context of all five functions listed above. First, physiological (especially endocrinological) mechanisms which ensure intersexual synchrony in the reproduction of reptiles were considered. The majority of papers discussed aspects of mate choice by females of conspecific males. Finally, the role of sexual selection at the level of groups of populations and species was considered, especially in the context of species identification and the speciation process itself.

In this article, I briefly review the papers which comprised the symposium on sexual selection and communication in amphibians and reptiles. The reader will notice that all but one of the 11 papers deals with amphibians, and that of these, all but two deal with anurans.

Reproduction is the single most important event in the life of any organism. To be successful, individuals must time reproduction such that young are produced during a season when they are most likely to survive. In addition, there must be a high degree of synchronization among partners for successful reproduction. David Crews (University of Texas at Austin, USA) discussed his work on two North American reptile species which achieve these two types of synchronization in rather different ways.

In the lizard *Anolis carolinensis,* seasonal changes in the environment trigger neuroendocrine events in males which stimulate both spermatogenesis and the production of male sex hormones by the testis. These hormones then feed back onto centers in the brain to activate both aggressive (directed to other males) and sexual (to females) behavior patterns. Crews has found that male behavior can profoundly influence the rate at which the ovaries of females become ready for reproduction. Male courtship display speeds ovarian growth, whereas aggression among males inhibits it.

Synchronization occurs differently in the snake *Thamnophis sirtalis.* Lengthy winter hibernation and the need to produce young by late summer have resulted in the uncoupling of the processes of spermatogenesis, steroid production and mating behavior in males. Males mate at a time when their testes are regressed; higher spring temperatures directly activate courtship. Female ovaries are also regressed at this time, and develop only after mating activates crucial neuroendocrine events.

The concept of persuasion in intersexual communication was developed by Lynn Houck (University of Chicago, USA), who presented the results of her studies of sexual behavior in the North American plethodontid salamander *Desmognathus ochrophaeus.* As in many salamander species, male *D. ochrophaeus* deliver courtship pheromones to females during the initial stages of courtship. These pheromones are produced by specialized glands maximally developed only in sexually active males, and are delivered to females only during courtship (thus they are not the same as sex attractants, which operate over longer distances and before the initiation of courtship).

Houck demonstrated experimentally that exposure of females to the male's courtship pheromone renders them fully sexually responsive in a time shorter than that shown by females exposed to males in the absence of pheromone. The courtship pheromone apparently functions to "persuade" the female to mate by increasing her sexual responsiveness above some critical threshold level. In other experiments, Houck has demonstrated that there is considerable variation among males in their success at inseminating females. At least some of this variation may be due to differences among males in the timing of pheromone delivery.

Behaviors which males use to attract and/or stimulate females may incur costs as well as the obvious benefit of increased mating success. Thus a behavior might attract predators as well as potential mates. In frogs, calls used to attract females also may be costly because they are energetically expensive to produce; in some species, calling is the most expensive activity an individual can perform. Kent Wells and Ted Taigen (University of Connecticut, USA) studied the energetics of calling in two treefrogs, with particular emphasis on how the cost of calling changes with increased levels of acoustic competition among males.

In the North American frog *Hyla versicolor,* males call for longer durations when exposed to the calls of other males, but show a decrease in calling rate. Because of this trade-off, vocal interactions among males appear to have little influence on the energetics of calling in this species. Males appear to be close to their maximum ability to call most of the time, the ceiling of which probably is set by the availability of glycogen in muscles. The situation is rather different in *H. microcephala* from Central America. When exposed to the calls of other males, a male of this species adds notes to his own call and increases his rate of calling; the cost of calling increases with increasing chorus size.

Increased rate of calling is only one means by which a male can attempt to maximize the efficiency of his own calls in attracting females. Another is for the male to time the production of his calls so as to avoid overlap with the calls of his neighbors. In this way he increases the conspicuousness of his own calls. Peter Narins (University of California at Los Angeles, USA) predicted that avoidance of overlap should occur in choruses of the Puerto Rican frog *Eleutherodactylus coqui,* because it is the properties of the call notes themselves (not internote intervals) that are important in male aggression and female attraction. Narins developed a model based on this prediction in which a given male actively avoids overlap with, at most, two neighbors. When Narins tested his model with data collected from natural frog choruses he found that, indeed, males avoid overlap with one or two neighbors.

Frog calls have been studied using a number of different approaches, including behavioral studies of phonotaxis, computer-modelling and neurophysiological investigations of the auditory system. Michael Ryan and his colleagues (University of Texas at Austin, USA) presented evidence that physiological properties of the female auditory system might direct the evolution of male calls. In the frogs *Physalaemus pustulosus* (Central America) and *Acris crepitans* (North America) the auditory system of females is able to process a range of acoustic parameters far wider than the range which is typical of the species. As a consequence, once a call type evolves, properties of the female auditory system can exert directional selection on certain call characteristics (e.g., dominant frequency), thus directing their evolution. The sensory apparatus of the female clearly is an important factor in shaping the evolution of male vocalizations.

Chorus behavior in a natural population of the South African frog *Hyperolius marmoratus* was described by Neville Passmore and his associates (University of the Witwatersrand, South Africa). Male frogs and their calling sites were individually marked, and the males' activities were monitored in detail over a four week period. Chorus sizes varied greatly, and the night-to-night turnover of males was high. Considerable variation among males in mating success was found, with some males mating repeatedly and some not at all. However, large males were no more likely to obtain matings than were smaller males. A better predictor of male mating success was the number of nights that a male spent calling to attract females; the more nights, the greater his chances of mating.

That large males were not at an advantage in natural choruses is surprising, for experiments on phonotactic responses of female *H. marmoratus* have shown that call characteristics typical of larger males are preferred by females. In such experiments it is usual for there to be little or no background noise upon which specific call stimuli are superimposed. What is the relationship of the results of phonotaxis experiments to patterns of male mating success seen under more complex, natural conditions?

To answer this question, Mandy Dyson (University of the Witwatersrand, South Africa) studied male mating success in a caged population of *Hyperolius marmoratus* in which she manipulated male density (and thus the amount of background noise each male was forced to call against). Large males, producing the most attractive calls, were more likely to mate than were smaller males at low densities. However, at higher densities, Dyson found that this large-male advantage disappeared, with patterns of male mating success becoming random with respect to body size. Dyson suggested that increased background noise at higher densities resulted in high levels of acoustic interference. As a consequence, female mating preferences could not be effectively expressed.

Male mating tactics and patterns of male mating success have been studied extensively in the bufonid anurans. Considerable

variation exists both within and among species in the tactics used by males to acquire mates, e.g., calling from fixed sites, the adoption of silent satellite tactics and intense scramble competition. Similarly, there is great variation in the degree to which males of certain phenotypes are more successful in mating.

Anthony Arak (University of Oxford, England) considered the causes of intraspecific variation in male behavior in toads. He argued that individual males adopt tactics likely to give them the highest probability of mating based on their own phenotype (e.g., body size) and prevailing conditions at the breeding site, Of the latter, male density and the ratio of males to reproductive females (the operational sex ratio) are the most important factors. Female bufonids are far from passive, however. In many species, females prefer as mates those males that produce the most conspicuous calls. However, as with *Hyperolius marmoratus,* the extent to which a female can effectively express her choice depends upon the intensity of competition among males.

That females benefit from choosing particular males as mates is obvious in those cases where males defend some resource necessary for successful reproduction by females. The situation is less clear in those species in which males provide only genes to their offspring. Bruce Woodward (University of New Mexico, USA) reported the results of experiments on the relationships between male body size and offspring performance in North American anurans (*Scaphiopus, Bufo, Hyla*).

Woodward found that mating success among males is non-random in many natural breeding assemblages. Female choice might be responsible for the mating advantage enjoyed by larger males. By carefully splitting clutches of eggs of individual females between large and small fathers, Woodward showed that offspring performance is greater when fathers are large than when small. For example, juvenile *S. multiplicatus* grow faster if their fathers are of large body size. For anurans that occupy temporary ponds, differences in the timing of metamorphosis and/or size of offspring at metamorphosis might make all the difference between successful or failed reproduction. Woodward argued that female choice for larger mates is advantageous if larger males sire superior offspring.

Encoded within the call of a male frog are a number of types of information, such as his species identity and body size. Both types of information may be used by females in making mating decisions. Carl Gerhardt (University of Missouri, USA) analyzed call preferences in two North American treefrogs, *Hyla versicolor* and *H. chrysoscelis.* In experiments on phonotactic responses in both species, females preferred synthetic calls with characteristics typical of their species. However, for calls with characteristics within the limits of their species, females preferred calls which are both energetically expensive to produce and which are produced by large males. Gerhardt suggested that females use the same male calls to select both mates of the correct species and mates of superior phenotype. Interestingly, field studies of natural breeding populations of these treefrogs revealed no tendency for large males to have a mating advantage, a result echoing that for *Hyperolius marmoratus.*

Gerhardt also explored the possibility that the presence of one species might select for greater differences in the call of another, decreasing the likelihood of mistaken interspecific mating (and reproductive failure). Call pulse rate in *Hyla chrysoscelis* was found to vary over a broad geographic scale, but this variation apparently was unrelated to the presence of *Hyla versicolor.*

The evolution of behavioral mechanisms which prevent interspecific gene flow also was considered in the last paper in the symposium. Paul Verrell (University of Chicago, USA) reported that geographically isolated populations of the salamander *Desmognathus ochrophaeus* may differ so greatly in aspects of their sexual behavior that they fail to mate with one another in the laboratory. The degree of sexual isolation among populations increased with increasing geographic distance, presumably because distant populations have been separated for the longest time and have the lowest rates of gene flow. Interestingly, sexual isolation was not significantly related to the degree of genetic differentiation among populations.

Verrell's data indicate that differences in sexual behavior which prevent gene flow among species occur in sympatry may evolve while populations are isolated from one another in allopatry, perhaps under the influence of sexual selection. Observation of heterosexual encounters among individuals from different populations revealed considerable variability in just when in the courtship sequence such encounters break down to result in isolation. Both olfactory and behavioral differences among populations are implicated in the emergence of sexual isolation.

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Announcement

SNAKES OF THE AGKISTRODON COMPLEX

by the late Howard K. Gloyd and Roger Conant

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Due to unforeseen delays, publication of this book will be delayed until late summer 1990. The color plates are printed and the text is now completely typeset and in page proof, but additional work is required to prepare the text for printing.

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SSAR greatly regrets this inconvenience to subscribers and asks for their continuing patience.—The Editor

PHORID FLY LARVAE AS PREDATORS OF TURTLE EGGS

The egg is one of the most vulnerable stages in the life cycle of turtles. Mortality factors include: erosion of the surrounding substrate, mechanical damage to the shell, changes in the physical-chemical conditions of the substrate (humidity, temperature, salinity, etc.), infection by pathogens such as bacteria or fungi, and predation by various vertebrates and invertebrates (Acuña 1980; Moll & Legler 1971; Pritchard et al. 1984; Dodd 1988). Invertebrate predators include crabs (Márquez et al. 1976), ants (Hughes 1974; Witherington 1986), and fly larvae.

Fly larvae have been reported from eggs of *Malaclemmys terrapin* (Aldrich 1916), *Trionyx muticus* (Muller 1921), *Graptemys pseudogeographica* (Vogt 1981), and *Lepidochelys olivacea* (Polimeni 1988). The flies in these cases were all Sarcophagidae. Manuel Benitez (pers. comm.) has found unidentified fly larvae in decomposing eggs of *Caretta caretta* buried 30-40 cm below the soil in El Salvador. Two species of flies of the family Phoridae have been reported from eggs of *Pseudemys scripta* in Panama (Moll & Legler 1971). We report here the presence of one of these species of Phoridae from eggs of *Rhinoclemmys pulcherrima.*

From a natural nest found in March 1988 in the city of Puntarenas (Puntarenas Province), Costa Rica, six eggs of *Rhinoclemmys pulcherrima* were placed in an incubator in which the temperature was maintained at 28° C. The eggs were partially buried in sterilized soil. After 113 days in the incubator, three of the eggs became darker and appeared to have stopped developing. One of these

three eggs was dissected and was found to contain fly larvae. The remaining two eggs were then transferred to a cage covered with fine mesh cloth. Within one week adult flies emerged from these two eggs. The other three eggs from the nest hatched normally.

Some of the flies emerging from the original two eggs were transferred to bottles containing a nutrient medium composed of agar (4 g), banana (100 g), dry active yeast (a few grains), propionic acid (2 g), and water (95 ml). The remaining flies were left in contact with the decomposing eggs where another generation was completed. These flies from the second generation, having exhausted their food supply of decomposing eggs, were then placed in bottles with nutrient media. The cage containing the emerged flies was cleaned and supplied with two fresh eggs from a captive (unmated) turtle of the same species. The eggs were first washed in water and were then partially buried in autoclaved soil and held at ambient temperature (18-26° C); a fine mist of water was applied to the soil every four days in order to avoid dehydration.

The flies reproduced very well on the nutrient media and apparently interbred with those of the second generation from the original field collected turtle eggs. The eggs from the captive turtle were readily attacked and adult flies emerged in ca. two weeks.

The flies were identified as a species of Phoridae, *Megaselia scalaris* (Loew) (identification by Brian Brown, University of Alberta). This species is extremely polyphagous, having been previously reported from various insect hosts (especially insects in culture), rotting plant tissue, feces, and as a cause of human myiasis (Robinson 1971). *Megaselia scalaris* has also been reared from viable frog eggs: a phyllomedusine in Costa Rica and a leptodactylid in Puerto Rico (Villa & Townsend 1983). We have encountered only one previous record of *M. scalaris* from turtle eggs (Moll & Legler 1971).

When turtle eggs are transferred from the field to the laboratory many of the eggs are frequently found to be infected by bacteria or fungus (Acuña 1980; Wyneken et al. 1988). It is possible that *M. scalaris* locates turtle eggs, in the field as well as in the laboratory, by means of odor from rotting eggs. Nonetheless, when flies were placed with fresh eggs from the captive turtle they demonstrated no difficulties in locating the turtle eggs. Another possible source of attractant for the flies is the cloacal secretions that have been observed in *R. pulcherrima* during deposition of eggs (Monge-Nájera et al. 1988). These cloacal secretions may not have been removed by simple washing in water. Eggs of *Pseudemys scripta* are reported to be most vulnerable during hatching but this was not the case in *R. pulcherrima.*

The adult females of *M. scalaris* oviposited on the surface of the captive turtle eggs and in the soil covering the eggs. Studies of the ultrastucture of the egg shell of *R. pulcherrima* have demonstrated the existence of pores ranging in size from 100 to 700 micrometers (Acuña 1987). Newly hatched larvae of *M. scalaris* were found to have a maximum diameter of 470 micrometers and are therefore quite capable of entering the eggs through larger pores. Once inside the shell the fly larvae probably utilize proteolytic enzymes to break through the egg membrane. Larval feeding within the egg causes the egg to become dehydrated, which in turn results in shell breakage. Flies were observed pupating within the egg and adults probably depend upon shell breakage for emergence from the egg.

Megaselia scalaris is certainly one of the most polyphagous of all insects, attacking a wide range of rotting materials as well as nonrotting but defenseless meat. In the case of turtles this fly appears to be capable of attacking both developing eggs (Moll & Legler 1971) and non-developing eggs (our results). Further study is needed to determine its role as a mortality agent of turtle eggs under natural conditions and whether rates of attack differ between turtle species.

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GEOGRAPHIC VARIATION IN THE EGG-LAYING STRATEGY OF THE MOLE SALAMANDER, *Ambystoma talpoideum*

There have been several conflicting reports on the egg-laying strategy of the mole salamander, *Ambystoma talpoideum* (Bishop 1943; Mosimann and Uzzell 1952; Shoop 1960; Semlitsch 1985; Semlitsch et al. 1988). Two distinct types of egg-laying patterns have been reported. The first, described by Bishop (1943) for Mississippi and Louisiana, Mosimann and Uzzell (1952) for South Carolina, and Shoop (1960) for Louisiana, indicates that females oviposit small, fragile clusters of eggs (4-41) on twigs, sticks, or grass stems. Shoop (1960) noted that often many clusters appear on the same twig, and may or may not be laid by the same female. The second, described by Semlitsch (1985), indicated that South Carolina females haphazardly scatter their eggs singly across the pond bottom on debris, leaves, and twigs (Fig. 1). A. Braswell (pers. comm.) has also noted this single-egg-laying strategy for North Carolina females. At least three explanations are possible for these observations: 1) one or more of the observations are erroneous, 2) *A. talpoideum* constitutes two cryptic species, each displaying a different strategy, or 3) this species has two distinct egg-laying strategies which vary geographically.

Although widely separated populations are differentiated, no present evidence suggests

two cryptic species within *A. talpoideum* (Lowcock, pers. comm.). Larvae from the Mississippi Valley Physiographic Province (Oktibbeha Co., MS and Shelby Co., TN), however, are distinctly different in pigmentation pattern from individuals found in the Atlantic Coastal Plain Physiographic Province (Union Co., NC; Aiken, Allendale, Barnwell, Charleston, Hampton, Orangeburg, and Sumter Counties, SC; Semlitsch, pers. obs.). Further detailed systematic biochemical and morphological studies of geographic variation are clearly needed to fully eliminate this possible explanation.

One of the reports of *A. talpoideum* egg-laying appears erroneous. Mosimann and Uzzell (1952) reported finding seven masses containing 10-41 eggs and nine adult *A. talpoideum* in a small pond in Dorchester Co., SC. Their report, however, is based on indirect evidence; neither did they observe directly *A. talpoideum* ovipositing nor did they rear larvae from those eggs to metamorphosis. Indeed, *A. talpoideum* is abundant in Charleston Co., SC and one of us (RDS) has found numerous ponds with single eggs presumably laid by *A. talpoideum* and also egg masses presumably laid by *A. tigrinum*. Larvae reared from similar egg masses collected in Aiken Co., SC have been identified as *A. tigrinum*. The single eggs, attached to decaying leaves, could easily have been overlooked if we had been "expecting" egg masses such as previous reports described. The egg masses of *A. tigrinum* in South Carolina have a similar appearance and contain a similar number of eggs (24-98) as do *A. talpoideum* egg masses reported from Mississippi and Louisiana. The egg masses of *A. tigrinum* in South Carolina, however, have a much thinner and "softer" external envelope than do those of *A. maculatum*, which Mosimann and Uzzell (1952) used for the comparative basis of their identification. Mosimann and Uzzell (1952) present the only early description of *A. talpoideum* eggs from the southeastern Atlantic Coastal Plain and we believe the eggs were identified incorrectly. Moreover, all other earlier descriptions of *A. talpoideum* eggs are from southern Mississippi or Louisiana (Bishop 1943), where *A. tigrinum* is altogether absent or rare (Dundee 1988; R. Altig pers. comm.).

Finally, we believe that *A. talpoideum* does exhibit two different egg-laying strategies: oviposition of single eggs on the Atlantic Coastal Plain and egg masses in the Mississippi Valley Physiographic Province. We have reared larvae to metamorphosis from eggs of both types (masses and single) from several natural ponds in both regions that, unquestionably, are *A. talpoideum* (preserved specimens are available for examination). In 10 years of study, South Carolina *A. talpoideum* females (both metamorphic and paedomorphic) have only oviposited eggs singly in natural habitats, dishpans, plastic wading pools, and cattle tanks. Masses have never been observed.

We believe that this variable egg-laying strategy of *A. talpoideum* is unique among salamanders and has gone undetected for years because of the difficulty of finding single eggs in natural ponds and expectations of finding egg masses. We know of no other salamander that is capable of variable egg-laying and suggest that a study of this species' geographic distribution, environmental advantage (e.g., predation and desiccation resistance), and evolutionary significance would be informative.

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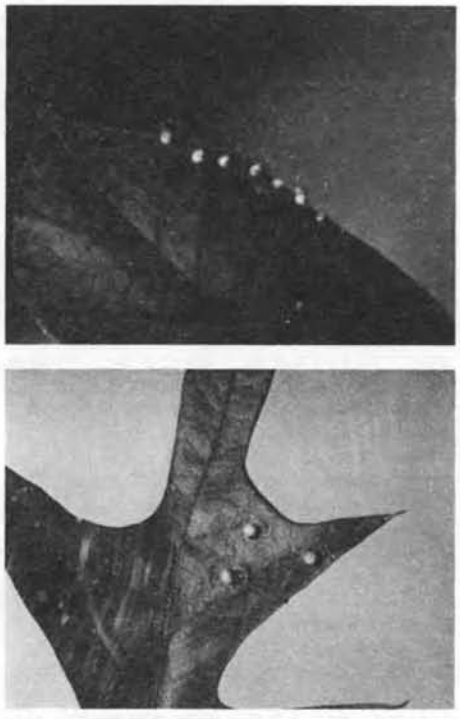


Figure 1. Eggs of the salamander, *Ambystoma talpoideum*, from Aiken Co., South Carolina, found attached to leaf litter at the bottom of an artificial breeding pond. Eggs are deposited as the female walks along the pond bottom and adhere to leaves, twigs, and other debris.

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TECHNIQUE

A NEW PROCEDURE FOR DERMESTID BEETLE PREPARATION OF SKELETONS FROM FORMALIN-FIXED SPECIMENS

Dermestid beetles (Coleoptera: Dermestidae) have long been used to prepare vertebrate skeletons (e.g. Hildebrand 1968). Fixed specimens (those either fixed in formalin, stored in 70% ethanol, or both) are difficult or impossible to skeletonize using standard dermestid techniques. Attempts to make these specimens more palatable to dermestids include application of beef fat or bacon grease (De La Torre 1951) or cod liver oil (Hooper 1956). In our experience dermestids stop feeding once the superficial layer of grease is removed and the process must be repeated. Alternatives to dermestid cleaning (maceration, hand cleaning) are time and labor intensive and usually do not produce skeletons of equivalent quality.

While preparing large series of skeletons from both fixed and fresh reptile specimens, we have found a method yielding far better results than any others we have tried. The only material needed for treatment is fresh muscle tissue or blood. The procedure is as follows.

1. Fixed specimens (to be skeletonized) are skinned, eviscerated, and soaked in cold or room temperature tap water for 1-3 days, depending upon body mass. Water changes may be made, but do not appear necessary.
2. A "blood solution" is prepared. A fresh specimen is soaked in a container of cold tap water until the water is full of blood and body fluids. It is useful to make one or more large incisions to allow the fluids to leave the body. A ratio of ca. 5:1 (body volume: water volume) works well. If the specimen is frozen it may remain soaking until thawed (overnight or longer for large specimens).
3. The fixed specimen is then soaked in this "blood solution" for 3-14 days (depending largely on body mass) at room temperature. It is then removed, excess blood removed by blotting or air drying, and the damp specimen placed in the dermestid colony. It is not recommended that it be placed in the colony while very wet, unless it is of a size that can be cleaned in one day or so, as dampness tends

to promote mold. Depending upon the condition of the dermestid colony, it may also help to remove all other food sources while the fixed specimen is present.

In some cases the dermestids do not completely clean the specimens. Even repeating the blood soaking procedure as many as six or seven times with a single specimen was usually more efficient and quicker than using cod liver oil or grease. In many cases specimens were completely cleaned after one blood soaking. This was rarely the case with other treatments.

This procedure does not require a fresh cadaver as a blood source each time. We have had excellent results by saving pieces of muscle tissue whenever fresh reptiles (e.g. zoo or pet shop specimens) were available. We have successfully used pieces that had been stored frozen for at least four years. Frozen muscle pieces from any fresh cadavers could readily be stockpiled for future use. This method might work with mammalian muscle and blood (e.g. from butcher shops) but we have not tried this.

Many variables may affect the success of this procedure, including concentrations and amount of fixative, length of time stored in fixative or preservative, and buffers present. These factors were unknown in nearly all the specimens that we prepared. We could not ascribe the observed variation in our results of these factors. We believe that extreme precision in temperatures, times or volumes used is not critical. Larger specimens tend to take more time for each step of the process than do smaller ones.

We have not had any major problems with this procedure. The odor produced by an extended blood soaking is comparable to that produced by maceration, so that adequate ventilation is required. We have not observed bone discoloration known to be due solely to this procedure. Many of our fixed specimens were noted during the skinning process to have discolored bones and we suspect that much of this is due to the action of the fixative. In any case, discoloration would seem a small price to pay for an otherwise clean skeletal preparation. We have not tested this method with terrestrial isopods (Maiorana dn Van Valen 1985).

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HERPETOLOGICAL HUSBANDRY

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and speciman manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Knoxville Zoological Park, Box 6040, Knoxville, Tennessee 37914, U.S.A.

REPRODUCTION IN THE PANCAKE TORTOISE, *Malacochersus tornieri*, IN CAPTIVE COLLECTIONS

The pancake tortoise has long been of interest to zoos and collectors, yet captive reproduction in this species is still sporadic and fortuitous. This paper will report on the breeding activity in two *Malacochersus tornieri* collections in the Washington, D.C. area, and review the published literature on the subject.

The National Zoological Park (NZP) acquired its first female pancake tortoise, which is still in the collection, in May 1965, but did not add any males until April 1972. Since then the collection has fluctuated considerably, from 1.2 to 4.7 adults housed in one or more groups, but has typically consisted of 1.3 adults in one exhibit. NZP presently has 3.6 adults in two separate groups.

The private collection of Anne F. Darlington (AFD) consists of 1.1 adults acquired as subadults in March 1986 and a subadult female added in February 1988.

HUSBANDRY

Caging and environment. Housing of the NZP animals has varied but usually they have been maintained as a group in an indoor exhibit similar to the current one. This is a 2.5x2.5 m enclosure with a 50/50 sand and potting soil substrate, and rockwork around the periphery forming crevices for the specimens and planters for live *Euphorbia* and *Sansevieria*. An 80 watt fluorescent fixture positioned 2.5 m above the substrate is set to give 12 h of illumination in summer and 9 h in winter. Skylights provide supplemental sunlight. Daylength at this 39° N latitude is 15 h in June and 9.5 h in December. The mean ambient cage temperature is 28.5° C, with an average daily fluctuation of 5.3° C. A 30x100 cm heating pad buried 5 cm under the substrate provides a hot spot exceeding 40° C. A water bowl is always available.

NZP specimens maintained off-exhibit are kept in a 1.2 m square plywood box with wooden hideboxes. A year-round 12 h daylength is produced by an 80 watt broadspectrum fluorescent fixture suspended 75 cm above the substrate of crushed oyster shell. The ambient temperature averages ca. 28° C and is supplemented by a 250 watt infrared heat lamp which produces an area over 40° C. These specimens are placed in a pan of water three times a week.

The AFD collection is housed outdoors in the Washington, D.C. area when the weather permits. This typically means the tortoises are outdoors continuously from mid-June to mid-September but only during warm, dry, daylight hours in the spring and fall. The enclosure is a fenced 2.5x3 m area of grass with wooden and terra cotta pipe hideboxes, and a pan of water. Other tortoise species also occupy the pen.

When indoors, the AFD *M. tornieri* are housed in a 1.5x2 m cage with wooden hideboxes. A 12 h photoperiod is provided by an 80 watt broadspectrum fluorescent fixture 35 cm above the oyster shell substrate. The ambient temperature averages 24° C during the day and 20° C at night, with a heating pad on continuously at over 42° C. Twice a week the tortoises are placed in pans of water. When nesting is anticipated, a pan of slightly moistened, hard-packed soil is placed in the cage.

Diet. The NZP pancake tortoises receive the Reptile House's herbivore diet. Until 1985, this was a salad of vegetables and fruits, supplemented with canned dog food and a vitamin and mineral powder, but since then it has consisted of alfalfa hay with soaked dry dog food, some vegetables, fruits, and supplements. The adults are fed twice a week. The AFD collection is fed mostly greens with some vegetables and a small amount of fruit, at least four times a week. When outdoors the tortoises can graze freely, but rarely do so.

COURTSHIP AND AGGRESSIVE BEHAVIOR

Season. Courtship in the NZP collection is seen year-round at a low level of frequency. The AFD male typically only courts while outdoors, but then does so one or more times a week. Grimpe (pers. com.) reports that courtship is so common at all times of year at the Tulsa Zoological Park (TZP) that the sexes are periodically separated to reduce the stress on the females.

Courtship behavior. At NZP, a male typically chases a female and mounts from behind, extending his front legs so that his body is nearly vertical. While mounted, the male either gapes or fully opens and closes his mouth at intervals of ca. one sec, without distinct vocalization. Males have occasionally been seen biting females on the neck. The AFD male courts the adult female in the same manner, without any biting. However, his

behavior with the subadult female has included additional sequences. On several occasions, he circled the subadult female and systematically bit each of her appendages. When he climbed atop her, instead of assuming the copulatory mount he remained horizontal, holding her down with his body, biting and scraping with his forelegs at her head and forelimbs to keep her retracted. He kept her thus immobilized for as long as 10 min and then left without attempting copulation. On other occasions, he chased, mounted and copulated with the subadult female as with the adult, without biting or otherwise attempting to immobilize her.

Loveridge and Williams (1957) describe male pancake tortoises viciously biting the females during courtship, even gripping and dragging them by their marginals. Wilke (1983), however, refers only to chasing and copulation.

During the summer of 1988 the AFD male was seen chasing a juvenile *Geochelone carbonaria* on several occasions. Loveridge and Williams (1957) relate that a male repeatedly attempted to mate with a *Kinixys b. belliana.*

Size at maturity. The AFD male was acquired at 117 mm CL and 165 g mass, and first displayed courtship behavior at 124 mm CL and 213 g. Both females were ca. 130 mm CL, 250 g when the male began to court them, and the adult female was 145 mm CL and 400 g at her initial oviposition. An NZP male raised from a hatchling commenced courtship upon being introduced to the group at 115 mm CL, 215 g, when he was 3.5 years old, but was sexed a year earlier.

Aggression. In the first six months after introduction, this same NZP male made five attacks upon another male in the group, who had to be separated permanently. These generally consisted of bites to the hind legs, but on one occasion the aggressor had overturned the other male and was found standing on him, biting his limbs. The victim is blind from cataracts, which may have been a causal factor. No other incidents of male-male aggression have been observed, though both these males have been housed for extended periods in mixed-sex groups.

Beattie (1971), however, relates a similar case of an adult male repeatedly ramming and biting a juvenile one, and also describes an adult female initially showing aggression toward this juvenile "to establish pecking order." When the AFD subadult female was first introduced to the pair, the male immediately approached and sat for several minutes with his snout and front marginals actually touching hers. This was interpreted by the observer, perhaps anthropomorphically, as an act of intimidation. In the aggregate, these incidents suggest that groups of *M. tornieri* may form dominance hierarchies which could have an impact on the success of breeding programs. Additional observations are required, however, before the existence, strength, and nature of such hierarchies can be determined.

EGG LAYING

Season. Eggs have been found in all months of the year except February at NZP, with a slightly greater concentration from November through January. The AFD female has laid from October through January. Wilke (1983) gives a July to November nesting season, and Grimpe (pers. com.) a September to January one, though eggs have been laid at NZP through the winter to May. Shaw (1970) reports egg production throughout the year, with a somewhat higher level from September through December.

Gravidity. Gestation has not been determined for either collection, but the relative periods of breeding and laying of the AFD pair imply a period of at least 60 days. Observation of nesting behavior is the first indication in either collection that a female is gravid. Experience to date indicates that palpation is not successful in *M. tornieri,* since no eggs have ever been felt, even when a female was palpated only a few days before laying.

False-nesting. At NZP, pancake tortoises have repeatedly been observed digging nests without eggs later being found. Gyarmaty (1988) also observed that several days of nesting behavior precedes oviposition. The AFD female engaged in two-to-four days of false-nesting before each of the first season's clutches, typically while remaining in the hidebox, and was twice seen digging the day after laying. No observations were made of the November 1988 clutch. In January 1989, the AFD female was observed digging nests on nine of eleven consecutive days, and so was given oxytocin. After laying an egg on the surface of the soil, she vigorously made covering motions with her hind legs for 10 minutes. Later that day and the following afternoon she was again observed making covering motions.

Nesting. All the AFD nesting behavior has occurred in the mid- to late afternoon. Most occurs at the same time of day at NZP, but some early morning and evening nesting also takes place. The female seems to prefer a very warm, well-lit location for the nest, and tips her head down and touches her chin to the soil before commencing. The nests are dug with the alternating rear leg movements typical of other tortoise species (Obst 1986), except the female does not urinate on the soil before or during digging. The completed nests are 6-9 cm deep, and the elongated eggs are placed horizontally. Also, at NZP eggs are often partially buried or left exposed on the surface, even when a seemingly suitable area for nesting is available.

Clutch characteristics. The AFD female laid four clutches in the 1987 season and two the following season. The first season the intervals averaged 28 days with a range of 27 to 29 days. Her second season, the interval was 45 days, but the second oviposition was induced with oxytocin. *M. tornieri* in the collection at TZP range from one to six clutches/yr/female (Grimpe, pers. com.), and Wilke (1983) reports one to four. Both sources indicate the shortest clutch interval as 23 days, and that the intervals would average ca. 40 days. Since it is not always possible when an egg is found at NZP to identify which female laid it, the number of clutches/yr/female or the interval cannot be determined. However, one season there were 12 eggs from five females, indicating an average of up to 2.4 eggs/female. This is consistent with the 19 eggs from seven or eight females in 1966 reported by Shaw (1970), and the three clutches/yr/female given by Obst (1986).

In November of 1988 the AFD female laid a clutch of two eggs. Two egg clutches have also been reported by Grimpe (pers. com.) and Gyarmaty (1988), but have not been recorded at NZP.

EGGS AND INCUBATION

Fertility and hatch rates. Three of the seven AFD eggs hatched (43%), one fertile egg spoiled (14%), two were infertile, and one is currently incubating. Four of the NZP eggs have hatched (6%), four were fertile but died in the egg, 11 were found broken (17%), and 46 were presumed infertile (71%). Low fertility and hatch rates seem common in captive *M. tornieri.* Wilke (1983) obtained 15 hatchlings from 23 eggs (65%), and Shaw (1970) had 31 of 76 hatch (41%). Grimpe (pers. com.) reports that of 52 eggs, seven hatched (13%), two died in the egg (4%), 35 were infertile (67%), four were found broken (8%) and four are now incubating.

Incubation methods and times. The NZP incubation method has varied over the years. The first hatchling, in 1978, incubated in the exhibit subtrate. Two others were from eggs artificially incubated in covered 10 gal aquariums heated with plumber's heat tape. The eggs were partially buried in dampened potting soil in plastic containers. The containers were placed in the aquarium on a layer of pea gravel and a relatively high humidity was maintained by adding water to the gravel. The mean temperature of this setup was 26.7° C (range 25.0°-30.2° C). The most recent hatchling was set up in a human incubator with a mean temperature of 30.8° C (range 29.0°-33.8° C) and moderate humidity. The incubation periods (to pipping) for the first two were 169 and 237 days, but the eggs may not have been found immediately after they were laid. The last was 99 days, and the egg was definitely found on the day of deposition.

The AFD eggs were maintained in a poultry incubator which was set for 30° C (range 24-34° C). The eggs were placed on a mixture of sand and peat moss which was kept moderately dry. Incubation times (to emergence) were 177, 184 and 188 days. Wilke (1983) reports incubation times of 117 to 188 days, with a mean of 147, at 28° C and 95% R.H., and Grimpe (pers. com.) gives incubation times of 122, 167 and 187 days at 26-30° C. Shaw (1970) reports a mean of 178 days for 28 eggs, ranging from 113 to 221 days, using various incubation methods with temperatures fluctuating between 26 and 35° C.

HATCHLINGS

Size. As the embryo completes development, the carapace width is oriented along the length of the egg. To fit within the narrow diameter of the egg, the carapace length is reduced considerably by a deep fold across the plastron. Thus when the hatchling first emerges it is highly bowed, and significantly wider than it is long. When the plastron has flattened, after about 24 h, the hatchling becomes nearly circular and the carapace is only moderately domed. See Table 1 for egg

and hatchling dimensions.

Husbandry. Both the NZP and AFD young are treated the same as the adults with regard to diet, environmental conditions and provision of water and hideboxes, except that they are fed four or more times per week and their food is finely chopped. They share the same strongly herbivorous dietary preferences as their parents. Their response to water is also as individually variable as in the adults. They have been maintained on an oyster shell substrate, housed in a variety of containers which are secure against their abilities to climb and squeeze through narrow cracks.

Growth. Hatchlings in both collections have quadrupled their weight by seven months old and doubled their carapace lengths by nine months of age. Wilke (1983) reports even faster gains. Gender identification may be possible at two to three years of age under captive conditions. Grimpe (pers. com.) reports that the first two TZP hatchlings were sexed as males by tail size and observations of mounting at three years old, though they were not responsible for fertile eggs until five years of age. An NZP male was first sexed at about two years, six months old.

Survival rates. Mortality in the hatchlings varies but is commonly low. Of the four NZP hatches, a one-year-old juvenile and a nine-year-old male survive, a five-year-old female died of pneumonia, and a two-year-old juvenile died of intestinal impaction. The AFD hatchlings are only one year old or less, but doing well. Wilke (1983) and Grimpe (pers. com.) both have 100% survival rates (four and seven years, respectively) after their first hatches. Shaw (1970), however, reports only 10 of 31 hatchlings (32%) still alive at the end of the 10 year period covered.

DISCUSSION

Clearly the reproductive potential of *M. tornieri* is greater than implied by the one egg per season reported in the early literature (Loveridge and Williams 1957). However, the fertility and hatch rates in existing collections are too low for that potential to be realized. This may be due to the lack of some or all of the necessary environmental cues in captivity that control the breeding season. Alternatively there may be a genetic incompatibility of the individual specimens. *M. tornieri* has a discontinuous distribution, with isolated populations occurring only in rocky terrain where suitable cover is available (Eglis 1967). Thus it is possible that there is sufficient genetic disparity to result in reduced viability of offspring if the parents came from different areas. In addition, some as yet unidentified problem with diet, husbandry or incubation methods may be reducing the rate of reproduction. At present, no conclusions can be drawn from the data available, and further study is required to resolve the issue.

ACKNOWLEDGMENTS

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Table 1. *Malacochersus tornieri* egg and hatchling sizes [mean (range)].

		Length (mm)	Width (mm)	Mass (g)	n=
NZP	**eggs**	44.8 (32.0-51.0)	28.1 (16.6-38.4)	21.8 (10.5-29.2)	52
	hatchlings	39.1 (35.2-44.2)	NA	15.3 (13.3-16.6)	4
AFD	**eggs**	46.8 (44.7-48.5)	26.6 (21.8-28.7)	20.2 (18.9-21.9)	7
	hatchlings	38.0 (37.4-39.0)	38.8 (38.4-39.3)	14.2 (13.4-15.1)	3
Wilke	**eggs**	43 NA	28 NA	19 NA	23
	hatchlings	38 NA	38 NA	11.6 NA	11
Shaw	**eggs**	46.6 (42.7-51.5)	28.9 (25.5-31.7)	23.4 (19.1-27.7)	27
	hatchlings	39.2 (36.5-47.5)	38.8 (37.8-42.4)	15.9 (12.4-23.3)	8

LIFE HISTORY NOTES

Life History Notes is analogous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which best describes the nature of their note (e.g., Reproduction, Longevity, Morphology, etc.). Figures are permissible to illustrate any data, but should **replace** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose! Articles submitted to this section will be reviewed and edited prior to acceptance.

Standard format for this section is as follows: SCIENTIFIC NAME (in caps), COMMON NAME (in parentheses) as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles,** (Second edition, Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), KEYWORD (in caps). DATA on the animal (one, or at **most** two, references may be ***briefly*** cited in text—***DO NOT*** include complete literature reviews—use summary articles wherever possible). Place of deposition or intended deposition of specimen(s), and catalog number(s). Then, skip a line and close with SUBMITTED BY (Name(s) in caps, and address(es) in full—no abbreviations).

(NCN) used for common name = no recognized common name.

Recommended citation for articles appearing in this section is as for Geographic Distribution.

ANURA

ELACHISTOCLEIS BICOLOR. **AMPLEXUS BEHAVIOR.** On 25 November 1987 a pair of *E. bicolor* was observed in amplexus at Roque Saenz Pena (26° 47' S - 60° 27' W), Chaco, Argentina. Axillary amplexus was observed in open water; the male was glued to the back of the female by a secretion produced by a glandular area of the male's chest behind the axilla. Externally, the glandular area appears as a porous, slightly darker pigmented area of skin that covers ca. 17-20% of the ventral surface. The secretion is strong enough to keep the frogs bonded together after placement in chloretone. The natural process of detachment is unknown. The specimens were deposited in the collection of the Fundacion Miguel Lillo, Tucuman, Argentina (FML 04357).

Submitted by **G.J. SCROCCHI** and **E.O. LAVILLA,** Instituto de Herpetologia, Fundacion Miguel Lillo 251, 4000 Tucuman, Argentina ●

CERATOPHRYS CRANWELLI (Escuerzo). **OVIPOSITION.** On 28-30 October 1985, oviposition in *C. cranwelli* was observed at Monte Quemado (25° 28'S- 62° 52' W) Santiago del Estero, Argentina. Males called from open areas on the margins of a pond; amplexus occurred in shallow water. During amplexus the frogs swam slowly on the surface, then dived suddenly, spraying ca. 25 eggs into the water when the cloacas were nearly perpendicular to the surface.

During oviposition the female produced a series of lateral movements with the femurs,

after which the pair returned to the surface, moved forward 3-5 m, and repeated the process several times during the same night. The eggs floated for a couple of minutes, then scattered individually as they sank slowly to the muddy bottom.

As tadpoles of this species are carnivorous and sedentary, we infer that this behavior results in a selective advantage that reduces fraternal cannibalism. Voucher specimens (FML 03635) were deposited in the collection of the Fundacion Miguel Lillo, Tucuman, Argentina.

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CAUDATA

PLETHODON DORSALIS (Zigzag Salamander). **MASS MOVEMENT.** Mass movements such as breeding migrations have been well documented in aquatic-breeding terrestrial salamanders in the families Ambystomatidae (Peckham and Dineen 1955. Proc. Indiana Acad. Sci. 6:278-280; Semlitsch 1985. Copeia 2:477-489), Salamandridae (Hurlbert 1969. Ecol. Monogr. 39:465-488), and Plethodontidae (Semlitsch and McMillan 1980. Brimleyana 3:97-105). Breeding migrations are unknown in plethodontid salamanders that lay eggs on land as reproductive activities occur within the normal home ranges of individuals (Duellman and Trueb 1986. Biology of Amphibians. McGraw Hill, New York 670 pp.). However, vertical and horizontal movement related to moisture level has been observed in *Plethodon cinereus* (Heatwole 1962. Ecology 43:460-472; Smith 1961. The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Survey, Urbana 298 pp.).

On the evening of 21 February 1981 I observed a mass unidirectional movement of *Plethodon dorsalis* in the LaRue-Pine Hills Ecological Area of the Shawnee National Forest in Union County IL. While driving on F.R. 345 between the face of the Pine Hills bluff and LaRue swamp (T11S, R3W, Sec 16 and Sec 9) just after sunset during a brief but heavy rain, I encountered roughly 100 salamanders crossing the road. All but one were descending from the bluff toward the swamp.

Southern Illinois experienced a drought in 1980, with total precipitation recorded at Cairo, IL (ca. 70 km SE of site) 28% below the 1941-1970 30-year mean (NOAA 1980. Climatological Data, National Summary 31[1-13]). Whereas January 1981 was also abnormally dry, with precipitation 91% below average, February 1981 was only 5% below normal (USDA 1981. Weekly Weather and Crop Bulletin 68[1-8]).

It appears that this mass movement of salamanders was in response to a period of increased moisture during the drought. *Plethodon cinereus* is less mobile and forages less efficiently during dry periods (Jaeger 1972. Ecology 53:535-546). Movement to a site that retains moisture (such as the vicinity of the swamp) may allow salamanders to continue to forage efficiently during dry periods.

I wish to thank Geri Hawley, Thomas Locke, and Gail Nachel for assistance in removing salamanders from the road, and Dale R. Jakson for commenting on the manuscript.

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TESTUDINES

CHELYDRA SERPENTINA (Common Snapping Turtle). **FEEDING BEHAVIOR.** Snapping turtles are particularly catholic in food selection. Nevertheless, the near exclusive diet of duckweed (*Lemna)* by a large (32.8 cm CL) male from Lake Co. Illinois seems worthy of note. In a biotelemetry study of turtles at Chain O'Lakes State Park, this turtle was observed feeding at the surface of a duckweed covered pond on ten occasions between 23 May and 3 August 1988. Feeding times ranged from 1250 h to 1655 h with pond temperatures (10 cm depth) varying from 19° to 34° (mean 29°) C. Although the dense duckweed obscured details of the feeding process, the turtle appeared to be using neustophagia (Belkin and Gans 1968. Ecology 49:768-769). Periodically raising the head just above the surface, the animal would then open and close its jaws several times in succession. After foraging for 1 to 10 min in a small area (ca. 1 m^2), it would move several meters and repeat the procedure.

The turtle was hand-captured and fecal samples were obtained on May 23, 29, and June 13. On July 26 the stomach was flushed (Legler 1977. Herpetologica 33:281-284). Composition of the 45 ml of feces collected was *Lemna* 92%, other plants 6%, and animal remains (insect, mollusks, amphibian bones) 2%. Composition of 50 ml of regurgitate from the flush was *Lemna* 95.5%, vascular plants 2%, and animal matter (snails and fish) 2.5%.

Lemna has been previously reported in snapping turtle diets but not as a staple (Ernst and Barbour 1972. Turtles of the United States. The University Press of Kentucky, Lexington, p. 24). Diets of 21 other snapping turtles collected at the site comprised ca. equal amounts of plant and animal material but no other individual had consumed more than trace amounts of duckweed. Fish was the most important animal food occurring in 38% of the samples and comprising 24% of the total volume consumed.

Submitted by **JENNIFER BUDHABHATTI** and **EDWARD O. MOLL,** Department of Zoology, Eastern Illinois University, Charleston, IL 61920, USA ●

HYDROMEDUSA MAXIMILIANI. **ECOLOGY.** *H. maximiliani* has a wide distribution in SE Brazil, ranging from Espiritu Santo (20° S) to Sao Paulo (Luderwaldt 1926. Rev. Museo Paulista 14:403-468). Virtually nothing has been published about the ecology of this species.

On 7 and 12 November 1988, 15 active individuals (2.10.3) were observed in a 1 km section of a small rocky stream 1-3 m wide in a subtropical rain forest at 900 m elevation in the Carlos Botelho State Reserve (24°03'S; 47°59'W) (water pH = 7.9, water temperature = 16-18° C, air temperature = 16-20.5° C). The cloacal temperature of the turtles ranged from 16°-20.0° C, $\bar{X}$ = 18.7° C; N = 12. The temperature of an individual captured while basking on a stone in a small patch of sunlight was 19° C. The body temperatures recorded for active *H. maximiliani* are the lowest recorded for a neotropical turtle, and only comparable to some Emydids (Brattstrom 1965. Amer. Midland Nat. 73:376-422).

The shells of adult *H. maximiliani* have a cryptic shape similar to that of a dead leaf (the carapace in juveniles is saw-toothed and lighter in color); the turtles rest at curves in the stream where dead leaves accumulate. Low light levels in the forest make the turtles very cryptic in these microhabitats.

Feces were examined from five newly-captured turtles and included remains of several insect orders: Coleoptera; Isoptera; Hemiptera; and Neuroptera as well as several unidentified insect larvae. The decapod crustacean *Aegla odebrechi* was the most common food item found in feces. No vertebrate remains were found in feces; grains of quartz and plant fibers found in the feces were probably taken incidentally. A female captured in November 1988 laid three 40 x 25 mm eggs in January 1989.

I thank S. Pacagnella for logistical support during this study. A.S. Abe and W. Magnuson provided comments on the first draft of the manuscript.

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LEPIDOCHELYS KEMPI (Kemp's Ridley Sea Turtle). **REPRODUCTION.** Kemp's ridley, the most endangered of the world's sea turtles, has a highly restricted nesting distribution. Approximately 95% of the nesting population emerges on a single 32 km beach (Rancho Nuevo) in Tamaulipas, Mexico. Only a small number of nesting records exist for localities elsewhere in Mexico and in Texas; there is one unconfirmed report from Colombia (Ross et al. 1989. The status of Kemp's Ridley, Report to the Center for Marine Conservation, Washington, DC, 51 pp.).

On 30 May 1989 at 0930 h EST, a Kemp's ridley nested on Florida's west coast at Madeira Beach (27° 47' N; 82° 48' W, Pinellas Co., 146th Ave. and Gulf Blvd.). This represents the first documented nesting of *Lepidochelys kempi* in Florida. Although this species is regularly recorded along Florida's west coast, most of these animals have carapace lengths that indicate that they are immature (Ogren, L. 1989. Pp. 116-123, Proc. First Int'l. Sympos. on Kemp's Ridley Sea Turtle Biology, Conservation. and Mgmt. [C. Caillouet and A. Landry, eds.]. Texas A&M Univ. Seagrass Program [TAMU-SG-89-105]).

The ridley deposited 116 eggs, which is a normal complement for this species; daytime nesting is also typical. The nest was inundated by storm tides on 6 June and relocated within a few hours to higher ground. Eighteen hatchlings emerged at dawn on 27 July, and an additional 6 on 28 July, after incubation periods of 58 and 59 days, respectively. Several hatchlings that died in the nest have been deposited in the American Museum of Natural History (AMNH 135224-27).

The nest site was on a highly developed stretch of coast, with high-rise condominiums and a seawall immediately adjacent. Dozens of tourists witnessed the turtle's emergence and nesting. A videotape of the

nesting sequence is archived at the Florida Marine Research Institute.

An attempted nesting by a second Kemp's ridley was recorded that same month on the east coast of Florida. On 22 May 1989 (1150 h EST), a ridley emerged at Phipps Ocean Park, in Palm Beach (Palm Beach Co., 4 km north of Lake Worth Bridge). The turtle excavated a nesting chamber but did not deposit eggs. A second sighting of what was presumed to be the same turtle was made by JF on 5/30; crawls observed in the same vicinity on 5/23 and 5/31 are also attributed to this animal. No eggs were deposited during any emergence, as far as is known. A photograph of this ridley taken by JF on 22 May 1989 is archived at the Florida Marine Research Institute. Neither the west coast nor the east coast ridley was tagged.

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***LACERTA PARVA*. COURTSHIP AND REPRODUCTION.** The sexual behavior of this species is as yet undescribed. Only some morphometrical statistics on preserved animals—including eggs and young—are available (Peters, G. 1962. Die Zwergeidechse (*Lacerta parva* Blgr.) and ihre Verwandtschaftsbeziehungen insbesondere zur Libanon-eidechse (*Lacerta fraasii* Lehrs). Zool. Jahrb. Syst. Jena 89:407-478).

Three wild-caught animals (2.1) were obtained from a dealer in June 1987. Animals were housed in a 50x30x30 cm glass terrarium, with a layer of sand, some rocks and branches. It was heated by a 25W spotlight for 5-8 h/day (increasing with the natural daylength) resulting in ground temperatures of 15-35° C ($\bar{X}\cong$ 18° C.).

After hibernation at 3-5° C from 5 December 1987 to 17 January 1988, 21 matings of these four lizards were observed from 4 February to 30 April 1988. The male approached the female and secured a mouthgrip on the side of her tail or body. Save for a few forward steps, receptive females remained passive. In 20.5±9.5 (5-44) seconds [$\bar{X}$±S.D. (range)] the male reached, by quick snapping movements, a position just before her hind legs. He then curled his body as she raised her tail base and they copulated.

Just after intromission was achieved, the male bit the female's femur and within one or two seconds relocated his grip to the fibulatibia of the same leg (Fig. 1). Rarely the femur bite was skipped. While *in copula,* one or two of the male's front legs (most often the one underneath him) vibrated rapidly. I once observed that a male had not inserted his hemipenis. Five seconds after "copulation" began, an amber-colored droplet appeared on each of the two terminal tips of the hemipenis. Three seconds later the male pulled his cloaca away from hers. As in all other sessions, the male released his bite-hold just after genital contact ended. Copulation took 11.1±3.2 (7-22) seconds. Immediately thereafter the male made fast (1-2 sec) semi-circles to figure 8's, over or under but especially in front of her, preceded by pushing his snout against the female. He stopped each circling movement on snout contact with the side of her head or body (Fig. 2), then rested his head on the female. These actions, which somewhat depended on her activity, decreased in frequency and velocity from a maximum of 10/min at the beginning to less than once in 4 min near the end. They lasted for 28±12 (15-68) min. In between these motions the male adopted an attentive posture close to the female, sometimes even on top of her, or on the rock under which she hid for a moment: His head and body were extremely raised with his very fingertips touching the substrate. At the same time he made quick lateral scanning movements with his head.

In view of the very open habitat of the species (Peters 1962, op. cit.), a functional explanation of this behavior is that the male is on the look-out for competitors: In this phase activities of other species in neighbouring cages caused fast dashes in their direction. If the female walked off, he either followed or prevented her from moving by increased circling thereby effectively barring her way. These behaviors preventing her "escape" are unique among the mating strategies of 24 (of the around 60 known) species of *Lacerta* and *Podarcis* observed by me. If more than one female was present, the male seemed unable to discern the recently mated one, and he divided his attentions, often even focusing on the wrong female, possibly since she tends to be more active than a recently courted one.

Sexual receptivity in the female lasts from one to six days after oviposition (one observation on day 11). On other occasions females reject the male with bites and tail vibrations.

Females laid 1-3 clutches of 4-5 eggs in March, April and May. A young female produced a first clutch of only two eggs in her first mating season.

At oviposition eggs measured 7.1±0.4 (6.0-7.9) x 12.0±1.0 (10.0-13.7) mm with masses of 0.39±0.05 (0.35-0.49) g (n=22). Eighteen eggs developed. Just before hatching they reached 11.4±0.9 (10.0-12.9) x 18.8±1.5 (16.2-20.8) mm and 1.37±0.22 (1.16-1.71) g. Incubation took 49±3 (45-52, n=14) days at 25° C, and 32 days (32-34, n=4) at 30° C. SVL of hatchlings (n=18) was 25.7±1.7 (23-28) mm, CL 42.7±3.5 (38-48) mm; mass = 0.51±0.03 (0.48-0.56) g.

After completion of the studies the animals will be deposited in the Rijksmuseum van Natuurlijke Historie (RMNH), Leiden.

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Figure 1. Copulation of *Lacerta parva.*



Figure 2. A male *Lacerta parva* circles a female after copulation.

SERPENTES

TANTILLA RUBRA RUBRA (Red Blackhead Snake). **ARBOREALITY.** The genus *Tantilla* is considered a nocturnal, fossorial form that lives under rocks, surface litter or in underground retreats feeding on arthropods, annelids, slugs, spiders and insect larvae. On 16 August 1978, a specimen (EAL 4566) was observed climbing a rough barked tree in a cleared, open area at 0930 h. It was clear and sunny. When first observed the snake was thought to be a vine or root until it was realized that it was moving upwards. It was ca. 3 m above the ground and out of reach when observed. It had to be flicked off with a collecting rake to make the capture. It was collected 9.8 km SW Cerralvo and 16.7 km W on Rancho El Milagro, Picachos Mts., elev. 457 m, Nuevo Leon, Mexico by Ernest A. Liner, Richard M. Johnson and Allan H. Chaney.

Submitted by **ERNEST A. LINER,** 310 Malibou Boulevard, Houma, LA 70364-2598 and **ALLAN H. CHANEY,** 1600 W Johnston 29, Kingsville, TX 78363, USA

XENOCHROPHIS FLAVIPUNCTATA (Common Keelback). **REPRODUCTION.** On 4 February 1989 a freshly laid clutch of 25 eggs was found in a community cage of this species at a local animal dealer's shop in Bangkok. The clutch was taken home and placed on a substrate of moistened vermiculite in an enclosed plastic jar. Incubation was achieved by leaving the clutch exposed to daily atmospheric temperatures. In Bangkok during February the mean maximum temperature is 32.7° C and the mean minimum 22.8° C. The mean maximum temperature in March is 33.8° C and the mean minimum is 24.6° C.

On 19 March 1989 neonates began emerging from the eggs and by the morning of March 20 the last had left the egg. Distractions prevented measurement until the sixth day after hatching. One hundred percent of the eggs hatched, but three of the hatchlings escaped. Of the 22 measured on 25 March 1989 the largest had a SVL of 141 mm., the smallest 110 mm. The $\bar{X}$ SVL was 121.55 mm. Hatchlings first began shedding the fourth day after hatching and the last of them had

completed their first shed six days after leaving the egg.

Submitted by **MEREL J. COX,** 695/17 Pracharaj Road, Soi Homhual, Bangkok 10800, Thailand ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of a species' range, and thereby permit a more significant interpretation of its biology.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles,** Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use metric for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full—no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged). Photographs may substitute for a preserved specimen only when the live specimen could not be collected (*e.g.,* it was a protected species or it was found in a protected area). Photographs must be deposited in a university or museum collection, and the catalog number(s) provided.

Please submit new geographic distribution records, in the standard format only, to Joseph T. Collins, Museum of Natural History, The University of Kansas, Lawrence, KS 66045, USA. Short manuscripts are discouraged, and are only acceptable when data cannot be presented adequately in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

(NCN) = no recognized common name.

ANURA

BUFO PUNCTATUS (Red-spotted Toad). MEXICO: BAJA CALIFORNIA SUR: Isla Santa Margarita. 17 September 1983. Francisco Reynoso. Verified b L. Lee Grismer. Universidad Autonoma de Baja California Sur (UABCS 0621-0627). New insular record and first record for this species on a Pacific island in Baja California (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians, Houghton Mifflin Co., Boston, MA).

Submitted by **FRANCISCO REYNOSO,** Museom de Zoologia, Universidad Autonoma de Baja California Sur. Box 21, La Paz, BCS, 23000, Mexico ●

HYLA CRUCIFER (Spring Peeper). USA: ILLINOIS: Dupage Co: Wood Dale Grove Forest Preserve, North Conservation Area (T40N, R11E, S15). 3 April 1988. M. Redmer. Verified by G.S. Casper. Milwaukee Public Museum Herpetology Photo Collection (MPM P-151). Confirms suspected occurrence of species in DuPage County (Cebula J.J. 1982. DuPage Conservationist 18(1):3-5); new county record (Smith P.W. 1961. Illinois Nat. Hist. Surv. Bull., 28(1):298 pp).

Submitted by **MICHAEL REDMER,** 21 W. 103 Par Ln., Itasca, IL 60143, USA ●

PSEUDACRIS STRECKERI STRECKERI (Strecker's Chorus Frog). USA: ARKANSAS: Yell Co:, NE 1/4 of NW 1/4 of Sec 22, T6N, R20W. 13 March 1986. Glyn Turnipseed and Bill Shepherd. Verified by Glyn Turnipseed. Univ. Kansas Mus. of Nat. Hist. (KU 209976-209977). Perry Co.: Upstream from Toadsuck Lock and Dam, (NE 1/4 of Sec 12, T5N, R15W). 9 March 1985. Bill Shepherd and Kenneth Lee Smith. Verified by Bill Shepherd. Arkansas State University Museum of Zoology (ASUMZ 4318 and 4319). Faulkner Co.: Northwest of Lollie (SW 1/4 of SE 1/4 of SE 1/4, of Sec 10, T4N, R15W). 24 March 1985. Bill Shepherd and Mel White. Verified by Bill Shepherd. (ASUMZ 4320 and 4321). These records represent a significant eastward range extension of ca. 156 km from Franklin Co. (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51) to Falkner Co.

Submitted by **GLYN TURNIPSEED,** Department of Biology, Arkansas Tech University, Russellville, AR 72801 and **BILL SHEPHERD,** Arkansas Natural Heritage Commission, Little Rock, AR 72204, USA ●

RANA AREOLATA CIRCULOSA. (Northern Crawfish Frog), USA, ARKANSAS: Pope Co. (NW 1/4 of NE 1/4 of Sec 32, T8N, R20W). 2 March 1977. Glyn Turnipseed. Verified by Glyn Turnipseed. Univ. of Kansas Museum of Nat. Hist. (KU 209981-209983). Yell Co.: (SE 1/4 of SE 1/4 of SE 1/4 of T6N, R20W, Sec. 7). 2 March 1977. Rich and Linda Shott. Verified by Glyn Turnipseed. (KU 209978-209980). New county records, and a significant east-

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ward range extension (ca. 88.5 km) (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

Submitted by **GLYN TURNIPSEED,** Department of Biology, Arkansas Tech University, Russellville, AR 72801, USA ●

RANA CATESBEIANA (Bullfrog). USA: WISCONSIN: Brown Co: Barkhausen Waterfowl Preserve, along western shore of Green Bay, Suamico (T25N, R20E, Sec 34/36). 1987. M. McFarland. Verified by P.A. Cochran. Photographic slide on file at University of Wisconsin-Green Bay Richter collection (1488s). First published county record (Cochran et al. 1987. SSAR Herp. Rev. 18:21,23), although acoustic records (calling males) were reported previously (Mossman and Hine. 1984. The Wisconsin frog and toad survey: establishing a long term monitoring program. Wisconsin Dept. of Nat. Res., Bureau of Endangered Resources. 13 pp.).

Submitted by **MIKE McFARLAND,** Barkhausen Water Fowl Preserve, 2024 Lakeview Drive, Suamico, WI 54173, and **RIANA BISHOP,** Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA ●

SAURIA

ANOLIS (CTENONOTUS) DISTICHUS (Bark Anole). BAHAMAS: GRAND BAHAMA ISLAND: 24.1 km east of Freeport. 10 October 1988. H.A. Dundee. Verified by A. Schwartz. Subspecies not determined but Schwartz suggests a Bahamian subspecies (except *ocior* or *biminiensis*), most likely *dapsilis.* Tulane University (TU 21140). New island record. Dr. P. Fluck (pers. comm.) says this species (along with *Anolis* [*Norops*] *sagrei*) was on Grand Bahama as early as 1968. The species is locally common.

Submitted by **HAROLD A. DUNDEE,** Department of Biology, Tulane University, New Orleans, LA 70118, USA ●

ANOLIS SAGREI (Brown Anole). USA: FLORIDA: Brevard Co: Mobile home park along Hwy A1A, Melbourne Beach. 7 January 1988. P.A. Cochran. Verified by P.A. Cochran. Milwaukee Public Museum (MPM 23363). New county record (Godley et al. 1981. SSAR Herp. Rev. 12:84-86; Ashton and Ashton. 1985. Handbook of Reptiles and Amphibians of Florida. Part two. Lizards, Turtles and Crocodilians, Windward Publ. Co., Miami). The presence of more than one size class and the discovery of egg shell fragments among tufts of fiberglass insulation on the underside of a mobile home indicate that a reproducing population has been established.

Submitted by **P.A. COCHRAN,** Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA ●

ANOLIS SAGREI SAGREI (Brown Anole). USA: LOUISIANA: Orleans Par: New Orleans, vic. Japonica St. and Claiborne Ave. 28 Oct. 1988. Stephanie Stevens. Verified by Robert A. Thomas. Louisiana State University Museum of Natural Sciences (LSUMZ 47957). Jefferson Par: Metairie, corner Airline Hwy (US 61) and N. Wilson St., Exotic Gardens Nursery. 5 Nov. 1988. R.A. Thomas and Patrick J. Thomas. Verified by R.A. Thomas and Douglas A. Rossman. (LSUMZ 47958-67). New state record. The latter is obviously an introduction at the nursery, presumably via plants imported from wholesalers in Florida. Population level is exceedingly high with all age classes present and has survived and prospered through at least two winters. Brown anoles are now seen in adjacent neighborhoods. The former (18.3 km east of the latter location) is presumed to have arrived on a plant purchased at the nursery (no additional specimens have been seen). Nearest known localities are Harris Co., TX (547 km west, Dixon 1987. Amphibians and reptiles of Texas. Texas A&M Univ. Press, College Station) and Marion Co., FL (785 km east, Ashton and Ashton 1985. Handbook of Reptiles and Amphibians of Florida. Part two. Lizards, Turtles, and Crocodilians. Windward Publ., Miami).

Submitted by **ROBERT A. THOMAS, PATRICK J. THOMAS, JENNIFER OUTLAW COULSON,** and **THOMAS COULSON,** Louisiana Nature and Science Center, New Orleans, LA 70187-0610, USA ●

CNEMIDOPHORUS SEXLINEATUS SEXLINEATUS. (Six-lined Racerunner). USA: ILLINOIS: Williamson Co., 3.5 km E Crab Orchard (T9S, R4E, S13). 15 June 1982. W.T. McDowell and S.L. Turner. Verified by R.A. Brandon. Southern Illinois University at Carbondale (SIUC R-2107-2109). New county record. (Smith. 1961. The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1-298).

Submitted by **WILLIAM T. MCDOWELL,** Biological Sciences Program, Southern Illinois University, Carbondale, IL 62901, USA ●

COLEONYX VARIEGATUS PENINSULARIS (San Lucan Banded Gecko). MEXICO: BAJA CALIFORNIA SUR: Isla Santa Margarita. 17 October 1983 and 29 April 1984. Francisco Reynoso. Verified by L. Lee Grismer. Universidad Autonoma de Baja California Sur (UABCS 0640, 1053-54). New insular record (Dixon 1970. Cat. Amer. Amph. Rept. 96.1-96.4).

Submitted by **FRANCISCO REYNOSO,** Museum de Zoologia, Universidad Autonoma de Baja California Sur. Box 21, La Paz, BCS, 23000, Mexico ●

GEHYRA MUTILATA (Stump-toed Gecko). MEXICO: BAJA CALIFORNIA SUR: La Paz. 20 September 1983. Clara M. Jimenez. Verified by L. Lee Grismer. Universidad Autonoma de Baja California Sur (UABCS 2885). First record of this species in Baja California (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians, Houghton Mifflin Co., Boston, MA).

Submitted by **FRANCISCO REYNOSO,** Museom de Zoologia, Universidad Autonoma de Baja California Sur. Box 21, La Paz, BCS, 23000, Mexico ●

HEMIDACTYLUS FRENATUS (House Gecko). MEXICO: BAJA CALIFORNIA SUR: La Paz. Verified by John W. Wright. Universidad Autonoma de Baja California Sur (UABCS 0331). First record of this species in Baja California (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians, Houghton Mifflin Co., Boston, MA).

Submitted by **FRANCISCO REYNOSO,** Museom de Zoologia, Universidad Autonoma de Baja California Sur. Box 21, La Paz, BCS, 23000, Mexico ●

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). USA: ARKANSAS: Sebastian County: south side of Science building on the campus of Westark Community College, Grand at Waldron, Fort Smith, Arkansas. 8 June 1987. J.J. Wages. Verified by T.M. Buchanan and M.A. Paulissen. University of Arkansas, Department of Zoology (UADZ 3550). A breeding population has existed on the Westark campus for at least 17 years (T.M. Buchanan, pers. obs.) and geckos can be found on all buildings on campus except the library (which was built in 1987 and may not have been "colonized"). First record for Arkansas (Dowling 1957. Occ. Pap. Univ. Ark. Mus. 3:1-51; Heidt, et al. 1979. Checklist of reptiles of Arkansas. Ark. Acad. Sci. Biota Surv. Checklist no. 20, 3pp.).

Submitted by **MARK A. PAULISSEN** and **THOMAS M. BUCHANAN,** Division of Science, Mathematics and Engineering, Westark Community College, P.O. Box 3649, Ft. Smith, AR 72913, USA ●

JAPALURA KUMAONENSIS (NCN). Pakistan: NWFP, Manshera District, Shaheed Pani, in cleared, grassy, open areas in otherwise coniferous forest, near the local snowline (2300-3000 m elev.). 8 May 1988. Khalid J. Baig. Verified by W. Auffenberg. Florida Museum of Natural History, University of Florida (UF 72787). Additional specimens in the Pakistan Museum of Natural History, Islamabad. These represent the first records of this genus and species from Pakistan. The only earlier record with definite locality data is mentioned in Smith (1935. Fauna of British India, Vol. 2, Sauria. Taylor and Francis, London, 440 pp), who listed it from Almora, Naini-Tal, Kumaon District, Uttar Pradesh Province, India. This range extension is expected since the Himalaya ranges are continuous between the two definitely known localities.

Submitted by **KHALID J. BAIG,** Pakistan Museum of Natural History, Markaz F-7, Block 2, Islamabad, PAKISTAN ●

SCELOPORUS TORQUATUS MIKEPRESTONI. (NCN). MEXICO: NUEVO LEON: 19.6 km NE San Antonio de Pena Nevada, Puerto de Pena Nevada, 2743 m elev. 16 July 1980. Ernest A. Liner and Richard M. Johnson. E.A. Liner private collection (EAL 4751); 24.3 km NW San Antonio de Pena Nevada on La Joya road, Puerto de Pena Nevada area, 3002 m. 14 July 1980. E.A. Liner and R. M. Johnson. (EAL 4755, 2 specimens); 19.6 km NE San Antonio de Pena Nevada, Puerto de Pena Nevada, 2743 m. 6 August 1980. E.A. Liner. (EAL 4771); 18.3 km SW Zaragoza at La Encantada,

2743 m. 6 August 1980. E.A. Liner. (EAL 4780, 6 specimens); 18.5 km NE San Antonio de Pena Nevada at Puerto de Pena Nevada, 2743 m. 23 July 1983. E.A. Liner and Allan H. Chaney. (EAL 4966, 3 specimens); 19.6 km NE San Antonio de Pena Nevada (by road) at Puerto de Pena Nevada, 2743 m. 21 July 1986. E.A. Liner and A.H. Chaney. (EAL 5029); 19.6 km NE San Antonio de Pena Nevada (by road) at Puerto de Pena Nevada, 2743 m. 22 July 1985. E.A. Liner and A.H. Chaney. (EAL 5035; 5044, 2 specimens); 1.5 km SW La Encantada, 2743 m. 22 July 1985. E.A. Liner and A.H. Chaney. (EAL 5036, 2 specimens). All verified by Ernest A. Liner. First records for the state of Nuevo Leon and extends the form ca. 35 km airline W from the only known locality (Marcela, Tamps., the type locality) (Smith and Alvarez 1974. Trans. Kans. Acad. Sci. 77:219-224).

Submitted by **ERNEST A. LINER,** 310 Malibou Boulevard, Houma, LA 70364-2598 and **ALLAN H. CHANEY,** Department of Biology, Texas A & I University, Kingsville, TX 78363, USA ●

SERPENTES

ARIZONA ELEGANS ARENICOLOR (Texas Glossy Snake). USA: TEXAS: Anderson Co: Frankston, 2 km S FM 837. 27 June 1986. T. Cole. University of Texas at Arlington (UTACV R-17946); US Hwy 287, 1.6 km NW jct FM 860. 10 September 1988. M.E. Dorcas and J.R. Mendelson III. (UTACV R-24826). Both verified by M.E. Dorcas. New county records that better define northeast extension of range. (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M University Press).

Submitted by **MICHEL E. DORCAS** and **JOSEPH R. MENDELSON III,** Department of Biology, University of Texas at Arlington, Arlington, Texas 76109, USA ●

ARIZONA ELEGANS PACATA (Peninsula Glossy Snake). MEXICO: BAJA CALIFORNIA SUR: 20 km N (by Mexican Highway 1) of La Paz. 24 October 1982. Francisco Reynoso. Verified by L. Lee Grismer. Universidad Autonoma de Baja California Sur (UABCS 0223). Extends range 211 km S of previous known southern locality at Ciudad Insurgentes (Dixon and Fleet 1976. Cat. Amer. Amph. Rept. 179.1-179.4).

Submitted by **FRANCISCO REYNOSO,** Museom de Zoologia, Universidad Autonoma de Baja California Sur. Box 21, La Paz, BCS, 23000, Mexico ●

CROTALUS ENYO ENYO (Lower California Rattlesnake). MEXICO: BAJA CALIFORNIA SUR: Isla Coronados. 12 June 1984. Luke George, Verified by L. Lee Grismer. Universidad Autonoma de Baja California Sur (UABCS 0987). New insular record (Murphy and Ottley 1984. Ann. Carnegie Mus. Nat. Hist. 53:207-230.

Submitted by **FRANCISCO REYNOSO,** Museom de Zoologia, Universidad Autonoma de Baja California Sur. Box 21, La Paz, BCS, 23000, Mexico ●

DRYMARCHON CORAIS COUPERI (Eastern Indigo Snake). USA: FLORIDA: Jefferson Co: 17.7 air km SE Wacissa (T3S, R4E, S20). 27 November 1988. John G. Palis. Verified by David L. Auth. Florida State Museum, University of Florida (UF 72746). New county record (Ashton and Ashton 1988. Handbook of Reptiles and Amphibians of Florida, Part One: The Snakes. 2nd. Ed. Windward Publ., Inc. Miami, FL. 176 pp.).

Submitted by **JOHN G. PALIS,** Florida Natural Areas Inventory, 254 East Sixth Avenue, Tallahassee, FL 32303, USA ●

ELAPHE VULPINA (Fox Snake). USA: WISCONSIN: Calumet Co: Brillion Nature Center (T20N, R20E, Sec 34). 24 August 1987. Mary Sobota. Verified by P.A. Cochran. Photographs on file at University of Wisconsin-Green Bay Richter Collection (1486-1487). New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Pub. Mus. 205 pp.).

Submitted by **MARY SOBOTA,** Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA ●

ERIDIPHAS SLEVINI SLEVINI (Baja California Night Snake). MEXICO: BAJA CALIFORNIA SUR: Isla Santa Margarita. 17 September 1983. Francisco Reynoso. Verified by L. Lee Grismer. Universidad Autonoma de Baja California Sur (UABCS 0590). New insular record (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians, Houghton Mifflin Co., Boston, MA).

Submitted by **FRANCISCO REYNOSO,** Museom de Zoologia, Universidad Autonoma de Baja California Sur. Box 21, La Paz, BCS, 23000, Mexico ●

FARANCIA ABACURA ABACURA (Eastern Mud Snake). USA: FLORIDA: Calhoun Co: 1.3 km E Clarksville on state hwy 20 (T1S, R9W, S6). 17 September 1988. John G. Palis. Verified by David L. Auth, Florida State Museum, University of Florida (UF 72743). New county record (Ashton and Ashton. . . 1988. Handbook of Reptiles and Amphibians of Florida, Part One: The Snakes. 2nd Ed. Windward Publ., Inc. Miami, FL, 176 pp.).

Submitted by **JOHN G. PALIS,** Florida Natural Areas Inventory, 254 East Sixth Avenue, Tallahassee, FL 32303, USA ●

LAMPROPELTIS GETULUS HOLBROOKI (Speckled Kingsnake). USA: TEXAS: Anderson Co: FM 59, 0.5 km N jct FM 2961. 10 September 1988. M.E. Dorcas and J.R. Mendelson III. Verified by M.E. Dorcas. University of Texas at Arlington (UTACV R-24825). New county record. (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M University Press).

Submitted by **MICHAEL E. DORCAS** and **JOSEPH R. MENDELSON III,** Department of Biology, The University of Texas at Arlington, Arlington, TX 76109, USA ●

LICHANURA TRIVIRGATA TRIVIRGATA (Mexican Rosy Boa). MEXICO: BAJA CALIFORNIA SUR: Isla Santa Margarita. 29 April 1984. Francisco Reynoso. Verified by L. Lee Grismer. Universidad Autonoma de Baja California Sur (UABCS 0876). New insular record (Yingling 1982. Cat. Amer. Amph. Rept. 294.1-294.2).

Submitted by **FRANCISCO REYNOSO,** Museom de Zoologia, Universidad Autonoma de Baja California Sur. Box 21, La Paz, BCS, 23000, Mexico ●

MASTICOPHIS FLAGELLUM FLAGELLUM (Eastern Coachwhip). USA: TEXAS: Gregg Co: ca. 2 km E Kilgore College, 2600 Dudley Road. 26 August 1988. David McGarity. Verified by M.E. Dorcas. University of Texas at Arlington (UTACV R-24827). New county record. (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M University Press).

Submitted by **MICHAEL E. DORCAS,** Department of Biology, The University of Texas at Arlington, Arlington, TX 76109, USA ●

OPHEODRYS VERNALIS BLANCHARDI (Western Smooth Green Snake). USA: NEW MEXICO: Torrance Co: Manzano Mountains, 4 km N and 6.5 km W Tajique, (T7N, R5E, S36), ca. 2225 m elev. 2 August 1986. J.N. Stuart. Verified by W.G. Degenhardt. Museum of Southwestern Biology, University of New Mexico (MSB 49629). First record for state's Central Highlands (Grobman, A.B. 1941. Misc. Publ. Mus. Zool. Univ. Mich. 50:1-38; 1988. pers. comm.). Partially fills distributional hiatus between Southern Rocky Mountains and Sacramento Highlands. We thank A.B. Grobman for assistance.

Submitted by **JAMES N. STUART,** Environmental Section, U.S. Army Corps of Engineers, P.O. Box 1580, Albuquerque, NM 87103, and **WILLIAM G. DEGENHARDT,** Museum of Southwestern Biology, Department of Biology, University of New Mexico, Albuquerque, NM 87131, USA ●

PSAMMOPHIS CONDANARUS (Asian Sand Snake). BALI: West Bali; north of Mount Merbuk, on a forest road near the seashore. 25 July 1985. Yvan Gradis. Verified by Ivan Ineich and Jean Deuve. Paris Natural History Museum (MNHN 1989-49). First record from Bali, Indonesia. Known before only from West Java, locality Gresik (Mertens, R. 1957. Senckenb. Biol. 38(1/2):23-31).

Submitted by **IVAN INEICH** and **JEAN DEUVE,** Museum national d'Histoire naturelle, Laboratoire des Reptiles et Amphibiens, 25 rue Cuvier 75005 PARIS, FRANCE ●

RHADINAEA MONTANA. (Nuevo Leon Yellow-lipped Snake). MEXICO: NUEVO LEON. 4.3 km N Las Adjuntas (by road), 792.5 m elev. 17 July 1985. Ernest A. Liner and Allan H. Chaney. Verified by Ernest A. Liner. E.A. Liner private collection (EAL 5002). Seventh known specimen of this species and extends the range eastward from the previous known localities ca. 34 km airline NNE of Ojo de Agua nr. Galeana (the type locality), and 55

km airline ESE La Huasteca (21 km W Monterrey) (Myers 1974. Bull. Amer. Mus. Nat. Hist. 153(1):1-262).

Submitted by **ALLAN H. CHANEY,** Department of Biology, Texas A & I University, Kingsville, TX 79363 and **ERNEST A. LINER,** 310 Malibou Boulevard, Houma, LA 70364-2598, USA ●

TANTILLA NIGRICEPS NIGRICEPS (Plains Black-headed Snake). USA: WYOMING: Platte Co: Guernsey. 29 August 1987. Bradley Carl Wichman. Verified by W.K. Hayes, D. Duvall, G.T. Baxter. University of Wyoming Museum of Zoology (H-0619). First state record. Another unpreserved specimen reported from Glendo State Park, Platte Co. (Baxter and Stone. 1985. Amphibians and Reptiles of Wyoming, 2nd ed. Wyoming Game and Fish Department, Cheyenne, 137 pp.), suggests the presence of a viable population along the North Platte River in eastern Wyoming.

Submitted by **WILLIAM K. HAYES, DAVID DUVALL, WILLIAM A. GERN** and **GEORGE T. BAXTER,** Department of Zoology and Physiology, University of Wyoming, Laramie, WY 82071, USA ●

THAMNOPHIS SIRTALIS (Common Garter Snake). USA: WISCONSIN: Calumet Co: Brillion Nature Center (T20N, R20E, Sec 34). 21 July 1987. Mary Sobota. Verified by P.A. Cochran. Photograph on file at University of Wisconsin-Green Bay Richter Collection (1485). New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Pub. Mus. 205 pp.).

Submitted by **MARY SOBOTA,** Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA ●

THAMNOPHIS SIRTALIS ANNECTANS (Texas Garter Snake). USA: TEXAS: Johnson Co.: 8.9 km SW Cleburne at junction Park Rd. 21 and US 67. 11 June 1989. C.T. McAllister. Verified by S.E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 13237). New county record (Dixon 1987. Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, TX, 434 pp.).

Submitted by **CHRIS T. MCALLISTER,** Renal Metabolic Lab (151-G), Veterans Administration Medical Center, 4500 S. Lancaster Rd., Dallas, TX 75216, USA ●

TESTUDINES

CHELONOIDIS CHILENSIS (Chaco Tortoise). ARGENTINA: FORMOSA: Patiño Department: Estancia Sawicki, Los Immigrantes, Ruta Nacional No. 81 (km 1386), 8 km W of Ibarreta (25° 13' S, 59° 51' W). 7 March 1988. P. Fidalgo and G. Scrocchi. Verified by E. Richard. Herpetological Collection, Fundación Miguel Lillo (FML, Chelonii 031: Adult, skeleton). First record for the Department. The species was previously recorded from Formosa Departments of Pirané and Ramón Lista (Waller, T. 1986. FVSA—Amp. y Rept. (Cons.) 1(2):36-48).

Submitted by **ENRIQUE RICHARD,** Instituto de Herpetologia, Fundación Miguel Lillo, Miguel Lillo 251, 4000-Tucumán, República Argentina and Proyecto Herpetofauna (FVSA), Sección NOA, Rivadavia 105, 5 to "G", 4000 - Tucumán, República Argentina ●

CHELONOIDIS CHILENSIS (Chaco Tortoise). ARGENTINA: SANTIAGO DEL ESTERO: Pellegrini Department: Algarrobal Viejo (25° 43'S, 64° 02'W). 10 October 1988. E. Richard and J.M. Gómez. Verified by E. Richard. Herpetological Collection, Fundación Miguel Lillo (FML, Chelonii 030: adult male); Figueroa Department: Ruta Provincial no. 5, 32 km before Caspi Corral (between La Banda and Caspi Corral). 27 October 1985. M. Fabrezi, J. Langone, E. Lavilla, R. Montero and G. Scrocchi. Verified by E. Richard. (FML, Chelonii 008: adult male). First records for the departments. The species was previously recorded from Santiago del Estero departments of General Toboada, Jiménez, Quebracho, La Banda, Ojo de Auga, Río Hondo, and Alberdi (Waller, T. 1986. FVSA-Amp. y Rept. (Cons.), 1(2):36-48). The Pellegrini Dept. record is a contribution of the "Proyecto Tortugas" (Proyecto Herpetofauna -FVSA), supported by the Kantonaler Zürcher Tierschutzverein (Switzerland).

Submitted by **ENRIQUE RICHARD,** Instituto de Herpetología, Fundación Miguel Lillo, Miguel Lillo 251, 4000 - Tucumán, República Argentina, and Proyecto Herpetofauna (FVSA), Sección NOA, Rivadavia 105-5to "G", 4000 - Tucumán, República Argentina ●

CHELONIA MYDAS (Green Sea Turtle). ARGENTINA: CHUBUT PRIVINCE: Fondeadero Sarmiento shore (42° 15'S, 64° 04'W). 13 July 1988. G. Venegas. Verified by J.A. Scolaro. Centro Nacional Patagónico, Colección Herpetológica (CNP-H #0331). This is the most southerly record for the species on the Atlantic coast and the first to be recorded on Valdes Peninsula, near Puerto Madryn city (Frazier 1984. Las tortugas marinas en el Oceano Atlántico sur occidental. Asoc. Herpetol. Argentina. S. Divulg. 2. La Plata. 22 pp.). The specimen (carapace length 39.5 cm; mass 5.7 kg) was collected dying at shore.

Submitted by **JOSÉ ALEJANDRO SCOLARO,** Centro Nacional Patagónico, Consejo Nacional de Investigaciones Científicas y Técnicas, Casilla Correo 69, (9120) Puerto Madryn, ARGENTINA ●

CHELYDRA SERPENTINA (Snapping Turtle). USA: WISCONSIN: Kewaunee Co: in School Creek near bridge along Hwy. 54, 1 km east of County Hwy. H (T24N, R22E, Sec 17). 11 June 1988. Dreux J. Watermolen. Verified by P.A. Cochran. University of Wisconsin-Green Bay Richter Collection (0318). Adult. New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Pub. Mus. 205 pp).

Submitted by **DREUX J. WATERMOLEN,** Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA ●

CHRYSEMYS PICTA (Painted Turtle). USA: WISCONSIN: Calumet Co: Brillion Nature Center (T20N, R20E, Sec 34). 15 September 1987. Mary Sobota. Verified by P.A. Cochran. Photographs on file at University of Wisconsin-Green Bay Richter Collection (1483, 1484). New county record (Vogt. 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Publ. Mus. 205 pp.).

Submitted by **MARY SOBOTA,** Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA ●

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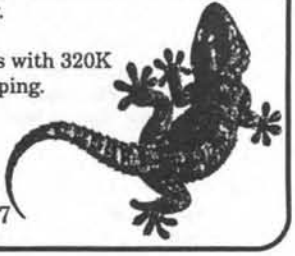
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CHRYSEMYS PICTA (Painted Turtle). USA: WISCONSIN: Manitowoc Co: County Hwy Z 1.5 km east of County Hwy T (T21N, R22E, Sec 23). 22 May 1988. Dreux J. Watermolen. Verified by P.A. Cochran. University of Wisconsin-Green Bay Richter Collection (0319). Door Co: boat launch parking area in Potawatomi State Park, Sturgeon Bay (T27N, R24E, Sec 26). 28 May 1988. Dreux J. Watermolen. Verified by P.A. Cochran, University of Wisconsin-Green Bay Richter Collection (0320). Shell fragments and body parts of road-killed adults. New county records (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Pub. Mus. 205 pp.).

Submitted by **DREUX J. WATERMOLEN,** Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA ●

CLEMMYS GUTATTA (Spotted Turtle). USA: GEORGIA: Sumter Co: 6 km S. of Americus. 6 March 1989. Bob Herrington. Verified by Bob Herrington. Georgia Southwestern College Vertebrate Collection (#1651). New county record, extends the range 37 km NW in the Muckalee Creek drainage and substantiates the presence of a small population in this drainage (Camp and Powder. 1980. SSAR Herp. Review 11(3):80).

Submitted by **BOB HERRINGTON,** Department of Biology, Georgia Southwestern College, Americus, GA 31709, USA ●

CLEMMYS MARMORATA (Western Pond Turtle). USA: CALIFORNIA: Amador County: Sutter Creek, 5 km W Volcano. Sewage treatment pond, Amador City. Jackson Creek, 150 m N Hwy 88. 23 June 1987. Buskirk and Kinji Hayashi. Twelve turtles seen, 6 photographed, 1 captured. Calaveras County: North Fork Calaveras Creek above Highway 12, 3 km NW San Andreas. Pond, Jesus Maria Rd 10 km W Railroad Flat Rd. 4 June 1988. Buskirk. Seven turtles seen, 3 photographed, 1 captured. Eldorado County: Pond, Hwy 49 3 km N Pilot Hill. 16 June 1987. Buskirk and Hayashi. Four turtles seen, 2 photographed. Lassen County: Pit River at Pittville. 3 October 1988. Buskirk. Six turtles seen, 3 photographed. Nevada County: Pond, Hwy 49 0.5 km N Limekiln Rd. Pond, Auburn Rd 0.3 km N Hwy 49, 12 March 1988. Buskirk. Four turtles seen, three photographed. Placer County: Secret Ravine near China Garden Rd, 2 km E Rocklin. 16 June 1987. Buskirk and Hayashi. Four turtles seen, one photographed. Yuba County: Backwater of Dry Creek above Hwy 20. 12 March 1988. Buskirk. One turtle seen and photographed. All specimens verified by Harry Greene and documented by photographs deposited in Museum of Vertebrate Zoology. All represent new county records.

The records for Amador, Calaveras, Eldorado, Nevada, Placer, and Yuba Counties fill in some of the gaps in the known distribution of *Clemmys marmorata* in the Sierra Nevada foothills between Tuolumne County (MVZ 78788) and Butte County (Hayes and Cliff 1982. A checklist of the herpetofauna of Butte County, the Butte Sink and Sutter Buttes, California. Herp. Review 13(3):85-87). Two localities in Eldorado County with inadequate supporting information are listed in Appendix B of Brattstrom and Messer (1988. Current status of the southwestern pond turtle *Clemmys marmorata pallida,* in southern California. Final report for CA Dept. Fish and Game Contract C-2044. 47 pp.) The Lassen County record is the first for this turtle between Fall River Mills, Shasta County (Pope 1939. Turtles of the United States and Canada. Alfred A. Knopf. 343 pp.) and Ash Creek, Modoc County (Buskirk 1985. SSAR Herp. Review 14(4):116).

Submitted by **JAMES R. BUSKIRK,** 4131 Terrace Street, Oakland, California 94611, USA ●

KINOSTERNON SCORPIOIDES SERIEI (Argentina Mud Turtle). ARGENTINA: FORMOSA: Patiño Department: Las Lomitas. 9 December 1987. J. Braunstein. Verified by E. Richard. Herpetological Collection, Fundación Miguel Lillo (FML, Chelonii 029, Adult male). First record for the Department. Extends range 160 km SE of nearest record: Ing. Guillermo N. Juárez, Matacos Department (Freiberg, M.A. 1967. Ciencia e Investigación, 23(8):351-363).

Submitted by **ENRIQUE RICHARD,** Instituto de Herpetología, Fundación Miguel Lillo, Miguel Lillo 251, 4000 - Tucumán, República Argentina and Proyecto Herpetofauna (FVSA), Sección NOA, Rivadavia 105-5to "G", 4000 - Tucumán, República Argentina ●

KINOSTERNON SCORPIOIDES SERIEI (Argentina Mud Turtle). ARGENTINA: SALTA: Rivadavia Department: Los Blancos (23° 36'S, 62° 36'W). 13 November 1985. M. Fabrezi, J. Langone, E. Lavilla, R. Montero and G. Scrocchi. Verified by E. Richard. Herpetological Collection, Fundación Miguel Lillo (FML, Chelonii 007: Adult). First record for the Department. The species was previously recorded from Salta Departments of General San Martin, Orán and Anta (Freiberg, M.A. 1967. Ciencia e Investigación, 23(8):351-363).

Submitted by **ENRIQUE RICHARD,** Instituto de Herpetologia, Fundación Miguel Lillo, Miguel Lillo 251, 4000 - Tucumán, República Argentina dn Proyecto Herpetofauna (FVSA), ección NOA, Rivadavia 105-5to "G", 4000 - Tucumán, República Argentina ●

PHRYNOPS WILLIAMSI (Williams' toad-headed Turtle). ARGENTINA: MISIONES: Departamento Iguazú: Arroyo Urugua-i, 30 km E Puerto Bemberg. Museo Argentino de Ciencias Naturales (MACN 12589-95). October 1949. J. Cranwell. Departamento Guarani: Arroyo Paraiso (trib. of Uruguay R.). Unnumbered, undated MACN specimen collected by J. Hintz. Verified by A.G.J. Rhodin. First records for Argentina. Material available to Rhodin and Mittermeier (1983. Rhodin and Miyata [eds.] Advances in herpetology and evolutionary biology. Mus. Compl. Zool. Harvard: 58-72) before describing *Phrynops williamsi* did not include the MACN specimens. Live specimens have been captured and photographed since 1985 in the Iguazú River below Dos Hermanas Falls, Iguazú National Park and the Arroyo Uruzú, Depto. Iguazú.

Submitted by **JAMES R. BUSKIRK,** 4131 Terrace St., Oakland, CA 94611, USA ●

BOOK REVIEWS

Banglar Bonnyoprani. Vol. I. (In Bangla), by Mohammed Ali Reza Khan. 1987. Bangla Academy, Dhaka. 1-16, 1-169. 44 pl., 1 map. Price taka 125 (US $4).

Bangla or Bengali is spoken by an estimated 200 million people in Bangladesh and eastern India. Khan's volume is the first in a series of three that attempts to describe, in Bangla, the vertebrates (excluding fish) of the Republic of Bangladesh. The series is an expanded version of Khan's (1982) checklist: Volume I deals with the wildlife habitats and the herpetofauna, and volumes II and III (recently published) deal with the birds and mammals, respectively.

Dr. Mohammed Ali Reza Khan was until recently Associate Professor of Zoology at Dhaka University and is presently Curator of the Al Ain Zoo and Aquarium at Abu Dhabi, U.A.E. A member of the IUCN/SSC Commission on Education and of several of IUCN's Survival Specialist Groups, Khan is recognised as an authority on the wildlife of Bangladesh and is a prolific author.

The volume is divided into three chapters following an introduction: a definition of wildlife and a description of the various forest types of Bangladesh, a rather short account of the amphibians, and a longer one of the reptiles. The herpetofauna of this little country includes some 143 species (Khan 1982) and shows an admixture of both Indian- and Indo-Malayan elements. Geographic data of the country, considered to be the most densely populated by humans, are naturally of interest to wildlife biologists. According to Khan, Bangladesh has a total area of ca. 143,998 km², of which 8,300 km² consists of streams, rivers and estuaries and a mere 21,950 km² of various categories of forests. The last figure, Khan admits, is a government statistic, and the actual forested area is much less.

The chapter on amphibians is only 12 pages, a reflection of how little is known about this group. Earlier, Khan (1982) listed 19 species of amphibians that may occur in Bangladesh, but field work in some of the more inaccessible, frog-rich regions, such as the Chittagong Hill Tracts and Sylhet, should increase this tally. Most of the frog and toad species dealt with are widespread throughout the Indian subcontinent. Mention is made of the tree toad (*Nectophryne kempi*), which the author suspects is found in Sylhet district. The chapter closes with an account of the country's trade in frogs.

The last and longest (99 printed pages excluding illustrations) chapter concentrates on the reptiles. It commences, after a brief account on reptiles in general, with chelonians, a group well represented in Bangladesh (25 out of the 33 species found on the subcontinent). This is also a resource heavily exploited; between July 1989 and June 1982, the equivalent of Taka 30-40 million was earned by the country through turtle export. This legal trade, Khan writes, is a tiny proportion of the country's turtle trade, as very large numbers of these animals are smuggled across the border to India.

Of the 850 or so species of amphibians, reptiles, birds and mammals thought to occur

in Bangladesh, only two, according to the author, can be considered endemic. These are the black softshell turtle (*Trionyx nigricans*) which is known to be restricted to a tank attached to the shrine reportedly of Byazid Bostami at Chittagong and in nearby ponds, and the Indian eyed turtle (*Morenia petersi*), widespread in Bangladesh. Khan did suspect the occurrence of the latter within Indian limits, and the species has been found in recent years in the Indian state of Bihar (Das 1985; Moll and Vijaya 1986).

Each species account of chelonians consists of a brief description, with natural history and status notes, often of considerable interest. Khan deserves to be commended for the first records of numerous turtle and tortoise species from his country, including *Batagur baska, Kachuga tentoria, K. dhongoka, Melanochelys tricarinata, Cuora amboinensis, Indotestudo elongata* and *Manouria emys*. The section following the species accounts deals with various issues, including the turtle trade, the resultant decline in wild populations and ways to stem this.

Compared to the chelonians, the lizard fauna seems impoverished, with only some 17 species recorded (Khan 1982) and the present volume describes only the commoner or more interesting forms. One of these, the flying lizard, is reported from the country by the author, from the Chittagong forests, based on a sight record: Khan assumes this to be *Draco maculatus*. The locality of the present specimen, however, more closely approaches the distribution of *Draco blanfordii norvilli*, known from the nearby Indian state of Assam as well as northern Burma (see Musters 1983).

There are other interesting snippets of information on the lizard species. According to this book, the tokay gecko (*Gekko gecko*), the largest of the geckos, is used in folk medicine in Bangladesh as a substitute for the once available spiny-tailed lizard (*Uromastyx hardwickii*), which is found in Pakistan and north-western India. Khan restricts the water monitor (*Varanus salvator*) to the salt-water regions in the country. This species is widespread, though often very rare at present, in non-coastal regions in southeast Asia and in north-eastern India, and thus may be found (or was in the past) in Sylhet, Mymensingh and the three Chittagong Hill Tracts districts of Bangladesh. There is an example of this species in the Indian National Zoological Collection, maintained by the Zoological Survey of India (Reg. No. 2126) with data indicating that it was collected from Rangpore in northern Bangladesh.

Seventy-nine snake species are known to occur in Bangladesh (Khan 1988). The present volume describes, once again, the commoner or the more interesting forms, among which are the two python species, the rock python (*Python molurus*), now largely restricted to the Sunderbans, and the reticulated python (*P. reticulatus*), distributed over Sylhet and the Chittagong Hill Tracts. Of the Indian egg-eating snake (*Elachistodon westermanni*), the author has no information, apart from an old specimen, now at the British Museum, collected from Rangpore. Following the brief descriptions of snakes are (often too lengthy) accounts of the various superstitions associated with these reptiles.

All three crocodilian species of the subcontinent occur in this small country. The gharial (*Gavialis gangeticus*) is present only in the northern district of Rajshahi; the saltwater crocodile (*Crocodylus porosus*) in the Sunderbans; and the rarest, the once ubiquitous mugger or marsh crocodile (*C. pelustris*), restricted to a tank at Bagerhat. The status of all crocodilians is thus alarming and governments of nearby countries, such as India and Nepal could start 'croc diplomacy' by providing surplus animals from their rearing centres for a well-designed management programme for crocodiles in Bangladesh.

Creation of common names for the different species is the first step towards public education, and the author has been bold in this venture. He calls *Lepidochelys olivacea*, jalpaironger kachim; *Cuora amboinensis*, diba kachim; and *Elachistodon westermanni*, dimkhor shap, all literal translations of their respective English common names.

There are, however, numerous typos in the book, and names of two taxa have been misspelt throughout — *Cuora amboinensis* and *Varanus flavescens*. These mistakes have been repeated from the earlier checklist.

For illustrations, the volume relies heavily on Daniel (1983) from which line-drawings, black-and-white photographs, and color photographs and paintings have been borrowed. Quality of reproduction, however, is poor. There are several other problems with the illustrations: p. 50 (fig. 3.4) illustrates a low-shelled, keel-less emydid which cannot be *Kachuga tentoria* as its caption identifies it. Captions of *Eretmochelys imbricata* and *Dermochelys coriacea* have been interchanged on p. 66. On p. 70, the three monitor species found in Bangladesh are shown, but the caption provides no identification to the species.

A bibliography of 15 herpetological books and papers, 11 in English, 4 in Bangla, round out this interesting book. Published by the Bangla Academy, the book is not widely available. I had to make a trip to Dhaka to buy my copy.

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Musters, C.J.M. 1983. Taxonomy of the genus *Draco* L. (Agamidae, Lacertilia, Reptilia). Zool. Verh. (199):1-120.

INDRANEIL DAS
Madras Crocodile Bank Trust,
Vadanemmeli, Perur Post,
Mahabalipuram Road,
Madras 603 104,
India

Proceedings of a Workshop on Neotropical Distribution Patterns, by P.E. Vanzolini and W.R. Heyer, eds. 1988. Academia Brasileira de Ciencias: Rio de Janerio: 1-488.

This volume is based on a workshop held in January 1987 in Rio de Janeiro, Brazil, that brought together a diverse group of botanists, entomologists and vertebrate biologists to examine *pattern* in the distribution of Neotropical organisms. The volume is refreshing in avoiding the facile explanation of current distribution provided by reference to hypothetical Pleistocene refuges that change location and extent depending upon the groups analyzed and the imagination of the investigator. Not surprisingly in such a volume the approaches are diverse and depth of coverage uneven since the aim was to inform the participants of on-going research by others. Five of the papers in the proceedings are of particular interest to readers of *Herpetological Review* and illustrate and emphasize this uneven treatment. For herpetologists interested in South America this forms a useful update and corrective for some of the extreme refugial positions taken in the *South American Herpetofauna* volume edited by Duellman (1979).

John E. Cadle and J.L. Patton discuss the distribution of amphibians and reptiles (and mammals) along the eastern slope of the southern Peruvian Andes. Their treatment is very useful in detailing the altitudinal extent of species distributions for the region and the difference in pattern between mammals (greater diversity and finer vertical partitioning of the forested slopes) and herps. In addition they provide a cladistic basis for determining if the distributions of related taxa are the product of vicariant (allopatric) or gradient (parapatric) speciation models. They conclude that the former is the dominant one, without providing concrete analyses of relationships to support that conclusion. The interpretation of the origin of the fauna of the region is strictly dispersalist. Apparently the authors believe that the Andean slopes of southern Peru were a *tabla blanca* invaded from the north, south and east. Is it not possible that a substantial portion of the fauna is autochthonous and has been more or less evolving *in situ* from a time prior to any Andean uplift? This would certainly be in keeping with their conclusion that Pleistocene events are not the principal influence on differentiation of the fauna of this region.

In a second paper W.R. Heyer undertakes a detailed examination of the adequacy of the anuran data base as a basis for determining patterns and evaluating their significance east of the Andes. He concludes that even though the data base has dramatically increased in the last 10 years, it remains inadequate for reasoned discussion of pattern (too much missing data) or historical causes (too many possibilities for *ad hoc* hypothesis construction). Nevertheless, Heyer is willing to highlight certain features of Neotropical frog distribution, which based upon his broad knowledge and experience, provide a context for future study. These include an emphasis on the morphoclimatic domains of Ab'Sáber (1977) as correlates of distributions, the significance of open versus forest formations

and the tendency for forest species to have smaller areal ranges than those in other formations.

In another paper M.T. Rodrigues reviews the distribution of the lizard genus *Tropidurus* in Brazil with particular regard for broad ecological determinants. Although he emphasizes the importance of the morphoclimatic domains in this treatment, one is impressed by the fact that most of the figured species distributions show low fidelity in terms of restriction to a particular domain. More impressive is the essential absence of this genus from the Amazonian forest region while it occurs in all other open and forest formations. An interesting conclusion is that the caatinga area has an endemic component rather than simply being invaded by species from adjacent open formations during the drying trend of the current interglacial.

In a more general paper on lizard distribution P.E. Vanzolini provides an excellent and detailed review of species occurrence in Amazonian and Atlantic Forests and the principal open-formations (caatinga, cerrado and Chaco). Other major areas are covered in less detail. This minor flaw is far outweighed by the opportunity to have in one place a summary of the thoughts of the leading authority on South America's lizard biogeography. Vanzolini concludes that the basic patterns were established during Tertiary (Mio-Pliocene) and many species date from that period (others however are products of Quaternary climatic cycles), that wide-ranging taxa are the exception and that *in situ* speciation within major domains is the rule.

The final paper in the proceedings, *A New Look at the Iguania* by E. E. Williams, encompasses a much wider range than any of the others, forming an attempt to analyze the phylogeny, biogeography and evolutionary processes responsible for differentiation in a major clade of lizards. While this effort seems somewhat far afield from the central issues of the workshop, it is of considerable value to have this summary of Williams' ideas on these subjects. After all, he has been deeply immersed in the study of one of the largest components of this group (the anoles and their allies) for over 30 years. Because of the space limits for this review only a few of the most important features of the *New Look* are touched upon here. Williams' phylogenetic analysis is based upon 13 features (out of 49) utilized by Etheridge and de Queiroz (1988) and two additional scale features. He concludes that the Iguania are comprised of a Gondwanan clade (morunosaurs*Polychrus,* anoloids, oplurines and chameleons) and a Laurasian one (all other iguaninians, including agamids). He regards anoloids as being the sister group to chameleons and oplurines, which are in turn sister taxa. These proposed relations are based primarily on post-xiphisternal inscriptional rib conditions, sensory scale organ similarities and ulnar nerve position. These views are now placed in considerable doubt by the more recent rigorous, cladistic analysis (67 characters) of Frost and Etheridge (1989), who conclude that "agamids" and chameleons are sister taxa and not particularly closely allied to oplurines or anoles.

Williams found, as did Frost and Etheridge (1989) that numerous apparent homoplasies make resolution of relationships among the major subdivisions in the Iguania difficult. He argues that a rule of Geographic Contiguity may be "at least" as valuable as parsimony (or compatibility) in evaluating homoplasy, i.e. homoplasy may be rejected as an explanation of character incongruity when evidence suggests that the clades in question have been contiguous or sympatric at or near their time of origin. It is partially this rule that led Williams to propose the anoloid, oplurine and chameleon relationship. In light of the work of Frost and Etheridge (1989), this idea seems to have little merit in explaining character distributions in higher taxa. It also appears, in the example given by Williams, that his choice from among several possible homoplasies as to which are indicative of relationships is subjective. Nevertheless the concept that the geographic distribution of character states may be important to phylogenetic analysis needs to be explored on a wider basis.

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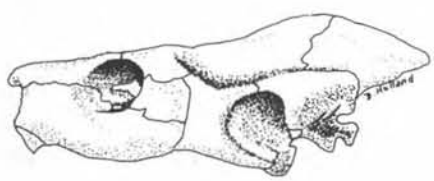
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Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations and photographs. Manuscripts submitted must be typed, double spaced, on 8.5X11 inch paper, and should be sent in duplicate. We encouregе submissions on Macintosh disks, though we can also work with TEXT (ASCII) files submitted on IBM and compatible floppies. **Herpetological Review** is composed on a Macintosh SE using Microsoft Word, which accepts files from several other word processor applications. Format your documents full-page width; we will fit to **HR** format. Unpublished photographs of an unusual nature or of uncommon amphibians or reptiles may also be submitted. These should be 8X10 inches black and white, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled lightly on the back of each print. Return of unsolicited photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs solicited by the Editor will be returned at our cost.

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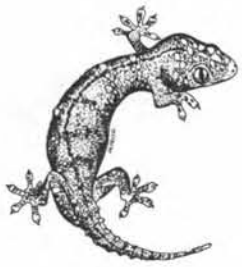
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Herpetological Review

Volume 20 December 1989 Number 4

1990 JOINT ANNUAL MEETING

The 38th Annual Meeting of

THE HERPETOLOGISTS' LEAGUE

and The 33rd Annual Meeting of

THE SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

at

TULANE UNIVERSITY
New Orleans, Louisiana

5-9 August 1990

Meeting Site

Tulane University is a private, non-sectarian university composed of 11 schools and colleges enrolling approximately 11,000 students. The main campus is located in a residential area of New Orleans, a city with a metropolitan area population of over one million inhabitants. The city is located on the Mississippi River and is one of the nation's largest and busiest seaports. New Orleans was founded in 1718 and preserves much of its early history in the Vieux Carre or French Quarter, an enclave of old buildings built in the French style of the 1700's. Other parts of the city contain exquisite old mansions from the mid 1800's.

The warm, maritime climate supports lush vegetation, much of it imported from tropical and semitropical regions. The physical setting and many unusual provincial customs make New Orleans a haven for tourists. The city is a focal point for jazz music, and more recently the music of the Cajuns (early French settlers of southern Louisiana) has grown popular in night clubs. The cuisine is internationally famous and some of the world's great restaurants are located here. Featured foods are especially outstanding seafood, French, Creole, and Cajun. The surrounding countryside ranges from the great expanses of coastal salt marsh to large tracts of swamp forests and pine-hardwood forests.

The meetings will take place in the University Center Building and housing is available in the nearby dormitories, thus a very compact setting.

Technical Paper Presentations

Research reports will be given as oral presentations at several concurrent sessions, or as poster sessions. No definite symposium topic has been furnished as yet, but the Zoo Liaison group will likely have one. Deadline for paper titles and abstracts is 15 May.

Special Events

Monday night, 6 August: Social gathering

Tuesday evening, 7 August: A barbeque, and later that evening the Dennis-Juterbock-Adler slide shows and the Adler video presentation on the 1989 World Congress of Herpetology meeting.

Wednesday night, 8 August: The very popular auction conducted by Joseph T. Collins. Attendees are encouraged to donate books, art items, and other herpetological materials; proceeds are used to defray costs of the annual meeting and help support the two societies' activities. Receipts will be given for all items sold (they are tax deductible contributions). Contributed items for this event should be sent or brought to Dr. Harold A. Dundee, Department of Biology, Tulane University, New Orleans, LA 70118, USA

Live herpetofaunal exhibits

5-9 August: Commercial artist and exhibitor displays.

Accommodations and Meals

Accommodations in residential halls are available with or without linen service; singles in hall with community bath are $19.50/night without linen, $22 with linen; doubles in these halls are $12.50/night/person without linen, $15 with linen. In 4 bedroom apartments with two baths and kitchen facilities singles are $22/night without linen, $24.50 with linen. Family rates (two adults and up to three children) for a family apartment with kitchen $70/night/family without linen, $75 with linen.

The university accommodations *are not subject to the 11% tax* normally applied to regular hotel accommodations. Registrants occupying residential halls receive free campus parking privileges.

The University Center cafeteria will be open regularly for breakfast and lunch on a cash basis; arrangements hopefully will be made to have them open for Monday, Wednesday, and Thursday evening meals. An Arby's fast food outlet in the University Center is open throughout the day. Other food facilities are generally 1/4 to 1/2 mile distant.

Meeting Anouncement

A detailed program and call for papers will be mailed separately in late February. Additional information can be obtained from the meeting chairperson, Dr. Harold A. Dundee, Department of Biology, Tulane University, New Orleans, LA 70118, USA. (504) 865-5191. All interested persons are welcome to attend. Non-members should write to the meeting chairman for registration forms. ●

SSAR BUSINESS

1989 KENNEDY STUDENT AWARD

The Society is pleased to announce that the winner of the 1989 Kennedy Student Award, given for the best paper by a student published in Volume 22 of the Journal of Herpetology, is Leo J. Fleishman of the Department of Zoology, University of Texas at Austin (formerly of Cornell University and the Smithsonian Tropical Research Institute). Mr. (now Dr.) Fleishman's paper (The social behavior of *Anolis auratus*, a grass anole from Panama) appeared in **J. Herpetol.** 1988, pp. 13-23.

The Kennedy Student Award Committee consisted this year of J. Eric Juterbock (Chair), Robert E. Gatten, Jr., Ken R. Marion, John S. Mecham, and Laurie J. Vitt. ●

CONGRESS PHOTOS WANTED

The Society requests that members who attended the First World Congress of Herpetology and who took photographs of events, people, speakers, posters, or anything which occurred at and was related to the meeting, donate "seconds" or duplicates of the slides/prints to the SSAR archives. Please mail them to: J. Eric Juterbock, SSAR Secretary, Department of Zoology, Ohio State University, Lima, OH 45804, USA. ●

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For further information on this program, contact Ruth M. Zantzinger, 2108 Cherry Street, Philadelphia, PA 19103-1312, USA. ●

ERRATUM

Readers of the **GEOGRAPHIC DISTRIBUTION** section please note the following error: In the September 1989 [20(3):75] issue of *HR*, under **Caudata,** a typographical error appeared in the first line of the account for the blue-spotted salamander hybrids. The correct name should have been ***"Ambystoma* (n) *laterale-jeffersonianum."*** The editor regrets the error and extends his apologies to the author of this note. ●

LETTERS TO THE EDITOR

EDITOR:

I read with interest Frost and Collins, 1988, nomenclatural notes (*HR* 19(4):73-74), but am not in complete agreement, especially with respect to kingsnake names I am obliged to use. Those authors correctly note that forms usually considered adjectival in context and orthography may instead be nouns in apposition, as Collins the Kansan or Eric the Red. Thus *Lampropeltis getulus* may be read as Shine-skin the Getulian, and *Lampropeltis g. niger* as Shine-skin the Black. Indeed, should *getulus* have been intended as an adjective, it might have been better coined as *getuliae, getulianae,* or *getulianensis.*

While I might agree with Frost and Collins that these orthographies are likely just mistakes, the situation is equivocal and, therefore, not compelling. To effect the name changes suggested requires, I believe, an unequivocal argument to be compelling.

I further note that the problem of *panamintus* does not arise as long as one keeps the species in genus *Gerrhonotus;* similarly, the problems of *silus, maculosus,* and *punctatus* are solved by leaving the species in *Crotaphytus.* No competent systematist could possibly believe the polytopic, polyphyletic, extreme of pattern variation named *"pallidula"* is a valid subspecies of the garter snake *Natrix sirtalis.*

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EDITOR:

In answer to Lazell's letter (bottom to top):
1. The comment by Lazell with regard to *pallidula* does not address a nomenclatural issue and is just a short polemic on the systematics of garter snakes. Collins and I addressed nomenclature, not systematics, in our paper and I question why Lazell addresses this issue in his letter.

Because Lazell did address systematics I will comment on his use of *Natrix* in place of *Thamnophis.* Unless Lazell's taxonomy is not intended to represent evolutionary relationships, this usage does not fit what is understood about the phylogenetic history of North American natricines. Because the Thamnophiini is a highly corroborated monophyletic group (Rossman and Eberle 1977, Herpetologica, 33:34-43; Lawson 1986, *In:* Rocek (ed.), Stud. Herpetol., Prague: 227-234), the taxonomic changes required to use *Natrix* for any New World species would be minimally that all of the nominal North American genera *Adelophis, Clonophis, Nerodia, Regina, Seminatrix, Storeria, Thamnophis,* and *Virginia,* as well as the African *Afronatrix,* and likely the Asian *Sinonatrix, Amphiesma, Rhabdophis,* and *Xenochrophis* (Lawson 1986), would necessarily be placed in *Natrix,* not just the species that are superficially similar to Old World *Natrix.*

Lazell's opinion notwithstanding, I am unaware of any data, other than general superficial similarity (the same measure that would evaluate an orange as more like a basketball than an apple), that could support the placement of *Thamnophis* in *Natrix.*

2. Lazell is welcome to retain *silus, maculosus,* and *punctatus* in *Crotaphytus,* but, like point 1, this is not the issue under discussion.

3. *Panamintinus* (like in points 1-2) also retains its form if placed in *Gerrhonotus.* Although this is irrelevant to our point, keeping *panamintinus* in *Gerrhonotus* would require synonymizing *Abronia, Mesaspis,* and *Barisia* (besides *Elgaria*) with *Gerrhonotus* (see Good 1989, Univ. California Publ. Zool., 121).

4. Contrary to Lazell's position on *getulus* or *niger* possibly being "the getulian" or "the black," the burden falls on Lazell to make the case for improper Latin to be compelling, and for proper Latin not to be compelling. Regardless of what Linnaeus should or could have do, the fact remains (see any Latin dictionary) that *getulus* in the combination *Lampropeltis getulus* is bizarre. As originally formed it was *Coluber getulus,* which under Lazell's reasoning could be "The Getulian [a noun] Snake" or "Getulian [adjective] Snake." Which do you think is reasonable? I find this question hard to categorize as "equivocal" (Lazell's term). Article 31(b)i (which is the rule whereby equivocal adjective or noun status is decided) does not come into play, because *getulus* and *niger* cannot reasonably be treated as nouns in combination with *Lampropeltis.* This isn't a case of *crucifer* or *rhombifer,* but only of adjectives that can be considered nouns under the most forced reasoning. Any other position is simply trying to justify usage *a posteriori.*

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NEWSNOTES

1990 SWRS STUDENT RESEARCH GRANTS

The American Museum of Natural History will award several research grants ($200-$1,000) to graduate students or recent postdoctoral students in support of studies undertaken at the Southwestern Research Station in Portal, Arizona. The thirty-five year old research station is located at 5400 feet elevation in the Chiricahua Mountains of southeastern Arizona. Easy road access to five Life-zones, Lower Sonoran to Hudsonian, provides many unique opportunities for researching one of the most species-diverse biota in North America.

Applications (to be filed by 15 February 1990) are available from: Office of Grants and Fellowships, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024, USA. ●

VOLUNTEER PROGRAM AT SWRS

Approximately 20 volunteer positions are open in 1990 at the American Museum of Natural History's Southwestern Research Station in Portal, Arizona. The volunteer program is run annually and offers students in biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging are provided to volunteers in exchange for four hours per day of routine chores, with the remaining time available for research activities.

The program is open to both undergraduates and graduate students; the latter may pursue their own research projects. *Faculty knowing of promising students should alert them to this opportunity* for professional experience toward, development of, and evaluation of their career goals.

Volunteers are needed between 15 March and November. Appointments are for part of this period, with a minimum appointment of six weeks. Applicants for spring positions (March through May) should submit forms by 15 February, summer volunteers (June-August) by 1 April, and fall volunteers (September-November) may apply any time.

For application forms, write: Resident Director, Southwestern Research Station of the American Museum of Natural History, Portal, Arizona, 85632, USA (602) 558-2396. ●

RESEARCH OPPORTUNITIES IN FIELD BIOLOGY

The Edmund Niles Huyck Preserve and Biological Research Station announces the 1990 competition for support of field research in biology. Since 1938 the Preserve, located on the Helderberg Plateau in southwestern Albany Co., NY, has supported more than 250 scientists working on the ecology, behavior, and evolution of its flora and fauna. During 1989 the Preserve funded nine scientists from throughout the U.S.

The preserve consists of 2000 acres of hardwood-hemlock forest, pine and spruce plantations, old fields, clear-cut areas, lakes, streams and waterfalls. The physical facilities include residences for researchers, a modern research center with wet and dry laboratories, a library, workshop/barn, boats, and weather station.

Support of up to $3500/yr is available to those pursuing advanced degrees and those with the Ph.D. Applications for grants are due by 1 February 1990, and awards are announced by the end of March. For more information call (518) 797-3440 or write: Richard L. Wyman, Ph.D., Director and Biologist, E.N. Huyck Preserve and Biological Research Station, P.O. Box 188, Rensselaerville, New York 12147, USA. ●

INFORMATION REQUEST

A Regional Studbook for South American river turtles (genus *Podocnemis*) is being established. Individuals or organizations holding any species of this genus are invited to participate in the program by supplying information about their captive specimens, particularly as it relates to captive reproduction. Send information or inquiries to: Richard Sajdak, Milwaukee County Zoo, 10001 W. Bluemound Road, Milwaukee, WI 53226 or call (414) 771-3040. ●

NIXON GRIFFIS FUND AWARDS GRANTS

The Nixon Griffis Fund for Zoological Research (NGFZR), established in 1984 by New York Zoological Society Trustee Nixon Griffis, awarded nine research grants in May 1989. One of the grants was awarded in the field of herpetology. Martin S. Wilder and Barbara B. Bonner of the University of Massachusetts at Amherst received funding for their project "Studies on the bacteriology and phagocytic cells of the red-eared slider turtle, *Trachemys scripta*."

NGFZR grants are available to members of the zoo and aquarium community. Fund recipients may be keepers, curators, veterinarians, or research and consulting biologists. Grants, not to exceed $3000, are awarded semi-annually. Closing periods are 1 January and 1 July.

For further information, contact John Behler, Coordinator, Nixon Griffis Fund for Zoological Research, c/o New York Zoological Society, Bronx Zoo, Bronx, NY 10460, USA. ●

WORKSHOP ON MORPHOMETRICS IN SYSTEMATICS AND EVOLUTIONARY BIOLOGY

A workshop* will be conducted by F.J. Rohlf, F.L. Bookstein, L.F. Marcus and guest lecturers at the State University of New York at Stony Brook 10-23 June, 1990. Participating students must be familiar with statistics and microcomputers and show promise of incorporating morphometrics into their teaching or into an active research program. Students may be advanced graduate students, postdoctoral researchers, or professionals. Thirty students will participate, and 20 can receive participant costs (travel, lodging, meals, course materials). Application forms must be received by 15 February 1990 to be considered. For additional information and an application form, contact M.A. Bell, Coorganizer, Department of Ecology and Evolution, State University of New York at Stony Brook, Stony Brook, New York 11794-5245. (516) 632-8574. Fax (516) 632-8577 / BITNET - MABELL@SBBIOVM. (*Contingent upon availability of funds.) ●

MEETINGS

SPNHC 5TH ANNUAL MEETING

The Society for the Preservation of Natural History Collections will hold its fifth annual meeting 7-11 May 1990, in Chicago, hosted by the Field Museum of Natural History. The tentative program includes sessions on pest control, museum hazards and safety, problem solving, and a symposium on conservation of exhibit specimens. The meeting is open to anyone with a professional interest in the management and preservation of natural history collections. For further information, please contact David Willard, Bird Division, Field Museum of Natural History, Roosevelt Rd. at Lake Shore Dr., Chicago, IL 60605, USA (312) 922-9410, ext. 269. ●

CALL FOR PAPERS

The 14th International Herpetological Symposium on Captive Propagation and Husbandry will be held 20-23 June 1990, in Dallas-Ft. Worth, Texas. Individuals wishing to present papers dealing with the breeding and husbandry of reptiles and amphibians are invited to write or phone for a copy of guidelines for abstracts and papers. Please contact Thomas A. Huff, Reptile Breeding Foundation, PO Box 1450, Picton, Ontario KOK 2T0, Canada. (613) 476-3351 (day) or (613) 476-3691 (evening). Abstracts and titles must be submitted by 28 February 1990. ●

REGIONAL SOCIETIES

HERPETOLOGICAL SOCIETIES UPDATE

The June 1989 issue of *HR* contained a listing of all known active herpetological societies throughout the world. At this time, we report several additions or corrections to that listing.

U.S. HERPETOLOGICAL SOCIETIES

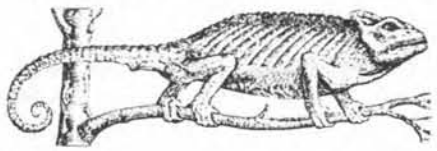
Eastern Seaboard Herpetological League
c/o Dr. Michael J. Uricheck
77 Faber Avenue
Waterbury, CT 07604
(corrected address)

Philadelphia Herpetological Society
c/o Mark F. Miller, Secretary
9573 Walley Avenue
Philadelphia, PA 19115

San Diego Herpetological Society
P.O. Box 4036
San Diego, CA 92104
(corrected address)

Shasta Snake Society
P.O. Box 171
Douglas City, CA 96024

CANTERBURY • 1989



A PLEA FOR RECORDS

The World Congress of Herpetology solicits photographic, video, and other records of its first congress recently held in Canterbury, U.K. These will be placed in the congress archives which, in turn, will be deposited in a permanent public archive. Photographic prints should be labelled and dated, including name of photographer. Video (VCR) records are especially desired. Please indicate whether materials are donations or loans for copying and return.

Address all materials to Kraig Adler, Cornell University, Seeley G. Mudd Hall, Ithaca, NY 14853, U.S.A.

Southern California Snake Association
P.O. Box 2932
Santa Fe Springs, CA 90670

Toledo Herpetological Society
c/o Charles Brooks
830 Alexis #5
Toledo, OH 43612

NON-U.S. HERPETOLOGICAL SOCIETIES

Hyla
Belgian Society for the Study of
Amphibians and Reptiles
p/a Andre Van Hecke
Eglantierlaan 39
2630 AARTSELAAR
BELGIUM ●

FEATURES

CLUTCH SIZE AND FEMALE LENGTH IN *Opheodrys vernalis*

Clutch size was recorded for 49 gravid females incident to a study (Grobman 1941) of geographic variation in *Opheodrys vernalis*. Larger females contain more eggs than smaller females. The relationship (Fig. 1) is Y = .04X - 6.15 where Y is the number of eggs and X is the length of the female. Ford and Killebrew (1983) have demonstrated a similar relationship, Y = 0.64X - 13.0, for the number of young and the female snout-vent length for *Thamnophis butleri*. Seigel, Fitch and Ford (1986) and Ford and Seigel (1989) have provided information on additional species of snakes.

Another statistical relationship suggested by the data is that between clutch size and the two subspecies of *O. vernalis*. The mean number of eggs in nine *O. v. blanchardi* clutches is 7.3 and the mean number in 40 *O. v. vernalis* clutches is 5.7, the difference being statistically significant (t-test; P = < .02; Fig. 1). The apparent association between clutch size and subspecies may reflect the greater length of *O. v. blanchardi* as compared with *O. v. vernalis*.

An additional suggested derivative association is clutch size with latitude in the eastern subspecies. The mean number of eggs in six New Brunswick (Canada) clutches is 3.8; in nine clutches from Massachusetts and Maine, 5.2; and in five clutches from Ohio and Pennsylvania, 7.0. It appears that the number of eggs in a clutch decreases with an increase in latitude, a probable reflection of the smaller size of northern specimens of *O. v. vernalis* compared with southern specimens of that subspecies.

Blanchard (1933) gives the frequency of eggs in clutches from 62 specimens of *O. v. vernalis* and I am able to provide information from 40 additional clutches. The combined data for the number of eggs in the 102 clutches of *O. v. vernalis* may be described as $\bar{X} = 5.75 \pm 0.19$.

I am grateful to Samuel S. Sweet, University of California, Santa Barbara, and Scott M. Moody, Ohio University, Athens, Ohio, for their helpful comments on the manuscript.

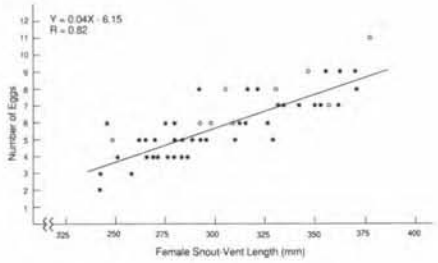


Figure 1. The relationship between clutch size and snout-vent length of 49 *Opheodrys vernalis*. Open symbols denote *O. v. blanchardi* while closed symbols represent specimens of *O. v. vernalis*.

LITERATURE CITED

Blanchard, F. N. 1933. Eggs and young of the smooth green snake, *Liopeltis vernalis* (Harlan). Pap. Michigan Acad. Sci., Arts & letters 27:493-508.

Ford, N. B. and D. W. Killebrew. 1983. Reproductive tactics and female body size in Butler's Garter Snake, *Thamnophis butleri*. J. Herpetol. 17(3):271-75.

Ford, N. B. and R. A. Seigel. 1989. Relationships among body size, clutch size, and egg size in three species of oviparous snakes. Herpetologica 45(1):75-8.

Grobman, A. B. 1941. A contribution to the knowledge of variation in *Opheodrys vernalis* (Harlan), with the description of a new subspecies. Misc. Publ. Mus. Zool. Univ. Michigan 50:1-38.

Seigel, R. A., H. S. Fitch, and N. B. Ford. 1986. Variation in relative clutch mass in snakes among and within species. Herpetologica 42(2):179-85.

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SALAMANDER OCCURRENCE WITHIN MT. ST. HELENS BLAST ZONE

The 18 May 1980 eruption of Mt. St. Helens released a blast of incandescent gas up to 200° C that traveled horizontally at a velocity estimated at 50 m/sec (Hammond 1980). Within a few minutes, the blast devastated an area of 500 km², leveling trees and killing people within the impacted region. MacMahon (1982) reported the survival of *Ambystoma macrodactylum, A. gracile, Dicamptodon ensatus* and *Taricha* sp. in the impacted region in 1981.

On 21 August and 5 September of 1982, we located 3 amphibian species (Table 1) 2.8 km inside the impacted region (elev. ca. 1100 m, T9N, R6E, Section 5, Skamania Co., Washington). The zone is characterized by fallen trees stripped of bark, branches, foliage, and embedded with pumice and lithic fragments, and the entire area is covered with grey ash 20-30 cm deep. The stream is 1-2 m wide, 5-10 cm deep, and is a tributary of Bean Creek. Flora adjacent to the stream included *Epilobium angustifolium* and Liliaceae and Compositae species.

All salamanders were located under bark within 1 m of the stream. From 1300-1630 hr, when the animals were found, air temperature was above 32° C in the sunlight and 20-25° C in the shade near the stream. Water temperature was ca. 10° C. Voucher specimens are deposited in the Herpetology Collection of the Department of Zoology, Washington State University.

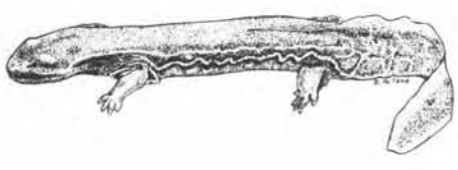
The approximate age indicated by snout-vent length suggests that *Rhyacotriton olympicus* and *Plethodon vandykei* individuals are more than 2 years old and survived the blast. The likelihood that these salamanders migrated to this stream is low because: 1) Migration over or through the ash is difficult because ash sticks to moist surfaces, 2) The nearest area in which trees are still standing (but ashfall is heavy) is 2.8 km from where the salamanders were found, and 3) Bean Creek was heavily impacted along its entire length of ca. 5 km, making it highly unlikely that the salamanders migrated up the stream.

The newly transformed *Ambystoma gracile* may have left nearby St. Charles or Meta Lake. In the latter, we have found *A. gracile* eggs and larvae in 1982 and 1985, indicating that reproductive activity continues.

In late May of 1985, we examined the stream site to determine approximate conditions at the time of the year when the eruption occurred. The site, which is a v-shaped gulch ca. 10 m deep and 100 m long, was filled with snow ca. 3 m deep. If the site was similarly covered when the eruption occurred, the snow may have buffered the thermal and physical effects of the blast.

Table 1. Species, sex (F = femae, M = male, and J = juvenile,) and snout-vent length (SVL) of salamanders suspected of surviving the 18 May 1980 eruption of Mt. St. Helens.

SPECIES	SVL (mm)	SEX
Ambystoma gracile	40	F
	42	F
	44	F
	44	M
	45	M
	50	F
Rhyacotriton olympicus	33	J
	53	F
Plethodon vandykei	31	J
	43	J
	51	M
	53	M
	59	F



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Hammond, P. E. 1980. Mt. St. Helens blasts 400 m off its peak. Geotimes, vol. 25, 8:14-16.

MacMahon, J. A. 1982. Mount St. Helens revisited. Natural History, 91:19-23.

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COURTSHIP BEHAVIOR IN THE CHINESE BOX TURTLE, *Cuora trifasciata*

Despite the diversity of emydid turtles in Southeast Asia, and their frequent exploitation by humans, published accounts on the natural history of most species are rare. *Cuora trifasciata* is native to southern China and northern Indochina (Pritchard 1979). Although this species has been frequently imported into the United States for the pet trade, little appears to have been written regarding its habits either in the wild or under captive conditions. The limited observations offered here should ideally be supplemented by studies under natural conditions.

Two juvenile *C. trifasciata* of unknown origin were obtained in November 1981. Carapace lengths (CL) were 10.3 and 10.5 cm, and secondary sex characteristics were not apparent. Specimens were housed in a glass aquarium measuring 91x63x33 cm. Water depth was ca. 9.5 cm and a dry 60x33 cm platform illuminated by a 40 watt incandescent bulb was provided for basking. Room and water temperature varied from 20 to 27° C, with the coolest temperatures in the fall, due to the effects of central heating. The light was on about 12 h/day. Nearby windows provided some variation in photoperiod. The diet included minnows, earthworms, Purina Trout Chow®, and various fruits and leafy vegetables—all readily accepted.

By November 1983 the smaller specimen (CL = 13.1 cm) had developed a comparatively longer tail with the anal opening distal to the rear edge of the carapace, a male characteristic in many turtle species. The larger turtle (CL = 14.1 cm) retained a shorter tail with a short pre-anal length, and was presumed to be a female. One year later (1984) the two had carapace lengths of 14.5 and 15.2 cm respectively, and were separated due to aggressive behavior by the male, resulting in bites to the female's neck, feet, and shell. They were placed together every few days to observe any changes in interactive behavior.

OBSERVATIONS

In May 1985 the first display of what was considered to be true courtship behavior was observed. Upon being placed in the water in the female's tank, the male turned toward her, extended and lowered his head, and swayed it back and forth in a horizontal arc of about 30°. The female responded by also lowering her head and swaying it in a narrow arc. The male then swam backwards and increased the rate of head swaying. After this had continued for several minutes, the female turned away; no further courtship activity was observed and the male was removed after about an hour.

The following day the male was again placed in the female's tank. This time he immediately pursued and mounted the female, clasping the rear edge of her carapace with his hind claws. With neck extended downward he pressed his chin firmly on the female's withdrawn head; he appeared to increase downward pressure when she struggled and (presumably) tried to breathe (water was about 9 cm deep). After about 10 min the male bit and held the female's neck skin and attempted to drop backwards, possibly to bring his tail and cloaca into a copulatory position. However, her struggles finally dislodged him after about 5 minutes. The male was removed after several more minutes of pursuing and biting the female's shell and neck; the female suffered a significant wound on the neck skin.

The above behaviors, along with minor variations, were observed on numerous occasions. Normally the male would use horizontal head-swaying for several minutes before attempting to mount the female. The female would sometimes respond with similar swaying, but her usual response was to escape, often by leaving the water and crawling up the basking ramp. No actual copulation by this pair was observed, although the male often mounted the female's carapace and attempted to keep her head withdrawn, as described above. A rare complement to this "nose pressing" behavior was a vertical "bobbing" of the male's head over the female's head.

If the male were left in the female's tank, intense courtship activity lasting perhaps an hour was usually followed by long periods of "peaceful coexistence." The male could be induced to resume courtship by pouring fresh, cool water into the tank, or by putting food in the tank, which caused the female to become active. Although courtship by the male was observed throughout the year, his interest seemed highest in the spring.

DISCUSSION

The violent nature of the observed courtship behavior was remarkable. The female's neck bears significant scarring from repeated "nuptial biting." However, until studies of the behavior of this turtle under natural conditions are available, there is no way to be sure that the above observations are indicative of "normal" courtship activity.

Observations on this pair of *Cuora trifasciata* ended in June 1988; at that time the male had a carapace length of 16.0 cm while the female's carapace measured 18.3 cm. It might be presumed that the male was sexually mature at the time of courtship initiation; maturity cannot be presumed for the female. No evidence of ovulation was apparent during the observation period, and the size or age of sexual maturity in this species is apparently unrecorded.

LITERATURE CITED

Pritchard, P.C.H. 1979. Encyclopedia of Turtles. T.F.H. Publ., Inc. Neptune, N.J. 895 pp.

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UNIQUE BEHAVIORS IN CAPTIVE ROCK HORNED LIZARDS, *Phrynosoma ditmarsi*

In August 1983, several live *Phrynosoma ditmarsi* were collected in the Sierra Baviacora, Sonora, Mexico, for study of their behavior and reproduction in captivity. Growth and reproductive data have been summarized elsewhere (Montanucci 1989); herein I present observations on diel activity as well as some unusual and unique behaviors pertaining to locomotion, aggressive interactions and sleeping sites not previously reported in this species or other *Phrynosoma*.

Most of my observations are based on eight adults (four of each sex), three subadults (two males, one female), and eleven juveniles (five males, six females) which were the descendants of an adult female and male procured in 1983. The adults were housed in plexiglass cages, 76 x 56 x 28 cm high; juveniles were kept in 20 gal. aquaria (approx. 76 x 32 x 31 cm high). The natural microhabitat was simulated on the basis of field data and information provided in Lowe and Howard (1975). The lizards were maintained under Vita-Lite and black light (F40BL-48, General Electric Co.), with a seasonally adjusted photoperiod (for Clemson, SC). Indoor reflector floodlamps, 75 W and 150W, were used as a heat source for the 20 gal. aquaria and plexiglass cages respectively. Adults were fed grasshoppers and *Tenebrio molitor* (larva, pupa, and adult stages). Juveniles were reared on termites, small ants, and small *Tenebrio* larvae. All food was dusted with a vitamin-mineral supplement (Reptivite by Zoo Med has been used since 1987). Lizards were over-wintered between 13° and 16° C, with occasional drops to 8° C.

Phrynosoma ditmarsi and its southern Mexican relatives, *P. braconnieri* and *P. taurus* are long-limbed horned lizards compared with the superficially similar *P. douglassii* (Montanucci 1987: Table 9). *P. ditmarsi* inhabits rocky areas in Madrean evergreen woodland (Lowe et al. 1971; Roth 1971; Lowe and Howard 1975), and its long limbs may be an adaptation for crawling over such terrain. When crawling on flat ground, *P. ditmarsi* typically maintains the abdomen well elevated, in contrast to *P. douglassii* which usually allows the posterior abdominal area to drag. The elevated stance of *P. ditmarsi* would appear to facilitate traversing an irregular rocky surface.

P. ditmarsi exhibited a unique mode of locomotion which I have not observed in other members of the genus (I have observed all species except *P. braconnieri*). While crawling slowly, *P. ditmarsi* frequently stopped its

limb movements in mid-stride. For example, as one forelimb was raised, it was stopped just above the substrate, then brought forward slightly and stopped again, brought forward a little more, and then brought down to the ground. These slow movements were thus characterized by slight hesitations and numerous pauses. During this "slow-walk," individuals could be seen with either a forefoot or a hindfoot momentarily stopped in mid-air. If there is any adaptive significance to this behavior, it is not apparent, although it may enhance crypsis in the natural habitat. In captivity, this odd locomotion was clearly associated with feeding activity and what might be generally categorized as "foraging" behavior. It was not associated with courtship or mating activity. When crawling at a normal pace or when running, the movements of *P. ditmarsi* were similar to those of other horned lizards.

Considerable aggressive behavior was observed among juvenile *P. ditmarsi* under crowded conditions (5 or more individuals in a 20 gal. tank). Individuals bit each other on the limbs, feet, and tail. Once the saliva-coated extremities dried, it was difficult to wash the saliva off with water, as it tended to clump rather than dissolve in water. In some cases serious injury occurred to the tail tip and digits during episodes of biting, and saliva-coated skin surfaces usually precluded normal ecdysis. The aggression among juveniles did not seem to be associated with feeding behavior as these conflicts occurred even when the lizards had been fed to satiation. More likely, the aggressive tendency in juveniles is a spacing mechanism since conflicts could be virtually eliminated by reducing the number of lizards per cage; in nature, the neonates probably quickly disperse following birth. I have not observed aggressive behavior in juvenile *P. douglassii*, even under crowded conditions. Also, no aggression was observed among adult *P. ditmarsi* that was not in some way related to feeding activity. Lynn (1965) speculated that aggressive behavior has been lost in horned lizards, but juvenile *P. ditmarsi* and adult *P. cornutum* (combat noted by Winton 1917; Whitford and Whitford 1973) are interesting exceptions under captive and natural conditions, respectively.

At night, *P. ditmarsi* entered rock shelters or secluded themselves among rocks and grass clumps in the cages. Sand burial was seldom observed, usually once or twice during the active season and during ecdysis (Montanucci 1989). Juveniles (young of the year) sought the same retreats as the subadults and adults, but in addition, they climbed grass clumps and slept elevated from the ground. Juveniles were observed climbing grass clumps within a few minutes after the lights were switched off by automatic timer. Aggression was not observed among juveniles as they ascended grass clumps to sleep. Among a litter of 10 young, as many as four at any one time were found sleeping at the top of a clump, and occasionally (four of 30 observations), two or three lizards were stacked one upon the other. Apparently, the lizards were limited by the number of grass clumps available in the cage. By marking juveniles, it was determined that all 10 juveniles slept at the top of a grass clump at least once during a three-month observation period. If such behavior occurs in nature, it may allow juveniles to avoid detection by small nocturnal snakes and other small predators such as scorpions and solpugids. Juvenile *P. ditmarsi* are relatively defenseless due to their small size and virtual absence of protective spines.

Herpetological Circular No. 18
Prepublication Announcement

TYPE CATALOGS OF HERPETOLOGICAL COLLECTIONS: An Annotated List of Lists

by
Charles R. Crumly

This annotated list of type catalogs for herpetological collections should prove useful to anyone engaged in taxonomic and/or systematic studies that rely upon the examination of museum material. Annotations for each entry include information regarding the contents of the referenced lists such as what kinds of types are listed, whether or not lectotypes are designated, what type of locality information is provided, how the list is organized, and references to other publications that have listed large parts of the collections. Also included are two indices: one lists the institutions for which type lists have been published, and the other is a family index wherein collections with types of specific families are cross-referenced. 51 pages.

Prepublication price	*$4.00*
After March 30, 1990	*$5.00*

Orders may be sent to Douglas H. Taylor, Department of Zoology, Miami University, Oxford, Ohio 45056 USA.

The diel activity of three captive adults and two juveniles were noted daily from July through October, 1985. The number of days (X lizards) for which activity occurred in the AM/PM respectively is as follows: July 5/43; August 7/23; September 13/32, and October 14/23. The data suggest that these lizards are more active during the afternoon hours than morning hours during these months. During the monsoon season in Sonora, which begins about mid-July (Walter et. al. 1975), overcast weather typically develops in the afternoon and provides suitable conditions for foraging (e.g. decreased temperature, increased humidity, increased insect activity; see Lowe and Howard 1975). During the preceding months, hot, dry conditions preclude or severely curtail afternoon foraging by these lizards.

It is surprising that my captive *Phrynosoma* displayed increased afternoon activity since the obvious natural cues were not available to them. An endogenous rhythm is one possible explanation, or the captive lizards could have been responding to changes in barometric pressure which accompany frequent summer afternoon storms in South Carolina. On some days the captive lizards did not emerge until after the lamps were switched off, despite the existence of a suitable thermal gradient in the cage. In fact, the lizards could be encouraged to leave their shelters by switching off the lights prematurely. This behavior suggests a crepuscular tendency in *P. ditmarsi,* as well as, perhaps, the habit of foraging during overcast conditions. Consistent with this idea is the presence of some crepuscular-nocturnal arthropods (e.g. scorpions, Vince Roth, pers. comm.) in the diet of this horned lizard. *Phrynosoma* species are generally active earlier, as well as later, in the day than most other sympatric lizards (Heath 1965; Norris 1949), and apparent nocturnal activity has been reported for some *Phrynosoma* (Harris 1958; Williams 1959; Mays and Nickerson 1968).

Conclusions drawn from the behavior of captive animals are often considered to lack validity when extended to natural populations. I hope, however, that the observations noted here will provide the impetus for field investigations of this interesting and little-known horned lizard.

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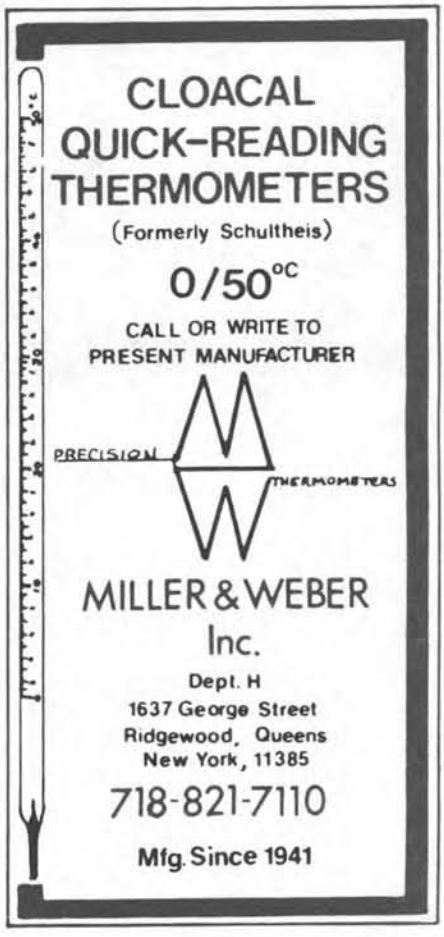
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OBSERVATIONS ON THE NESTING ECOLOGY OF GREEN SNAKES (*Opheodrys aestivus*)

Because snakes are highly secretive, periodically dormant, and generally intractable, the use of radiotelemetry can provide ecological information that could not be gained otherwise. For example, discoveries of the nests of snakes occur rarely and are found fortuitously when investigators search for specimens. However, with radiotelemetry it is possible to directly observe an individual snake's nesting behavior and choice of nest sites. I used radiotelemetry to study nesting movements, nesting behavior, and nest sites of arboreal green snakes, *Opheodrys aestivus* (Plummer 1990). Because accounts of individual animals engaged in rarely observed events may contribute to a better understanding of a species' ecology (Fitch 1987), I here provide anecdotes concerning a little known aspect of the ecology of snakes, especially the heretofore unreported habit of nesting in tree cavities.

Miniature radiotransmitters (Model SOPI-1038-LD, Wildlife Materials, Inc.) were implanted into nine large (>500 mm snout-vent-length, SVL) gravid *Opheodrys.* On 19 June 1988, the telemetered snakes were released at their capture sites in the shoreline vegetation (primarily alder, *Alnus rugosa*) of a small lake 2 km west of Denmark, White County, Arkansas. Each snake was relocated several times each day until nesting occurred and once each day thereafter. Occasionally, I observed individual snakes through binoculars for periods of up to two hours.

The nesting ecology of *O. aestivus* at the Denmark locality may be summarized as follows (Plummer 1990): Prior to ovipositing, activities of female *Opheodrys* are restricted to small activity ranges averaging 15 m in length within the vegetation of a narrow band of alder at the shoreline. As the time of oviposition nears, snakes descend from their arboreal habitats and move terrestrially away from the shoreline and their activity ranges. Snakes



nest in small chambers within the hollowed interiors of living oak and hickory trees averaging 56 m from their activity ranges. Snakes move back toward their activity ranges after nesting. Selected individual accounts follow.

Opheodrys no. 5 exibited the most extensive nesting movements. After being monitored for 21 days in a typical pattern of restricted prenesting movements at the shoreline, she moved 55 m on 11 July and ascended an oak tree apparently in response to a severe thunderstorm. She remained coiled on a branch in the tree until fair weather returned on 13 July. She then descended and moved 45 m to a hollow hickory tree, spending at least two hours crawling on and in and out of the tree, but not ovipositing. Subsequent investigation of the tree hollow revealed four *Opheodrys* eggshells from a previous year. All eggshells contained longitudinal slits like those made by the egg tooth at pipping and were judged to have successfully hatched. After moving another 55 m on 13-14 July, *Opheodrys* no. 5 entered a second hollow hickory tree (Fig. 1A) and oviposited. On 15 July, she began moving toward her original activity range, eventually establishing a pattern of restricted movements in the vicinity of her original activity range similar to those of the prenesting period. On 15 July, I opened her nesting tree and found three freshly opened *Opheodrys* eggs with contents removed, apparently by a skink, *Eumeces laticeps*, which had been brooding a clutch of 11 eggs in the same hollow.

Opheodrys no. 104 moved from her activity range to a nesting site 30 m distant on 26 June and oviposited the same day. She then moved back to her activity range on 27 June where she was monitored until 15 July. The hollow oak tree where she oviposited contained four *Opheodrys* eggshells from a previous year, all appearing to have successfully hatched.

Opheodrys no. 604 moved from her activity range on 24 June directly to a tree where she was observed trying unsuccessfully to enter a small opening (Fig. 1C). After she abandoned her efforts, I opened the cavity and found 16 *Opheodrys* eggshells from previous years. Based on appearance, the eggshells could be segregated into a younger group of five and an older group of 11 eggs, all appearing to have successfully hatched. Apparently, growth of the tree had decreased the diameter of the opening and prevented her entrance.

Prenesting and nesting behavior of other *Opheodrys* were similar to those above. Of special note is the persistence shown by no. 110 attempting to enter a tree on 6 July. She was observed for over an hour attempting entrance into the rotted interior of an oak tree (Fig. 1B), eventually abandoning her efforts and retreating to a small nearby bush where she coiled and became inactive. Three hours later, she continued her efforts and eventually gained entrance into the tree where she oviposited (Fig. 1D).

Although nesting in tree holes containing eggshells from previous years could result from communal nesting of several individuals, the behavior of no. 604 suggested that she returned to a site previously used. She moved 55 m directly away from the shoreline to a tree, climbed 3 m up the trunk to a small opening difficult to detect by two humans from the ground, and for 30 minutes attempted to enter a cavity containing old eggshells. Along her path she passed within 5 m of 52 trees, 22 of which were hollow (Plummer 1990).

At least five authors have reported finding eggs of *O. aestivus* under surface cover (summarized in Plummer 1990), observations which question the prevalence of tree cavity nesting by this species. The discovery of an *O. aestivus* nest containing seven fresh eggs 10 July 1989 in a tree cavity on the Savannah River Site near Aiken, SC (M. Gibbons and T. Mills, unpublished data) suggests that the behavior is geographically widespread. Also suggestive of tree cavity nesting is the record of a large communal *O. aestivus* nest found in the insulation of a metal refrigeration panel which was standing upright against an oak tree in North Carolina (Palmer and Braswell 1976). The greater number of references to nesting under surface cover probably reflects more where field workers search than an actual nesting affinity of *Opheodrys*. Because nests in tree cavities are difficult to detect without adversely affecting the trees and since routine field use of chain saws is neither desirable nor recommended, this bias will not likely change. Despite these difficulties, I encourage field workers to nondestructively investigate tree cavities when possible (McComb and Noble 1981).

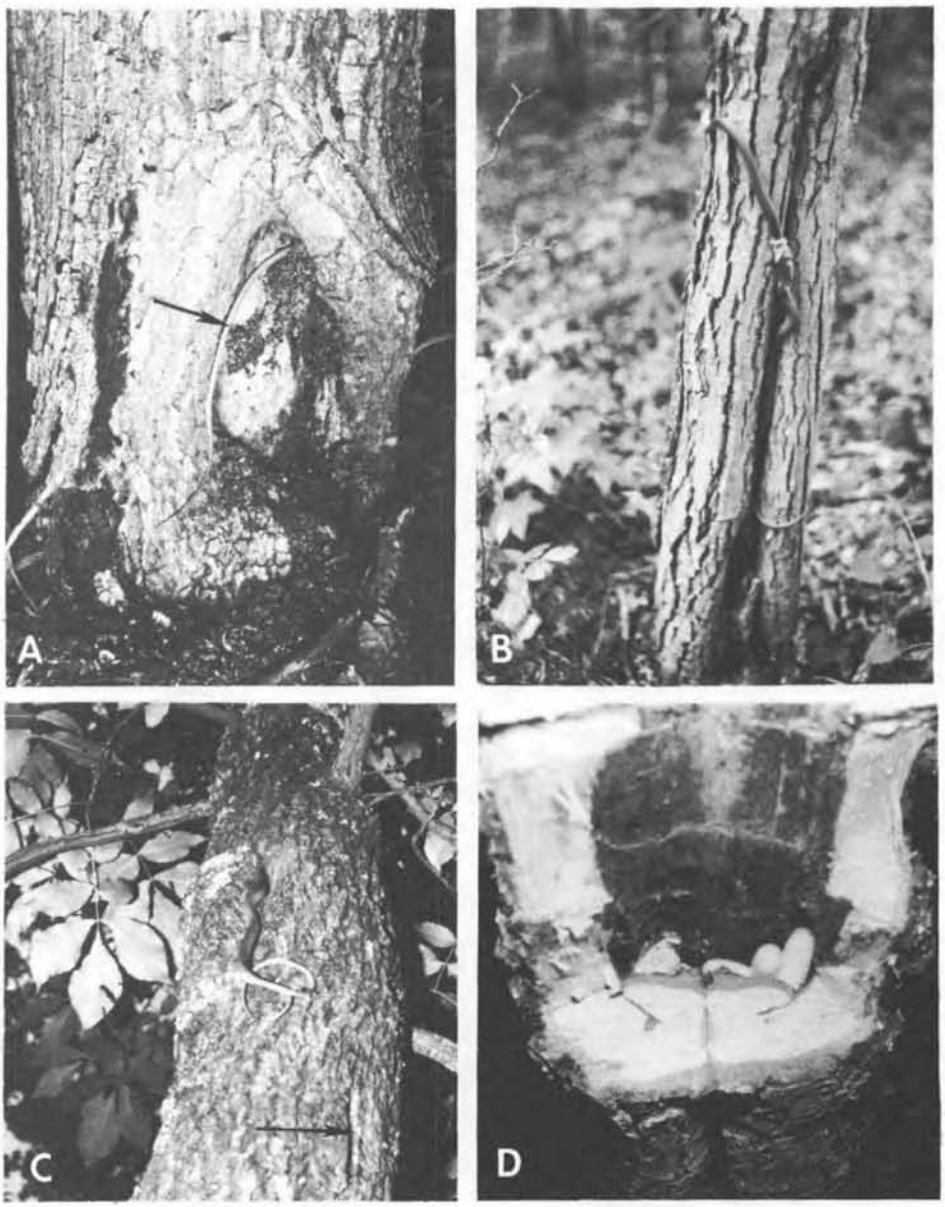


Figure 1. Nesting ecology of *Opheodrys aestivus*. (A) *Opheodrys* no. 5 entering nest tree at ground level (arrow). (B) *Opheodrys* no. 110 investigating tree where she later nested (see 1D). (C) *Opheodrys* no. 604 attempting to enter nest tree 3 m above ground level. Note slit where new tree growth has closed an old opening into the tree hollow (arrow). Sixteen *Opheodrys* eggshells from previous years were found within this tree. (D) Nest cavity and eggs of *Opheodrys* no. 110 exposed by opening tree with a chain saw.

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TECHNIQUES

A NEW THERAPY FOR MARINE TURTLES PARASITIZED BY THE PISCICOLID LEECH, *Ozobranchus branchiatus*

Marine leeches, *Ozobranchus* spp., are prominent ectoparasites on the green turtle, *Chelonia mydas,* in the Hawaiian Islands and on certain other sea turtle populations worldwide (Hirth 1971; Balazs 1980). Both *O. branchiatus* and *O. margoi* have been documented on green turtles in Hawaii, but the former species is believed to be more prevalent (Balazs 1980). A quantitative survey on this subject is currently in progress by the authors.

The two species of leeches are easily distinguished in that *O. branchiatus* has seven pairs of branchiae and *O. margoi* has only five. The former species ranges in length from 3.5 to 11 mm, and the latter is 4 to 30 mm (Sawyer et al. 1975; Davies 1978; Lauckner 1985). Both species attach to soft skin surfaces of the axial and inguinal regions, as well as the neck, eyes and cloaca. In heavily parasitized turtles, yellowish mats of leech egg cases are commonly found cemented to the plastron and ventral surfaces of the neck and flippers.

Increasing numbers of green turtles afflicted with debilitating fibropapillomas (fibrous epithelial growths) have been recorded during recent years in the Hawaiian Islands (Balazs 1986; Dailey and Balazs 1987). A concomitant increase in parasitization by *Ozobranchus* has also been seen, especially on the turtles diseased with tumors. Fibropapillomas are highly vascularized, thereby affording ideal sites for leeches to attach. The relationship between *Ozobranchus* and fibropapillomas was first described by Nigrelli and Smith (1943).

Experimental prophylaxes on captive sea turtles parasitized by *Ozobranchus* have included the use of various toxic agents. Schwartz (1974) immersed captive loggerheads, *Caretta caretta,* and green turtles in copper sulfate solution; this treatment proved effective in eliminating *O. margoi* adults and their egg cases but induced increased swimming activity in the turtles. Concentrated topical iodine used by Schwartz (1974) was only temporarily effective. Davies and Chapman (1974) reported that 3 of 85 captive sea turtles heavily parasitized by *O. branchiatus* and *O. margoi* died several months after treatment with copper sulfate, but cause of death was not determined. They also applied 10% formalin directly to the leeches and their eggs, after which the turtles were left out of the water for 3 hours. This treatment, however, was not highly effective (Davies and Chapman 1974). At Sea Life Park in Hawaii, several topical treatments with isopropyl alcohol successfully eradicated *O. margoi* in a massive outbreak on captive green turtles, loggerheads and hawksbills, *Eretmochelys imbricata* (Sea Life Park unpublished data, 1978).

As with any toxic chemical treatment for parasites, there is the possibility of undesirable, acute or chronic side effects to the host. Consequently, the use of a benign therapy would be preferable, if such a treatment were available. On 9 August 1987, a lethargic juvenile green turtle, afflicted with tumors and measuring 55 cm in carapace length, was found stranded at Kailua Beach on the Island of Oahu, Hawaii. Numerous *O. branchiatus* were present on the turtle, especially on the ulcerated tumors protruding from the neck and eyes. Egg cases also were present in abundance. The turtle was subsequently held in a shaded seawater tank measuring 2.4 m in diameter and filled to a depth of 0.5 m. The turtle continued to survive in this holding facility, where it was fed chopped fish and squid on a daily basis. Incidental observations made during routine tank cleaning over the following weeks revealed that the leeches seemed to be negatively affected by rinsing with fresh water from a hose. As a result, systematic treatment and observations were conducted. Treatment consisted of draining the turtle's tank completely and filling it with fresh water. When treatment began on 23 September 1987, 120 leeches were attached to the turtle. The leeches reacted immediately to immersion in fresh water by rapidly crawling over the surface of the turtle. Within 30 minutes of soaking in fresh water, leeches began to fall off and were found dead on the tank bottom. After 90 minutes, 80 leeches remained on the turtle. The tank was then drained and refilled with seawater. The number of leeches on the turtle decreased progressively after the freshwater immersion. On the following day, only 35 of the initial 120 leeches remained. Only four leeches remained after 4 days; no leeches were present on Day 6.

Two weeks after treatment, leeches began to reappear, and the egg cases had changed from a dark to a light color. Close examination revealed that the lighter color represented newly hatched eggs. Consequently, it was concluded that the freshwater treatment had little or no effect on the egg cases and that additional treatments would be needed to completely rid the turtle of leeches as new ones hatched. Subsequent immersions were conducted on this turtle and on a second one also found stranded with a heavy infestation of *O. branchiatus.* Eventually, both turtles were completely freed of leeches, and no negative effects were seen.

The relative scarcity of *Ozobranchus* on healthy green turtles in Hawaii suggests that some natural mechanism exists to deter or eliminate these parasites. Hawaiian green turtles commonly use algal and sea grass foraging habitats, where freshwater discharges into the sea. Reduced salinities at these locations may aid in the control of *Ozobranchus* through hypotonic shock. According to Sawyer et al. (1975), both *O. branchiatus* and *O. margoi* occur exclusively in salinities over 30%. Another possibility in controlling leeches is that healthy turtles subject themselves to more frequent grooming by certain fishes at discrete underwater cleaning stations known to exist in Hawaii (Balazs 1980; Balazs et al. 1987). The special circumstance of adult green turtles sometimes basking ashore in Hawaii may also facilitate leech control through heating and desiccation (Whittow and Balazs 1982).

Future research should examine different levels of salinity and duration of immersion needed to effect mortality in leeches on captive turtles. These data may then be used to help explain, or predict, the natural means of parasite control by sea turtles in the wild and to refine a practical nonchemical treatment against leeches in captive turtles.

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THE APPLICATION OF PLASTIC TAGS TO LEATHERBACK SEA TURTLES, *Dermochelys coriacea*

The loss of flipper tags applied to sea turtles is an issue of perpetual consternation to sea turtle biologists (Balazs 1982; Green, 1979; Hughes, 1982; Mrosovsky, 1976, 1983; Richardson et al., 1978a, 1978b). The application of tags that are readily shed renders the tagging effort futile and precludes the acquisition of data relative to annual nesting periodicities, inter-annual remigration schedules, population size and stability, and the movement of tagged individuals. Tags may show varying degrees of retention depending on the type of tag used and the species of sea turtle, as well as the geographic area frequented by the tagged individual. It is important, therefoe, to evaluate tagging methods in the specific context of species and locale.

In 1981, the U.S. Virgin Islands Division of Fish and Wildlife began the first systematic population and movement study of leatherback sea turtles (*Dermochelys coriacea*) nesting at Sandy Point National Wildlife Refuge on St. Croix. In 1982 we initiated a saturation tagging program to assess the fecundity, reproductive periodicity, and philopatry of individual turtles. Monel metal tags, successfully applied to nesting leatherbacks elsewhere (Hughes 1978; Schulz 1975; Siow 1977), were used at Sandy Point.

As the 1982 nesting season progressed, returning turtles showed carapaces abraded as a result of contact with the tag (presumably) inflicted during normal swimming activity. During nesting, coarse sand exacerbated abrasion damage. We attempted to mitigate tag-inflicted injury by applying monel tags "up-side-down" (so that the abrading cinch-tab faced upward). In addition, we applied flexible Riese plastic tags in order to assess both retention and carapace damage by these tags. Plastic tags are non-corrosive, highly visible, and show retention rates superior to that of monel tags on loggerhead sea turtles (*Caretta caretta*; Jim Richardson, pers. comm.), green sea turtles (*Chelonia mydas;* Green 1979), and east Pacific black sea turtles (*C. m. agassizi*; Alvarado et al. 1988).

Gravid leatherbacks deposit as many as 10 clutches of eggs per annum at regular time intervals at Sandy Point (Eckert 1987). Thus, tag status is monitored on a continuing basis. This paper reports the retention rates of monel metal and Riese plastic tags on leatherbacks returning to nest on Sandy Point between 1981-1985. The potentially injurious effects of monel metal tags on leatherbacks are also discussed.

METHODS

During the nesting seasons (March-July) of 1981-1985, the 2.4 km nesting beach at Sandy Point was patrolled on foot nightly (1930-0550 h). Nesting turtles were tagged immediately following egg deposition. Tags were of two types: monel size-19 tags (National Band and Tag Co., USA) and Riese size-2 "Flexible Jumbo" tags (Dalton Ltd., UK). Tags were applied to the trailing edge of each foreflipper, ca. 20 cm from the body and 3.0 cm from the flipper edge. Fleshy areas too thick to accommodate the locking mechanism of the tag were avoided. Neither the monel nor the Riese tags were self-piercing. The former required that a single slit be made in the flipper with a small stainless steel knife; the latter required a circular hole be made with a leatherpunch. Monel tags were hand-inserted and clinched securely with a pair of channel-lock pliers. Riese tags were clinched with tagging pliers. Prior to 1982, turtles received a single monel tag. In 1982-1983, turtles received either a single Riese tag and two monel tags, or vice versa.

RESULTS

The mean and modal remigration periodicity of gravid leatherbacks to Sandy Point was two years (mean=2.07, sd=0.38, range 1-3 yrs). Remigrants comprised 14.3-45.0% of the nesting population annually. Twenty-eight remigrations involving 20 individual turtles were documented between 1981 and 1985, inclusive. Twenty-six plastic tags had been placed on 18 of the 20 remigrants. Only two of these turtles retained their plastic tags into a second nesting season: the first returned after one year of absence carrying one (of two) Riese tags, the second returned after one year of absence carrying two (of two) Riese tags. The turtle returning with two Riese tags shed them both during the course of the second breeding season, rendering the loss of plastic tags 25/26 (96.1%). Thirty-one monel tags had been placed on 19 of the 20 remigrants. The loss of monel tags from turtles returning after 1-3 years of absence was 5/31 (16.1%). These rates of loss differ significantly ($P < 0.05$; Proportion testing, Brase and Brase 1983).

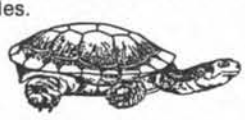
DISCUSSION

Sea turtles shed monel flipper tags for a variety of reasons, including tissue necrosis, abrasion, corrosion, tearing, and improper application (Balazs 1982). With the exception of corrosion, the same problems can be expected to plague plastic tags. Abrasion and/or algal colonization obscured the numbers embossed into plastic tags applied to green sea turtles in the Galapagos Islands (Green 1979) and to loggerhead sea turtles in South Carolina (Talbert et al. 1980).

In the present study, the primary impetus behind the loss of plastic tags appeared to be localized tissue necrosis, which resulted in an enlargement of the placement hole and allowed the tag to slip through the flipper. This loss was rarely associated with a discernible pigment or mutilation scar (e.g., a tear or a hole). The flesh healed remarkably well; often the only "scar" was an internal silhouette of the original wound made visible by holding a flashlight against the underside of the foreflipper. Based upon this observation, we suggest caution in the interpretation of tag scars on leatherbacks. Nesting females often come ashore with holes of varying sizes in their flippers; in our experience, the vast majority of these do not represent the loss of a tag.

Siow (1977) has advocated use of plastic tags on leatherbacks, but Hughes (1974) and Fretey (pers. comm.) have discouraged it. After observing a 96.1% loss of plastic tags over a period of three years, we must concur with Hughes (1974) that, "all plastic tags proved useless in the long run as virtually every tag has ben lost." We conclude that (1) monel tags secured to the foreflippers of leatherback turtles can carve furrows in the carapace as a result of contact during swimming and nesting, leaving the animal bleeding and vulnerable to infection; (2) placing monel tags up-side-down (cinch-tab up) eliminates tag-inflicted carapace damage; (3) "Flexible Jumbo" plastic Riese tags effect no carapace damage but show very poor recovery rates; (4) tag loss on leatherbacks is rarely associated with an external pigment or mutilation scar.

The use of self-piercing titanium tags (both front and rear flipper placement) is currently under investigation as an alternative to monel or plastic tags for marking nesting leatherback sea turtles.



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FLUORESCENT POWDER — A METHOD FOR TRACKING REPTILES

It is often difficult to determine the daily movements of reptiles for calculating home ranges or evaluating microhabitat utilization. In the past, such information has been gained by 1) direct observation, 2) radioactive tags, 3) radiotelemetry, or 4) trailing methods (Ferner 1979). Direct observation is suitable only for conspicuous reptiles whose behavior is not affected by a nearby observer. Radioactive tags have the advantage of giving exact location information, but only one individual in an area can be distinguished and no information on movements between locations is obtained. Radiotelemetry can be used to detect the location of several individuals in one area, but there are size constraints and trade-offs between size of the transmitter, transmission range and duration of the signal. Trailing techniques (used primarily for chelonians) have the advantage of providing information on movements of animals in the absence of an observer, but they are limited to large animals with suitable behavior.

While studying the ecology of the island night lizard, *Xantusia* (=*Klauberina*) *riversiana*, on Santa Barbara Island off southern California, we needed information on microhabitat utilization and home range size and overlap. Radioactive tags were used to determine some aspects of home range and microhabitat use, but we needed more specific data on movements of individual lizards occupying overlapping home ranges.

Fluorescent powder has been used to track mice (Lemen and Freeman 1985), salamanders (Ireland 1973) and fish (Phinney 1969) and it also proved to be a good technique for island night lizards. We captured lizards in Sherman mammal traps and marked them by dipping them in a plastic bag containing about 50 cc of powder. Lizards were held by the head so that we could keep the powder out of their eyes and ear openings. To assure good adherence and coverage, we gently massaged the powder against the lizards from the outside of the bag thus covering the entire body except the head. The lizards were then released at the point of capture. The powder adhered well even though *X. riversiana* have smooth scales.

A portable ultraviolet light was used to locate the powder which rubbed off onto the ground and vegetation during the lizard's normal movements. Under ultraviolet light, the powder fluoresced brightly so that even a few specks could be seen. By laying out string along the routes traveled, we were able to map the areas of activity at a later time. It was helpful to use flagging tape to hold the string in place and also to indicate the color of the powder. It was not possible to determine direction of movement nor how many times a lizard followed a particular route.

We used six colors (red, orange, pink, green, chartreuse, and blue) to allow us to track different lizards in the same area (color names refer to the color under normal daylight). Unfortunately, under ultraviolet light, some of the colors were difficult to distinguish. For example, red and orange were very similar as were green and chartreuse. Blue was distinctive, but not particularly bright. With care, all pigments could be identified, but this sometimes entailed comparison with known colors. It helped to use a standard flashlight occasionally since some colors were more distinctive under incandescent lighting.

Powder continued to be deposited for at least five days. Since island night lizards are rather sedentary and use the same areas repeatedly, it was not possible to tell whether powder continued to be deposited after that time. Movements made during the first day or two showed up as distinct trails of powder. Areas of new activity became increasingly difficult to detect and generally required a careful examination of the ground and vegetation for occasional specks of powder. Brief trials with the western fence lizard (*Sceloporus occidentalis*) suggested that powder adheres better to lizards with keeled scales and hence it may be possible to detect new movements for a longer time.

The use of fluorescent powders is a good technique for certain species of reptiles. Since the powders are very bright, they may not be appropriate for conspicuous, diurnal species which might suffer increased predation or intraspecific interactions. Also, the powder might influence heat absorption and thus affect thermoregulatory behavior. These problems could be reduced by applying powder to only the ventral and perhaps lateral parts of the animal. For secretive, nocturnal or semifossorial species the technique works well with a minimum of influence on normal behavior. Several lizards were captured 7-10 days after marking. Nearly all of the powder had rubbed off and none of the lizards showed any ill effects from marking.

Fluorescent powder (Series R-103-G) was obtained from Radiant Color (2800 Radiant Ave., Richmond, California 94804). In 1987, these pigments cost about five dollars per one pound can. One pound would be sufficient to mark at least 100 animals. Our ultraviolet light was a Blak-Ray longwave ultraviolet lamp (ML-49) from Scientific Marking Materials (P.O. Box 24122, Seattle, WA 98124). It sells for about $130. The light runs on two 6-volt lantern batteries. The less powerful UV lights which use C or D size batteries do not provide enough light for reliable tracking.



Since ultraviolet light (both long and short wavelengths) can damage the eyes, it is prudent to avoid looking directly at the light. Glasses which filter UV light are available from Scientific Marking Materials.

ACKNOWLEDGMENTS

The National Park Service provided transportation to the island and financial support for the research. Joan Fellers, Martin Rosenberg and two anonymous reviewers offered useful comments on the manuscript.

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BURROW-TO-TORTOISE CONVERSION FACTORS: COMPARISON OF THREE GOPHER TORTOISE SURVEY TECHNIQUES

Gopher tortoise (*Gopherus polyphemus*) burrows are generally the most conspicuous indication of tortoise presence in an area, and burrow counts can serve as an index to animal numbers. Accuracy of these censuses depends on reliable survey technique and a suitable correction factor relating tortoise number to burrow number.

Traditional gopher tortoise censusing techniques use strip transects to survey an area for burrows and count the number of burrows in each of three or four activity classes, based on field sign. Auffenberg and Franz (1982), Kushlan and Manzotti (1984), Logan (1981), Burke (1989), and many unpublished surveys estimated tortoise numbers by multiplying the sum of "active" and "inactive" burrows by 0.614. This correction factor is based on results of a long-term study of 122 burrows in Alachua County, Florida (Auffenberg and Franz 1982).

Review of recent studies (Table 1) shows considerable variation in reported correction factors, ranging from 4 to 75% of active and inactive burrows, and 21 to 98% of active burrows. Variation may be attributed to differences in surveyors' evaluations of burrow activity status or variation in gopher tortoise burrow use, or both. Breininger et al. (1986), based on studies in different habitats and seasons with an underground camera system, cautioned that correction factors should be determined on a site-specific basis. A number of reasonably reliable techniques may be used to establish gopher tortoise burrow occupancy (Burke and Cox 1989). Cox et al. (1987) suggested that, depending on survey goals, trapping, using an underground camera system, the activity classification system used by Auffenberg and Franz (1982) and the "stick" method (Hallinan 1923, Burke and Cox 1989) may be acceptably reliable techniques.

MATERIALS AND METHODS

I used the 0.614 correction factor, a stick survey, and a portable, motorized car carrying a video camera ("Burrow Bug," Moe Devices, 2968 Elsie, Toledo, Ohio 43613) to compare tortoise/burrow correction factors. The study site was the Wade Tract Preserve, a privately owned 80 ha old-growth longleaf pine forest in Thomas County Georgia. This forest, managed by Tall Timbers Research Station, is representative of conditions over much of the southeastern United States prior to European settlement (Platt et al. 1988). During a thorough June 1988 survey, Tall Timbers personnel found 199 active and inactive burrows, and occupancy of each was tested using the stick method. All burrows were assigned an identifying number, and using a random number generator, 12 active and 10 inactive burrows were randomly selected and examined using the video camera. Results are displayed in Table 2.

DISCUSSION

Based on the results from this study (Table 2) and others (Table 1), the generalized use of any specific correction factor such as that of Auffenberg and Franz (1982) cannot be supported. Rather, occupancy of tortoise burrows likely differs by season or habitat types, or in different parts of the range, especially considering regional and local variation in the harvesting of tortoises for food. Seasonal changes in burrow use have been documented (McRae et al. 1981), and while some tortoise populations may not burrow at all (Auffenberg 1969), others may use seven or more burrows per tortoise (McRae et al. 1981).

Spillers and Speake (1989) in Alabama, and Lohoefener (1982) in Mississippi reported correction factors of ca. 0.6 times the number of *active* burrows. Neither study reported sample sizes or considered habitat, seasonal or other sources of variation. In addition, Lohoefener did not state how occupancy was determined. Unfortunately, Cox et al. (1987) and others have misinterpreted the results of these studies as supporting the general use of the conversion factor calculated by Auffenberg and Franz (1982), who counted both active and inactive burrows. Clearly, omission of inactive burrows from calculations can significantly alter census results. Also, distinguishing between active and inactive activity classes can be difficult, even for trained field workers. Breininger et al. (1986) created an additional activity class, "maybe active." Probably the most reliable approach is to group active and inactive burrows, rather

Table 1. Examples of reported correction factors

Tortoises/active burrow	Tortoises/inactive burrow	Tortoises/active+ inactive	Source
*	*	n=122, 61.4%	1
* (11%) **	*	*	2
49/103 (48%) **	*	*	2
33/103 (32%) **	*	*	2
67/124 (54%)	0/30 (0%)	67/154 (44%)	3
43/44 (98%)	3/16 (19%)	45/60 (75%)	4
4/19 (21%)	0/25 (0%)	4/44 (9%)	5
35/174 (20%)	0/144 (0%)	35/318 (11%)	5
*	*	127/411 (31%)	6
* 61.5%	*	*	7
9/19 (47%)	0/225 (0%)	9/244 (4%)	8
7/10 (70%)	0/47 (0%)	7/57 (12%)	8
* 66.0%	*	*	9
*	*	10/89 (11%) ***	10

* not reported or additional details not reported
** includes "maybe active" activity classification
*** unknown number of tortoises had been harvested prior to survey

1: Auffenberg and Franz (1982), 2: Breininger et al. (1986), 3: Burke (unpub. data), 4: Doonan (1986), 5: Fucigna and Nickerson (1989), 6: Linley (1986), 7: Lohoefener (1982), 8: Speake (1983), 9: Spillers and Speake (1989), 10: Stout et al. (1989).

than try to distinguish between them.

This study was designed to compare three techniques, not to estimate population size. However, the results show that use of a direct technique can result in a much lower estimate of population size than indirect techniques. While indirect methods such as the stick survey are relatively easy and inexpensive, they are probably inaccurate and their error rate is unknown. Stick surveys require repeat visits to each marked burrow, and numerous factors could alter the ratio of tortoises present to burrow mouths disturbed. These techniques may be appropriate for coarse estimates, especially when time is limited. They are probably most reliable when used to compare sites for which factors affecting burrow use are similar—for example, to detect population changes over time in the same habitat.

Breininger et al. (1986) and Spillers and Speake (1989) developed camera systems to census gopher tortoises. Their systems are more expensive (approximately $15,000), heavier, and bulkier than the Burrow Bug, which costs approximately $5,000, and along with battery, can be carried by one person all day.

Like some of the systems used by Breininger et al. (1986) and Spillers and Speake (1989), the Burrow Bug I used was too large to fit into any burrows smaller than those of small adults. However, because most gopher tortoise populations are mainly composed of large adults, this was rarely a problem. It also cannot be operated in flooded burrows. The accuracy of censuses using the Burrow Bug also depends on tortoises being in their burrows when survey is done. Therefore, it may be particularly useful during winter months, when assessment of activity signs and use of the stick method (which require tortoise activity) are particularly unreliable. Despite high tortoise densities, they are very rarely seen above ground at the Wade Tract Reserve. Unlike the situation in some other areas, tortoises at the Preserve are apparently very wary of humans and stay below ground whenever people are around, even during warm months.

Once mechanical problems were resolved, an average of six minutes was required to set up and view the interior of each burrow. This is probably too slow to thoroughly survey a large area, but if random sampling were used, reliable site-specific correction factors could be derived. I only viewed the interiors of ca. 10% of the available burrows, but the system could produce an accurate population estimate if more burrows were surveyed. Video systems also can provide information on the presence of commensal species in burrows, and could document multiple occupancy by the tortoises, which indirect methods cannot indicate. Another use might be to investigate burrow use by uniquely marked individual tortoises. When tortoises must be captured, the system could be used to limit capture effort only to occupied burrows. I have also used the Burrow Bug successfully to observe burrows of desert tortoises (*Gopherus agassizii*).

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Table 2. Comparison of three survey methods used to census the gopher tortoise population at the Wade Tract Reserve, Georgia.

	SURVEY METHOD		
Burrow Activity Class	Walking	Stick	Camera
active	96	73	6 of 12
inactive	90	126	0 of 10
old	13		
	Using 0.614 Correction Factor	**Each Active= One Tortoise**	**Based On Tortoises Seen**
Population Estimate	114	73	48

of the gopher tortoise relocation symposium. Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program Technical Report No. 5. Pp. 15-43.

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NEW TEXAS HERPETOLOGICAL DISTRIBUTION RECORDS FROM THE UNIVERSITY OF TEXAS AT ARLINGTON COLLECTION OF VERTEBRATES

The recent publication of Dixon's (1987) *Amphibians and Reptiles of Texas* has been a milestone in defining the distributions of Texas species. Nevertheless, Texas has a diverse geography, encompasses considerable territory and additional geographic records will continue to be discovered. The appearance of Dixon's excellent work on Texas has made possible an evaluation of that material housed in the University of Texas at Arlington Collection of Vertebrates (UTACV) representing new county records. Some of these new county records represent range extensions and these are indicated where appropriate. All Serpentes were verified by M.E. Dorcas, and all other specimens were verified by J.S. McCord, Jr., unless otherwise indicated.

CAUDATA

SIREN INTERMEDIA (Lesser Siren). Smith Co: Tyler, Caldwell Zoo grounds. 10 April 1985. W. W. Lamar, J. Stout and K. Hovey. (UTACV A-19003).

AMBYSTOMA TIGRINUM (Tiger Salamander). Cherokee Co: Mixon. 1985. R. Robinson. (UTACV A-23521).

AMPHIUMA TRIDACTYLUM (Three-toed Amphiuma). Wood Co: FM 312, 3.2 km S of State Hwy 154. 13 June 1984. A. Loller. (UTACV A-13595).

ANURA

SCAPHIOPUS COUCHI (Couch's Spadefoot). Moore Co: Blue West Recreational Area, on North shore of Lake Meredith. 6 August 1986. T. L. Hibbits. (UTACV A-20845).

SYRRHOPHUS GUTTILATUS (Spotted Chirping Frog). Pecos Co: State Hwy 285, 47.9 km N of State Hwy 285-U.S. Hwy 90 junction. 6 October 1984. J. S. McCord, Jr., J. M. Johnson, P. J. Bradley. Verified by J. A. Campbell. (UTACV A-17418). Extends range ca. 48 km Northeast of Brewster county.

HYLA CRUCIFER (Spring Peeper). Bowie Co: North Mill Creek, U.S. Hwy 259, ca. 7 km N of U.S. Hwy 259-F.M. 2735 junction. 2 March 1986. J. S. McCord, Jr. and D. Roberts. (UTACV A-18585).

PSEUDACRIS STRECKERI (Strecker's Chorus Frog). Johnson Co: junction of Ham Creek and Brazos River. 15 May 1985. M. Burleson. (UTACV A-15900-15901).

BUFO PUNCTATUS (Red-spotted Toad). Crane Co: 8.4 km SSE of jct of U.S. Hwy 385 and State Hwy 329. 18 October 1986. G. Ferguson, M. Ferguson, D. Ferguson, A. Landwer and J.S. McCord, Jr. (UTACV A-25392-25394).

BUFO SPECIOSUS (Texas Toad). Jim Hogg Co; Randado, on State Hwy 16. 25 June 1981. J. P. Karges. (UTACV A-9099). Zapata Co: FM 3169, 15.5 km NE of junction of FM 3169 and U.S. Hwy 83. 18 May 1980. J. P. Karges. (UTACV A-8515).

RANA AREOLATA (Crawfish Frog). Henderson Co: 3.7 km N of Malakoff. 16 March 1957. W. F. Pyburn. (UTACV A-294).

RANA CATESBEIANA (Bullfrog). Randall Co: 3.2 km N of Canyon. 19 December 1963. J. R. Glidewell. (UTACV A-2970).

GASTROPHRYNE CAROLINENSIS (Eastern Narrowmouth Toad). Delta Co: Cooper Dam site, 12.9 km NE of Commerce. 30 April 1983. T. L. Hibbits. (UTACV A-13582).

TESTUDINES

CHELYDRA SERPENTINA (Snapping Turtle). Jasper Co: Angelina National Forest, 4.8 km W of U.S. Hwy 69 on dirt road to Bouton Lake. 17 March 1979. J. P. Karges. (UTACV R-8415). Llano Co: 12.8 km N of Llano, Houston Ranch. 19-21 March 1985. Natural History Class (University of Texas at Arlington). (UTACV A-17769). Rockwall Co: Rockwall. 9 February 1979. J. Boyd. (UTACV R-8413). Taylor Co: Summerhill Road jct with Double Lazy "J" Ranch. 18 June 1983. J. Joy. (UTACV R-12830).

KINOSTERNON FLAVESCENS (Yellow Mud Turtle). Anderson Co: Engeling State Wildlife Management Area. 18-20 April 1986. J. S. McCord, Jr. and M. E. Dorcas. (UTACV R-17771). Comanche Co: U.S. Hwy 377, 27.7 km SW of Dublin. 16 May 1979. J. A. Campbell, L. S. Farris and J. P. Karges. (UTACV R-9179). Red River Co: Big Pine Creek, ca. 3.2 km Northwest of Manchester. 5 May 1979. J. R. Glidewell. (UTACV R-11222).

KINOSTERNON SUBRUBRUM (Eastern Mud Turtle). Franklin Co: 8.8 km N of Mount Vernon. 6 April 1975, J. R. Glidewell. Verified by M. E. Dorcas. (UTACV R-5164).

KINOSTERNON SUBRUBRUM (Eastern Mud Turtle). Franklin Co: 8.8 km N of Mount Vernon. 6 April 1975. J. R. Glidewell. Verified by M. E. Dorcas. (UTACV R-5164).

STERNOTHERUS CARINATUS (Razorback Musk Turtle). Camp Co: Ferndale Lake, 11.2 km SE of Pittsburg. 4 June 1979. J. R. Glidewell and P. J. Prete. (UTACV R-11188-1190). Extends range ca. 34 km NW of Marion county.

DEIROCHELYS RETICULARIA (Chicken Turtle). Van Zandt Co: N of Ben Wheeler on Neches River. August 1987. J. Isaacs. Verified by M. E. Dorcas. (UTACV R-22394).

GRAPTEMYS KOHNII (Mississippi Map Turtle). Franklin Co: Sulfur River, 0.8 km E of State Hwy 37 bridge. 30 May 1986. J. Cover, D. McCaffey and D. G. Barker. Verified by J. S. McCord, Jr. (UTACV R-17053). Hill Co: Nolan River, just below Blum. Late June 1985. M. Burleson. Verified by M. E. Dorcas. (UTACV R-22254).

PSEUDEMYS CONCINNA (River Cooter). Cooke Co: Moss Lake, 19.3 km NW of Gainsville. 16 July 1977. J. R. Glidewell. (UTACV R-11253). Extends range ca. 37 km N of Denton county. Johnson Co: Mill Creek, 0.2 km N of County road 1108. 13 May 1979. G. Carl and R. Stevens. (UTACV R-8737). Extends range ca. 42 km S of Tarrant county.

PSEUDEMYS TEXANA (Texas River Cooter). Taylor Co: Abiline, Dyess Air Force Base. 13 August 1983. (UTACV R-12966).

TERRAPENE ORNATA (Western Box Turtle). Collin Co: 8 km SE of Blue Ridge. 10 August 1976. L. C. Fitzpatrick, J. L Hughes and J. R. Glidewell. (UTACV R-11230).

TRACHEMYS SCRIPTA (Slider). Camp Co: Ferndale Lake 11.2 km SW of Pittsburg. 4 June 1979. P. J. Prete and J. R. Glidewell. (UTACV R-22598-22605). Hill Co: Nolan River, ca. 0.8 km N of junction of Brazos River and Nolan River. 13 September 1987. T. M. Kubin. (UTACV R-19361). Both verified by M. E. Dorcas.

SAURIA

SCELOPORUS OLIVACEOUS (Texas Spiny Lizard). Hamilton Co: Sand Branch Creek at U.S. Hwy 281 and FM 221. 21 March 1987. J. S. McCord and M. E. Dorcas. (UTACV R-18480-18481).

EUMECES OBSOLETUS (Great Plains Skink). Jeff Davis Co: 1.6 km S of Fort Davis. 9 February 1965. Thomas R. VanDevender. (UTACV R-27).

EUMECES TETRAGRAMMUS BREVILINEATUS (Short-lined Skink). Parker Co: 6.4 km NW of junction of FM 113 and U.S. Hwy 180. 12 August 1986. J. Forester and J. S. McCord, Jr. (UTACV R-16437-16439).



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This second edition is enhanced by the addition of much new and previously unpublished information. Two chapters that have been included are written by recognized experts in their fields of interest, Dr. Alex Rubel of Zurich, and Dr. Douglas Mader. Dr. Rubel contributed a monograph on radiography, and imaging. Dr. Mader wrote a monograph on antibiotic therapy and discusses the relevance of metabolic scaling of antibiotic dosages. Other chapters include an introduction to herpetology, captive husbandry, a guide to nutrition, infectious diseases, antibiotic therapy, conditions related to the captive environment, radiology and imaging, hematology, non-hemic parasitology, ophthalmic disorders, reproductive disorders, developmental anomalies, anesthesiology, surgery, comparative histology, euthanasia, necropsy techniques, and pathologic conditions. More than 1,800 color photos are included.

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SERPENTES

LEPTOTYPHLOPS DULCIS (Texas Blind Snake). Zapata Co: FM 3169, 6.0 km NE of junction of FM 3169 and U.S. Hwy 83. 18 May 1980. J. P. Karges. (UTACV R-10008).

ARIZONA ELEGANS (Glossy Snake). Armstrong Co: State Hwy 207, SE of Palo Duro Canyon. July 1983. R. Meckel. (UTACV R-22263). Leon Co: Buffalo. Late April 1979. E. H. Ezell. (UTACV R-8995). Shackleford Co: State Hwy 6 (U.S. Hwy 180), 21.1 km W of Albany. 27 April 1974. S. Wylie and L. Wylie. (UTACV R-2907).

CEMOPHORA COCCINEA (Scarlet Snake). Van Zandt Co: State Hwy 64, 2.4 km N of junction of State Hwy 64 and FM 314. 15 June 1984. K. Hovey. (UTACV R-12793).

ELAPHE OBSOLETA (Rat Snake). Sterling Co: State Hwy 163 at N. Concho River. 16 May 1979. J. A. Campbell, L. S. Farris and J. P. Karges. (UTACV R-9032).

FARANCIA ABACURA (Mud Snake). Denton Co: U.S. Hwy 380, 0.3 km W of Trinity River, E of Denton, May 1983. R. Meckel. (UTACV R-15828). Extends range ca. 32 km NW of Dallas county.

MASTICOPHIS TAENIATUS (Striped Whipsnake). Williamson Co: 4.8 km W of Georgetown, Weir's Ranch. 30 April 1965. H. W. Greene. (UTACV R-1340).

NERODIA ERYTHROGASTER (Plainbelly Water Snake). Calhoun Co: State Hwy 185, 11.1 km W of junction of State Hwy 185 and FM 1289. 4 July 1986. R. W. Brown and P. Brown. (UTACV R-17166). Cottle Co: Buckle "L" Ranch, 16.4 km S of Childress. 14 October 1979. J. P. Karges. (UTACV R-9461). Hopkins Co: Merrit Creek, 4.0 km N of junction of State Hwy 11 and FM 2653. 1 September 1986. J. S. McCord, Jr. and J. Dingler. (UTACV R-17754).

REGINA GRAHAMI (Graham's Crayfish Snake). Brown Co: U.S. Hwy 377, 17.6 km S of Brownwood. 23 May 1982. W. W. Lamar and D. G. Barker. (UTACV R-10971). Extends range ca. 60 km E of Coleman county.

SONORA SEMIANNULATA (Ground Snake). La Salle Co: FM 624, 12.9 km W of La Salle county line. 25 May 1986. R. W. Brown. (UTACV R-16786).

THAMNOPHIS PROXIMUS (Western Ribbon Snake). Collin Co: Plano High School, Plano. 9 May 1979. J. Dunlap. (UTACV R-9021).

MICRURUS FULVIUS (Eastern Coral Snake). La Salle Co: FM 624, ca. 16 km S of Los Angeles. 22 May 1984. S. Smith, A. Tennant and N. B. Ford. (UTACV R-15722).

AGKISTRODON CONTORTRIX (Copperhead). Hill Co: Lake Whitney Dam. 19 August 1953. W. E. Huffman. (UTACV R-1956). San Patricio Co: Lake Corpus Christi. 15 April 1972. J. W. Hock and J. A. Victory. (UTACV R-2631).

SISTRURUS MILIARIUS (Pigmy Rattlesnake). San Jacinto Co: 17.7 km E of New Waverly. September 1971. D. Rogers. (UTACV R-7344).

We would like to thank all the collectors who made the publication of these new county records possible. Special thanks go to Jonathan A. Campbell and John L. Darling for their assistance and support.

Submitted by **JOHN S. McCORD, JR.,** Fort Worth Tarrant County Public Health Department, 1800 University Drive, Room 227, Fort Worth, TX 76107, and **MICHAEL E. DORCAS,** Department of Biology, The University of Texas at Arlington, TX 76019, USA ●

BOOK REVIEWS

Contributions to the History of Herpetology, edited by Kraig Adler. 1989. 202 pp, frontis. (col.). 149 photos, Soc. Study Amphs. Repts. (SSAR·Publications Secretary Robert D. Aldridge, Department of Biology, St. Louis University, St. Louis, Missouri 63103 U.S.A.) Clothbound $20.00.

By now the herpetological world has seen enough of the work of Kraig Adler to be sure that anything edited or written by him will exemplify exacting and exhaustive scholarship, and will bear an unmistakable touch of class as well. The present work is no exception.

Elegance is provided by the striking color frontispiece of John Edwards Holbrook; by the inspired title page in color, bearing a replica of a compartmented, 1584 anglosaxon border; by the 149 portraits of the workers of the past chosen for biographical sketches (only 3 lack portraits); by replication of the signatures of every biographee (many appearing on the book's cover as well as with the appropriate biographic account); by the insertion as a frontispiece to Adler's own article of a facsimile of a letter written by J.E. Holbrook in 1837 to a potential collector, together with a transcription (the original is difficult to decipher) and brief notes on Holbrook; and of the black-margin divider readily separating the three articles contained in the book. The two-column, 8½ x 11 in format provides superior (over a smaller size) economy of space, ease of reading and adequate space for illustrations, all without incurring the filing problems that a larger size would pose.

The book contains three sections. The first, by Adler, "Herpetologists of the Past," occupies 141 pages, with its index. The second, by John S. Applegarth, "Index of Authors in Taxonomic Herpetology," cover 36 pages, and the third by Ronald Altig, "Academic Lineages of Doctoral Degrees in Herpetology," 24 pages. All are exhaustively researched in spite of overwhelming difficulties of pursuing each lead separately, for there are no previous compendia from which to draw. Altig's article, for example, accounts for an incredible 1446 holders of doctoral degrees from institutions in 23 countries. Applegarth's list includes all authors, with birth-death dates, countries and pertinent orders, having named one or more taxa among living families of amphibians or reptiles, or having had one or more taxa named for them as well as having published at least one title in the field. That staggering task included 2506 persons, including almost all who worked in *any* field of herpetology through 1920, but a progressively lesser per cent since then. At one time the history of herpetology was the history of its taxonomy, and not much more; that is far from the case now or for the past several decades.

Much remains incomplete in both the Applegarth and Altig compilations—especially dates for the former—as the authors were well aware, asking for corrections and additions.

A historian's touch is obvious in Adler's section, containing as it does an enormous amount of detail about the lives, influence and contributions of each of the biographees, all deceased. In the process, a total of 590 people are cited, according to the index. Sources of biographical material are meticulously cited for each account, although only primary sources were available for some, and were additionally explored for many others. Thus much information appears in this book for the first time. Most accounts are less than a page long; a few exceed one page, and only one (for E.D. Cope) exceeds two pages. The arrangement is more or less chronological, based on dates of peak of influence, hence is somewhat arbitrary. Most impressive is the cosmopolitan choice of biography; Adler scrupulously attempted to avoid provinciality, limiting U.S. biographees to 38. The remaining 114 are broadly international.

In like fashion, Adler carefully avoided any pejorative comments, although the importance of the work of each person included was invariably discussed.

Each of the three sections of this book constitutes, then, an important original contribution to the history of herpetology, and is an outstanding credit to the meticulous diligence of its author. The book should be regarded as an essential component of every herpetologist's library, to be savored in utmost appreciation for the contributions of those who have gone before, and upon which we now build. Nothing else in herpetology so leads us to reflect upon how much others have contributed to the whole that is the heritage we and those yet to come benefit from.

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Ecology of Reptiles, by H.F. Heatwole and J. Taylor. 1987. Surrey Beatty & Sons, 43 Rickard Road, Chipping Norton, NSW 2170, Australia. ISBN 0 949324 14 0. 325 pages including 48 figures, 20 tables, 36 Australian species on 6 color plates, and about 1150 references for $44.00 in hardcover.

This book is a second edition of Dr. Heatwole's 1976 contribution to the Australian Ecology Series. The second edition contains five more chapters, is 150 pages longer, and has over 650 more references than the first edition. The scientific literature is updated through much of 1985, with some 1986 references. Among the several ambitious goals of the book are (1) to provide college students, teachers, scientists, and conservationists

with a "basic conceptual and factual background" in reptile ecology, and (2) to stimulate insightful research. The book focuses on research results on Australian reptiles, but the majority of citations are from research on non-Australian reptiles; most of the important review publications on the many facets of reptile ecology are also cited.

The chapters are: (1) Australia's Environment and Distribution of Reptiles, 20 pages; (2) Thermal Ecology, 75 pages; (3) Water Relations, 23 pages; (4) Salt as an Ecological Factor, 8 pages; (5) Activity Cycles, 8 pages; (6) Feeding Ecology, 6 pages; (7) Reproductive Ecology, 19 pages; (8) Population Dynamics, 27 pages; (9) Ecological Energetics, 8 pages; (10) Social Organization, 11 pages; (11) Reptilian Assemblages, 41 pages; with a 5 page Appendix on Australia's Reptilian Fauna. The exceptional lengths of chapters 2 and 11 probably reflect both the senior author's familiarity with those topics (see the Bibliography) and the preponderance of research in reptile thermal ecology in earlier decades.

Such uneven topical treatment, as indicated by the extreme brevity of some chapters, is bound to disappoint most readers. Particularly irksome to me is the chapter on feeding ecology. Given my opinion that food acquisition mode is the single most important adaptive syndrome in an animal, I find the four and one-half pages of text, one figure, and one table in the chapter stunningly inadequate. But, even in the short chapters, most of the important publications, or reviews of those publications, are at least mentioned.

The authors stated in the Preface to Second Edition that "the literature on reptile ecology is becoming voluminous and unwieldy." With this assessment it is no surprise that the information in each chapter is not well integrated with information of other chapters. Even such obviously related chapters as Reproductive Ecology (chapter 7) and Ecological Energetics (chapter 9) are poorly integrated. The short section on evolutionary strategies of life history in the end of the eclectic chapter 8, on population dynamics, likewise should have been woven in with material of chapters 7 and 9.

The first chapter, regrettably, did not contain major themes that could have set a coherent, cohesive tone for the book. For example, questions about Australian reptile species diversity and individual species distribution and abundance (venerable natural historical issues) could have been showcased immediately in the first chapter. But the requisite tables, graphs, and maps of vegetation types and climatic patterns are missing; and the related histories of reptiles, climate, and vegetation are not well integrated. The chapter on reptilian assemblages (one of the better chapters) would have been a good place to assess and summarize themes initiated in earlier chapters.

Although *Ecology of Reptiles* does not have an effective thematic approach like S.D. Bradshaw's *Ecophysiology of Desert Reptiles* or Eric Pianka's *Ecology and Natural History of Desert Lizards*, it certainly has a more comprehensive treatment of reptile ecology than either of these two books. It seems, however, that snakes, chelonians, and crocodilians are underrepresented in most chapters. The authors also missed opportunities to make many valuable comparisons among reptilian taxa (orders through subspecies), and among reptiles with differing body sizes, food-acquisition modes, and habitat types. Moreover, I have the strong impression that recent theoretical and empirical advances, trends, and disputes in animal ecology have been only weakly addressed in *Ecology of Reptiles*.

Some of the research results on Australian reptiles that were chosen as examples came from honour's theses and other unpublished works, or were not as useful as some publications of exemplary research on reptiles from other continents. In these cases, the reader would have been better served with the finer examples of published research that are easier to obtain and examine than theses. The Australian bias is well illustrated in a quizzical phrase that I bumped into frequently in the text: "an American lizard." One can ascertain from this phrase neither the continent, climatic zone, nor habitat-type occupied by the animal, nor even the lizard's taxonomic family. On the whole, however, the emphasis on Australian reptiles should prove useful to herpetologists already familiar with the literature on non-Australian reptiles.

A more annoying problem for me was the authors' frequent lack of discrimination among studies when they cited evidence for particular phenomena. Papers with essentially anecdotal information or estimated parameters were not differentiated from papers with statistically analyzed data. And more than a few papers are what I consider to be miscited (as is one of mine) or curiously interpreted. Careful presentation of unanswered questions and contrasting hypotheses, and evaluation of evidence bearing upon questions and hypotheses are rare commodities, particularly in the shorter chapters. Despite the problems typical of textbooks—an often vague, encyclopedic review-paper approach, and inadequate critical evaluation of data and ideas—*Ecology of Reptiles* is worth having as a reference (over 1150 citations) and a tentative guide to (Australian) reptile ecology.

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Herpetological Collecting and Collections Management, by John E. Simmons. 1987. SSAR Herpetological Circular No. 16. 70 pp. $6.00. Order from: Robert D. Aldridge, SSAR Publications Secretary, Department of Biology, Saint Louis University, St. Louis, MO 63103, USA.

The same SSAR series that brought us George Pisani's excellent *Guide to Preservation Techniques for Amphibians and Reptiles* (Pisani 1973; Pisani and Villa 1974), now includes another very useful methodology volume. In addition to reviewing preserving techniques, *Herpetological Collecting and Collections Management*, by John Simmons, covers methods and materials used before preservation, during collecting, and after preservation, in collection management. Simmons' well-organized and complete treatment provides in-depth coverage of topics from recording frog songs to rehydrating alcoholic specimens. About one-fifth of the volume covers collecting and preserving methods, three-fifths is a collection management guide and the final fifth is an extensive bibliography.

In the first section the author treats such subjects as how, where and what to collect, how to document the collection, and what collecting gear and supplies to carry into the field. His suggestions include hints on photographic and sound recording equipment and supplies. Fluid preservation of specimens is covered in some detail but other methods, such as skeletonizing, and clearing and staining are treated via lists of references. No reference for preparation of specimens destined for electron microscopy was included; Dawes (1988) is suggested.

Under killing methods it would have been useful to mention freezing as the best method for killing specimens intended for skeletons, and isopropyl alcohol as a cheap, readily available and unrestricted alternative to nembutal. When injected into the brain of reptiles through the optic foramen isopropyl gives rapid results and leaves specimens totally relaxed within minutes.

The majority of Simmons' volume is dedicated to collection management. He briefly reviews the history and purpose of systematic collections, suggests what types of facilities are required, and outlines how to correctly undertake a long list of procedures normally used in herpetological collections. He discusses choosing a preservative, accessioning and cataloging processes, development of indexes, handling of types and special collections, and making and receiving loans. A series of miscellaneous but important topics including updating nomenclature, topping up alcohol and rehydrating specimens is buried in the section on loans; more attention to headings would have given these topics better visibility. The text ends with some guidelines for collection growth and the evaluation of collection management.

Although the coverage of collection management tasks is complete and I agree with the methodologies suggested, a set of priorities for these tasks would also have been useful. Most collections are short on help and may not be able to attend to all of the tasks outlined. In these less-than-ideal situations special attention must be paid to the top two priorities of the collections manager. He/she must be certain that no specimen deteriorates and that no specimen is separated from the data available for it. I was raised under the philosophy that specimens should remain physically associated with their data and therefore strongly support the use of data tags. Simmons feels that data tags are clumsy and will damage specimens. This type of damage will be minimized by following a few simple rules: (1) always tie a knot in the tag string about three-fourths of an inch from the tag so the tag can be turned free of the specimen, (2) always lie the tag under small specimens when packing them for shipping, (3) never jam specimens into jars containing alcohol and other specimens (instead, place

specimens with tags up in empty jars and then add alcohol) and (4) never tie data tags to very small specimens but handle them as suggested by Simmons for catalog tags on pages 32 and 33.

Simmons suggests that these larger tags are prone to disintegration; this is not the case if they are printed on paper of the quality used for catalog tags (see p. 35) and are not used as handles to pick up specimens. There are several advantages to having data tags on specimens: (1) it eliminates the necessity of having to keep adding data to jar labels (this usually means rewriting the whole jar label) and allows breakdown of full jars without the need to write out all of the data on the labels, (2) the data go out with specimens on loan without any extra effort, and (3) depending on the amount of data included on the jar label, it may reduce the time that ever-precious catalogs will have to spend in the collection room exposed to alcohol spills. Under this system, jar labels show only the most general geographic origin of all of the specimens in that jar: country or country and state for foreign material, state or state and county for domestic material.

In the section on loans, Simmons suggests using Parcel Post to ship specimens. In most cases library rate is even less expensive.

As Simmons points out in his introduction, there are no standardized procedures for managing herpetological collections. In this volume he has attempted to set some standards, and high ones at that. Adherence to the methods he suggests would ensure that a collection would be maintained in an excellent condition and in a state of maximum readiness for researchers. All collections managers should definitely aspire to these ideals, and no collection or series collector should be without a copy of this guide.

LITERATURE CITED

Dawes, C. J. 1988. Introduction to biological electron microscopy: theory and techniques. Ladd Research Industries, Burlington, VT 315 pp.

Pisani, G. 1973. A guide to preservation techniques for amphibians and reptiles. SSAR Herpetological Circular No. 1, 22 pp.

Pisani, G. and J. Villa. 1974. Guia de tecnicas de preservacion de anfibios y reptiles. SSAR Herpetological Circular No. 2, 28 pp.

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The Amphibians and Reptiles of Missouri, by Tom R. Johnson. 1987. Missouri Department of Conservation, P.O. Box 180, Jefferson City, MO 65102-0180, USA, xii + 368 pp., 258 color photos, 109 maps. Soft cover, $13.00; hard cover, $16.00 (Missouri residents add 81¢ or $1.00 sales tax, respectively).

Missouri joins the roster of states having an authoritative recent summary of its herpetofauna. The book fulfills a need in providing an updated coverage of both amphibians and reptiles. Johnson's book is one of the best. It should be a staple reference for years to come and used considerably by anyone having an interest in Missouri's amphibians and reptiles.

Johnson's book includes sections that are typical of state books on amphibians and reptiles, but there are some added features of interest to the professional herpetologist. The author's artistic talent pervades the text with black and white drawings and excellent color photographs in the accounts of species, as well as a watercolor print of the Three-toed Box Turtle that adorns the front cover.

A preface by Roger Conant is preceded by a table of contents and two pages of acknowledgments. A brief history of Missouri herpetology (3 pp.) provides biographical sketches of Julius Herter, Sr. and Paul Anderson. Five physiographic provinces are recognized in Missouri (6 pp.), are discussed with colored photos of each, and each is delimited on a county map of Missouri. A methods and procedure section (2 pp.) is followed by a checklist (4 pp.) of 107 species (131 species and subspecies, 23 of salamanders, 26 frogs and toads, 21 turtles, 11 lizards, and 50 of snakes).

Illustrated keys (pp. 16-35) to Missouri's species of salamanders (20), frogs and toads (22), turtles (17), lizards (10), and snakes (38) precede the species accounts (286 pp.). Species are arranged phylogenetically and introduced by general comments relating to respective families and to major groups of the herpetofauna (salamanders—frogs and toads, turtles, lizards, and snakes); family comments are embellished by a black and white sketch of a representative Missouri species. Myths about snakes (p. 226) precede the species accounts. Each species is discussed under subheadings of Description, Habits and habitat, Breeding, and Missouri Distribution; many species accounts have additional subheadings of Remarks or Subspecies. Excellent color photos accompany each species account, and presumably all (some not identified by county origin) are specimens from Missouri (except a Kansas specimen of *Trionyx muticus* by Joseph T. Collins).

In addition to adults (often more than one photo to show characteristics), accounts of some species may include color photos of amphibian egg masses, tadpoles, reptile eggs, hatching young, and juveniles; the account of the gray tree frog includes sonograms of syntopic Missouri specimens of *Hyla versicolor* and *H. chrysoscelis*. Shaded distributions of each species (and subspecies) are depicted on a county map of Missouri with documentation for known county records indicated by single black dots (open circles indicate no voucher specimens).

Following accounts of species is an annotated list of three salamanders, two anurans, three lizards, and five snakes of possible or of questionable occurrence in Missouri (3 pp.). A section for identifying selected tadpoles (7 pp.) includes labelled illustrations, and descriptive comments with accompanying line drawings (left side of body-tail, and oral disc) of 11 species.

Finally, a Glossary of 79 terms precedes the Bibliography, which is subdivided into two parts—general works (279 references) and Missouri references (109 references). In a terminal index (pp. 359-367) common and scientific names are cross-indexed under all the different appellations with principal accounts of species in bold-face type. Missouri counties are named on a map on the last page (hardcover) or inside of back soft cover. A photograph and vita sketch of the author fill the outside back cover.

There is little to quibble about regarding substantive information. The use of *Nerodia rhombifer* (instead of *rhombifera*) is novel. *Trionyx spinifer* is used throughout text, but *T. spiniferus hartwegi* is employed in the checklist. I do not understand the meaning of the third alternative feature used in couplet 12 in the key to turtles (p. 26) in regard to "first marginal. . .ventral." Only three (not four) species of trionychid turtle occur in the U.S. (p. 189). There are some errors, misspellings, and omissions—I discovered only 13 misspellings and two text citations to references with incorrect year (p. 93, Wright and Wright 1942 = 1949; p. 157, Mahmoud 1969 = 1968), but many instances of a, b, etc. not accompanying the year in text citations when author published more than one paper the same year (e.g., p. 121, Fitch 1956 and Nelson 1972). The bibliography (although not a Literature Cited)

FIRST CONGRESS POSTER



The official poster for the First World Congress of Herpetology held in Canterbury, U.K., in September, is now available for sale. The print measures 11 1/2 by 15 inches and includes a full-color drawing of an Eastern Box Turtle (*Terrapene carolina*), from a watercolor by David M. Dennis. The poster was issued as part of SSAR's salute to the congress and printed in an edition of 1500 copies. About 500 copies remain for sale, at $8.00 each or $5.00 in quantities of 10 or more, postpaid.

Address orders to the SSAR Publications Secretary, Robert D. Aldridge, Department of Biology, St. Louis University, 3507 Laclede, St. Louis, Missouri 63103, U.S.A.

seems to contain some references not cited in text (e.g., Lodato, 1983). However, there are 11 text citations to references that do not appear in either of the two sections of the bibliography.

Despite these minor flaws the book is of high quality and scholarship, exceptional in treatment, admirable in production, and is highly recommended. The Missouri Department of Conservation and author should be proud of this book, and thankful to have been able to publish it at a most reasonable price. I am glad to have this book.

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World Checklist of Threatened Amphibians and Reptiles, by Brian Groombridge. 1988. Nature Conservancy Council, Peterborough, United Kingdom. 138 pp. Soft cover. £16.00 (ca. $27.00).

The stated purpose of this book is to "provide a summary of basic information on all species listed in CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) or appearing in the IUCN (International Union for the Conservation of Nature and Natural Resources) Red List of Threatened Animals." A secondary purpose is to present a comprehensive list of references to allow access to more detailed information on the species listed. From a misleading title, which gives the impression of a wider comprehensive coverage, to poor editing and a woefully inadequate list of references, this book (really a checklist) falls far short of meeting the needs of either the scientific community or administrators charged with monitoring the status of threatened species.

The book consists of three sections: introductory notes, species lists, and references. Taxonomy generally follows the most current source (e.g., Frost's *Amphibian Species of the World*), and is conservative in its treatment of controversial groups, such as tortoise genera. One taxonomic placement that I disagree with, however, is the inclusion of *Tomistoma* within the Crocodylidae rather than the Gavialidae (see Densmore 1983. *Evolutionary Biology* 16:397-465). The species lists include scientific and English common names, range (sometimes with accompanying reference number), CITES and Red Data Book status, major exploitation type, and reference number. The final section consists of the 549 numbered references corresponding to citations in the species list. Although otherwise alphabetical, nine references are tacked on the end of the bibliography and one (#545) is a repeat of #76.

For North American herpetologists, both errors and oddities in the species list abound. For instance, *Bufo nelsoni* is recorded from California where it does not occur; a common name of *Xerobates agassizii* is listed as "western gopher tortoise"; the only common name of *Gopherus polyphemus* is given as "Florida gopher tortoise"; one of the references for *G. polyphemus* (#210) actually refers to a survey of Gambian reptiles; St. Croix is included in the present distribution of *Ameiva polops* although the species has been extirpated from the island; the list states that *Charina bottae umbratica* is no longer recognized although the matter seems far from settled (see Stewart 1988. Proc. Conf. Calif. Herp., pp. 131-138). There also are distracting typographical errors, such as cocqui (p. 6), mountian (p. 10), and referernce (p. 24).

There are numerous errors or omissions in the reference section. Four references are listed by title only without an appropriate citation (#92, 308, 468, 499). One reference has a citation but no title (#549), while the citation and title are reversed in another reference (#493). In several instances, scientific names are not underlined (#59, 70), and typographical errors occur more frequently than, in my opinion, they should.

My main criticism, however, is that the book fails in one of its chief goals, i.e., to be a source of references for more comprehensive information on listed species. For instance, 136 species of lizards and 24 species of snakes are listed without any primary references whatsoever, although a few references are sometimes scattered under geographic distribution. If readers want more data on these species, where do they look? A second reference criticism is the reliance on unpublished reports, manuscripts, or even "in litt." citations (50 of 549). Indeed, some of the references with complete citations are extremely obscure (e.g., #155, *World Wildlife Fund Pakistan* 4(1):5-9), making them of dubious value as information sources. If the purpose of the book is to serve as a source for additional information (p. v), then the use of so many unpublished and obscure references is self-defeating.

A related problem is that checklists, rather than the primary literature, frequently are used as sources of information. For example, nearly every amphibian has Frost's *Amphibian Species of the World* as a reference. However, there are far more pertinent references for most species that give more information on biology and distribution. Most turtle references cite Iverson's *A Checklist with Distribution Maps of the Turtles of the World* rather than original or review works dealing with the particular species. The fact that the author did include very specific references in some instances highlights the uneven quality of the literature review.

Finally, specific literature citations are often outdated or not comprehensive. For example, Busack (1976, Biol. Conserv. 10: 309-319) is a better general reference for *Chioglossa lusitanica* than those listed; Mount (1975. *The Reptiles & Amphibians of Alabama*) gives more data on *Sternotherus depressus* than Iverson's checklist; Pritchard and Trebbau (1984. *The Turtles of Venezuela*) is mentioned only rarely in accounts of South American turtles. Many other examples are available. Indeed, Groombridge cites himself as author of the 1982 Red Data Book account on *Sternotherus depressus* when Robert Mount provided the account. And certainly, Fritts et al. (1982. J. Herpetol. 16:39-52) is more appropriate than having no reference at all for *Coleonyx switaki*!

Conservation biologists and resource managers do not need checklists containing spotty, incomplete information; they simply are of little or no value. Rather, detailed accounts, such as those in Groombridge's 1982 Red Data Book (*The IUCN Amphibia-Reptilia Red Data Book, Vol. 1*) are vitally necessary. This checklist offers little information on the species in question, appears hastily put together, and is excessive in price. Resource managers in the United Kingdom and researchers elsewhere should save their money and await the next volumes in the Red Data Book series.

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Wildlife Management: Crocodiles and Alligators, edited by Grahame J.W. Webb, S. Charlie Manolis and Peter J. Whitehead. 1987. viii + 552 pp. + 10 color plates. Surrey Beatty & Sons Pty. Limited, 43 Rickard Road, Chipping Norton, New South Wales 2170, Australia.

In January, 1985, a "Technical Conference on Crocodile Conservation and Management" was convened in Darwin, Northern Territory of Australia, under the sponsorship of the Conservation Commission of the Northern Territory. This book includes the papers presented at that conference plus additional papers submitted *in absentia*. It includes 51 chapters broadly grouped into 10 sections. For Surrey Beatty & Sons Pty. Limited, this is yet another in their quality series of specialist conference proceedings. The publisher and editors are to be commended for a truly outstanding volume. Together, they have produced a text that is both handsomely crafted and remarkably free of production errors.

Part 1, "World Crocodilians," opens with a brief recount of the evolutionary history of the order Crocodilia. This is followed by a review of the distribution and status of modern crocodilians. Although this serves as a convenient checklist with distribution maps for each of the species, its utility is compromised by two shortcomings. First, the treatment of subspecies is inconsistent, subspecies being considered only within the *Caiman crocodilus* complex. Treatment of only species level taxa could certainly have been justified, but the selective exclusion of subspecies seems arbitrary. More importantly, this chapter is almost completely without literature citation. This is especially unfortunate in the discussion of the taxonomic confusion surrounding the *Caiman crocodilus* complex. Such statements as the following should not have been included without proper citation.

> 1) ". . .a major field authority on South American crocodilians proposed. . .", 2) "It has been proposed that this name should only be applied to. . ., while populations from. . .are distinct at the subspecific level and should be named *C. c. chiapasius*." and 3) "Two new subspecies. . .have recently been described and accepted in a major checklist. . ., yet these taxa are regarded as totally without foundation by others more familiar with the field situation."

Part II opens with a brief chapter on the World Conservation Strategy and CITES, which is then followed by 10 chapters detailing the history of management programs in the United States (Louisiana; Florida), Zimbabwe, India, Papua New Guinea, Venezuela,

and Australia (Northern Territory; Western Australia; Queensland). This section provides a valuable, historical overview of crocodilian management programs (both recovery and harvest) which have worked and those which have failed in various parts of the world. Part III, "Crocodile Management and Indigenous People," includes only two brief chapters, but they are a refreshing addition and emphasize the complex logistical and social issues which must be recognized if management programs are to be successfully implemented in cultures with very different economic perspectives or in which crocodilians are viewed as sacred.

The six chapters of Part IV provide an introduction to survey methods, techniques for gathering life history data, and population modeling. Part V includes two chapters focusing on the need for public education and providing approaches for cultivating public support for the goals of crocodilian management programs. Part VI includes four chapters covering techniques of capture, immobilization and anesthesia of crocodilians. Chapters 26 and 27, especially, are must reading for individuals who might have occasion to chemically immobilize crocodilians or to handle very large ones. Very large crocodilians may die from lethal acidosis resulting from prolonged struggling against manual capture (Chapter 26), and types of chemical immobilization effective on one species may prove ineffective on another. For example, ketamine hydrochloride, which is effective when used on *Alligator mississippiensis*, has proven lethal to *Crocodylus niloticus* (Chapter 27). The risks associated with handling and the possibility of interspecific differences in pharmacological response should always be kept in mind when working with rare species or valuable captives.

The three chapters of Part VII concern crocodilian behavior and thermoregulation, with a particular emphasis on management implications. The seven chapters of Part VIII discuss crocodilian farming and ranching operations in Zimbabwe, Thailand, Australia, and Israel, farming and ranching research in Louisiana and Florida, and diseases and disease control on crocodile farms. The four chapters of Part IX cover aspects of skinning; curing, storage, and marketing of hides; and identification of species from which skins or products have been derived. Part X includes ten chapters covering hormonal control of reproduction; chemistry, respiration, and water relations of eggs; embryology; and the effects of incubation temperature on sex determination, embryonic development rate, and post-hatching growth rate.

Given the size of the volume and the participation of 51 contributors, it is not surprising that there are occasional inconsistencies. For example, in Chapter 2 and on Plate 1 we are told that there are 22 species of living crocodilians, yet later (Chapter 28:289) we learn that "Nearly all of the 21 species of crocodilians have bred in captivity..." I at first thought that this discrepancy merely reflected the author's differing view regarding the specific distinctness of *C. mindorensis*, but elsewhere in the same chapter (p. 283) he makes reference to *C. mindorensis*. Other inconsistencies may be more apparent than real. In Chapter 43 it is indicated, based on tests with *C. johnstoni* eggs, that rotation of eggs is lethal if it occurs between days 2-13 post-laying, whereas Chapter 32, based on collection of *A. mississippiensis* eggs, suggests the period of sensitivity to be 7-16 days post-laying, with little mortality associated with egg movement up to day 7. This apparent inconsistency may represent real differences between the species investigated or simply differences between the effects of collection and those of actual rotation of eggs; the question is of real significance to management programs involving the collection of eggs for artificial incubation.

Also, in chapters dealing with crocodilians overall, there is an occasional tendency to overgeneralize from data on a few well known species. On page 278, for example, it is stated that "Crocodilians gape by opening their mouth for long periods, and this behavior may function to cool the head during basking." Although this behavior is common in most Crocodylinae and Gavialinae, it is seen much less commonly in the Alligatorinae, and its occurrence in *Paleosuchus*, for example, is doubtful.

One caption accompanying Plate 6 states that "The 'mouth-open' posture is partly a territorial display, but it also allows evaporative cooling across the palate, which effects (*sic*) the rate of heating of the head." Although the thermoregulatory function of open mouth gaping has often been cited, it is undocumented. The reference in the previous paragraph and another in Chapter 30 (p. 302) more conservatively suggest that gaping "may function...to alter heat exchange in the head versus the body," but it is noted on page 278 that gaping also occurs in the rain and at night. In this regard, the photograph on page 260 of a crocodile immobilized with gallamine triethiodide, a neuromuscular blocker, may be significant. This specimen is exhibiting a fairly typical mouth-open posture as a consequence of drug induced relaxation of the jaw musculature. In some cases, at least, gaping may indicate nothing more significant than relaxation.

Nonetheless, the shortcomings of this book are few and minor compared to its considerable value as a reference work on crocodilian biology and management. It belongs on the bookshelf of anyone with a serious interest in crocodilians and should be required reading for those who yearn for times past, when crocodilian management was concerned almost exclusively with recovery efforts.

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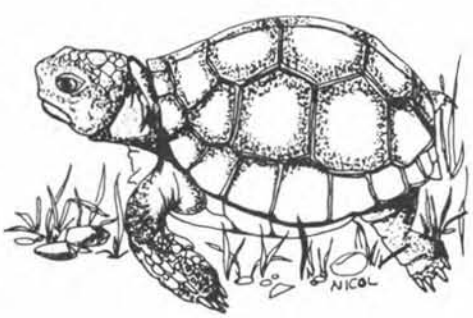
The Isle of Sea Lizards, by Angus Bellairs. 1989. The Durrell Institute of Conservation and Ecology, Canterbury. 299 pp. £5 ($8.15).

Novels by herpetologists or about herpetology are uncommon, and good ones are rarer yet. This book is the exception—an entertaining story with a herpetological theme that a herpetologist can read without wincing at the liberties being taken with the subject he knows. The basic plot is a familiar one—the remote island that serves as refugium for presumably extinct creatures, mosasaurs in this case, and inhabited by a relictual human population—descendents of mutineers from a mythical 18th century British sloop-of-war supplemented much later by the crew of a German submarine. Action shifts between a British university where a herpetologist and museum curator is engaged in a power struggle with a particularly odious American neurobiologist and the island where a liberal feminist government is confronted by a budding neo-Nazi movement that also threatens the mosasaurs. Interspersed through the book are numerous delightful digressions on topics as diverse as the history of the first mosasaur fossils, the last days of the Third Reich, and the raunchy "Hell-fire Club" of Victorian England.

Needless to say, the herpetology is first rate. In the hands of a master of reptilian functional anatomy, the mosasaurs are more believeable than some of the human characters. A colorful snake, evidently an undescribed Bolyerine, reposes on the bare breast of a Polynesian beauty and rates more descriptive prose than the lady. There is a glaring (and deliberate) misuse of the scientific name of a venomous snake—most readers will find it. At the novel's end, the mosasaurs have been formally described and registered for inclusion in the *Red Data Book*. Their island is safe, but one senses cruise ships just beyond the horizon. The herpetologist hero retains his museum and makes the Queen's Honours List.

Many herpetologists will see something of themselves or someone they have known. The story doesn't require too much suspension of disbelief particularly when you realize that *Varanus komodoensis* and *Latimeria* are discoveries of this century. Whether viewed as a tale of science fiction or adventure or a bit of both, this is good reading.

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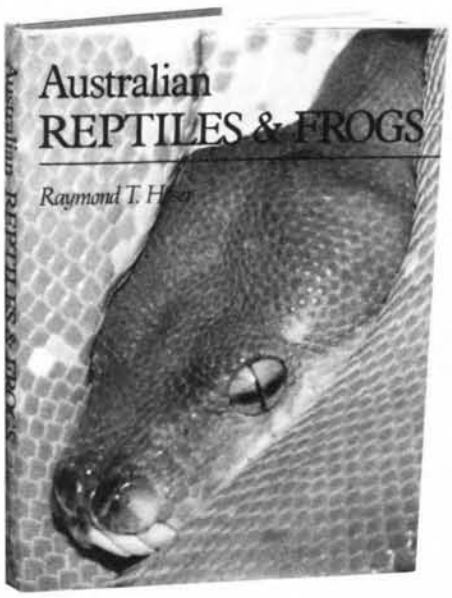




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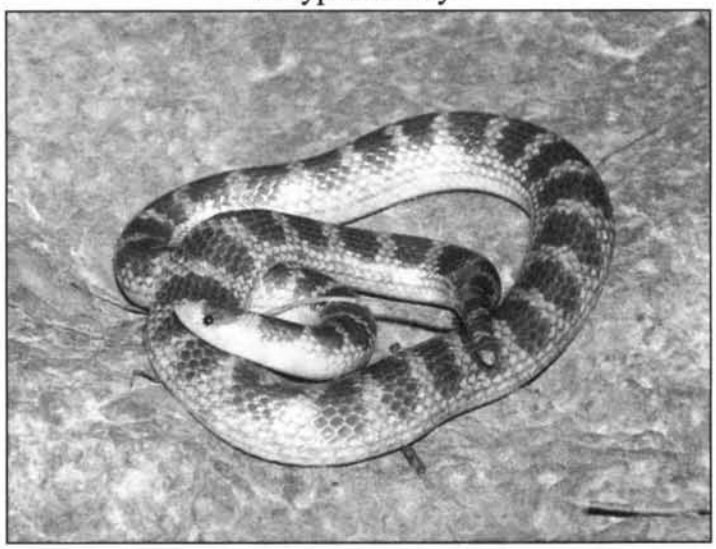
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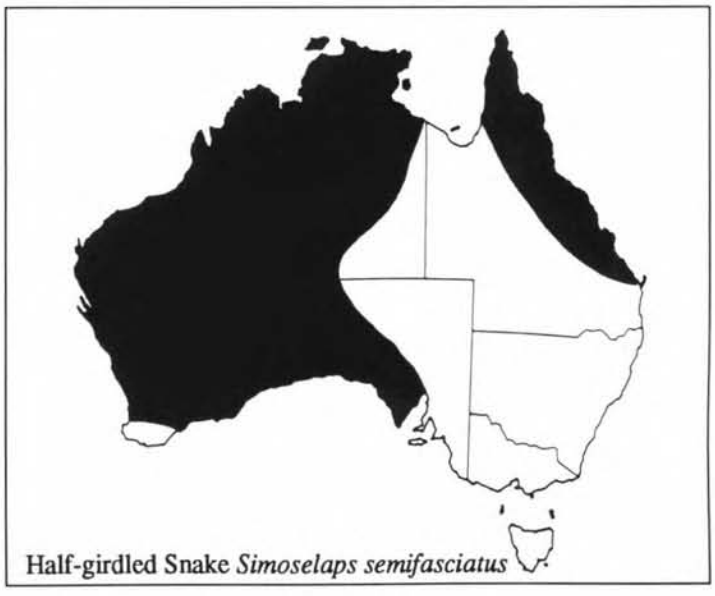
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Half-girdled Snake *Simoselaps semifasciatus*

About the author.

Raymond Hoser has a world reputation for his activities in the field of reptiles. At St. Ives and Redfern, New South Wales, he managed one of the premier reptile captive-breeding facilities in Australia. After a clash with the Parks and Wildlife Service in New South Wales he left his position in 1985, but has continued his herpetological interests and deep interest in conservation. The author is also a highly skilled photographer, as evidenced by the color plates in the book.

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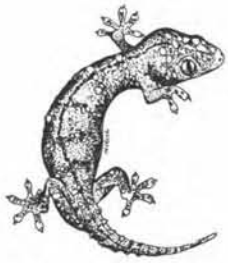
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Herpetological Review

Volume 20 September 1989 Number 3

SSAR BUSINESS

SSAR GRANTS-IN-HERPETOLOGY

Proposals are now being accepted for the 1990 SSAR Grants-in-Herpetology Program. This program is designed to provide financial support for deserving individuals or organizations involved in herpetological research, education, or conservation. In keeping with the Society's goal of encouraging participation of the broadest possible community, preference may be given to individuals who might not have access to other funding sources. All applicants must be members of the SSAR, with the exception of those applying in the REGIONAL HERPETOLOGICAL SOCIETY category. Applicants are limited to submission of one proposal in one category per year. If proposals in any of the categories are not forthcoming, or judged not be of sufficient quality, the funds in those categories may be transferred to other categories. Grant proposals will be considered in the following categories:

1. REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS. Proposals may address educational projects, speaker's fees, regional research, defrayment of one-time-only costs, or other purposes that would strengthen regional societies. Proposals may be submitted by regional herpetological societies or by individual members and must be accompanied by a letter of support from the current president of the regional society.

2. HERPETOLOGICAL RESEARCH OR EDUCATION IN ZOOS. Proposals may address any herpetological endeavor conducted in zoos, such as improvement of displays, husbandry, or behavioral research. A lettter from the director or herpetological curator of the sponsoring zoo must accompany the proposal.

3. CONSERVATION OF AMPHIBIANS AND/OR REPTILES. Proposals should address research on species endangered or threatened at the state, national, or international level, or address research on potentially threatened habitats or species. Proposals must be from individuals only and must be accompanied by a letter of support from another member of the SSAR.

4. FIELD WORK. Proposals may address support for travel to ecological study sites or for survey collections. Proposals normally submitted in the CONSERVATION or GRADUATE STUDENT RESEARCH categories, but for travel (or field station) support, should be submitted here. Proposals for survey collecting are appropriate for this category. Proposals must be from individuals only and accompanied by a letter of support from another member of the SSAR.

5. GRADUATE STUDENT RESEARCH IN HERPETOLOGY. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only. Applications must be accompanied by a letter of support from the student's major advisor or committee chairperson.

Each proposal must include the following: (A) BACKGROUND AND OBJECTIVES of the proposed project. (B) METHODS of carrying out the project. (C) BUDGET, which should not exceed $300. (D) BRIEF RESUME of the applicant or project coordinator. (E) LETTER OF SUPPORT. The proposal must be typed, double spaced, and must not exceed five pages, excluding resume and budget.

Applicants must designate to which of the five categories their proposal is submitted (although the committee reserves the right to reassign categories). All proposals must be submitted in duplicate and postmarked no later than 31 January 1990. Failure to meet the guidelines may result in elimination of a proposal from consideration. The awards will be announced by 1 April 1990. Successful applicants will be expected to submit to the SSAR a written report of the result of this support within a reasonable amount of time after the project year is completed. They are also encouraged to submit the results of research projects for publication in the **Journal of Herpetology** or **Herpetological Review** or to present their findings at the annual meeting of the SSAR. Submit proposals or questions regarding application procedures to:

DARREL FROST, CHAIR
SSAR Grants-in-Herpetology Committee
Museum of Natural History
University of Kansas
Lawrence, Kansas 66045, USA
(913 864-3439)

Financial contributions by SSAR members, institutions, and other benefactors support this program significantly and can increase the number of awards in this program. Your tax-deductible contribution to this program will benefit directly meritorious research and education in herpetology. Contact the President of SSAR for additional information on contributing to the Grants-in-Herpetology Program. If you are employed by an organization that will match donations made to nonprofit organizations, please notify your employer that you have made a donation to the Grants-in-Herpetology Program. ●

REPORT OF THE GRANTS IN HERPETOLOGY COMMITTEE 1989

Committee: Dale Belcher, Arthur Echternacht, Thomas Fritts, Darrel Frost (Chair), Michael Plummer, Eric Rundquist.

In 1989 the Grants in Herpetology Committee reviewed proposals in four categories: Zoo Research (2), Graduate Student Research (17), Conservation (5), and Regional Societies (5). Of these, one in each of the four categories was awarded a grant of $350.

Zoo Research: "Competitive ability of sympatric tadpoles, *Bufo houstonensis* and *Bufo valliceps*." Recipient: Steven B. Reichling, Department of Herpetology, Memphis Zoo and Aquarium, Memphis.

Graduate Student Research: "Evolution of parental care: a multidisciplinary approach in some dendrobatid frogs." Recipient: Ellen M. Smith, Department of Zoology, University of Washington, Seattle.

Conservation: "Studies in the bacteriology of the red-eared slider turtle, *Trachemys scripta*, under ware-housed and wild conditions." Recipient: Barbara Bonner, Department of Microbiology, University of Massachusetts, Amherst.

Regional Societies: "Educational program on the venomous snakes of North Carolina." Recipient: North Carolina Herpetological Society. Project Director: Ann B. Somers, Greensboro, North Carolina. ●

NEWSNOTES

INFORMATION REQUEST

Beginning in 1977, the Vertebrate Pests Committee of the Standing Committee of Agriculture (Australia) has been working to develop guidelines for uniform legislation by all Australian States and Territories, to provide adequate control over the introduction, movement and keeping of vertebrate species not indigenous to Australia. The proposed legislation's objective is to control animal species which are actually or potentially a threat to agriculture, the natural environment or public safety.

As part of these endeavours, lists of species in Australia have been developed and efforts are now being directed towards a rational process of risk assessment. To assist in this process and provide important background data for the reclassification of reptile and amphibian species proposed for importation into Australia, information is requested on the establishment, anywhere in the world, of any species of reptile or amphibian in the wild outside its natural range.

In particular, details are sought on the species concerned, where and when it/they became established, and how the establishment arose (escape, release, etc.). Particulars on the threat posed and steps taken to minimize or halt the damage, would also be of great assistance. Copies of any published accounts of this/these establishments would be appreciated.

Please send to: Chris B. Banks, Curator of Reptiles, Royal Melbourne Zoo, P.O. Box 74, Parkville; Victoria 3052, AUSTRALIA. ●

TOLEDO ZOO SEEKS CURATOR OF REPTILES

The Toledo Zoo, Toledo, Ohio, is seeking to fill the position of Curator of Reptiles. Preference will be given to applicants holding a bachelor's degree (or higher) in biology, zoology, or related field, with an emphasis in herpetology. The Curator will be responsible for acquisition, breeding and maintenance of the collection and supervision of the keeper staff. Previous curatorial experience preferred. Salary range is $24,000-$28,000 with excellent benefits.

Send letter and resume to: Libby Westerhausen, Personnel Coordinator, the Toledo Zoo, 2700 Broadway, Toledo, OH 43609, USA. ●

NEW OUTLET FOR HERPETOLOGICAL PUBLICATIONS IN THE NORTHWEST

In 1988, the membership of the Pacific Northwest Bird and Mammal Society expanded the taxonomic scope of its activities to include amphibians and reptiles. The name of the Society was changed to the Society for Northwestern Vertebrate Biology and the journal, which had been called *The Murrelet* since its inception in 1920, was renamed the *Northwestern Naturalist*.

The journal is now accepting original contributions dealing with the biology of birds, mammals, amphibians, and reptiles in northwestern North America. This is defined as Alaska, Yukon, District of Mackenzie, British Columbia, Alberta, Saskatchewan, Washington, Oregon, Idaho, Utah, Montana, Wyoming and Colorado west of the Great Plains, and Nevada and California north of the Mohave Desert. As a regional journal, the *Northwestern Naturalist* will also publish distributional records of interest, including first and second records of a species for a State, Province, or large biogeographical region.

Address all manuscripts or requests for additional information to:

Frederick F. Gilbert
Editor, *Northwestern Naturalist*
Department of Natural Resource Sciences
Washington State University
Pullman, WA 99164-6410, USA

Submitted by Keith B. Aubry, Associate Editor in Herpetology; U.S. Forest Service, Pacific Northwest Research Station, 3625 93rd Ave. SW, Olympia, WA 98502, USA ●

JOHN GIBBONS TRUST FUND

Dr. John R. H. Gibbons, his wife Lily, and their two children were drowned in a tragic accident near the island of Lakeba, on 15 November 1986. At the time of his death, Dr Gibbons was a Lecturer in Biology at the University of the South Pacific. He had served with the University for eight years.

In memory of Dr. Gibbons' contributions to teaching and research in biology, and to his pioneering efforts in the conservation of local wildlife, the Council of the University of the South Pacific has authorized the institution of a Trust Fund to finance an academic prize or scholarship. The fund will receive private donations and the income arising from investment will be used to finance the prize or scholarship.

Individuals who were acquainted with John, his work, or his family are invited to contribute to this fund. Checks or money orders should be made out to The John Gibbons Trust Fund and sent to: Senior Accountant (Special Affairs), Bursar's Office, University of the South Pacific, P.O. Box 1168, Suva, Fiji ●

MEETINGS

PITVIPER SYMPOSIUM

A Symposium on the Biology of Pitvipers, celebrating the 50th Anniversary of the founding of the Texas Herpetological Society, will be held 17-19 November 1989 at the University of Texas at Arlington. The program will consist of about 18 invited presentations, poster sessions, slide shows, tour of the Dallas and Fort Worth Zoos, and a social, banquet, and auction. Program information and registration material may be obtained from: Jonathan A. Campbell, Department of Biology, UTA Box 19498, Arlington, TX 76019, USA ●

14th IHS

The 14th International Herpetological Symposium on Captive Propagation and Husbandry will be held 20-23 June 1990 in the Dallas-Fort Worth area of Texas. In addition to the paper sessions, there will be several workshops, visits to the renowned Dallas and Fort Worth Zoos, barbecues, and other activities.

A Call for Papers will be issued in December, but individuals wishing to present papers or organize workshops are invited to submit their proposed titles to the symposium organizers at this time.

Individuals who attended IHS meetings over the past two years are on the mailing list and will receive registration material in March 1990. Those who have never attended an IHS meeting, or who have not done so in the last two years and who wish to be added to the mailing list, should contact the symposium coordinator.

Inquiries regarding IHS meetings should be directed to: Dr. Michael J. Uricheck, Symposium Coordinator, Department of Chemistry, Western Connecticut State University, Danbury, CT 06810, USA, (203) - 797-4232, 754-6839 ●

REGIONAL SOCIETIES

CFHS 1989-90 Scholarship Recipient Selected

Each year the Central Florida Herpetological Society awards a full scholarship to someone who has been accepted into the Biological Parks Program at Santa Fe Community College in Gainesville, Florida. Upon graduation from this program, students receive an Associate's Degree in Biological Parks Management and are qualified to work at zoos or other attractions that require exotic animal care.

In the selection of a scholarship recipient, it is important that the student have an interest & background in herpetology. However, students in the Biological Parks Program receive training in the care of a wide variety of animals. We are pleased to announce the 1989-90 scholarship recipient is Charles Jenkins from Eustis, Florida.

Last year's scholarship recipient, Nicole Haff, has graduated from Santa Fe Community College. She is currently employed at Ophiological Services in Gainesville, Florida. ●



Jay Veltkamp, 1989 President of the Central Florida Herpetological Society and Charles Jenkins, this year's scholarship recipient.

SPRING ESHL MEETING

The spring meeting of the Eastern Seaboard Herpetological League will be held on Saturday, 17 March 1990 in Greenville, North Carolina. The meeting will be hosted by the North Carolina Herpetological Society. The program for the meeting, along with information on travel and accommodations, will be mailed to all constituent societies of ESHL by the end of the year. Herpetologists who are not members of a regional herpetological society may obtain information about this meeting by contacting: Dr. Michael J. Uricheck, Department of Chemistry, Western Connecticut State University, Danbury, CT 06810, USA, (203)-797-4232, 754-6839 ●

LEGISLATIVE ALERT

MICHIGAN PROTECTS ITS REPTILES AND AMPHIBIANS

Michigan has been, regrettably, one of the last states to recognize the ecological and economic values of reptiles and amphibians, and the need to conserve and manage this resource. Strict laws have existed for many years to manage and protect fish, birds, and mammals, while amphibians and reptiles have been practically ignored. The Endangered Species Act of 1974 does protect a few species that are either greatly diminished in numbers or are peripheral species in Michigan. However, habitat loss and direct exploitation have reduced many other species which do not yet fit the specific criteria for listing as "endangered" or "threatened." Now, with the passage of Public Act 373 of 1988, the State will have the ability to better regulate the exploitation of reptiles and amphibians. The act may also, indirectly, encourage better public education concerning these animals.

PA 373 amends an earlier act (PA 165 of 1929) and basically declares all fish, reptiles, amphibians, mollusks, and crustaceans to be the property of the State of Michigan, authorizes the regulation of "taking, possession, transportation, size, and sale" of these animals, and provides for licensing and penalties for violations of the act. It states that the animals concerned may only be taken "in a manner and during those times prescribed by the director of the Department of Natural Resources." It requires persons taking or catching turtles or frogs to have a fishing license, and further requires persons taking, trapping, or catching reptiles and amphibians for commercial purposes (e.g. for sale or profit) to purchase an annual license for $150.

The new regulations were prepared by the Fisheries Division, with advice and input from D.N.R. personnel and other knowledgable and interested persons (including professional herpetologists, private individuals, hobbyists, and representatives of Michigan United Conservation Clubs and the Michigan Society of Herpetologists). Some of the more important points contained in the director's order are summarized below:

- Certain rare, declining, or vulnerable species are now protected by law and *cannot* be taken from the wild. These include the Eastern box turtle (*Terrapene c. carolina*), the wood turtle (*Clemmys insculpta*), the spotted turtle (*C. guttata*), the black rat snake (*Elaphe o. obsoleta*), and the cricket frog (*Acris c. blanchardi*). These are all listed as "special concern" species under the Endangered Species Act. Of course, any species listed as officially "endangered" or "threatened" is fully protected (check with the DNR Wildlife Division for an updated list).
- Turtles and other amphibians or reptiles may not be taken with firearms. (Turtle "plinking," a serious problem in some areas, is now illegal.) The order states several methods which may be used, including traps, hook and lines, hand nets, and by hand. Turtle traps must be constructed of mesh at least 1 inch wide, must be set so that trapped animals can breathe, and must bear the user's name, address, and license number.
- Reptiles and amphibians must be possessed and transported in the field in a manner that allows clear identification of species and size. Any such animals taken that are protected, under legal size, or out of season, must be immediately released to the wild.
- Snapping and softshell turtles can only be taken from 1 July to 30 September in the Lower Peninsula, and from 15 July to 30 September in the Upper Peninsula (protecting them during winter hibernation and when breeding or nesting). These species must have a carapace length of 12 inches to be kept. Snappers have a daily and possession limit of 10, except that holders of a commercial reptile and amphibian license may possess up to 30. Softshells have a daily limit of 2, and a possession limit of 6.
- All other reptiles (those not otherwise protected) have a daily catch limit of 2 and a possession limit of 6, except that holders of a commercial license may take up to 25 Eastern garter snakes daily, and may possess up to 50. Reptiles taken from the wild cannot be bought or sold, except that a holder of a *commercial* license can buy or sell animals legally taken and possessed in accordance with the order.
- Reptile eggs may not be disturbed or removed from the wild.
- Frogs and toads can only be taken from the last Saturday in May to 15 November. (These dates were determined by previous legislation.) Salamanders may be taken from 15 March to 15 November. The daily and possession limit for amphibians is 12. A person holding a *commercial* reptile and amphibian license can take or possess up to 200 frogs. A holder of a commercial license may take up to 500 salamanders daily, with a possession limit of 1000. Only the following species of amphibians may be taken for commercial purposes: Leopard, pickerel, green, and bull frogs, and tiger, spotted, and blue-spotted salamanders, mudpuppies, and newts.

The regulations summarized above took effect in spring, 1989.

JAMES H. HARDING
Michigan State University
East Lansing, MI 48824, USA ●

MINNESOTA REMOVES RATTLESNAKE BOUNTY

The Minnesota Legislature voted to eliminate the payment of bounties on rattlesnakes by county or township governments. The governor signed the bill on 9 May 1989 and it took effect on 1 August 1989. The bounty had been in the state statutes for over 50 years. There were four counties in the southeast corner of the state still paying bounties.

The legislation was introduced and promoted by the Minnesota Herpetological Society with assistance from the Nongame Wildlife Program of the Minnesota Department of Natural Resources. ●

FEATURES

ANALYSIS OF A *Python anchietae* FAECAL SAMPLE

Only a single report on the natural diet of the Angolan dwarf python, *Python anchietae* appears in the literature (Steyn and Els 1963). Additional information on the feeding habits of this species is therefore of considerable value.

Python anchietae is a small, rare python associated with the hills and mountains of the Namibian and southern Angolan escarpment. The southern limit of its range is 22° S. The only available record on the natural diet of this species (Steyn and Els 1963) reports recovery of the head of a gerbil, *Tatera schinzi* (= *T. leucogaster*, the bushveld gerbil; see Meester et al. 1986) from the stomach of a dead specimen.

Steyn and Els (1963) also reported feeding a captive specimen on the sparrow, *Passer jogoensis motitensis*. Since no sparrow with this species name has been described, the author (or publisher) may have misspelled *iagoensis*. Also the subspecies, *motitensis* does not appear to have been formally described. Howard and Moore (1984) give the distribution of *Passer iagoensis* as the Cape Verde islands, so it would appear that the referred-to species is most probably the great sparrow, *P. motitensis benguellensis* (Howard and Moore 1984; Maclean 1985). The main diet of specimens at the Transvaal Snake Park, where a captive breeding programme is in operation, is the multimammate mouse, *Mastomys natalensis* which is readily taken (Morgan, pers comm.).

On 25 June 1985, a female *Python anchietae* (snout-vent length = 915 mm; tail length 106 mm) was donated to the Transvaal Snake Park after being collected in southern Angola and confiscated by the Directorate of Nature Conservation. Shortly after its arrival at the Park the specimen defecated and the sample was stored in 70% alcohol until analysis in November 1988.

Analysis of the faeces at X16 revealed the following:

Feathers: The bulk of the sample consisted of feather remains which were very broken up by digestive action. As no reference collection for this type of material was known to the author, detailed chemical and electron microscopic analysis were not carried out. Day (1966) considered the nodes on the downy barbules of covert feathers to be diagnostic to order level. An examination of covert feathers from orders such as Galliformes, Columbiformes and Passeriformes showed that there were distinct differences in the nodes and the pigmentation at the nodes of the barbules. Microscopic comparisons with the feather remains in the faecal sample indicated that these remains were Passeriformes and of the genus *Passer* (Ploceidae).

Hair: Identification was based on the negative cuticular scale patterns of hairs which were produced on gelatin-coated slides after Day (1966), Brunner and Coman (1974), Douglas (1985 and 1988 unpublished) and

Keogh (1985). Final identification was based on a negative cuticular scale pattern reference collection, compiled from hairs in the National Museum Mammalogy Department study skin collection. Work being done on other species by the author has shown that a large amount of dietary information may be lost in studies of this type by not identifying the hair portion and that up to 70% of this information may be lost, particularly from intestinal and stomach remains. Examination of the sample revealed only 11 individual pieces of hair. Owing to the fact that the majority of the hairs were only pieces of hair or not guard hairs (on which this type of identification is based), only one positive identification was possible, namely that of an elephant shrew, Macroscelididae. It was not possible to be more specific because: (a) R. Parker (1985, pers. comm.) found that while working on Macroscelididae guard hairs, there were no defining morphological characters which enabled identification to below family level, and (b) Distribution records for Macroscelididae in southern Angola are very incomplete.

Other recognizable items: Twelve teeth of the python were found in the sample and were either swallowed during tooth replacement or were lodged in the prey items when these were caught or swallowed.

A portion of chitinous insect remains was also present, but these were regarded as secondary items, possibly from the Macroscelididae specimen.

Fairly large amounts of very fine quartz gravel were evident and were most probably ingested while swallowing prey or were present in the digestive tracts of prey items.

The results of this analysis indicate that birds and small mammals are eaten by *Python anchietae* in the wild. The feather, mammal hair and other limited feeding data available, would also imply that *Python anchietae* is an opportunistic feeder.

ACKNOWLEDGMENTS

I would like to thank R. Boycott, formerly of Transvaal Snake Park, for supplying the sample; D. Morgan, present Curator of Transvaal Snake Park, for information relating to the specimen; and R. Parker, formerly of the Mammal Research Institute, University of Pretoria, for his valuable information on Macroscelididae hair identification. I would also like to thank S. Louw and M. Bates of the National Museum of commenting on the manuscript.

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ROD DOUGLAS
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HERPETOLOGY AT THE SAVANNAH RIVER ECOLOGY LABORATORY

Over 200 herpetological research publications have been generated by the resident staff, students, and affiliates of the Savannah River Ecology Laboratory (SREL). SREL is operated by the University of Georgia under contract with the U.S. Department of Energy (DOE). Although well-equipped for controlled organismal and population research in laboratory and outdoor seminatural enclosures, SREL is particularly conducive to field research. It is located on 483 km² of protected, DOE-owned land in South Carolina called the Savannah River Site (SRS). The SRS is bordered on the southwest by the Savannah River and encompasses parts of Aiken, Barnwell, and Allendale Counties, about 40 km SE of Augusta, Georgia. Although the SRS's prime function is the production of radionuclides, the site is designated as a National Environmental Research Park. Hence, long-term research can be done on much of the SRS without the threat of habitat destruction or public interference, particularly at the exclusive SREL research areas. More than 8100 ha have been declared by DOE as research set-aside habitats that are protected from industrial development and forestry programs.

The SRS is within the sandhills region of the Upper Coastal Plain, about 32 km downslope from the Piedmont and 32 km upslope from the Lower Coastal Plain. Possiblities for field research are enhanced by the diversity of terrestrial habitats on the SRS. Many old fields, abandoned since 1951, are now either pine plantations (58000 ha) or turkey oak-long leaf pine associations (2000 ha). Terrestrial communities also include scattered stands of upland hardwoods (1000 ha), more extensive lowland hardwood forests (8000 ha), and, nearer the Savannah River, cypress-black gum forests (2000 ha).

Some of the best herpetological research opportunities on the SRS have proven to be in and along the many aquatic environments on the SRS (see Representative Publications). Notable are the numerous streams and more than 190 Carolina bays, the natural, lentic freshwater wetlands of the region (average size is 2.7 ha, range 0.1-50 ha). Some Carolina bays retain water almost permanently, whereas most are ephemeral. Swamps (3000 ha) and floodplains along the Savannah River, farm ponds, and four reservoirs are also available for research.

The diversity of habitats, mild climate, and extensive herpetological field research for more than 20 years are the primary reasons for the recorded capture and documentation of more than one million individuals and 100 species of amphibians and reptiles on the SRS. The plethora of research possibilities presented by so many species is demonstrated by the diversity of research of the two herpetologists in permanent residence at SREL, J. Whitfield Gibbons and Justin D. Congdon, and the large number of post docs, technicians, graduate students, visiting faculty, and undergraduates.

Dr. J. Whitfield Gibbons (representative publications 1, 2, and 3) has been investigating questions concerned with the life history and evolutionary ecology of freshwater turtles. The studies are formulated in a manner to apply basic biological research findings to local or natural environmental problems that address contract obligations of funding agencies and organizations. Some of the major habitats in this program have been the Carolina bays known as Ellenton Bay, Flamingo Bay, and Lost Lake, and the reservoir known as Par Pond, all on the SRS. Dr. Gibbons has also conducted long term research at Sherriffs's Marsh in southwestern Michigan, in association with Michigan State's Kellogg Biological Station. Recent accomplishments include the completion of *Life History and Ecology of the Slider Turtle* (Smithsonian Institution Press, in press). The 10000 marked turtles on the SRS are the focus for continued field observations of and experiments on turtles. Dr. Gibbons attributes the success of the program to the involvement of numerous colleagues, especially Judy Greene. Othes recently involved directly in the turtle studies are Tony Mills, Marie Fulmer, Jeff Lovich, Steve Morreale, Tim Owens, and Sarah Collie.

Dr. Justin Congdon, also a SREL staff herpetologist, is examining parental investment and developmental energetics of embryos of turtles, snakes, lizards, and alligators on the SRS. His results indicate that at least half the lipids present in the egg are available to the offspring after hatching, hence these lipids can be considered a form of parental care (publication number 4). Dr. Congdon also uses a multi-year, repeated-capture study of turtles on the George Reserve in Michigan to investigate life history evolution of long-lived organisms (numbers 5 and 6).

Trip Lamb, a post-doc with Whit Gibbons, has examined the effect of hybridization of the genetic architecture of anurans (7) and uses mitochondrial DNA analysis to address zoogeographic variation in the turtle genera *Xerobates* (8), *Malaclemys*, and *Graptemys*. He also uses flow cytometry to study genetic damage of nuclear DNA in turtles (*Trachemys scripta*) inhabiting radioactive seepage basins on the SRS (9).

Roger Anderson (10), a post-doc with Justin Congdon, is working in the turkey oak-longleaf pine woodlands on the SRS, studying the daily patterns of thermoregulation, movement, prey capture and metabolism of

lizards which differ in food acquisition modes. In the lab, Dr. Anderson is using locomotory performance measures to investigate the adaptedness of lizard body form as it relates to food acquisition mode and predator evasion requirements.

Several graduate students are pursuing Ph.D. research at SREL. Robert "Bud" Fischer, technician with Justin Congdon and Ph.D. student at Clemson University, has been collaborating with Dr. Congdon on aspects of parental investment in reptiles and fish. Bud has also been working with several visiting faculty on numerous aspects of the physiology of alligators. Jeff Lovich (3, 11, & 12), University of Georgia Ph.D. candidate under Dr. Gibbons, is investigating sexual size dimorphism and sexual dichromatism in turtles, focusing on effects of sexual selection and natural selection on the evolution and maintenance of sexual size dimorphism in *Trachemys scripta* and *Malaclemys terrapin.* Joe Pechmann (13 and 14), technician with Dr. Gibbons, and Ph.D. candidate from Duke University, under the direction of Dr. Henry Wilbur (Duke University) and Dr. Gibbons, is developing terrestrial and aquatic field experiments on ambystomatid salamanders. He is using large-scale enclosures adjacent to two Carolina bays to analyze regulation of population sizes and community structure in larval and adult amphibians. David Scott (14, 15 & 16), a technician under Dr. Gibbons, and Ph.D. student at the University of Virginia, working with Dr. Gibbons and Dr. Ed Connor (University of Virginia), is also using large-scale enclosures for aquatic field experiments in two Carolina Bays. He wants to determine the effects of intraspecific and interspecific larval interactions on larval and adult traits in *Ambystoma opacum* and *A. talpoideum.* Thomas Hinton (16), Ph.D. candidate at Colorado State University under Dr. Ward Whicker and Dr. C. Richard Tracy, is working with Dr. John Pinder, a radioecologist at SREL. Tom uses radioactive tracers to examine the assimilation and retention of radium, strontium, and calcium in *Trachemys scripta* as influenced by age, sex, season, and stable calcium in the diet.

Three Masters students are currently working with SRS reptiles. Ray Lorraine (University of South Florida) studies the foraging ecology of *Seminatrix* at Ellenton Bay. Laura Brandt (Florida International University) is examining population structure and density of *Alligator mississippiensis* in Par Pond Reservoir. Dave Penick (SUNY, Buffalo) is examining daily field metabolism and thermal ecology of *Terrapene carolina* in bottomland hardwoods.

SREL also provides research opportunities to visiting herpetologists. Some receive a stipend and travel expenses through cooperative research programs between SREL and the Oak Ridge Associated Universities Program. No fewer than a dozen visiting faculty have been involved in herpetological research at SREL in the past two years.

One such visiting faculty is Ray Semlitsch (Memphis State University) who is continuing work on ecological and genetic consequences of paedomorphosis in *Ambystoma talpoideum* from the SRS (14, 17 & 18). Drs. Semlitsch and Gibbons have also completed a field guide to the reptiles and amphibians of the SRS, due for publication in 1989. Rich Siegel (Southeastern Louisiana State University) is also a visiting faculty who recently finished a post-doc under Whit Gibbons (19 & 20). He has been examining the life history and population ecology of aquatic and terrestrial snakes: *Nerodia taxispilota, Seminatrix pygaea,* and *Coluber constrictor.* He and Mary Jackson (Master's candidate at Memphis State University) have recently completed work on the effects of temperature on the locomotor ability of *Seminatrix.*

Dr. William Cooper (Auburn University at Montgomery) and Dr. Laurie Vitt (UCLA) have published 20 papers in the past five years from research performed as visiting faculty at SREL (see 21 and 22; Dr. Cooper has several more with Dr. William Garstka, University of Alabama) on various aspects of *Eumeces* biology such as reproduction, lipid cycling, diet, chemical communication, and sexual selection. Drs. Garstka and Cooper have been working with Jeff Lovich in examining the efficacy of using castrated and hormonally implanted *Trachemys scripta* for mate-choice experiments. Dr. Neil Ford (University of Texas, Tyler), in collaboration with Rich Siegel, has used laboratory experiments to study how foraging success affects the reproductive potential of *Thamnophis marcianus* and *Elaphe guttata* (19 and 20). Dr. Gordon Ultsch (University of Alabama) has recently completed work at SREL on aspects of the physiology of the respiratory and circulatory systems in musk turtles and box turtles (23).

Still more visiting faculty are collaborating with researchers at SREL. Dr. Nat Frazer (Mercer University) has worked with Dr. Gibbons during the last three years on age-dependent growth models in turtles. Dr. Jim Spotila (Drexel University) has been working closely with his student Dave Pennick on *Terrapene carolina,* and continues to be interested in temperature-dependent sex determination in reptiles. Dr. Robert Gatten (University of North Carolina) and Justin Congdon have recently completed a study of anaerobic metabolism in nesting *Chrysemys picta.* Dr. Gatten, Dr. Frank Mazzotti (University of Florida), Dr. Congdon, and Bud Fischer have been examining the anaerobic component of sustained and burst activity in *Alligator mississippiensis.* Dr. Mazzotti has also been working with Dr. Gatten, Bud Fischer and Dr. Congdon on parental investment in alligator embryos as affected by temperature. George McCoy (Benedict College) is collaborating with Bud Fischer and Dr. Congdon on the effects of temperature on the rates of metabolism and development of alligator embryos.

SREL has other attractions. Top quality undergraduates come to SREL from all over the United States under the auspices of the SREL/DOE Cooperative Research Program. Each student participates in research for 10-12 weeks. More than a dozen SREL publications in herpetology have been a consequence of undergraduate projects. Graduate students can also be supported through this program to conduct their research for up to three years. The invited seminar program at SREL brings in a total of about two dozen herpetological seminars each year. The SREL library has 135 journal titles and many books relevant to ecology; a rapid interlibrary loan arrangement with the main campus fills the need for other references. The 16 other faculty members at SREL (all ecologists, in such fields as plant ecology, biogeochemistry, ornithology, mammalogy, ichthyology, aquatic invertebrate ecology, and microbial ecology), their post-docs, graduate students, technicians, and colleagues also help create a bustling academic environment. There are many reasons, indeed, for the exemplary ecological research in herpetology at this dynamic institution.

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INCONSISTENCIES, INACCURACIES, AND INADEQUACIES IN HERPETOLOGICAL METHODOLOGY AND TERMINOLOGY, WITH SUGGESTIONS FOR CONFORMITY

The responsibilities of scientists include being objective, finding truth, organizing to prevent chaos, and establishing accuracy and consistency. Communication is difficult enough; language may have several meanings for the same word, several spellings for the same pronunciation, several pronunciations for the same spelling, and so on. Herpetology has its own peculiar flaws, some of which form the subject matter of this report.

First, consider higher category nomenclature—it needs stabilization. For example, compare usage such as Caudata vs Urodela, Salientia vs Anura, Testudines vs Chelonia vs Testudinata, Sauria vs Lacertilia, all names of wide usage, but shamefully not subject to the restrictive rules that we apply to family group names via the International Code of Zoological Nomenclature. Very few authors cite authorities for the higher taxon names. These dualities are the subject of another manuscript that I have in preparation.

Where do we learn terminology and methodology? From our mentors? From textbooks? From literature? From our own researches? Regardless of how, the fact is that we often do things differently without defining our methods clearly, or we blindly follow something we have read without examining its accuracy. And we omit because we follow someone else's format. Below I provide examples with suggestions for correct usage or improvement.

OMISSIONS

Many papers fail to give maximum or minimum sizes for specimens: identification is often assisted when size range is known, and additionally our curiosities are sated. Many papers give only total length or body length (the latter especially in salamanders) and may not clearly state what the length figure represents, e.g. Rossman and Wallach (1987) merely say "length"; Vermersch and Kuntz (1986) say "body length" for *Leptotyphlops* but simply say "length" for others; Martof et al. (1980) give total length for anurans and carapace length for turtles, but only total length for other groups; Salthe (1973) and Anderson (1969) omit length entirely. Few articles give allometric growth data. In Salamanders, length ratios (e.g., tail to body) typically change from juvenile to adult; such changes are useful in systematics and help explain adaptive or ecological functions.

How often does an investigator give scale count data in relation to size or age of specimens? Dunn (1942) and Inger (1943) offered ideas on survival value of varietal characters. Abnormal ventral or subcaudal scale counts are more likely in juveniles, which may die off early and thus would have different count ranges or frequencies. I recommend that meristic data be presented for different size groups (or age groups) either as statements of range or, more ideally, as graphs for the count distribution of the different groups.

METHODOLOGY

Many workers, certainly amateurs, get their nomenclature and measurement methods from popular field guides or compendia texts. Are these reliable sources of methodology? Let's compare and make a determination. Conant (1975) shows snout-vent length in salamanders as being from tip of snout to distal end of vent. Stebbins (1985), in the

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same guide series, does not define or show how S-V length is determined, but obscurely in the text he says snout-to-vent, which suggests proximal end of vent. The major text on salamanders (Bishop 1943) usually said total length and tail length, but on occasion would say length to posterior end of vent. Duellman and Trueb (1986), Porter (1972), and Goin, Goin, and Zug (1978) give no details on S-V length, thus a logical source of definition would seem to be Peters (1964). This latter reference states that the main use of the term S-V length is to the posterior end of the vent, occasionally to the anterior end. An unusual approach to the problem appears in Pfingsten and Downs (1989). They used "standard length" for data known to be based on snout to posterior angle of the vent, "snout-vent length" for measurements known to extend only to the anterior angle of the vent *and* for data gleaned from publications where authors did not specify their method of measuring body length. Obviously the latter interpretation does not provide readers of original papers of the Pfingsten and Downs accounts with unqestionably known measurements.

To eliminate inconsistent usage I recommend that in salamanders body length is tip of snout to posterior end of the vent, inasmuch as the cloaca, for which the vent is the outlet, is a derivative of the body, and tails rarely break off at the anterior end of the vent.

TERMINOLOGY

Gravid. Does this mean the same as pregnant? When a eutherian mammalian egg is fertilized and is *in utero* we say "pregnant." Eggs of amphibians and reptiles may become quite large and an animal carrying large, unfertilized ova is conspicuous externally or when opened; here "gravid" is a more appropriate term. If the ova are fertilized and are carried in the fashion termed "ovoviviparous," then pregnant seems the better term.

In the discussion of salamander S-V length I spoke of the cloacal opening or vent. In reptiles we normally identify the tail as beginning where the cloacal opening is situated, and here we have considerable awkward usage—the term "anus." Peters (1964) did not define anus, but in morphology the term means the terminal outlet of the alimentary tract, hence in mammals the end of the rectum. But in amphibians and reptiles the terminal part of the alimentary tract per se enters the cloacal chamber. Herpetologists refer to the outlet from the chamber as "vent" in salamanders, "anus" in frogs, toads, and reptiles. But the cloaca is a chamber into which digestive, reproductive, and urinary tracts may empty. Thus because the terminus of the digestive tract, the anus, is within the cloacal chamber we need a distinct term for the cloacal outlet.

Salamanders and crocodilians have longitudinal cloacal outlets, frogs, toads, caecilians, and turtles have circular openings, and snakes and lizards have transverse openings. The term "vent" certainly would be acceptable, with all references to body length therefore confined to snout to posterior end of vent. But because so many references to anus and vent are undefined I propose that we be definitive and say that body length is from tip of snout to posterior end of cloacal aperture in amphibians, turtles, and crocodilians, and in snakes and lizards we would say tip of snout to posterior end of scute covering the cloacal aperture.

We also have a peculiar adaptation of the adjectival term "anal." What is the name of the large scale that covers the cloacal aperture in a snake or most lizards? Virtually all herpetologists use the term "anal plate" or a comparable term such as "anal scute," "anal shield," or "anal scale," or just "anal." Peters (1964) gives the term "anal" (= anal plate) as the "terminal plate in the ventral series in snakes, usually larger than ventral scales..." and some varied synonyms. Peter (1972), at least, said cloacal or anal scale or shield. I object to the term "anal" for the same reason as I did in discussing S-V length. The term "anal" should be replaced by "cloacal" or "vent"; my preferred term would be "cloacal scute" or "cloacal scale."

But the term "cloacal" or "vent" alone does not solve the problem. Reptile bodies are covered by epidermal derivatives that we call scales, scutes, shields, etc., and dermal derivatives that are bone. Peters (1964) tells us that a plate is a large scale, but indicates that it has been used for bony elements of the turtle shell in contrast to the epidermal elements. Various herpetologists discussing turtles have used the term "epidermal laminae," "shield," "scute," and "horny laminae" for epidermal components, and the terms "plate" or "bony plate" for the bones of the shell.

Inasmuch as the dermal elements of the turtle carapace originate as flat, platelike elements separate from the chondral bones with which they may unite, I suggest that those dermal components be called bony plates to clearly distinguish them from the epidermal derivative. If we abandon the term "plate" in application to epidermal derivatives we need only to consolidate terminology of the epidermal elements.

The term "laminae" used by Carr (1952) was rejected by Zangerl (1969) because "lamina, e.g., Lamina cribosa" is a term used for bony sheets or plates in anatomy. Therefore I believe we should not apply "lamina" to epidermal elements. That leaves us free with shield, scale, and scute as possible synonyms for the epidermals.

The Squamata and the Testudines have large (an arbitrary value) epidermal elements that closely adhere to and cover bones, as, e.g., on top of the head. For these I have no objection to the term "shield," but a shield nevertheless is a scute or scale. Peters (1964) defined a scute as a large scale usually meaning much the same as plate, lamina, shield, and a scale is epidermal in his definition. Therefore I suggest that we restrict the term "shield" to large scales that are closely adherent to and cover bones. Large scales atop the head of snakes, lizards, and turtles can be called shields, much as the epidermal elements such as appear on turtle shells. For the scales of the soft snake or lizard body the term "scale" or "scute" suffices. In lizards, scales containing osteoderms probably should be said to be shields. Some scales, e.g., labial series, may pose a problem of usage. This would be negated if we get rid of the term "shield" and confine ourselves wholly to scute or scale for all epidermal derivatives.

The scutes of the belly of snakes and lizards have been referred to by several names: belly scales, gastrosteges, ventrals, but fortunately we seem to have stabilized at ventrals. But for the underside of the tail we have a problem. Conant (1975) used the term "subcaudal," sometimes shortened to "caudal." Stebbins (1985) used caudals. As I see it, any scale on the tail is a caudal, hence the appropriate term for those that we normally count on the underside of a squamate tail is "subcaudal." Some Australian herpetologists use an archaic term, urostege, which though understood to be the equivalent of subcaudal is really nonrestrictive because "uro" means "tail" and "stege" means "covering" (cf gastrostege, which is restrictive because the meaning "belly covering" is definitive). Thus I reject urostege as a synonym of subcaudal because the term could apply to any tail scale.

NOMENCLATURE OF TURTLE SHELL EPIDERMAL AND DERMAL COMPONENTS

Shell component nomenclature is badly confused and variable. Zangerl (1969) supposedly solved the dilemma, but subsequent usage has been diverse. Table 1, a compilation of terminology from various books and monographs, shows much of the variation in terms utilized. For example, the first median scute of the carapace has been called precentral, neural, cervical, and nuchal. For this and other scutes no clear consensus can be determined. Perhaps the most impressive



comments for a set of nomenclatural terms was given by Pritchard and Trebbau (1984). They stated that Zangerl's term "cervical" for a scute has little following. They did not like Zangerl's term "pleural" for a scute because that term is used more familiarly for underlying bones—the lungs are pleura, thus the bone closer to the lung should be a pleural. Scutes are closer to the more superficial ribs or costae, hence scutes should be costals. They also preferred to maintain Greek nomenclature for carapace bones and Latin names for scutes (but note that they are flawed in use of "nuchal," a Latin derivative, for both a bone and a scute). Whether we use Latin or Greek seems immaterial; latinization is the only necessity to conform to the language of biological nomenclature. I therefore propose the following set of names for carapacial elements (see Fig. 1):

BONE: proneural, neural, suprapygal (over the pelvic area), pygal, pleural, peripheral.

EPIDERMAL SCUTES: nuchal, vertebral, supracaudals for the last scutes on the margin and equivalent to what some might term "marginal 12," (11th in kinosternids, 13th in *Caretta*), costal, marginal. A few minor alterations will be needed to accommodate certain pleurodires.

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EPIDERMAL

ELEMENT	CARR 1952	PETERS 1964	ZANGERL 1969	COCHRAN-GOIN 1970	WEBB 1970	GOIN-GOIN 1971	ERNST-BARBOUR 1989 1972	PORTER 1972	CONANT 1975	MOUNT 1975	GAFFNEY 1977	DOWLING-DUELLMAN 1978	GOIN-GOIN-ZUG 1978	ROSSMAN ET AL. 1979	PRITCHARD-TREBBAU 1984	WARD 1984	STEBBINS 1985	ERNST-BARBOUR 1989	PROPOSED
1ST MEDIAN	PC	NU	CV	PC	NU	PC	CV	PC	NU	NU	CV(NU)	CV	CV	PC	NU	NU[1]&CV	NU	CV	NUCHAL
MEDIAN	CE	CE	V	CE	V	CE	V	CE	V	V	V		V	CE	V	V	V	V	VERTEBRAL
LAST MEDIAN	CE	CE	V	CE	V	CE	V	CE	V	V			V	CE	V	V	V	V	VERTEBRAL
MARGIN	M	M	M	M	M	M	M	M	M	M			M	M	M	M	M	M	MARGINAL
12TH MARGINAL	POC	M	M-12	POC	M	POC	M	POC	M	M		SCA[2]	M	POC	SCA	M	M	M-12	M-12
LATERAL	L	C	PL	L	C	L	PL	L	C	PL			PL	C	C	PL	C	PL	COSTAL
EPIDERMAL UNITS	EL	EL	SH	LA	SC	EL	SC	HL	SC	SC		SC	SC	LA	SC	SC	SH	SH	SCUTE

BONE

1ST MEDIAN	PN	NU	NU	PN		PN	NU	PN(NU)				NU	NU	NU	NU[3]			NU	PRONEURAL
MEDIAN	NE	NE	NE	NE		NE	NE	NE				NE	NE	NE	NE			NE	NEURAL
LAST OVER VERTEBRA	SP	SP	SP	SP		SP	SP	SP				SP	SP	SP	SP			SP	SUPRAPYGAL
MARGIN	PE	PE	PE	PE		PE	PE	PE				PE	PE	PE	PE	PE		PE	PERIPHERAL
LAST ON MARGIN	PY	PY	PY	PY		PY	PY	PY					PY	PY	PY			PY	PYGAL
LATERAL	PL	C	C	PL		PL	C	PL				C	C	PL	PL			C	PLEURAL
DERMAL UNITS	B	B	B	B		B	B	BP				B	B	P	B	B		B	BONY PLATE

B BONE
BP BONY PLATE
C COSTAL
CE CENTRAL
CV CERVICAL
EL EPIDERMAL LAMINA
HL HORNY LAMINA
L LATERAL
LA LAMINA
LLA LATERAL LAMINA
M MARGINAL
NE NEURAL
NU NUCHAL
P PLATE
PC PRECENTRAL
PE PERIPHERAL
PL PLEURAL
PN PRONEURAL
POC POSTCENTRAL
PY PYGAL
SC SCUTE
SCA SUPRACAUDAL
SH SHIELD
SP SUPRAPYGAL

[1] REFERS TO NUCHAL NOTCH [2] BATAGURINAE [3] MARGIN 1 IN PLEURODIRES

Table 1. Nomenclatural applications of turtle epidermal and dermal elements. Sources are identified in Literature Cited.

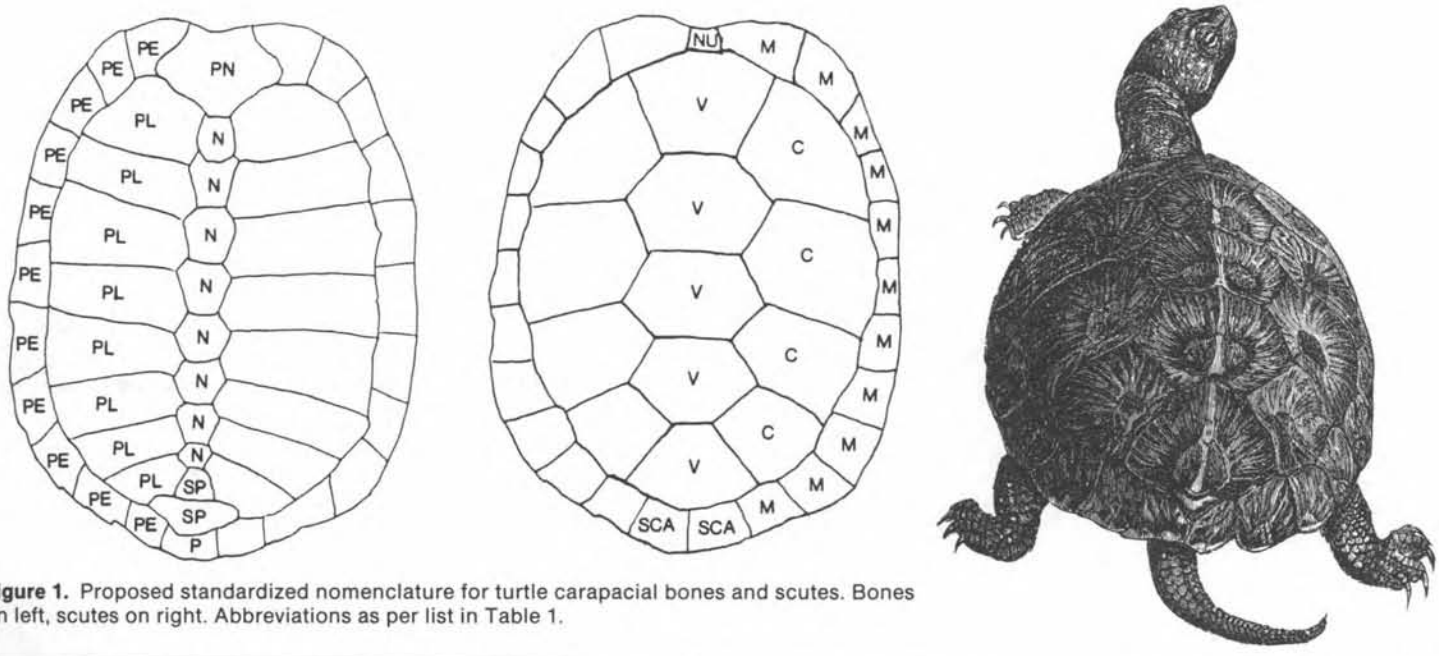


Figure 1. Proposed standardized nomenclature for turtle carapacial bones and scutes. Bones on left, scutes on right. Abbreviations as per list in Table 1.

NOTES ON THE NESTING ECOLOGY OF *Platemys macrocephala* IN THE BRAZILIAN PANTANAL

Platemys macrocephala occurs from the Pantanal and Rio Paraguai in southwest Mato Grosso, Brazil to northeast Paraguay and northeast Bolivia (Rhodin et al. 1984). The only information on reproduction of this species is based on Rhodin et al. (1984) who examined fifteen specimens and estimated the breeding season.

Here we present nesting data based on active nests which we found by walking on the banks of marshes, bays and burrow pits distributed along the Trans-Pantanal Highway at the Rio Alegre ranch (56° 59'W, 17° 16'S), in the Pantanal, municipality of Poconé, Mato Grosso, Brazil. The Pantanal is a large (100,000 km²) seasonal swampland. The climate and habitat characteristics have been described by Prance and Schaller (1982) and Cintra (1985 a, b; 1987).

We recorded the habitat, location and dimensions of nests (Table 1), eggs (Table 2), and the dimensions of adults and a hatchling that hatched in captivity (Table 3). Oélio Falcão found a nest under construction in April. We examined two nests found in clay soil on the margins of a marsh and one in sandy soil in an abandoned pasture. One individual was observed building a nest at 1800 h. The turtle urinated, softening the soil and dug a hole with its hind legs. Of the two nests found in clay soil, one was under construction and the other had been destroyed by a predator (Crested Caracara, *Polyborus plancus*) which had eaten 50% of the eggs. The eggs of this nest were in two layers. The four surviving eggs were in the deepest part of the egg chamber, and were collected and maintained in a small box with cottonwool. One young hatched after six months. The upper part of the carapace, plastron and sides of neck were covered in orange/red patches. The pupils were gray and the iris buff.

Clutch size ranged from four to eight eggs/nest. Eggs were completely white, rounded and about three cm in diameter. The egg mass varied between 11 and 20 g (Table 2). The eggs have a porous surface and the shell is about 0.4 mm thick.

Three adult females and one adult male were collected from the wild and placed in captivity. All females laid eggs in captivity but the eggs were eaten by lizards (*Tupinambis* sp.). The adult female of 29.5 cm carapace length (Table 3) is the largest size recorded so far for this species.

The data presented here suggest that *Platemys macrocephala* starts breeding in the Pantanal near the end of the wet season (April-May) when the flooding of the Pantanal starts to recede, confirming the prediction of Rhodin et al. (1984).

Because *P. macrocephala* starts nesting at the end of the wet season, the eggs are exposed to high temperatures (up to 50° C at the surface of the soil) and low soil moisture during the dry season (June to November). The hard, calcified and relatively impermeable shells may be important to protect the embryos from dessication. Heavy rains occur in the Pantanal between December and March (Schaller and Crawshaw 1980; Cintra 1987) and we believe that it is in this period, when the soil is soft, that most hatching occurs.

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Table 1. Habitat and dimensions at nests of *Platemys macrocephala*

NEST	1	2	3
	22/05/85	17/05/85 *	28/08/85
Substrate	Earth	Earth	Sand
Distance from water (cm)	80	200	250
Condition	Partially preyed	Building	Preyed
Height above water level (cm)	16	30	35
Temperature in the chamber	32° C	-	-
Air temperature	30° C	-	-
Size			
Length (cm)	11.2	6.5	10.5
Width (cm)	7.5	6	8.6
Depth of chamber (cm)	8	4	10
Number of eggs	8	0	4

*A nest was seen being built one month before at the same site.

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Table 2. Sizes of eggs of *Platemys macrocephala*.

		LENGTH (mm)	WIDTH (mm)	MASS (g)
Nest number 1		31.5	30.5	18.5
		31.5	31	18.5
		32.5	31	19
		32	31	19
	$\bar{x} \pm$ SD	31.8 ± 0.41	30.8 ± 0.21	18.8 ± 0.22
Laid in captivity				
Female 1		30.5	29.8	20
		30.5	29.7	19.5
		30.2	29.7	19
		30.9	29.3	19
	$\bar{x} \pm$ SD	30.5 ± 0.24	29.6 ± 0.19	19.3 ± 0.41
Female 2		28.5	26.5	13.5
		28	26.3	12
		29	26.5	13
		29.5	26	12
		28.8	25.8	11
		28	26.5	12
	$\bar{x} \pm$ SD	28.6 ± 0.53	26.3 ± 0.27	12.2 ± 0.80
Female 3		30	30	14.5
		30.3	29.5	15.5
		31	30.5	16
		29.5	29.5	15.5
		30	29.8	17
		30.5	30.4	17.5
		30.5	29.8	16
		31.3	31	16
	$\bar{x} \pm$ SD	30.4 ± 0.52	30 ± 0.49	15.7 ± 1.09

Table 3. Dimensions of a young and adults of *Platemys macrocephala*.

AGE	SEX	CL (cm)	CW (cm)	CH (cm)	PW (cm)	PL (cm)	HW (cm)	MASS (g)
Hatchling	?	3.8	2.6	0.9	2.4	2.7	1.3	10
1. Adult	F	26.5	19.5	10.5	17.5	24	5.7	2.507
2. Adult	F	23	15.5	8.5	14	20	5.5	1.590
3. Adult	F	29.5	20.5	12	17.5	25.5	6.7	3.257
4. Adult	M	23.5	17	9	14	21.3	5.1	1.757

	CL/CW	CL/CH	PL/PW	CW/PW
1.	1.36	2.52	1.37	1.11
2.	1.48	2.71	1.42	1.10
3.	1.44	2.46	1.45	1.17
4.	1.38	2.61	1.52	1.21
Hatchling	1.46	4.22	1.12	1.10

F = Female; M = Male; CL = Carapace Length; CW = Carapace Width; CH = Carapace Height; PW = Plastron Width; HW = Head Width; PL = Flastron Length

TECHNIQUES

A SIMPLE CODE FOR TOE CLIPPING ANURANS

A limited number of unique toe clipping codes have been proposed (see Ferner 1979 for a review). The most widely cited code is that of Martof (1953). Martof's system is appropriate if the study involves thousands of individuals. However, it has the disadvantage of requiring the clipping of many digits for even numbers of two or three digits (e.g., #16 requires clipping three toes, #66 four toes and #199 six toes). Clarke (1972) has shown that toe clipping toads reduces the probability of recapture, suggesting that the procedure may be detrimental to them. Underhill (pers. comm. in Daugherty 1976) also reported weight loss in toe-clipped *Rana pipiens*. Toe clipping may also reduce the mobility of arboreal frogs.

A system that minimizes toe clips is preferred. I have used the system shown in Figure 1. This system allows the first 99 individuals to be marked with only one or two toes clipped (Table 1) and involves the clipping of no more than three digits for up to 736 individuals, a number large enough to be adequate for many studies. After 99, not all consecutive numbers are available. When two amputations occur on one side of the body (left or right), the lower digit takes the higher value. For example clipping the first and third digits on the right hand side would represent

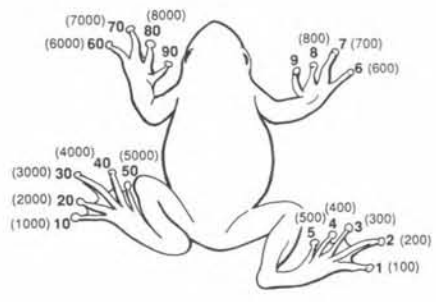


Figure 1. A simple code for toe clipping anurans. Note, when two clips are made on one side of the body, the number in brackets is adopted by the lowest digit (e.g. marking the first and third digits on the right foot would represent number 103 not 301).

the number 103, not 301. Hence it is then necessary to delete those numbers which become obsolete (e.g., number 301 cannot be used). Repeating marks can be avoided by using a table of clip codes (Table 1) and checking the codes as they are used. In addition to minimizing the number of clips, this simplified system is easily remembered, thus allowing more rapid marking and recognition of frogs in the field.

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	NUMBERS AVAILABLE	Total number of unique marks
1 Toe Clip	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 60, 70, 80, 90	18
2 Toe Clips	11-19, 21-29, 31-39, 41-49, ...91-99. 102-109, 203-209, 304-309, 405-409, 506-509, 607-609, 708, 709, 809 1020, 1030, 1040, 1050, 1060, 1070, 1080, 1090	124
3 Toe Clips	112-119, 122-129, 132-139, 142-149, ..., 192-199 213-219, 223-229, 233-239, 243-249, ..., 293-299 314-319, 324-329, 334-339, 344-349, ..., 392-399 415-419, 425-429, ... , 495-499 516-519, 526-529, ..., 596-599 617-619, 627-629, ..., 697-699 718-719, 728-729, ..., 798-799 819, 829, 839, 849, ..., 889, 899 1021-1029, 1031-1039, 1041-1049, ..., 1091-1099 2031-2039, 2041-2049, ..., 2091-2099 3041-3049, 3051-3059, ..., 3091-3099 4051-4059, 4061-4069, ..., 4091-4099 5061-5069, 5071-5079, ..., 5091-5099 6071-6079, 6081-6089, 6091-6099 7081-7089, 7091-7099 8091-8099	736

Table 1. Numbers available using 1,2 and 3 clips, and the accumulated total number of unique marks available. Note that after 99 not all numbers are available (see explanation in text).

HERPETOLOGICAL HUSBANDRY

See Herp. Review *20(1) for author's instructions.*

ARTIFICIAL HIBERNATION OF GARTER (*Thamnophis* sp.) AND CORN (*Elaphe guttata guttata*) SNAKES

Previous studies utilizing artificial hibernation for garter snakes report high rates of mortality (24% for adult females and 50% for adult males in Vagvolgyi and Halpern 1983; and 47.2% and 63%, resp., for adults in Joy and Crews 1987). During the course of our studies on chemosensory structures and functions in snakes, we have used artificial hibernation as a means of simulating natural conditions and lowering the cost of maintaining captive garter snakes (*Thamnophis* sp.) and corn snakes (*Elaphe guttata guttata*). The methods described below have provided a high survival rate for both adult and neonatal snakes. In addition, we observed robust courtship behavior and successful mating for both genera.

MATERIALS AND METHODS

All animals were contained in plastic sweater boxes (Hugh H. Wilson Co., Sunbury, PA), measuring either 40.6 x 27.3 x 16.5 cm (model 0957) or 40.6 x 27.3 x 9.5 cm (model 0956), with air holes in the cover. All snakes, except for *T. sirtalis parietalis*, were provided with pine shavings as a substrate. Three brown paper towels were used to line the bottom for *T. s. parietalis*. One bowl of tap water, cooled down to hibernating temperatures, was placed in each sweater box.

In September 1986, 50.50 adult *T. s. parietalis* were purchased commercially, group housed by sex, and maintained at ambient temperature (25° C ± 2°) for several days with water ad libitum. On 16 September, male snakes were separated into groups of 12 or 14/sweater box, and females were separated into groups of eight or 10/sweater box. All sweater boxes were then put into large cardboard boxes, which were closed and put into a refrigerated room (5° C ± 5°, but never below 0° C). A large piece of opaque plastic was placed over the cardboard boxes to prevent light from entering the boxes and to keep humidity high. No acclimation period was provided nor did we attempt to feed the snakes prior to hibernation. All snakes appeared healthy. Water and paper towels were changed every three weeks under red light illumination; otherwise the snakes were left undisturbed for 111 days (males) and 112-125 days (females).

On 16 October 1987, 12.15 adult *T. marcianus*, collected by the first author in LaSalle Co., TX and purchased commercially, were put into sweater boxes (four males/box and 3-4 females/box) and placed within an unlit low-temperature incubator (Queue Systems, Model 1210, Parkersburg, WV). On the same day, 7.7 adult corn snakes were put in sweater boxes individually and placed within the same incubator with the *T. marcianus*. All snakes were exposed to declining temperatures (16 to 10° C ± 2°) over 18 days. Water was changed every two weeks, and the pine shavings were not changed during the hibernation period. Prior to hibernation, these snakes had been maintained in the laboratory on a 12:12 h light:dark cycle at ambient temperatures. *T. marcianus* were fed as many goldfish as they would eat once/week, and the corn snakes were fed one adult mouse/week. Water was available ad libitum. Feeding was discontinued one week prior to hibernation. All snakes were brought out of hibernation after 73 days, directly into ambient room temperatures.

On 22 September 1988, 118 male and female *T. s. parietalis*, purchased commercially, were randomly distributed into sweater boxes (10 snakes/box) and put into hibernation as described previously for this species. Twenty-eight snakes were removed after 92 days in hibernation, 20 snakes after 99 days, nine after 119 days, 20 after 131 days, 10 after 153 days, and 30 after 180 days.

Table 1 shows the hibernation periods for corn snakes, *T. marcianus*, *T. radix*, and *T. proximus proximus* in 1988. All of these snakes were hibernated in the same manner as described for the snakes in 1987 except no acclimation period was given. These snakes were exposed to 10° C ± 2° from the onset. Juvenile corn snakes were not hibernated

during their first winter. Adult *T. radix* were purchased commercially in the summer of 1988. All neonate *Thamnophis* were born in captivity from pregnant females purchased commercially. Prior to hibernation, the adult and juvenile corn snakes were fed an adult or juvenile (5 g) mouse, respectively, once/week; adult *T. radix* and *T. marcianus* were fed as many goldfish as they would eat once/week; neonate *T. radix* were fed as much chopped earthworm as they would eat three times/week; and each *T. p. proximus* neonate was fed 2-3 guppies three times/week. *T. radix* neonates were also given vitamin supplements with each feeding (Reptical, Terrafauna Products, Mountain View, CA). Water was available ad libitum to all snakes, and all were maintained on a 12:12 h light:dark cycle at ambient room temperatures. Feeding was discontinued one week prior to hibernation.

RESULTS

Of the 100 snakes hibernated in September 1986, only one snake (a female found 50 days into hibernation) died (1% mortality). Although not quantified, males courted females with "chinning" and caudal undulations the day after removal from hibernation.

No deaths occurred among the snakes hibernated on 16 October 1987. Courtship was observed two weeks after removal from hibernation, lasting another two weeks. This reproductive activity resulted in three pregnant *T. marcianus* and six clutches of corn snake eggs.

Of the 118 snakes hibernated on 22 September 1988, only one male was found dead (0.8% mortality), at 37 days into hibernation. In every instance, courtship was observed from the day after removal from hibernation and up to two weeks afterward.

The results of all other snakes hibernated in 1988 are shown in Table 1.

DISCUSSION

The highest mortality (13.8%) occurred among the *T. p. proximus* neonates. This is still below the estimated mortality (45-85.5%) for natural populations of colubrid snakes surviving their first hibernation (reviewed in Parker and Plummer 1987; of course other factors, such as greater temperature and humidity fluctuation, availability of suitable hibernation sites, and predation upon emergence, may affect these results). Previous attempts to raise *T. radix* and *T. s. parietalis* neonates resulted in greater than 90% mortality when kept in constant laboratory conditions for over three months and fed only earthworms. These snakes would eat steadily for the first three months of their lives but would then refuse food. This refusal of food occurred in October. Under natural conditions, these species would have been in hibernation. Although artificial hibernation may help *Thamnophis* neonates survive by providing a necessary physiological shift, these previous mortalities may have been due to nutritional deficiencies (i.e. lack of vitamin supplements).

The most impressive results were found for adult *T. s. parietalis*, where less than 1% mortality occurred in snakes hibernated over six months. Prior to 1986, our artificial hibernation techniques produced up to 50% mortality in adult *T. s. parietalis*, probably due to dehydration. Previously, we hibernated our garter snakes as described in Vagvolgyi and Halpern (1983) and Joy and Crews (1987). In these studies, temperature and light regimes did not differ from this study, but snakes were placed in cotton bags with damp sponges and placed in light tight cardboard boxes. This method results in a quicker loss of moisture. Interestingly, Whittier et al. (1987) used clear plastic boxes for part of their study and report a mortality rate of 16.0 ± 1.5%. We believe that moisture availability is critical for long-term artificial hibernation as suggested by Constanzo (1985, 1988).

Vagvolgyi and Halpern (1983), Joy and Crews (1987), and Whittier et al. (1987) also used acclimation periods. Although we do not know how this interacted with the other hibernation procedures, we believe that temperature acclimation may not be necessary for successful overwintering, as suggested recently (Murphy and Campbell 1987). However, it should be noted that most of our data involves northern natricine snakes. Another study using southern species of *Lampropeltis* (Tryon and Murphy 1982) with acclimation procedures resulted in 0% mortality. It would be interesting to know if there are differences in survivorship during hibernation of northern versus southern snakes of the same species or between natricines and other colubrids.

Table 1: Results of artificial hibernation of adult and juvenile *Elaphe g. guttata* and adult and neonate *Thamnophis* in 1988 (except *T. sirtalis parietalis* - see text).

SPECIES	Total No. Hibernated (No. of males, if known)	Date in Hibernation	Date out of Hibernation	No. of Days in Hibernation	No. of deaths (% mortality)
Elaphe g. guttata					
Adult	9 (7)	10/26/88	2/26/89	123	0 (0)
Juvenile	17(10)	11/3/88	2/6/89	95	0 (0)
Thamnophis radix					
Adult	8 (0)	10/28/88	2/24/89	119	0 (0)
Neonate	53	12/2/88	2/26/89	87	3 (5.7)
	8	12/2/88	5/1/89	150	0 (0)
T. marcianus					
Adult	10 (5)	10/28/88	2/9/89	104	0 (0)
	17 (8)	11/3/88	2/23/89	112	1 (5.9)
T. p. proximus					
Neonate	29	11/29/88	2/29/89	90	4 (13.8)
	8	12/2/88	4/24/89	143	1 (12.5)

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LIFE HISTORY NOTES

See Herp. Review *20(1) for author's instructions.*

ANURA

RANA SYLVATICA (Wood Frog). **ATTEMPTED PREDATION.** On 2 April 1988 at 2130 h (air temperature 11° C) an adult male *R. sylvatica* (58 mm SVL) was observed to bite and hold onto an adult *Notophthalmus viridescens* (SVL not recorded) at a breeding pond complex 0.75 km S of Jeffersonville, Sullivan Co., NY (390 m elevation). The frog appeared to maneuver the newt in its mouth as if to attempt swallowing, but after 2 min of struggling, the frog suddenly pushed the newt from its mouth into the pool. The frog wiped its mouth with its forelimbs, then swam to matted vegetation at the bottom of the pool. The newt floated still for several minutes before swimming to cover. Ten min later the frog began vocalizing. The "prey handling" activity exhibited by this frog suggests its behavior was not a territorial response, as reported for some ranids (Emlen S.T. 1968. Territoriality in the Bullfrog, *Rana catesbeiana.* Copeia (2), June 5. pp. 240-243), but was a predatory encounter. Apparently, the noxious character of the newt (Duellman and Trueb. 1986. Biology of Amphibians. McGraw-Hill Book Company, NY. pp. 250-251) thwarted ingestion by *R. sylvatica;* this is believed to be the first observation of attempted predation on *N. viridescens* by *R. sylvatica* reported. No specimens were collected.

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CROCODILIA

ALLIGATOR MISSISSIPPIENSIS (American Alligator). **FORAGING BEHAVIOR.** Although the diet of juvenile alligators has been documented by Fogarty and Albury (1968. Proc. Ann. Conf. Southeast. Assoc. Game Fish Comm. 21:220-222) and Chabreck (1971. Proc. Ann. Conf. Southeast. Assoc. Game Fish Comm. 25:117-127), no published accounts of juvenile alligator feeding behavior in nature exist.

On 27 March 1988, I used binoculars to observe a juvenile alligator (TL ca. 1 m) from a distance of ca. 20 m in the Sabine National Wildlife Refuge, Cameron Parish, Louisiana. During five minutes of observation the alligator, which was floating at the surface in a long, narrow opening in emergent vegetation, performed a stereotypic feeding behavior ca. 10 times. The alligator first aligned itself parallel and adjacent to the vegetation, then rapidly pumped a forelimb up and down in the vegetation for one to two seconds, following which it opened and snapped its jaws shut in the direction of the limb. Upon completion of this behavior the alligator moved forward several cm to half a meter, then repeated the behavior. Foot-pumping was performed on either side of the body, but more often on the right. The behavior appeared to be an attempt to frighten or dislodge potential prey from the vegetation. Although I could not determine whether the alligator succeeded, it occasionally seized and promptly discarded bits of vegetation. The observed behavior is concordant with the prominence of aquatic invertebrates, small fishes, and aquatic vegetation found in the stomachs of juvenile alligators in southeast Louisiana (C. Brantley, pers. comm.).

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TESTUDINES

CHELYDRA SERPENTINA (Common Snapping Turtle). **FECUNDITY.** While collecting research materials on the Valentine National Wildlife Refuge, Cherry Co., Nebraska, in June 1988, we unearthed a nest of a common snapping turtle containing 104 eggs ($\bar{X}$ mass for 103 fertile eggs = 13.887 g, SD = 0.586 g). The nest was less than 24 h old when it was opened, because it was not present when we examined the site the preceding day. We judge that the nest held eggs laid by a single female, because the eggs were contained within a single chamber, they were fairly uniform in size, and no trace of damaged eggs was found nearby. Had the clutch actually been produced by two females ovipositing in the same cavity, a portion of the first set of eggs certainly would have been destroyed by the second female while re-opening the nest chamber.

Ernst and Barbour (1972. Turtles of the United States. The University Press of Kentucky, Lexington) reported that clutches of common snapping turtles range in size from 11-83 eggs. Our observation indicates that some individuals of this species actually produce in excess of 100 eggs.

Submitted by **KIRK MILLER,** Department of Biology, Franklin and Marshall College, Lancaster, PA 17604, **GEOFFREY F. BIRCHARD,** Department of Biology, George Mason University, Fairfax, VA 22030, and **GARY C. PACKARD,** Department of Biology, Colorado State University, Fort Collins, CO 80523, USA ●

CHRYSEMYS PICTA BELLI (Western Painted Turtle). **EGG RETENTION.** Aseasonal retention of eggs had been reported for a wild chelonian in *Lissemys punctata punctata* by Duda and Gupta (1978. Herp. Review 9:46.), who also reviewed reports of egg retention in other chelonian species, all of specimens in captivity. The authors felt that egg retention might be prompted by adverse seasonal weather conditions or lack of appropriate nesting grounds. Here I report a case of egg retention by a female *Chrysemys picta belli,* with notes on attempts made by the individual to nest.

On 9 June 1987 on the west shore of Middle Findley Lake on the Turnbull National Wildlife Refuge, Spokane Co., Washington, a female *C. p. belli* (plastron length 177 mm) was captured after partially constructing a nest cavity and then abandoning it without depositing any eggs. An X-ray the following day indicated the presence of 11 eggs. The female was observed attempting to nest in the same area on 11 June and 12 June, and made two attempts about 15 cm apart on the latter date. All four nest cavities were abandoned at a size that was probably inadequate for deposition of a clutch of 11 eggs, as judged from observations of nesting in this population and a nearby population in Latah Co., Idaho (Lindeman 1988. M.S. Thesis Univ. Idaho). All contacted immovable underlying basalt, and on one occasion the claws of the female's hind limbs made audible rasping sounds, scratching at the rock for several minutes before the cavity was abandoned.

The female was captured again on 24 June, and a second X-ray indicated that presumably the same clutch of 11 eggs (in the same relative positions) was still present. Palpation of oviducts indicated a continued presence of shelled eggs in the abdomen at the next three captures of the female on 25 June, 15 July, and 16 July, but not at the next capture on 12 August; thus eggs first detected somewhat early in the nesting season were retained by this female until at least 19 days after the last other record (27 June) of a gravid female in either population under study. The Turnbull Refuge is characterized by shallow soils covering basaltic formations, particularly around Middle Findley Lake. Prolonged retention of eggs by this female was very likely due to difficulty in finding suitable nesting ground with deep, rock-free soil.

Submitted by **PETER V. LINDEMAN,** Division of Biological Sciences, Madisonville Community College, College Drive, Madisonville, KY 42431, USA ●

CLEMMYS GUTTATA (Spotted Turtle). **REPRODUCTION.** There are apparently no published records of *Clemmys guttata* depositing more than one egg clutch in a single nesting season (Ernst. 1976. J. Herpetol. 10(1): 25-33; Ernst, pers. comm.). On 14 June 1988 a female *C. guttata* (CL=101 mm) kept in a semi-natural pond enclosure deposited a clutch of six eggs in a nest excavated in short grass about 4.8 m from the pond edge. Nineteen days later, on 3 July 1988, this same specimen deposited three eggs in a nest excavated about one m from the water's edge.

The female turtle was captive hatched and known to be in her ninth year. She was kept

under natural conditions after the first winter, and hibernated normally in the 0.24 ha enclosure. The diet was supplemented on an intermittent basis with Purina Trout Chow®, earthworms, and beefheart. It is significant that this specimen's total egg complement for 1988 exceeded the maximum published clutch size for the species (eight eggs, [Adler. 1961. Ohio J. Sci. 61:180-182]). The eggs were removed for artificial incubation; all eggs proved fertile. The first clutch produced five live hatchlings (the sixth died late in incubation); the second clutch produced three live hatchlings.

Submitted by **PETER R. WILSON,** 5692 W. Toles Road, Eaton Rapids, MI 48827, USA ●

GRAPTEMYS CAGLEI (Cagle's Map Turtle). **SIZE MAXIMA.** Haynes and McKown (1974. Tulane Studies in Zoology and Botany 18:143-152) reported the maximum size of male (92.8 mm CL) and female (161.1 mm CL) *Graptemys caglei* from the Guadalupe River System of South Texas. A mark-recapture program was begun on the turtle populations of the Guadalupe River near Cuero, DeWitt Co., Texas, in May 1985. A total of 712 *Graptemys caglei* have been released, including 609 males and 103 females. Four hundred seventy-nine males and 57 females have been captured that exceed the previously reported size maximum. The largest male (CL=125.7 mm) exceeds the previous report by 32.9 mm, and the largest female (CL=202mm) exceeds the previous report by 40.9 mm. These specimens were 230 g and 920 g, respectively. Various of the largest specimens were photographed prior to release, and several specimens exceeding the previous size maxima are currently deposited in the West Texas State University Museum of Natural History, including both male (WTSU 11755, 11778-11781, 11785-11789, 11800-11802, 11804-11811, 11813-11815, 11818, 11820, 11894, 11898-11899, 11902-11905, 11908-11909, 11912-11923) and female specimens (WTSU 11790, 11816, 11819, 11900). Funding for the mark-recapture program was from the Texas Advanced Research Program (Grant No. 1157) and an Organized Research Grant.

Submitted by **FLAVIUS C. KILLEBREW** and **DAN PORTER,** Department of Biology and Geosciences, West Texas State University, Canyon. TX 79016, USA ●

PSEUDEMYS TEXANA (Texas River Cooter). **SIZE MAXIMUM.** McAllister and Lamar (1987. Life History Notes: *Pseudemys texana*. SSAR Herp. Rev. 18 (4): 73.) reported 30.5 cm as the maximum CL for *Pseudemys texana* in North-central Texas. This record represents an increase of 3.2 cm over the size maximum reported by Conant (1979. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 2nd Ed., Houghton-Mifflin Co., Boston. 429 pp). However, sexual dimorphism in size has not been reported.

A total of 561 *P. texana* (411 males; 150 females) have been caught and measured during a long term mark-release-recapture program, initiated on the Guadalupe River in 1985. *P. texana* larger than the previous size maximum have been deposited in the West Texas State University Museum of Natural History as voucher specimens.

We have noted a slight sexual dimorphism in size, with males being slightly smaller than females. Three females exceed 30.0 cm CL, but only one (WTSU 12009) (CL=31.9 cm/ 3080 g) exceeds the maximum size reported for the Northcentral Texas specimen by 1.4 cm. The largest female was caught in the Guadalupe River at US Alternate 90, 4 miles East of Belmont, Gonzales Co., Texas. The largest male (WTSU 11768) is distinctly smaller than the largest female (CL=253 mm/ 1792 g). This specimen was captured on the Guadalupe River at Cuero, DeWitt Co., Texas. Preliminary field observations indicate that clutch size varies in direct proportion to carapace length in this species. Thus, sexual dimorphism in carapace length in this species may have been selected for to provide maximum reproductive effort.

Funding for the mark recapture project was provided by the Texas Advanced Research Program (Grant No. 1157) and a WTSU Research Enhancement Grant.

Submitted by **FLAVIUS C. KILLEBREW** and **DAN PORTER,** Department of Biology and Geosciences, West Texas State University, Canyon, TX 79016, USA ●

SAURIA

ANOLIS SAGREI (Brown Anole). **BEHAVIOR.** The behaviors reported herein were displayed by brown anoles collected in a mobile home park in Melbourne Beach, Brevard County, Florida.

On 13 January 1988 a small newly captured juvenile anole (size not measured) was placed in a small cage containing two previously collected individuals. The larger of these two (SVL = 5 cm), a male, immediately attacked and began eating the juvenile. Apparently disturbed by observers, the large anole left the juvenile motionless on the floor of the cage, but a short while later it was gone and the large anole was noticeably plumper in appearance. Polis and Myers (1985. J. Herpetol. 19:99-107) included a report of cannibalism in *A. lineatopis* but not for *A. sagrei*. Fitch and Henderson (1987. Amphibia-Reptilia 8:69-80) reported several cases of intrageneric predation by *Anolis*.

Binder and Henderson (1982. Herp. Review 13:10) described tailwaving by *A. carolinensis* as a diversionary tactic used in the presence of saurophagous snakes. On several occasions, I observed individuals within a group of five captive *A. sagrei* waving their tails laterally in an erratic fashion similar to the motion of autotomized tails. Perhaps this behavior is also effective against conspecific predators.

I thank Joseph and Andrew Cochran for assistance in collecting anoles and Mary Lou and Nick DeNicolo for their hospitality.

Submitted by **PHILIP A. COCHRAN,** Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA ●

CNEMIDOPHORUS LINEATISSIMUS DUODECEMLINEATUS (Whiptail Lizard). **NESTING BEHAVIOR.** The nesting behavior of several species of teids is well known (see Magnusson, W.E. 1987. J. Herpetol. 21 (4):307-316), but there is little information on the nesting habits of *C. lineatissimus* of the tropical dry forests of Western Mexico. On 6 October 1988, at the Estacion Biologia Chamela, Jalisco, Mexico, we observed two female whiptails excavating nesting holes. The holes were excavated in sandy soil in an open area devoid of vegetation about 1 m apart. Detailed descriptions of the climate and vegetation of this site are given in Bullock (1986. Arch. Met. Geoph. Biol. Ser. B36:297-316) and Lott et al. (1987. Biotropica 19(3): 228-235. The digging lasted ca. 10 min and the completed holes were 13 cm deep and 4 cm in diameter. After the excavation was completed the females deposited their eggs in the holes, taking ca. 20 min, and rapidly covered the nests. One female deposited five eggs and the other 5-7 eggs. We do not know how common it is for female whiptails to nest communally, and more data are required to assess the characteristics of nest sites chosen by *C. lineatissimus*. We wish to thank Carlos Martinez del Rio, Juan Pablo Gallo, and Edna Naranjos for their comments on this manuscript.

Submitted by **AURELIO RAMERIZ-BAUTISTA** and **ZEFERINO URIBE-PENA,** Laboratorio de Herpetologia, Departmento de Zoologia, Instituto de Biologia, UNAM. Ap. 70-153, Mexico, D.F. 04510 Mexico ●

EUMECES OBSOLETUS (Great Plains Skink). **ESCAPE BEHAVIOR.** Some skinks (*Scincella laterale, Eumeces anthracinus, Eumeces septentrionalis*) are known to take refuge in water (Conant, R. 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. 2nd ed. Houghton Mifflin Co., Boston, 429 pp.; Collins, J. T. 1982. Amphibians and Reptiles in Kansas. 2nd ed. Univ. Kansas Publ., Mus. Nat. Hist., Public Ed. Ser. No. 8, 356 pp.; Taylor, E. H. 1936. Univ. Kansas Sci. Bull. 23(14):1-643). To my knowledge, this behavior has not been reported for *Eumeces obsoletus*.

On two occasions in Yuma County, Colorado, I have observed *Eumeces obsoletus* escape into water. In both cases, the skinks were active and in the open when I first saw them. The first occasion took place on 19 June 1983, along the South Fork of the Republican River a little upstream of Bonny Reservoir. At 0945 h, an adult skink wriggled down a grassy slope between me and another person as we tried to catch it. The skink quickly disappeared into the water. The second occasion took place on 29 May 1988, at a small pond near the North Fork of the Republican River, ca. 7 km E of Wray. At ca. 1700 h, I saw an adult skink beside a thick board near the edge of a shallow pond. As I approached, it wriggled over 30 cm of water and disappeared into a clump of emergent sedges. No conspicuous retreats appeared to be available for the first skink. The grassy area sloped steeply toward the water and contained no obvious rodent burrows or rocks that could have served as hiding places.

More potential refuges seemed to be available to the second skink. In addition to the large board near which I first saw it, yucca and other terrestrial vegetation was available a few meters up the gentle slope from the pond. In both cases, algae and other aquatic vegetation obscured my view into the water. Both times I felt around on the bottom of the water but was unable to locate either skink, and did not see either one return to land.

Submitted by **LAUREN J. LIVO,** 1215 S. Osceola Street, Denver, CO 80219, USA ●

UTA PALMERI (San Pedro Side-blotched Lizard). **CANNIBALISM.** Cannibalism in iguanid lizards, which typically are insectivorous or herbivorous, is infrequently reported (Polis 1981. Ann. Rev. Ecol. Syst. 12:225-251; Polis & Myers 1985. J. Herpetol. 19:99-107), although in some populations it has been observed frequently (J. Stamps, pers. comm).

On 15 April 1987 we observed an incidence of cannibalism in the insular endemic iguanid *Uta palmeri* by an adult male (75 mm SVL) on a juvenile (ca. 40-50 mm SVL). We first observed the adult carrying the limp body of the juvenile, biting it at the middle of the trunk. The male then carried the body several m, disappearing under a rock for less than ten sec. He was next seen biting the body by its head and, after a few seconds, he began engulfment. His forelimbs were not used to assist in engulfing the body, but we observed small, side-to-side head movements during this period.

The frequency of cannibalism in *U. palmeri* is unknown. Wilcox (1980. PhD Dissertation. University of California, San Diego) observed an adult male carrying a dead juvenile, but was unsure if subsequent ingestion occurred. We and our coworkers have conducted over 3,000 man-hours of observation on *U. palmeri* during two-month field seasons in three different years (not always the same months each year), and have seen only this one case of cannibalism. However, only the 1987 field season coincided with a period when hatchlings and very small juveniles were abundant on the study grids.

U. palmeri is substantially larger in body size than other *Uta* (Ballinger and Tinkle 1972. Misc. Pub. Mus. Zool. Univ. Mich. 145:1-83) with adult male body size ranging from 70-80 mm SVL (Hews, unpublished data). Hatchling size ranges from 27-32 mm (N=7) (Hews, unpublished data) and thus a large disparity in size between adults and small juveniles might facilitate cannibalism in *U. palmeri.*

Submitted by **DIANA K. HEWS,** Department of Zoology, The University of Texas at Austin, Austin, TX 78712, USA and **JEFFREY C. DICKHAUT,** 3822 Hope Lane, Erlanger, KY 41018, USA ●

SERPENTES

COLUBER CONSTRICTOR PALUDICOLA (Everglades Racer). **FORAGING.** Two adult racers were observed employing widely searching foraging behavior. Although reports of diets and accounts of wild snakes swallowing food are fairly common, observations of prey capture are rare, and consequently foraging modes are poorly known (Siegal and Fitch 1984, Oecologia 61:293-301).

My observations were made on 3 January 1989 in Everglades National Park (Florida) at the boardwalk in Mahogany Hammock. Habitat was open mature subtropical hardwood hammock. Filtered sunlight reached the ground in several spots in the area snakes were observed. Shade temperature on the boardwalk at 1400 h was 27.4° C.

At 1346 h we heard a racer (ca. 100 cm SVL) emerge from a cabbage palm 6 m W of the elevated portion of the boardwalk. It foraged ca. 17 m in 13 min over a slightly circuitous path, passing under the boardwalk, and finally investigating and disappearing into an elevated cavity in a strangler fig at 1359.

At 1401 h a slightly larger racer (ca. 105-110 cm SVL) emerged from an upturned stump about 10 m S along the boardwalk from where the first snake disappeared. It basked briefly and then foraged 6 m S along the boardwalk. At 1412 the racer dashed forward after a treefrog. The frog jumped from the leaf litter to ca. 0.5 m up a treetrunk, and thence immediately to leaves of an adjacent shrub. The racer simultaneously turned from the treetrunk and cleanly picked the frog from leaves ca. 0.7 m off the ground. The snake moved immediately to a sunny patch and basked in a loose coil for 14 min (until 1429). It then foraged an additional 6 m S, climbing into a palmetto and onto the boardwalk. At 1439 it dashed down the palmetto and seized another fleeing treefrog. Foraging resumed immediately, and the snake vanished into a thicket at 1441.

Both treefrogs were brown and ca. 2.5-3 cm SVL, and thus were probably *Hyla squirella,* which I have seen in this hammock. In both cases the frog was swallowed less than 5 sec after capture. The second frog managed to emit a single squeak before being swallowed. I estimate that the foraging racers covered 31 linear meters in 25 minutes of movement (1.24 m/min). Both crawled steadily while darting the head side to side in arcs ca. 15 cm wide. They would occasionally stop to investigate an area more extensively, probing quickly into the leaf litter or investigating a log or stump. No rapid movements were seen except the two strikes at prey.

Over 40 people walked within 2-4 m of the two snakes from 1346-1441, and two walked past while the second snake was on the boardwalk. Neither species responded visibly to the other. The snakes seemed conditioned to ignore the steady human traffic, allowing us to make these observations.

Submitted by **PHILIP C. ROSEN,** Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ 85721, USA ●

CROTALUS SCUTULATUS SCUTULATUS. (Mojave Rattlesnake). **MATING BEHAVIOR.** We have seen references to the minimum length of the gravid rattlesnake (Klauber, L.M. 1972. Rattlesnakes. Univ. Calif. Press, pp. 175-176). However, we have no knowledge of reports that indicate the minimum age or length for copulation. This is a report of the copulation of two juveniles (both one year old) observed on 13 October 1988 in the Museo de Historia Natural, Facultad de Ciencias Biologicas, Universidad Autonoma de Nuevo León, San Nicolas de los Garza, Nuevo León, México. The snakes were siblings and were housed in a 5 gallon covered container laterally perforated. The male had an SVL of 523 mm; CL = 38 mm; mass = 111.2 g, and the female presented SVL = 435 mm; CL = 25 mm; mass = 101.3 g. The temperature in the container was 26° C. Copulation began at 0900 h and ended at 1726 h. The female shed before copulation; the male shed after copulation. We suggest that ecdysis of the female stimulated copulation in a manner similar to that reported for adult snakes. In reptiles, precocious sexual behavior has only been observed in turtles (Kramer 1987. Joint Ann. Meet. Veracruz, Mexico. Programs and Abstracts).

We thank David Lazcano for providing information, and Ivan Parra and Lea Andersen for criticism and suggestions.

Submitted by **MANUEL NEVARES,** Facultad de Ciencias Biologicas, Universidad Autonoma de Nuevo León, San Nicolas de los Garza, Nuevo León, México, and **ADRIAN QUIJADA-MASCAREÑAS,** Escuela Superior de Ecologia, Centro de Estudios Superiores del Estado de Sonora (CESUES), Calle Ley Federal del Trabajo, Col. Apolo. Hermosillo, Sonora, México ●

CROTALUS VIRIDIS VIRIDIS (Prairie Rattlesnake). **PREDATION.** Among viperids, mark-recapture studies have suggested that survivorship of young snakes is low, however, little information is available concerning causes of such mortality. The following observations concern prairie rattlesnakes that overwintered in a perennially occupied hibernaculum in Coal Creek Canyon, Carbon County, Wyoming in the spring of 1986. These animals were captured as they emerged, transported to camp for SVL and mass measurements as well as radio telemeter implants ($\bar{X}$ mass of telemeters = 3.4 g, range = 3.1 - 3.5 g), then returned to the den site for release.

On 27 May at 1130 h a 14.9 g, 28 cm snake which had a transmitter implanted surgically on 7 May was found dead and being eaten by many ants (*Formica* spp.). It had moved 57 m south between 2045 h on 25 May and 1620 h on 26 May. On 28 May at 2000 h a 14.0 g, 27 cm snake which had a transmitter implanted surgically on 3 May was found dead and being eaten by *Formica.* This snake had moved 35 m east between 1415 and 2000 h on 28 May. On 30 May at 1700 h an 18.2 g, 30 cm snake that had a transmitter implanted surgically on 28 May was found with its transmitter wedged between a rock and a sagebrush. Many *Formica* were on the snake and biting it, and there was a column of ants traveling between the snake and an ant mound. The snake was alive, although it responded very sluggishly to tactile stimuli. The snake had moved 36 m southeast between 1000 h on 30 May (when it was released) and the time of the above observation. Many ants clinging to it by their mandibles were removed manually and the snake was returned to camp where it died during the night. On 4 June at 1940 h a 9.0 g, 31 cm snake that had a transmitter forced into its stomach on 2 June was found dead and

being eaten by *Formica*. The snake was 30 cm from a large *Formica* colony. It had moved 48 m southeast between 1020 h (when it was released) and 1515 h on 4 June, and another 76 m south by the time of the above observation.

These four observations suggest that ant predation on small rattlesnakes may not be uncommon. Although in three of the four instances snakes were found dead (and thus could represent instances of scavenging rather than predation), the snake found on 30 May was alive, currently being attacked by ants, and died later presumably from toxins delivered via ant bites. Also, all of the snakes made lengthy movements (compared to mean daily movements for all neonates tracked in the spring of 1986 was 3.7 m; SE = 3.9; Graves, B. M. Unpubl. Ph.D. dissertation, University of Wyoming, Laramie) immediately prior to their deaths, suggesting that they were in relatively healthy states and that their movements may have brought them vicinal to foraging ant colonies.

Submitted by **BRENT M. GRAVES,** Department of Biological and Environmental Sciences, McNeese State University, Lake Charles, LA 70609, USA. ●

ELAPHE BAIRDI (Baird's Rat Snake). **DRINKING BEHAVIOR.** On 13 February 1988, at 1600 h, a captive-bred (hatched July 1985) male *Elaphe bairdi* (TL = 136.9 cm, SVL = 89.54 cm), maintained in a 50.5 x 25 x 30 cm terrarium was accidently splashed with water. As beads of water on the snake's head rolled down to the upper labial scales, swallowing was observed. The water on the labial scales was drawn into the mouth while it was closed. This behavior lasted 42 sec.

This behavior was repeated 23 out of 24 trials conducted during the next 24 days. The duration of swallowing was 9-62 sec ($\bar{X}$ = 35.8, N = 25). Swallowing was observed when water touched the head, even though it did not always reach the mouth. During two of the trials the snake tilted its head and rubbed its labial scales along its dorsum, sucking water droplets off its body.

A bowl of clean water was always present and the snake has been observed drinking from it. Water falling on the head seems to stimulate swallowing regardless of the snake's hydration state. This may be a stimulus-response behavior that is an adaptation to living in an arid environment with limited standing water (e.g., west Texas). It would allow the snake to utilize water in the form of precipitation or condensation.

More complex variants of this behavior have been observed in the lizards *Moloch horridus* (Gans and Blumer 1982. Amphibia-Reptilia 3:57-64), *Phrynosoma cornutum* (Sherbrooke 1981. Horned Lizards. Southwest Parks and Monuments Assoc.) and *P. douglassii* (pers. obs.), and the snakes *Bitis peringueyi* (Louw 1972. Symp. Zool. Soc. Lond. 31:297-314; Robinson and Hughes 1978. Ann. Transvaal Mus. 31:189-193), *Bothrops asper* (Greene 1986. 99-108. *In:* Predator-Prey Relationships. Univ. Chicago Press), and *Nerodia fasciata compressicauda* (Miller 1985. Herp. Review 16:71). Unlike *E. bairdi*, these species have or appear to have scales modified to collect water.

I am indebted to John F. Lokke for providing me with the snake and its breeding history.

Submitted by **LOUIS A. SOMMA,** Department of Zoology, University of Florida, Gainesville, FL 32611, USA ●

LOXOCEMUS BICOLOR (Burrowing Python). **SIZE.** Wilson and Meyer (1985. Snakes of Honduras. Milwaukee Public Museum, Milwaukee. 150 pp.) list *Loxocemus bicolor* as having a maximum recorded total length of 130.9 cm.

In the Dr. Rafael Lucas Rodriguez National Wildlife Refuge (Palo Verde), Costa Rica (10° 21'N; 85°21'E), eight live individuals of *L. bicolor* were measured during March and April, 1984. Their SVL measured to the nearest 0.5 cm in order of capture were: 1) 121, 2) 127.5 (UCR9376, female), 3) 129 (UCR8787, female), 4) 115, 5) 141.5 (UCR9375, female), 6) 75, 7) 79.5, and 8) 76.5. UCR initials indicate the catalog number of the specimen at the Museum of Zoology, University of Costa Rica. The fifth individual caught was the longest (SVL 141.5, TL 153 cm) specimen of *L. bicolor* that has been recorded anywhere.

The eight Palo Verde snakes were found at, or near, nests of *Ctenosaura similis* and *Iguana iguana*, whose eggs they are known to predate (Mora, J. M. 1987. J. Herpetol. 21:334-335). The nest sites lacked vegetation because of the lizards' burrowing activities. The nests were located in the interface between two types of habitat: fresh water swamps, where cattail (*Typha domingensis*) was the dominant vegetation, and the tropical dry forest.

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Submitted by **JOSE M. MORA,** Escuela de Ciencias Ambientales, Universidad Nacional, Heredia, Costa Rica (Current address: Department of Wildlife and Fisheries Science, Texas A&M University, College Station, TX 77843, USA, and **ANNY C. CHAVES,** Organization for Tropical Studies (OTS), Universidad de Costa Rica, Ciudad Universitaria "Rodrigo Facio," Costa Rica ●

MASTICOPHIS FLAGELLUM (Coachwhip). **BEHAVIOR.** *Masticophis flagellum* is a large whipsnake that occurs in relatively warm, dry habitats across the southern half of the United States (Wilson 1973. Catalogue of American Amphibians and Reptiles. p 145.1). Behler and King (1979. The Audubon Society Field Guide to North American Reptiles and Amphibians, p 629) noted that *Masticophis*, when cornered, coils and vibrates its tail, and strikes repeatedly, often at the enemy's face.

Death feigning (letisimulation) has not been reported in this typically aggressive snake. On 16 April 1988, a large *M. flagellum* was collected by members of the Oklahoma State University herpetology class near Quartz Mountain in Kiowa County, Oklahoma. The snake was found in a mesquite grassland under a piece of corrugated aluminum siding. The weather was cloudy and rainy with the air temperature at 21° C. Upon capture, the snake was placed in a cloth sack and held for ca. one hour. Prior to release, the snake was handled extensively by the class; yet it made no attempt to bite and little effort to escape. While being handled the snake became limp. When released, it pushed its nose into the substrate, twisted its head and protruded its tongue in a manner similar to that of the hognose snake (*Heterodon* sp.) (Ditmars 1936. The Reptiles of North America, 291-292). When turned on its back it demonstrated fighting reflexes, but continued to tilt the head and leave the tongue out, rolling in the dirt. After ca. ten minutes of this behavior the snake was moved to tall grass and observed. Two minutes elapsed before the snake began to crawl away slowly.

This snake's actions may be due to its depressed body temperature, which would make any behavior requiring speed (e.g. biting, flailing, striking, etc.) extremely difficult. This observation suggests that alternate behavior strategies may be found in ectothermic organisms. The "typical" behavior observed during warm weather may be considered typical only because the animal is most commonly encountered in warm weather. During colder weather, when it is more difficult to move, perhaps alternate behavior such as letisimulation is the most adaptive behavior. Field and laboratory studies of known temperature specimens are needed to support this hypothesis.

Submitted by **MATTHEW TUCKER,** Department of Zoology, Oklahoma State University, Stillwater, OK 74078, USA ●

MASTICOPHIS FLAGELLUM TESTACEUS (Western Coachwhip). **PREDATION.** On 18 June 1988, on the northeast bank of the Colorado River (35 km south, 24 km west of Coleman, Coleman County, Texas), we observed a male western coachwhip (SVL = 915 mm, TL = 1149 mm, mass = 190 g without prey items) preying upon a female western rough green snake (*Opheodrys aestivus majalis*; SVL = 396 mm, TL = 618 mm, mass = 21.2 g). The encounter lasted 3 h 49 min from when we first noticed the snakes at 0940 h.

We were drawn to the snakes by a rustle in the vegetation under a pecan tree (*Carya illinoinensis*) 7 m from the river. There we observed the coachwhip searching for the nearby, slowly-moving green snake. The coachwhip sighted the green snake as it was half-way up a 30 cm cedar elm (*Ulmus crassifolia*) sapling, and seized its dorsum just anterior to the cloaca. The green snake reacted by wrapping its tail around the coachwhip's neck and pulling the rest of its body into the branches of the cedar elm. After 28 min of occasional tugging by both snakes, the green snake was released. The green snake immediately crawled to the upper limbs of the cedar elm sapling. It was seized in the tail region after a short, seemingly-frantic search by the coachwhip.

After 2 h 7 min of repeated seizing of the green snake near the cloaca, the coachwhip finally grasped the green snake in the neck region. This was the coachwhip's first grip near the head in eight attempts. The green snake immediately bit the coachwhip on the

neck, but with no effect. The coachwhip then proceeded to swallow the green snake, but, the green snake's tail was completely entwined around a clump of nutgrass (*Cyperus* sp.), preventing the coachwhip from swallowing it completely.

The coachwhip spent the next 1 h 40 min attempting to free the half-swallowed green snake from the nutgrass. The coachwhip tried pulling from several different directions, and at one point even wrapped the green snake around a branch on the ground in attempting to dislodge it. The coachwhip also thrashed around and chewed on the tail near the knotted portion. Tail twitching by the green snake ceased about 25 min from being seized by the neck and partially swallowed. Finally, 3 h 49 min after first observing the encounter, the coachwhip pulled the green snake free. The coachwhip was immediately captured and the green snake and a sphinx moth caterpillar (Sphingidae: probably *Manduca* sp., but too mutilated for positive identification; TL = 57 mm, mass = 2.7 g) were palpated from it. After covering the caterpillar with dye (alizarin red) to enhance the teeth marks, it was examined under a microscope. Based on the size and spacing of the teeth marks it appeared that the caterpillar had been eaten by the green snake and then was regurgitated into the coachwhip's stomach.

The coachwhip was measured, marked, and released. The green snake and caterpillar were deposited in the Texas Cooperative Wildlife Collections, catalog number TCWC 66176. We thank J.R. Dixon for examining the caterpillar and determining which snake preyed upon it.

On 22 August 1988, one of us (JMM) witnessed the close proximity of a coachwhip and a green snake ca. 24 km upstream from the site previously described. This second site was 40 m above the FM 1929 crossing of the Concho River on the north bank. At 1200 h the coachwhip was seen foraging about 3 m above the water's edge in debris lodged in an American elm (*Ulmus americana*). The green snake lay on a live elm limb extruding from the debris ca. 2 m above the water and ca. 1.5 m from the coachwhip. To move from its limb, the green snake would have come in close proximity of the coachwhip. I (JMM) monitored the 2 snakes' activities for 3 h 30 min, during which the green snake remained motionless. The coachwhip failed to detect the green snake and moved away from it ca. 1 m. There it stopped foraging for the remainder of my observation. I believe it may have detected the green snake through chemoreception but could not determine the snake's exact location. The green snake may have survived this encounter due to its cryptic habits.

The abundance of both green snakes and coachwhips along rivers in this region coupled with the observances we have described above suggest that coachwhips may be keying in on green snakes as a prey species. As opposed to water snakes (*Nerodia* spp.) which usually drop into the river to escape danger, green snakes, once discovered, remain terrestrial or arboreal and try to survive through knotting their body around vegetation (see Hammerson 1988, Herp. Review 19(4):85). This leaves them vulnerable to predation by coachwhips.

We thank the Colorado River Municipal Water District for funding the project during which these observations were made. We also thank J.R. Dixon and B.D. Greene for their comments on this paper.

Submitted by **JAMES M. MUELLER** and **MARTIN J. WHITING.** Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, TX 77843, USA ●

OXYBELIS FULGIDUS (Green Vine Snake). **REPRODUCTION.** A wild-born female was received at the Detroit Zoological Park on 28 April 1987 from an animal dealer. The animal was maintained in a stainless steel cage (L=56 cm, W=39 cm, H=32.5 cm) with branches and a water dish. On 5 May ecdysis occurred. Food (*Anolis carolinensis*) was accepted on 6 and 11 May. Ten adherent eggs were discovered in the cage on 19 May 1987. The eggs appeared desiccated, and were placed in a plastic container with a mixture of water and vermiculite in a 1:1 ratio (Tryon 1975. Bull. New York Herp. Soc. 11:33-37). After 24 h in this medium some of the eggs had rehydrated, and at this time the clutch mass was 53.2 g. Post-oviposition mass of the female was 148 g, SVL =115 cm, TL =167 cm. The eggs were incubated in the aforementioned medium at 27° C±2°. On 22 August, after 105 days incubation, two of the eggs hatched, and a third hatched the following day. Measurements of the hatchlings were as follows: A-SVL=23.1 cm, TL=36 cm, mass=3.3 g; B-SVL=21.7 cm, TL=33.5 cm, mass=3.7 g; C-SVL=25.6 cm, TL=35.7 cm, mass=4.3 g. A fourth egg slit, but the snake was found dead in the shell. The individual measured 22.8 cm SVL, TL=31.0 cm, mass=3.4 g. Mean values determined with the inclusion of the unhatched animal were: SVL=23.3 cm, TL=34.1 cm, mass=3.7 g. Fertility could not be determined in the remaining eggs. Fungal contamination of the entire clutch was noted after about 70 days incubation. *Aspergillus* and *Mucor* were cultured from the eggshells at this time.

The hatchlings were identical in coloration to their mother. They all exhibited the head-swaying behavior described by Henderson (1980. Milwaukee Pub. Mus. Contrib. in Bio. and Geo. 37:27-38). Subadult *Anolis carolinensis* were fed upon within 4 wks of hatching. One of the juvenile snakes died at the age of 5 months. Cause of death was undetermined. At 17 months the two surviving snakes were feeding on small mice, and had increased in size to: mass=85.2 g, SVL=81 cm, TL=111 cm, and mass 62.8 g, SVL=74 cm, TL=104 cm.

A computer search of the literature revealed little published information on reproduction in this species. Golder (1983.Salamandra 19:55-60) describes a captive breeding and the hatching of one egg. In that study the female suffered from dystocia, and oviposition was protracted over two weeks. Egg dimensions were L=5.1-49. cm, W=2.0-2.2 cm. In the present study eggs were not measured immediately after laying; however, the viable eggs were ca. L=3.0 cm, W=2.0 cm shortly before hatching.

I thank K. Koch for translation assistance, and M. Sulecki and L. Wachsberg for collecting data.

Submitted by **J. STEVEN CONNERS,** Department of Herpetology, Detroit Zoological Park, P.O. Box 39, Royal Oak, MI 48068, USA ●

***PSEUSTES SULPHUREUS.* REPRODUCTION.** On 23 July 1987 the Columbus Zoo received eight *P. sulphureus,* exported from Surinam, and all in excess of 1.5 m SVL. On 1 August, a female of ca. 1.7 m SVL laid a clutch of 14 eggs. These ranged from 50-64 mm along the long axis and from 22-31 mm along the short axis ($\bar{X}$ = 55.9 x 27.1 mm). The clutch, which adhered into two masses upon laying, and seven single eggs, had a total mass of 395 g. Another female, ca. 1.5 m SVL, laid a clutch of seven eggs on 8 August 1987. These ranged from 52-72 mm x 20-22 mm ($\bar{X}$ = 60.0 x 20.6 mm) and from 36 to 44 g ($\bar{X}$ = 39.4 g). The second clutch failed to develop during incubation. Seven specimens hatched



from the first clutch on 24-26 October 1987 after 84-86 days incubation at a minimum of 28° C. Two additional specimens cut the eggshells and died within the eggs, although one of these was stunted and deformed. The seven hatchlings ranged from 350-418 mm SVL ($\bar{X}$ = 401 mm), and from 486-591 mm total length ($\bar{X}$ = 549.9 mm).

Submitted by **MIKE GOODE,** Reptile Department, Columbus Zoo, 9990 Riverside Dr., Powell, OH 43065, USA ●

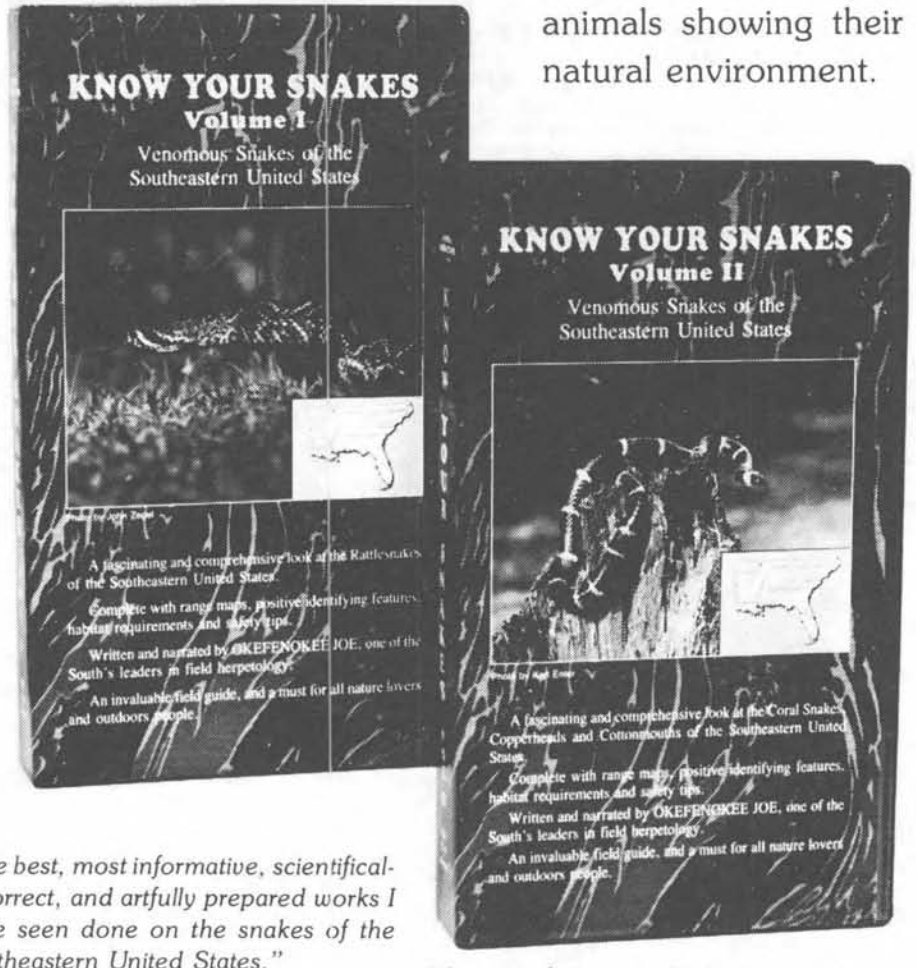




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TYPHLOPS RICHARDI (Richard's Blind Snake). **ARBOREAL ACTIVITY.** Arboreal activity by leptotyphlopid blind snakes has been reported by Vanzolini (1970. Papeis Avulsos Zool 23:13-16) and later by Gehlbach and Baldridge (1987. Oecologica 71:560-563). Herein we report climbing behavior, presumably associated with foraging, in a typhlopid blind snake. On 21 February 1988 at 2030 h we observed a ca. 400 mm SVL *Typhlops richardi* climbing the trunk of a 30 cm DBH Papayo, *Metopium toxiferum*, in a subtropical xeric forest on Cayo Icacos, Reserva Natural La Cordillera, Puerto Rico. When discovered the snake was 1.5 m off the ground, only 33 cm below a large (0.75 m x 0.5 m) nest of the neotropical termite *Nasutitermes nigriceps*. The snake was clinging to irregularities on exfoliating bark of the tree and was slowly waving the head from side to side, constantly flicking the tongue as it climbed. On La Cordillera we have most commonly observed *T. richardi* beneath termite nest fragments partially imbedded in the soil (which are often associated with ant nests). We infer that the snake was climbing the tree to gain access to the nest in order to forage within it. After identification and measurement the snake was released at the point of capture. While we have never collected *T. richardi* from active termite nests, the senior author did collect a *Typhlops biminiensis* from an active termite nest in xeric forest on the U.S. Naval Base at Guantanamo Bay, Cuba.

Submitted by **PETER J. TOLSON** and **EARL W. CAMPBELL III,** Toledo Zoological Society, 2700 Broadway, Toledo, OH 43609, USA ●

GEOGRAPHIC DISTRIBUTION

See Herp. Review *20(1) for author's instructions.*

ANURA

HYLA CINEREA (Green Treefrog). USA: NORTH CAROLINA: Montgomery Co: 3.9 km NW Pekin. 8 July 1988. J.C. Beane and T.J. Thorp. Verified by W.M. Palmer. North Carolina State Museum of Natural Sciences (NCSM 29349). New county record; extends range ca. 46 km NNW of nearest record in Richmond Co., NC (NCSM files).

Submitted by **JEFFREY C. BEANE,** North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, NC 27611, USA ●

CAUDATA

AMBYSTOMA* (n) *LATPRALE-JEFFERSONIANUM (Blue-spotted Salamander hybrids). USA: MAINE: Aroostock Co: Castle Hill: Turner Road, 2.9 km S of State Rte 227 (46°41'33"N, 68°12'57"W). Connor Township and Cyr Plantation: along US Rt 1 (between 47°01'33"N, 68°00'38"W and 47°03'55"N, 67°59'19"W). Masardis: Garfield Rd, 4.4 km W State Rt. 11 (46°32'04"N, 68°24'22"W). 13-21 April 1987. Carroll B. Knox. Verified by James P. Bogart. Harvard Museum of Comparative Zoology (MCZ A-110571-572; A-110575; A-110577-578; A-110580; A-110582-592; A-110595-598; A-110600; A-110603; A-110607-608; A-110610-612). Preliminary identification by erythrocyte measurement; verified by karyotyping and allozyme electrophoresis. Specimen A-110610 from Masardis was a tetraploid (4n=56) female, genotype LLLJ. First county records. Extends range ca. 317 km NNE of only previously recorded state locality near Bangor (Conant 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., 429 pp.

Submitted by **CARROLL B. KNOX,** 13 Elizabeth Avenue, Caribou, ME 04736, USA ●

PSEUDOEURYCEA BELLI SIERRAOCCIDENTALIS (Pine-Oak Salamander). MEXICO: CHIHUAHUA: ca. 6 km (by air) WNW Ocampo on unpaved road to baseball field "El Aguila"; ca. 1830 m elev. 24 June 1987. T.R. Van Devender and P.A. Holm. Verified by C.H. Lowe. University of Arizona Department of Ecology and Evolutionary Biology Collection (UAZ 47824-25 PSV, prints and negatives). The observation of four adults documents a second population for the subspecies and extends the known range 85 km E from near Yecora, Sonora (Lowe et al. 1968. Los Angeles Co. Mus. Contr. Sci. 140:1-11). This is the first record of the family Plethodontidae for the state of Chihuahua. The two Sierra Madre Occidental populations are disjunct and ca. 885 km NNW of the nearest locality for *P. b. belli* in the Sierra de Nayarit near Tepic, Nayarit (Gadow 1905. Proc. Zool. Soc. London 1905(2):191-244).



Figure 1. *Pseudoeurycea belli sierraoccidentalis* photographed in the field, ca. 6 km WNW Ocampo, Chihuahua.

Submitted by **THOMAS R. VAN DEVENDER,** Arizona-Sonora Desert Museum, 2021 N. Kinney Rd., Tucson, AZ 85743, **CHARLES H. LOWE** and **PETER A. HOLM,** Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ 85721, USA ●

SAURIA

SCELOPORUS OCCIDENTALIS BISERIATUS (San Joaquín Fence Lizard). MEXICO: BAJA CALIFORNIA: Isla Todos Santos (south island). 20 June 1949. Laurence M. Huey. Verified by L. Lee Grismer. San Diego Natural History Museum (SDSNH 40044). First insular record of this species (Stebbins 1985. Houghton Mifflin Co., Boston 336 p.).

Submitted by **L. LEE GRISMER,** Department of Biology, San Diego State University, San Diego, CA 92182, USA ●

SERPENTES

CHILOMENISCUS CINCTUS (Banded Sand Snake). MEXICO: BAJA CALIFORNIA SUR: Isla Danzante. 20 July 1986. Victor M. Velazquez. Verified by L. Lee Grismer. Hospital Militar de La Paz, Baja California Sur. Mexico (HMLP 1750). First record of this species from Isla Danzante (Murphy and Ottley 1984. Ann. Carnegie Mus. Nat. Hist. 53:207-230.)

Submitted by **L. LEE GRISMER,** Department of Biology, San Diego State University, San Diego, CA 92182, USA ●

GONIONOTOPHIS KLINGI (Dwarf File Snake). LIBERIA: Sino County: vicinity of Gbaboni Research Station, Sapo National Park, ca. 5°25' N, 8°45' W. 27 and 29 January 1988, 6 February 1988. P. Chippindale. Verified by A. Fishbein. Royal Ontario Museum (ROM 18981-83). Tissues in ROM frozen tissue collection. Two males and one female, all collected inside rotting logs in high forest. First records for Liberia; represents a range extension of ca. 900 km from nearest record at Tafo, Ghana (Leston and Hughes 1968. The snakes of Tafo — a forest cocoa-farm locality in Ghana. I.F.A.N. Bulletin 30:737-770.). Also known from Songo-Otta, Nigeria (Dunger 1971. The snakes of Nigeria part I: The file snakes. Nigerian Field 36:54-71.), and Togo (Welch 1982. Herpetology of Africa. Krieger. Malabar, FL).

Submitted by **PAUL CHIPPINDALE,** Department of Zoology, University of Toronto, and Department of Ichthyology and Herpetology, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario, Canada M5S 2C6 ●

HYPSIGLENA TORQUATA KLAUBERI (San Diego Night Snake). MEXICO: BAJA CALIFORNIA: Isla Smith. Collector and date of collection unknown. Verified by L. Lee Grismer. Los Angeles County Museum of Natural History (LACM 138012). First record of this species from Isla Smith (Murphy and Ottley 1984. Ann. Carnegie Mus. Nat. Hist. 53:207-230.

Submitted by **L. LEE GRISMER,** Department of Biology, San Diego State University, San Diego, CA 92182, USA ●

MASTICOPHIS BILINEATUS. (Sonoran Whipsnake). USA: ARIZONA: Pima Co: Hwy 85, 4.8 km N north boundary of Organ Pipe Cactus Nat. Mon. 8 May 1968. Robert A. Anderson. San Jose State University (SJSU R650. Maricopa Co: Hwy 85, 19.2 km N Ajo. September 1984. Andrew W. Ford. (SJSU R1836). Both verified by J. Boundy. Extends range 16 km and 56 km NNW of Ajo Mtns., resp. (Stebbins 1985. A Field Guide to Western Amphibians and Reptiles. Houghton Mifflin Co., Boston).

Submitted by **JEFF BOUNDY** and **ANDREW W. FORD,** 4560 Paul Sweet Road, Santa Cruz, CA 95065, USA ●

RHADINAEA FLAVILATA (Pine Woods Snake). USA: NORTH CAROLINA: Scotland Co: 12.2 km NNE Laurel Hill. 31 August 1988. Stanley L. and Mary S. Alford. Verified by W.M. Palmer. North Carolina State Museum of Natural Sciences (NCSM 29517). New county record; extends range ca. 74 km W of nearest record in Cumberland Co., NC (NCSM files). First record for Sandhills region of North Carolina.

Submitted by **JEFFREY C. BEANE,** North Carolina State Museum of Natural Sciences, Box 27647, Raleigh, NC 27611, and **STANLEY L. ALFORD,** 792 N McCrary St., Asheboro, NC 27203, USA ●

RHADINAEA FLAVILATA (Pine Woods Snake). USA: FLORIDA: Palm Beach Co: ca. 0.4 km W Boynton Beach, in vacant lot at corner of Congress Avenue and Old Boynton Beach Road (T45S, R42E, S24). 12 April 1988. P. Louton. Verified by S. B. Reichling. Memphis State University (MSUMZ 101). New county record, first record south of Lake Okeechobee, and extends the range ca. 70 km southward along SE Florida coast (Ashton and Ashton 1981. Handbook of Reptiles and Amphibians of Florida. Part 1- The Snakes. Windward Publ. Co., Miami).

Submitted by **STEVEN B. REICHLING,** Department of Herpetology, Memphis Zoo and Aquarium, 2000 Galloway, Memphis, TN 38112-9990, and **PETER LOUTON,** P. O. Box 3285, Memphis, TN 38173-0285, USA ●

THAMNOPHIS HAMMONDII HAMMONDII (Hammond Two-striped Garter Snake). MEXICO: BAJA CALIFORNIA: Mission San Fernando. 24 July 1988. Jim A. McGuire, Sabrina M. Manion, and Victor M. Velazquez. Verified by L. Lee Grismer. Hospital Militar de La Paz, Baja California Sur, Mexico (HMLP 2742). This record extends the range of the subspecies 43.1 km to the southeast from its nearest known locality at El Rosario (Welsh 1976. Unpubl. Masters Thesis, Humbolt State University).

Submitted by **JIM A. McGUIRE,** Department of Biology, San Diego State University, San Diego, CA 92182, USA ●

THAMNOPHIS RADIX HAYDENII (Western Plains Garter Snake). USA: MONTANA: Teton Co.: US Rt. 89, Freezeout Lake, 4.8 km N. Fairfield. 13 August 1988. Carl H. Ernst. Verfied by C.H. Ernst. George Mason University (GMU 3606). Adult male taken DOR. Extends range ca. 155 km west of nearest known locality in Montana (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians. 2nd Ed. Houghton Mifflin Co. Boston. 336 pp.), and 170 km south of range in Alberta, Canada (Stebbins 1985; Cook 1984. Introduction to Canadian Amphibians and Reptiles. National Museums of Canada. Ottawa. 200 pp.).

Submitted by **CARL H. ERNST,** Department of Biology, George Mason University, Fairfax, VA 22030, USA ●

TESTUDINES

CLEMMYS GUTTATA (Spotted Turtle). USA: LOUISIANA: Vermillion Parish: Pecan Island, Morgan archaeological site: 3.2 km E of Pecan Island (town) on Highway 82. Richard and Diane Fuller. Verified by E.S. Wing. Peabody Museum, Harvard University (MVIA6a). One whole entoplastron was identified among archaeological remains which date (by C^{14} dating methods) to 1000±80 BP (AD 950). The presence of skeletal remains from this species does not necessarily represent a natural occurrence, i.e., the past human inhabitants of the archaeological site brought either the turtle or the remains of the turtle to the site. Possibly the spotted turtle once ranged into southern Louisiana; this could be the focus of future research.

Submitted by **LAURA KOZUCH,** Department of Natural Sciences, Zooarchaeology Range, Florida Museum of Natural History, Gainesville, FL 32611, USA ●

CLEMMYS INSCULPTA (Wood Turtle). USA: VIRGINIA: Rockingham Co: along North Fork Shenandoah River, DOR on Rt. 259, 1.3 km W of jct. with Rt. 613 at Cootes Store. 16 May 1987. K. A. Buhlmann. Verified by J. C. Mitchell. Carnegie Museum (CM 117057). New county record. Extends range 33.0 km SSW of nearest Shenandoah Co. record (Tobey 1985. Virginia's Amphibians and Reptiles. 114 p., privately published). Southernmost record for *C. insculpta.*

Submitted by **KURT A. BUHLMANN,** 2001 N. Main Street, Blacksburg, VA 24060, and **JOSEPH C. MITCHELL,** Department of Biology, University of Richmond, Richmond, VA 23173, USA ●

PSEUDEMYS CONCINNA CONCINNA (Eastern River Cooter). USA: VIRGINIA: Montgomery Co: New River, 6.0 km N Radford. 6 June 1987. K. A. Buhlmann and E. Stinson. Verified by J. C. Mitchell. Carnegie Museum (CM 117056). New county record and first record for the New River system in Virginia. Extends range 75-86 km S of New River Gorge National River, WV, localities (Buhlmann and Vaughan 1985. Herp. Review 16(3):84-85) and 67 km S of Bluestone Reservoir, WV, locality (Seidel 1982. Brimleyana 6:24-44). Several large *Pseudemys* were observed basking at this hatchling's collection locality.

Submitted by **KURT A. BUHLMANN,** 2001 N. Main Street, Blacksburg, VA 24060, USA ●

NEW HERPETOLOGICAL RECORDS FROM ISLANDS OF THE GULF OF CALIFORNIA, MEXICO

In May 1985, as part of the project "Island's conservation from a sea in the desert," collections were made on Angel de la Guarda, San Lorenzo Sur, and Tiburón islands. New records were obtained which add to the distributions reported by Murphy and Ottley (1984. Annals of Carnegie Museum 53(8): 207-230).

Specimens are deposited in the Herpetological Collection of the Instituto de Biologia, UNAM (IBHUNAM), México, D. F. Identifications were verified by A. Ramirez-Bautista and E. Pérez-Ramos.

COLEONYX VARIEGATUS (Western Banded Gecko). BAJA CALIFORNIA NORTE: Isla Angel de la Guarda; southeast side of the island. 12 May 1985. A. Ramírez-Bautista and E. Pérez-Ramos. (IBHUNAM 5735-2). First voucher specimen from island.

TRIMORPHODON BISCUTATUS LAMBDA (Sonora Lyre Snake). SONORA: Isla Tiburón. 13 May 1985. A. Ramírez-Bautista and E. Pérez-Ramos. (IBHUNAM 5734). First record for island.

We would like to thank the University of California at Davis and The Nature Conservancy, International Program, for supporting the expedition through Dr. Enriqueta Velarde, and A. García for reading the manuscript.

Submitted by **AURELIO RAMÍREZ-BAUTISTA, EDMUNDO PÉREZ-RAMOS** and **ZEFERINO URIBE-PEÑA,** Laboratorio de Herpetología, Departamento de Zoología, Instituto de Biología, UNAM. Ap. 70-153, México, D. F. 04510, México ●

BOOK REVIEWS

The Amphibians and Reptiles of Louisiana, by Harold A. Dundee and Douglas A. Rossman, Illustrated by Eugene C. Beckman. 1989. 24 color plates, 126 pages, 10 line drawings, XI-300 pp, 7½" x 10". Louisiana State University Press, Baton Rouge and London. Available from Louisiana State University Press, Baton Rouge, LA 70893. ISBN 0-807-1436-7, $29.95 + 1.50 h/p.

When I was a kid and saw a copy of Ditmars' *The Reptile Book,* I dreamed of writing up the herps of Louisiana. Years later, when Dundee and Rossman announced that they were going to do this publication, this dream came to an end. Instead, I gave them what support I could. Now, after years of waiting, the "herps of Louisiana" has become a reality, it is a very worthy testimonial to their efforts and I envy them their excellent product.

The book is divided into two parts. Part one consists of a short history of herpetology in Louisiana (2 pp), a summary of the distribution of amphibians and reptiles in Louisiana (6 pp), techniques for collecting and preservation (6 pp), the problem of snakebite (1 p), care of amphibians and reptiles in captivity (3 pp), conservation (1 p), species and subspecies (1 p) and common and scientific names (1 p). The remainder of the book consists of part two, the identification keys and species accounts (248 pp), followed by an excellent glossary (5 pp), literature cited (17 pp) and an index to the scientific and common names (4 pp).

Figures include a vegetational map of Louisiana, and drawings of salamander, anuran, turtle, lizard and snake structures used in keys. A map is included for each species, differentiating between those specimens examined (solid circles) or museum and literature records not examined (hollow circles). This can be somewhat misleading for some ranges, such as *Hemidactylus turcicus* (an

introduced species), p 213, where only six localities are listed with none for Terrebonne Parish (the reviewer's home parish) where it has been known for over 20 years.

The 24 color plates have from two (alligator) to 11 (salamander) items on each. The salamander, anuran and turtle plates depict the dorsolateral view of each species while some anuran groin areas are also shown. The lizards are shown whole for all except *Ophisaurus,* for which an adult and juvenile lateral view of the head end are shown. The snakes have a dorsolateral view of the head end with a patch of the venter of each given. In some cases a juvenile pattern is also included with an adult patterned form. The alligator plate consists of an adult and a juvenile. The color plates are excellent drawings of the various taxa and should be in themselves enough to identify most species without aberrant patterns or those that change significantly with age.

As stated in the preface, Dundee treated the amphibians and turtles while Rossman treated the alligator, lizards and snakes. This has produced some slight differences in the treatment of the accounts, but the uniformity is quite good for two such diverse people.

In the keys the salamander larvae and adults are treated in the same key while separate keys are used for larval and adult anurans. A novel key presents anuran sounds using phonetic characters instead of spectrograms. Anuran keys include graphs of seasonal reproductive features and calling temperatures; both are very good. Problem species in the state are lumped as one, e. g. the *Desmognathus fuscus-auriculatus* complex and the *Hyla chrysoscelis-versicolor* complex, and a lengthy review of the problem species in the state is presented.

A reviewer is expected to point out errors in a book of this sort. For the most part, the book is well edited. I was not able to find a single typographical error. The only other errors that I have been able to find are of a minor nature except one. A "key" map of the state should have been included. Louisiana has 64 parishes (counties of other states) and a map showing the location of these parishes would greatly aid someone using the distribution maps. While I have long been familiar with the various parishes, I still have to stop and think about the location of some of them.

On page 11 I question the statement specimens can be collected from a distance of 40 feet with a .22-caliber pistol with a smooth bore using dust shot. In my experience, 25 feet is the maximum accurate distance. On page 171, Grand Isle is stated to be in Terrebonne Parish but it is actually in Jefferson Parish. On page 212 a reference citation is given as P. K. Anderson et al. (1952) but in all other citations in the book, including this one used elsewhere, all authors are given. On page 228 the *Cemophora* distribution is stated to be flatwoods of St. Tammany Parish and the hill country of northern Louisiana; map 88 shows it also in Washington and Tangipahoa Parishes.

This is a book that I would recommend for every working herpetologist's library as well as for any bibliophile. It is filled with new information and it summarizes a large amount of previously published data. With the high cost usually associated with herpetological books today, the $29.95 price is surely a bargain.

ERNEST A. LINER
310 Malibou Boulevard
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Guide to Philippine Flora and Fauna. Vol. X. Amphibians and Reptiles, by Angel C. Alcala. 1986. Natural Resources Management Center, University of the Philippines xiv, 195 pp. ISBN 971-1026-28-7. Paperback.

This book is part of a 12 volume, detailed inventory of the Philippine flora and fauna. Special attention is paid to economically valuable and endangered species. The amphibians and reptiles of this archipelago are covered in the present volume. The author, a noted authority on vertebrates of the Philippines, presents information on 271 species (66 of amphibians and 205 of reptiles). Following the species accounts there are three pages of references, a glossary, and indices to common and scientific names.

This book is not a field guide. There are no identification keys, and not every species is illustrated. Therefore most species cannot be identified with high certainty. Many of the illustrations are taken from Taylor's monographs or other published sources, and are not always of the best quality. Others are of preserved specimens, some of which are poorly preserved and may not accurately represent the living animal (e.g. *Staurois natator,* p. 30). On the other hand, this book does assemble a comprehensive photographic collection (176 photographs and illustrations) of Philippine herps and for this reason alone fills a long-standing need.

The species accounts are not clearly organized. Most species are listed alphabetically within the genus, but there are numerous exceptions, making it difficult to find individual accounts. Although the date of publication is given as 1986, and despite the statement (p. iii) that the text has "been updated with the latest data added," it appears as though the text is current only to about 1979. Many recent taxonomic changes are not noted, e.g. *Draco evereti, D. quadrasi,* and *D. rizali* are now considered synonyms of *D. volans* (Inger 1983, Musters 1983). Important recent references, including some published in the Philippines, are not cited (Brown and Alcala 1980, Rabor 1981). Other critical references are not cited, for example Vol. 2 of De Rooij 1917 [the snake volume] is not cited, although Vol. 1 is cited. Surprisingly, the major recent monograph on Philippine amphibia (Inger 1954) is not mentioned in the Introduction, although a monograph on Bornean amphibians is cited (Inger 1966) (p. 1).

The author notes (p. 2) that 64% of the amphibians and 62% of the reptiles of the Philippines are endemic. This may be true but I hesitate to accept his figures. He incorrectly defines "endemic" in the glossary as including "indigenous" species, citing species as being "endemic" that are of limited occurrence in the Philippines but that do occur elsewhere (e.g. *Xenopeltis unicolor*). There are a few surprising omissions in the text. For example, the photograph and description of *Xenopeltis unicolor* are of a young specimen; adults lack the light collar. This is not mentioned in the text. Also, I would disagree with the author as to the function of the laterally expanded toes of *Hydrosaurus pustulosus.* Rather than being used for "swift swimming movements" (p. 88), I suspect instead that they function during bipedal running upon the water surface. This behavior has been recorded in the literature but is not mentioned by Alcala.

The book is adequately manufactured, although many of the photographs are poorly reproduced. The quality of the editing was reasonable, although a few typos remain (*Polypedates leucomystax* repeatedly spelled *"leucomystar"*; "vascular" defined in the glossary as "eardrum"). However, given the political and economic conditions in the Philippines we are fortunate to have the book at all. The author is to be commended for his efforts.

Despite the shortcomings, the book succeeds in presenting a needed summary of the current knowledge of the Philippine herpetofauna for the education of the public and for the guidance of future generations of students (hopefully many from the Philippines). It will be a useful reference for some time to come and should serve as a baseline for much-needed future studies.

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Know Your Snakes, Vols. 1 and 2: Venomous Snakes of the Southeastern United States, produced and hosted by Okefenokee Joe. Anhinga Productions, Route 1, Box 660, Odum, Georgia 31555. 1988. $49.95 each or $99.95 for the set of two, including a teacher's manual. Approximate running time: 50 minutes total.

In the last ten years or so, there has been a true revolution in the entertainment/education industries, that revolution being "Video." In a remarkably short period of time, video has simultaneously become the number-one money maker for Hollywood, and a major tool for the education of millions of American students ranging from kindergarten to college and beyond. While the video revolution has produced a number of rather inane products, it has also enabled producers to put out some pretty interesting fare. One such program is Okefenokee Joe's series on the venomous snakes of the southeastern United States.

I was admittedly skeptical when I first heard about these tapes, but that initial skepticism quickly faded as I watched the programs. In short, both volumes of *Know Your Snakes* are very well thought out and produced. The series was produced with novice reptile hobbyists, nature centers, and school educational programs in mind. The experienced herpetologist will probably not find any new information here, but there are other reasons why such an individual would find these tapes to be a good investment, as detailed below.

The two-part series is attractively packaged with full-color covers. Tape 1 concerns the three rattlesnake species indigenous to the southeast. Tape 2 discusses the coral snake, the water moccasin, and the copperhead. The series was produced as a video field guide; each species discussion includes a range map, comparison with sympatric nonvenomous species, and discussions of preferred habitat, prey preferences, and behavior.

Tape 1 begins with a scene showing Joe poling his way through the swamp in a flat-bottomed boat, with the song "Swampwise" playing in the background. The narrator introduces Okefenokee Joe as a freelance naturalist and expert on herpetology. The scene then shifts to a red rat snake that Joe plucks from the trunk of a tree. He proceeds to explain why snakes are so misunderstood yet play such a valuable role in nature.

At this point, the program moves on to an in-depth discussion of the Eastern diamondback rattlesnake. The snake is shown in a variety of situations, including an interesting sequence in which one specimen comes across what appears to be a nest of young wild rabbits, which it quickly dispatches and eats. This section lasts about five minutes, as do the following sections on the timber rattlesnake and pigmy rattlesnake.

Tape 2 follows the same format as Tape 1, but covers the water moccasin, the coral snake, and the copperhead.

The information contained in the two-tape series is quite accurate, with one exception. In tape 2, Okefenokee Joe remarks that coral snake venom is neurotoxic and acts on the central nervous system. Technically this is not correct, as the symptoms of coral snake envenomation are produced by blocking at the neuromuscular junction, which is part of the *peripheral* nervous system.

From a technical standpoint, *Know Your Snakes* is well produced. The vivid colors and good definition of the picture could only come from a high quality broadcast-type video format. Each section moves along well, with good pace and little added fluff. The actual shots and scenes used are well chosen and look very natural. Unfortunately, at times Okefenokee Joe's own on-camera narration fades a little indicating a poorly-placed field microphone; the problem doesn't happen often, however. Another problem appeared during the cottonmouth-eating-fish sequence. There was a strange background noise during this section. I listened to the sequence several times but was unable to identify the source of the noise, which was quite distracting.

As a field guide, *Know Your Snakes* presents its subject matter in a way that can never be matched by any book. Simply put, still photographs can never portray a living animal as realistically as a motion picture can.

Know Your Snakes will make an interesting and valuable addition to any herpetological library. And as an educational tool for schools, Okefenokee Joe's programs are perfect.

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Euthanasia of Amphibians and Reptiles. 1989. Published by Universities Federation for Animal Welfare and World Society for the Protection of Animals, 8 Hamilton Close, South Mimms, Potters Bar, Herts, EN6 3QD UK. ISBN 0 90067 46 4.

As stated in the Preface, *Euthanasia of Amphibians and Reptiles* "reviews some of the biological and practical considerations relevant to the killing of amphibians and reptiles and attempts to make clear recommendations for humane methods." The report points out that often it is the purpose for which an animal is killed that will dictate the technique utilized. Amphibians and reptiles are killed 1) in laboratories and schools for teaching purposes and research; 2) for commercial or industrial purposes; and 3) in emergency situations where veterinary surgeons and others are attempting to alleviate suffering. Methods of killing are divided into chemical and physical methods. In the report, barbiturates were considered the most suitable agents, but other chemicals also are mentioned including CO_2 (in certain situations). In response to this, the reviewer has used CO_2 in an attempt to euthanatize reptiles and anesthetize amphibians and has found it unsuitable.

With regard to inhalation agents, the report mentions that it may take hours for some ectothermic species to succumb to inhalation agents and may recover if removed from the system prematurely. Under physical methods of euthanasia the following are listed: 1) concussion, 2) shooting, 3) electrocution, 4) hypothermia, 5) hyperthermia, 6) decapitation and transection of the spinal cord, and 7) exsanguination of unconscious animals. The unsuitability of most of those methods is not stressed.

The major shortcomings of this report include: 1) lack of detailed listing of suitable chemical agents with recommendations on proper dosages; and 2) how to administer agents properly. The report should provide information on 1) sites for I.V. and I.P. injections in various groups of reptiles; 2) how to evaluate levels of consciousness; and 3) how one determines whether a reptile is dead or not. Auscultation of the reptile heart with a stethoscope is universally unrewarding in the live healthy amphibian and reptile. EKG machines and doppler flow detectors are useful. In any event, when an amphibian or reptile is unconscious, it should be decapitated. This will ensure it will not recover.

Two issues that were not discussed in this report concern the pithing of frogs and euthanasia of amphibians and reptiles collected in the field for museums. Pithing of frogs in the name of education can no longer be condoned. Likewise, killing of reptiles and amphibians in the field by lethal injections of/or submersion in formalin is unacceptable. Alternative methods, such as injection with a barbiturate or submersion in a solution of MS222 (for tadpoles), is easy and economically feasible.

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HERPETOLOGICAL MONOGRAPHS OF THE MUSEUM ALEXANDER KOENIG BONN

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20. NILSON, G. & C. ANDREN. 1986. The Mountain Vipers of the Middle East - the *Vipera xanthina* complex (Reptilia, Viperidae). 90 pp. DM 18.-

22. KLAVER, C. & W. BOEHME. 1986. Phylogeny and Classification of the Chamaeleonidae (Sauria) with special Reference to Hemipenis Morphology. 64 pp. DM 16.-

27. BOEHME, W. 1988. Zur Genitalmorphologie der Sauria: Funktionelle und stammesgeschtliche Aspekte. 177 pp. DM 33.-

28. LANG, M. 1989. Phylogenetic and Biogeographic Patterns of Basiliscine Iguanians (Reptilia: Squamata: "Iguanidae"). 172 pp. DM 33.-

Orders can be placed to Frau U. Werner, Museum Alexander Koenig, Adenauerallee 150-164, D-5300 Bonn 1, West Germany.

Turtles and Tortoises of the World, by David Alderton. 1988. 191 pp., 98 plates (61 in color plus color frontispiece), 6 figures, 12 maps. Facts on File Publications, New York. $22.95

At first glance this is a beautiful book, reasonably priced, well bound, attractively printed on quality paper, and filled with excellent color plates and well-organized chapters. Unfortunately, the closer one looks at the book, the more disappointing it becomes.

In order, the book covers human-turtle relationships (a mere eight pages), anatomy and physiology (43 pp), reproduction (31 pp), and evolution and distribution (17 pp), as well as a family-by-family overview of all of those aspects (66 pp) and a taxonomic list to subspecies (with common names) of all the turtles of the world. Its coverage is thus much more even than previous general turtle books (especially in its laudable inclusion of many aspects of turtle physiology). I personally would have enjoyed more information on the population ecology of turtles, and some amateur readers will also lament the lack of a section devoted to husbandry.

Perhaps the single most significant omission is a literature cited section. A 28-item bibliography of secondary sources is included, but without reference in the text to primary sources it is difficult for the reader to check the "facts" presented. For example, we are informed: 1) that *Cuora* and *Terrapene* have more than one hinge (p. 20 and 21 and Plate 67; unquestionably only one) and *Kinosternon* only one (p. 21; generally two); 2) that turtles generally aren't aggressive toward each other (p. 59; see Lovich 1988, Herpetologica 44:197-222, or Berry and Shine 1980, Oecologia 44:185-191, among many others); 3) that green turtles breed when only four years old (p. 60; 20 to 30 years according to Frazer and Ehrhart 1985, Copeia 1985:73-79); 4) that the clasping organs of kinosternines are "on the inner surface of the hind feet" (p. 68; on the legs); 5) that "arid area" turtles ("temperate and seasonal tropical"; according to Ewert 1979, pp. 333-413 in Turtles: Research and Perspectives, Wiley) lay smaller eggs than those from tropical wet ones (p. 73); 6) that low fecundity in tortoises in explainable by group selection related to overgrazing (p. 75); 7) that the female marine turtle "invariably returns to the beach where she herself hatched (p. 75; an unproven hypothesis); 8) that the egg tooth "regresses" after hatching (p. 85; it is shed); 9) that hatchling marine turtles orient to the sea by the sound of the waves (p. 88; light is the cue most substantiated); 10) that the thecodont reptiles are direct descendents of the cotylosaurs, and thus the Archosauria and Lepidosauria are not sister groups (p. 93, Fig. 6; any modern text considers the latter sister groups); 11) that climate change was responsible for the Cretaceous-Tertiary boundary extinction event (p. 97; no mention is made of asteroids, vulcanism or fire storms); 12) that painted turtles only lay as many as 11 eggs (p. 125; to at least 23; MacCulloch and Secoy 1983, Can. J. Zool. 61:1499-1509); 13) that *Deirochelys* is "well able to prey on creatures bigger than itself, such as crayfish" (p. 128; unlikely even if the author means lobsters); 14) that "Box turtles are most commonly found close to wooded areas" (p. 133; not applicable to the Coahuilan and Ornate box turtles); 15) that musk turtles lay only up to 3 eggs at a time (p. 143; Tinkle 1960, Ecology 412:68-76, recorded at least 7); and 16) that *Pelomedusa* produces 40 eggs per clutch (p. 173; physically impossible based on Harding 1981, Bull. Chicago Herp. Soc. 16:86-94). Unfortunately, these are only a small fraction of the inaccuracies found in the text (see also Reimer 1989, Plastron Papers 18(6):11-13). I also found the combination of the King's English and a teleological writing style distracting.

However, the figures and photographs are generally of the highest quality, although fuzziness of Plates 26 and 46 should have precluded their inclusion and Figure 1 (a poor redrawing of Fig. 4 in Carr 1952) confusingly represents the ribs as being on top of the carapace. In keeping with the generally excellent job of editing, very few errors of orthography are perpetuated (but see *Kinosternon* on p. 142, *mawei* on p. 113, *yniphora* on p. 156, *sinensis* on p. 178, and *tristernalis* on p. 180). However, the legends are switched in Figs. 23 and 24 and a few additional typographical errors escaped editorial detection (e.g. pp. 61, 69, 114, and 166).

Having myself spent 15 years preparing a preliminary book on turtle distributions (1986, Checklist with distribution maps of the turtles of the world), I was at first pleased to see the family distribution maps, but then dismayed when several were transposed and incomplete (e.g. the lack of tortoises or emydids in Indonesia or *Clemmys* in California). Furthermore, in that same reference I attempted to be as objective as possible in recognizing controversial taxa (and then always with comment); however, the author seems usually to have followed my checklist, but in some cases to have obviously ignored it (as well as supporting published evidence) and used his own preferred names. This is even more problematical in several cases where the text and his taxon list disagree (e.g. the staurotypines are considered part of the Kinosternidae on pp. 24, 83, and 179, but as a separate family on pp. 142 and 145; *Pseudemys floridana hoyi* (no longer valid) is recognized on p. 128, but not on p. 176; and *Kinosternon abaxillare* has full species status on p. 144, but is a subspecies of *scorpioides* on p. 179). Data-based disagreement is fine, but inconsistency is inexcusable.

Last, but not least, I am not alone in finding serious fault in the author's repeated (pp. 7-8, 59, and 117) assertions that the solution to the problem of turtle conservation lies in farming them. This is a complete surprise to me given the record of the continued need of existing turtle "farms" to replenish their stock of adults or eggs from natural, often endangered, populations. The sound of Archie Carr's vigorous maligning of the turtle farm logic during my graduate student days still rings in my ears!!

In conclusion, this book is a pretty, but weak attempt to synthesize accurately our current knowledge of the turtles of the world. I can recommend it only for the basest amateur turtle enthusiasts, and definitely not for the professional or even for serious amateurs.

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Reptile Egg-shells SEM Atlas, by H. Hermann Schleich and Werner Kaestle. 1988. Gustav Fischer Verlag, Stuttgart. 123 pp., $46.00 (hard cover).

The structure of reptilian eggshells has been neglected for a long time and only recently have more researchers become concerned with this topic. Thus, detailed studies of eggshells, especially those of squamates, are scarce. Schleich and Kaestle are to be commended for undertaking such a difficult task.

On the first eleven pages, the authors describe the characteristics of reptilian eggshells, shell morphology, functional morphology, and techniques for eggshell preparation. This introduction, followed by three pages of literature survey, is very helpful for a reader with limited knowledge of structural and functional aspects of eggshells.

In the main part of the book, the authors describe eggshells of four species of crocodiles, 17 species of turtles, and 51 species of squamates. Micrographs are presented on 38 plates opposed by pages with data of the specimens, the description of the shell structures, and schematic diagrams. The schematic diagrams are very helpful for the interpretation of the different shells and the features seen in the micrographs, especially for workers not familiar with eggshell structure. The authors put painstaking work into researching and compiling these specimens.

A section describing fossil reptilian eggshells from Germany concludes the book.

The SEM Atlas will undoubtedly become a major reference book for students, lay-people interested in eggshells, and even for specialists working in this field. It is a very good and welcome start with all its data, diagrams and illustrations, but it has its shortcomings.

In several cases the authors appear to have sacrificed diligent research in favor of presenting a large number of species. They do not refer to basic problems, or describe these too superficially. Several examples of this are given:

It is known to the specialist, but not to the uninformed reader, that some features of the eggshell structure may differ between eggs of feral animals and those raised in captivity. In rigid-shelled eggs the mammillary layer varies between freshly laid, incubated, and hatched eggs.

Fixation of eggs may induce structural artifacts. For these reasons, it is advisable to use material of consistently high quality in a work such as the SEM Atlas.

Abnormal shell material should be described in a separate section; otherwise it may confuse the unexperienced reader or even induce erroneous information.

Most of the pictured fossil gecko eggshells are multilayered, and therefore pathological. Ar et al. (1979) pointed out that the ability to hatch is based on the delicate equilibrium of all physiological features of egg and eggshell. The embryo will suffocate in multilayered shells with misalignment of the pores, or it will not be able to break through the double or multi-layered shell. The authors never mentioned this fact.

Important publications of reptilian eggshells are not cited in the literature review. These include extensive studies of crocodilian eggshell (Ferguson 1982); studies of turtle eggshells (Ewert 1979: Ewert et al. 1984; Packard

et al. 1982); studies of gas and water exchange, calcium mobilization, etc. (Packard 1982; Packard et al. 1984; Andrews and Sexton 1981; Sexton et al. 1979) It would have broadened the scope of the book if the authors had incorporated some of the results of the cited research.

It is a questionable praxis to identify fossil eggs only by macrofeatures such as size, shape, and possibly a shell-like layer. Nature produces so many egg-like phenomena (wasp burrows, worm holes, pellets, peloidal mudstones and so forth) that one can be mistaken. The specimens from Gaimersheim (Pl. 41, 42) and Offenbach (Pl. 43) fall into this category. The absence of any identifiable shell material or collapsed eggs, as is typical for soft-shelled eggs, makes the stated identification of these specimens very questionable. An egg-like look alone is just not enough evidence as Meyer (1867) and van Straelen (1928) have stated; some microstructural, elemental or mineralogical features of the shell layer should be identifiable.

Preparation techniques and research methods could have been further elaborated for persons who are unfamiliar with the SEM. As an example, mapping for calcite under the SEM will show more or less organized structural features of the calcite in soft eggshell. Although this is an SEM Atlas, other important procedures, such as light and polarizing microscopy, should be mentioned. It would have been very helpful if the authors had used arrows or letters in the illustrations to mark some of the features mentioned in the descriptions of the specimens.

Even with its shortcomings, the Atlas is a book worth having. It contains very useful data, and offers a good introduction to the topic of reptilian eggshells.

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Frogs and Toads of the World, by Chris Mattison. 1988. Blandford Press, Poole, England. 191 pp. $22.95.

Amphibians in general, and frogs in particular, are becoming increasingly popular among herpetoculturists. This is good news, and long overdue. There will always be trends that come and go, but this change is broader than a trend. There has been a slow but steady drift towards increasing popularity of anurans in recent years. This is due, at least in part, to the breaking down of some of the myths concerning the "difficulty" of keeping these beautiful animals that naturally follows the publication of new books on the subject. Elke Zimmerman's *Breeding Terrarium Animals* immediately comes to mind. *Frogs and Toads of the World,* by Chris Mattison, will prove to be another force further pushing this drift forward.

In the introduction, Mr. Mattison lays out the aims of his work: He seeks to "provide insight into the varied lives of an interesting group of animals, produce answers to some of our questions and at the same time raise others." These aims are aptly met by this small but jam-packed book.

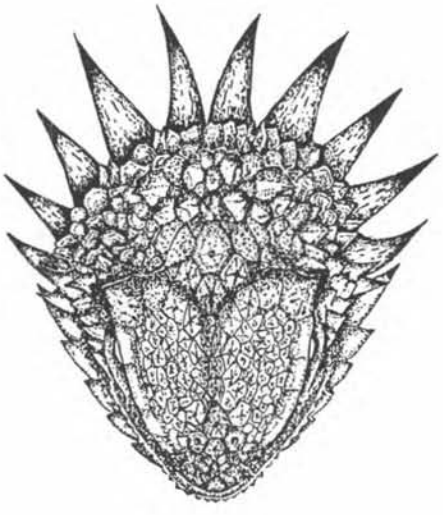
The herpetoculturist inherently knows of the intangible attraction that frogs and toads hold. With no slight to female herpetoculturists intended, the "boy-within-us" feels the mystique. Books deal in facts and figures, in words and illustrations—all tangible things, and with these the author must try to impart the intangible. He must engage the readers' imagination, tap into the mystique, as it were. Have you ever wondered why some people can regard, or rather disregard, anurans as "slimy—detestable" things while others are absolutely compelled to view them as infinitely beautiful and altogether fascinating? When a herpetoculturist reads this book there is a communion of kindred spirits between the author and the reader. What lies between the lines is what really makes this book a success! Chris Mattison loves frogs—he cannot help himself. I felt this as I read the book.

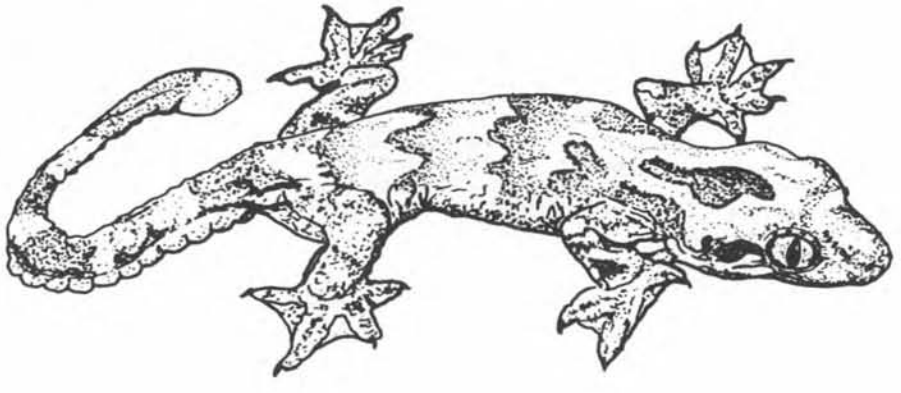
The title *Frogs and Toads of the World* sounds rather ambitious and all-encompassing. An exhaustive treatise on all the anurans of the world it certainly is not, but neither does it claim to be. What it is, is a good general introductory survey book. I use the word "introductory" without meaning to imply that the more advanced frog enthusiast would not find it valuable as well. The author makes no assumptions concerning the readers' knowledge of frogs, or lack thereof; this is good.

The chapters begin with the more general and progress towards the specific. There is an excellent balance of general anatomical/physiological information, natural history, and husbandry information. The text flows well, and is easily readable, as these various topics are discussed. Each chapter builds on the one before it. When you finish reading the book you will know more about anurans than you did before, and you will have a sense of the whole picture. The photos, both the color and the black & white, are excellent and plentiful.

In summary, I consider this book to be a valuable addition to my own library. My only regret is that I did not write it. What higher compliment can a reviewer pay an author?

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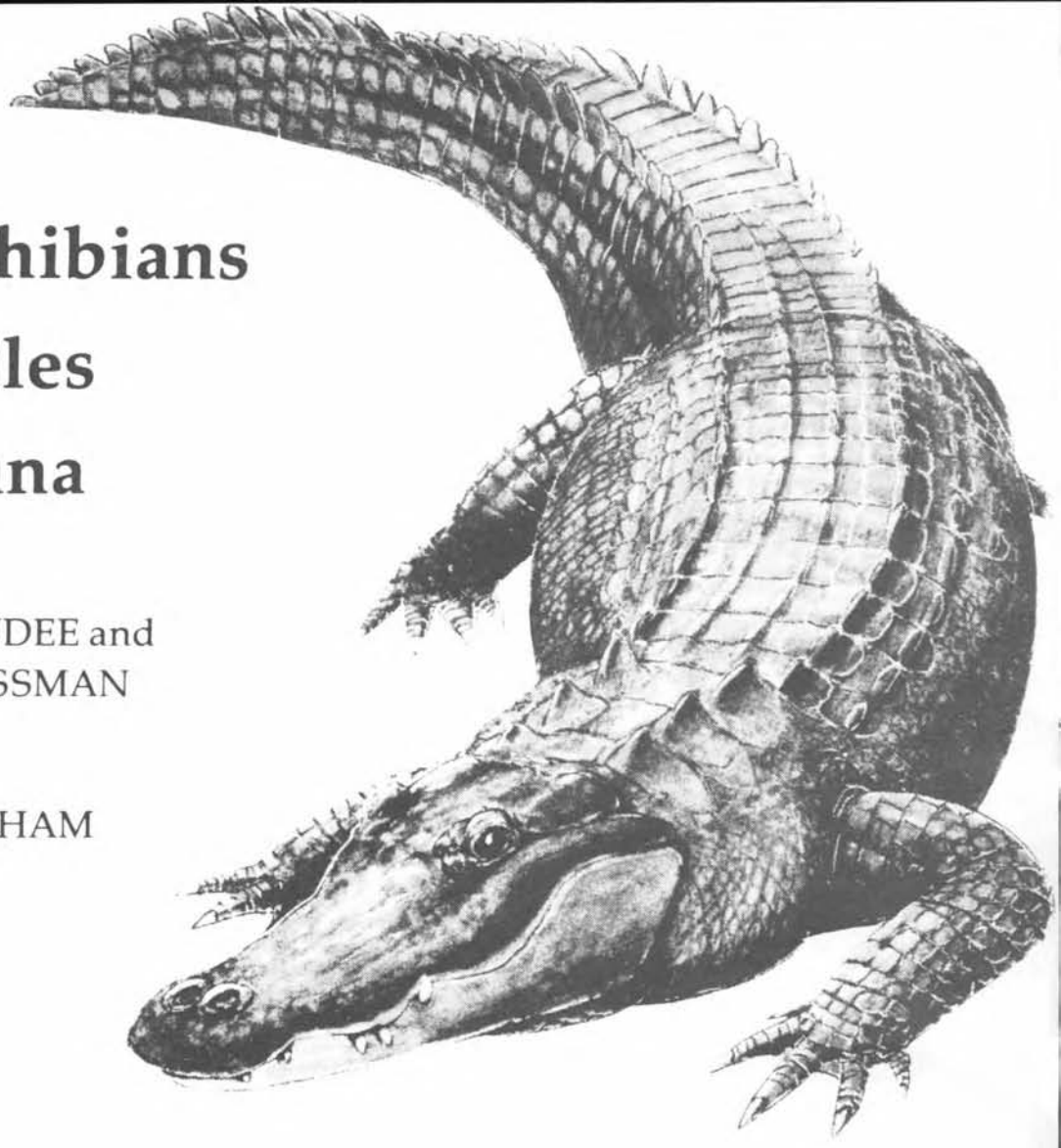
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The Amphibians and Reptiles of Louisiana

HAROLD A. DUNDEE and
DOUGLAS A. ROSSMAN

Illustrated by
EUGENE C. BECKHAM



In the only detailed and comprehensive study ever published on the state's widely varied herpetofauna, Harold A. Dundee and Douglas A. Rossman describe each of the state's 130 species, providing information on each animal's life history as well as feeding, behavioral, and reproductive habits. They also offer a valuable discussion on taxonomy and taxonomic problems of the various species and provide keys for the identification of the animals. Exquisitely rendered color paintings highlight each species' significant structural features and markings. The Amphibians and Reptiles of Louisiana will prove useful and informative for professional and amateur herpetologists and students. Illustrated with 24 color plates, 126 maps, and 10 line drawings.

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HERPETOLOGICAL REVIEW EDITORIAL POLICY

The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** In 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to rtteview herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology, and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations and photographs. Manuscripts submitted must be typed, double spaced, on 8.5X11 inch paper, and should be sent in duplicate. We encouregе submissions on Macintosh disks, though we can also work with TEXT (ASCII) files submitted on IBM and compatible floppies. **Herpetological Review** is composed on a Macintosh SE using Microsoft Word, which accepts files from several other word processor applications. Format your documents full-page width; we will fit to **HR** format. Unpublished photographs of an unusual nature or of uncommon amphibians or reptiles may also be submitted. These should be 8X10 inches black and white, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled lightly on the back of each print. Return of unsolicited photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs solicited by the Editor will be returned at our cost.

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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (4 issues annually), **Herpetological Review** (4 issues annually), and occasional issues of **Facsimile Reprints in Herpetology**. Members may purchase other Society publications at reduced rates.

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Individuals are encouraged to join at the higher membership categories. Money from such support substantially helps promote the publications and services of SSAR. For membership information, contact the Treasurer (see address in left column).

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Herpetological Review

Volume 20 June 1989 Number 2

SSAR BUSINESS

NOTICE TO *J. HERPETOL.* SUBSCRIBERS

Due to a printer's error, some subscribers may have received defective copies of the March issue (Vol. 23, No. 1) of the *Journal of Herpetology*. These copies may have had some blank pages. If you received such a copy, please return it to the Publications Secretary and a good copy will be mailed to you. Send to: Robert D. Aldridge, SSAR Publications Secretary, Department of Biology, Saint Louis University, St. Louis, MO 63103, USA. •

NEWSNOTES

LONGEVITY SURVEY

The Longevity Survey of Reptiles and Amphibians in North American Collections will be updated in 1989. Individuals and institutions that contributed data to the 1977 survey will be mailed forms in 1989. Those not included in the original survey may contribute data by contacting Kevin Bowler or Andy Snider at Audubon Zoo, 6500 Magazine Street, New Orleans, LA 70178, USA. (504) 861-2537. •

INFORMATION REQUEST

An annotated bibliography on amphibians and reptiles in the diets of North American raptors is being compiled. Raptor species to be included are: all falconiformes, owls, loggerhead shrike, and the common raven. Especially sought are papers that include frequency of occurrence and biomass data. Any information on poorly-known species is particularly desired. Contributors will be duly acknowledged. Please send all material to David A. Ross, Wisconsin River Power, Company, Box 8050, Wisconsin Rapids, WI 54495-8050. •

COLLECTIONS TRANSFERRED TO THE FLORIDA MUSEUM OF NATURAL HISTORY

The Herpetology Division of The Florida Museum of Natural History (formerly The Florida State Museum) has acquired the herpetology collections of Tall Timbers Research Station near Tallahassee, Florida, and The Florida State University (1800 and 4000 specimens, respectively). The majority of the two collections are from the Florida panhandle. The division now has over 44,000 specimens from Florida available for loan. For further information, or to arrange loans, contact David L. Auth, Collection Manager, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611, USA. (904) 392-1721. •

GROUP PROTECTS COSTA RICAN RESOURCES

The Asociacion Preservationista de Flora y Fauna Silvestre was founded in 1985. It is a group of Costa Rican citizens concerned about poaching and illegal timber cutting activities within the country's forest reserve and National Park lands. It is also dedicated to the education of children in rural schools on wildlife issues. Members of the association are empowered by the government to arrest violators and confiscate illegal wildlife products.

This group is largely responsible for generating its own operating funds. Volunteers are in great need of funds for basics such as boots, flashlights and a tranquilizer gun for relocation of nuisance predatory animals. Contributions can be sent as bank drafts or personal checks to:

Asociacion Preservationista de Flora y Fauna Silvestre
Apdo. 8-4330-1000
San Jose, Moravia
Costa Rica, Central America

For more information please contact the group at the above address or: Kevin N. Brewster, Municipal Water Analysis Laboratory, Box 218, Eagle River, WI 54521, USA •

MEETINGS

DGHT ANNUAL MEETING

The Deutsche Gesellschaft fur Herpetologie und Terrarienkunde (DGHT) is holding its 25th Annual Meeting from 27 September through 1 October 1989, at the Senckenberg Museum in Frankfurt. Members of SSAR are invited to attend this meeting. For further information, contact Ingo Pauler, Im Sandgarten 4, D-6706 Wachenheim, West Germany. •

HERP COLLOQUIUM AT AAZPA MEETING

A special colloquium on the Conservation and Captive Propagation of Reptiles and Amphibians will be held in conjunction with the 1989 Annual Conference of the American Association of Zoological Parks and Aquariums in Pittsburgh, Pennsylvania 24 to 28 September. For details please contact Kevin Bowler at Audubon Zoo (504) 861-2537. •

ASZ CENTENNIAL MEETING IN BOSTON

The 1989 Centennial Meeting of the American Society of Zoologists with the American Microscopical Society, Animal Behavior Society, The Crustacean Society, International Association of Astacology, and Society of Systematic Zoology will be held 27 - 30 December at the Marriott Copley Place Hotel, Westin Copley Place Hotel, and the Copley Plaza Hotel in Boston, Massachusetts, during the traditional post-Christmas period.



Guest Editorial
HERP. REVIEW AT A CROSSROAD—AGAIN

I will preface these remarks by emphasizing that, as in any editorial, they represent my personal views rather than the official view of the Society. Therefore, send all hate mail to me at the address below!

Over the years, the folks who bring you this useful, nice publication have thrown themselves into its production in the tradition more typical of the regional society publications from which we developed. This is not said in derision, but in awe; what many publications (including some of SSAR's) pay printing firms ***large*** amounts of money to produce, HR and its regional society ancestors accomplish with ***large*** amounts of effort from the editors and managing editors. But, the last few years have plainly shown that SSAR is not attracting the number of new members, whose dues support our publications, as before. Income limitations, coupled with the amount of money spent to produce a first-rate *Journal of Herpetology*, have combined over time to limit what's available for those other SSAR activities that many of us feel makes SSAR special. No, I'm not leading up to suggesting a dues increase—I'm no longer on the Board, and never supported frequent increases anyway. My purpose here is to point out that HR's Editor elected to try something more innovative to give you—our core base of support—more for your money.

That something is a term we all hear tossed about, but may not know much of—Desk Top Publishing. Let me make crystal clear the fact that the term is a lie. It more accurately is Desk Top TYPESETTING/ COMPOSITION; publishing also involves volume printing and distribution, and unless *your* desktop is the size of the flight deck of an old Essex-class aircraft carrier you can't publish from it! But, it's a great technique. Going into this Volume, HR labored along under a *3-year* backlog of manuscripts incurred because there flatly wasn't money to publish them! The backlog now is close to **zero**. As a member of SSAR's committee to investigate Desktop technology (Harold Dundee, Chair), I last year thought HR would make a good model to test. An appeal last year for help brought three responses, but we had no real way to tell folks what to expect via time commitments and problems. So, new plan. My grand plan involved sharing the hat of Managing Editor, tapping people I knew who could type faster than in geologic time (my speed), and then doing the layout on my Macintosh SE. Marty agreed to try it. Thus, we composed 14 pages of HR 20(1) for the sum of $25, instead of the ca. $55 **per page** normal cost to take the publication to the printing threshold. In 20(2), we did 17 pages plus the Herp Values insert for about the same dollar cost.

But, dollars aren't the only cost; if they were, we'd mandate the method for all pubs and be able to return to the days when we could distribute Circulars free, set dues at $18, and do **all** the things SSAR has pioneered. Volunteer time and SSAR money are like matter and energy—they are interchangeable, but can neither be created nor destroyed! Well—not created, anyway. Part way through issue 1, my daughter opted to pursue more typical activities for a 14-year old than typing, though it was a "kick" for her to see her name on the cover. So, a friend and I did the rest of it, plus most key-stroking for issue 2. **NOT FUN.** Happily, Tom Johnson supplied Herp Values on IBM-type floppies, and I just transferred the file to HR in the Mac. But there, folks, is the biggest drawback to the technique—the tedious transfer of typed manuscript to the itty-bitty blips of electrical charge on a hard disk that are so easy (relatively) to format. No, I'm not whining for a pat on the head; I'm just typing out reality. And as I wear too many hats already (in and out of SSAR), I can take the effort no further. Also, having his own plethora of hats to wear, Marty would, as he expressed here last year, like to hand over HR to a new editor. Hopefully, that wish will be easier to realize now that a new recruit won't face the awful weight of that former backlog.

But, it sure would be nice if new souls would be willing to capitalize on what we've started here. It's not a job for anyone who lacks good support facilities like a laserwriter (in generic sense), a top-notch word processor (we use Microsoft Word© 3.02), folks to keystroke, etc. And, since the whole model involves graphics and is set up around Macintosh CPUs (yours truly has never successfully communed with MS-DOS machines), it would be nicest if brave new souls also liked and used Macs. But, the success of the technique depends ultimately less on hardware choices than on skill and determination. My recommendation would be for a new editor to recruit a Production Staff (some of the 3 early volunteers were agreeable to so working) to handle keying, and, ideally, a computer-fluent managing editor willing to help format (or do all of it), freeing the editor to deal with authors, reviewers, and budgets. We could probably come up with an additional managing editor here in Lawrence to interface with our printer, freeing the rest from worrying about the mechanics of getting the issues out.

That's our crossroad—all the above. SSAR was built on a tradition of volunteer effort, in a spirit that's hard to capture in a large society with members far and wide. But, volunteers have to pay bills, earn tenure and live their own lives, so the system only works if there are *lots* of people who understand and appreciate what others give, and in turn are willing to volunteer. The **only** alternative is the deadly spiral of paying escalating costs for services and financing those with higher tithes, which discourages new members (especially the younger ones whose involvement, or lack of it, determines the future viability of any group) and in turn pushes *up*, not *down*, the cost of belonging!

How about it gang—any takers??

George Pisani, Biological Sciences, University of Kansas, Lawrence, KS 66045

The Call for Contributed Papers has been issued by ASZ, and a 4 August deadline for receipt of abstracts of papers (oral or poster presentations) has been set.

Plenary lectures are scheduled the first three mornings of the meeting and include talks by Howard A. Bern, Joseph Bonaventura, Stephen J. Gould, Hugh Huxley, Masakasu Konishi, Gary W. Litman, George O. Mackie, Lynn Margulis, Keith Porter, Berta Scharrer, Marvalee H. Wake, and E. O. Wilson.

Symposia presently scheduled are: (1) Science As A Way of Knowing—Neurobiology and Behavior, (2) Animal Behavior—Past, Present and Future, (3) Frontiers in Hormone Research, (4) Application of Molecular Genetic Approaches in Understanding the Basis for Immune and Other Forms of Specific Recognition, (5) The Origins and Evolution of Metabolic Pathways in Animals, (6) Workshop on Invertebrate Habitats: The Ecological and Functional Biology of Endosymbiosis, (7) Workshop on the Teaching of Invertebrate Zoology, (8) Recent Advances in Phylogenetic Studies of DNA Sequences, (9) Experimental Approaches to the Analysis of Form and Function, and (10) Biology of the Thalassinoidea (Crustacea, Decapoda).

Meeting plans include art, book and instrument exhibits, programs on public affairs, ethics, and tools & technologies, several socials, commercial exhibits and a job placement service. The housing and registration deadline is 17 November; forms will be available mid-September.

This meeting is hosted by Harvard University and Northeastern University, with Karel F. Liem and Kenneth P. Sebens co-chairing the Local Arrangements Committee. Plan to join ASZ in the celebration of its 100th Anniversary.

For more information contact: Mary Adams-Wiley, Executive Officer, American Society of Zoologists, 104 Sirius Circle, Thousand Oaks, CA 91360, USA. (805) 492-3585. •

REGIONAL SOCIETIES

CHICAGO HERPETOLOGICAL SOCIETY
$2000 Prize Competition

The Chicago Herpetological Society is looking for high quality , original material not elsewhere published that deals with various aspects of herpetology. Towards this end the Society is offering cash prizes for the best articles and photograph to appear in Volume 24 (1989) of the CHS *Bulletin*, a monthly publication. The following four prizes will be awarded:

$1000 for the best article
$500 for the second place article
$250 for the third place article
$250 for the best photograph

Article topics could be, but are not limited to: captive breeding and husbandry; a faunistic survey or other field work; an historical account of herpetologists or the animals they studied; or an exciting personal adventure in herpetology; Articles must be typed double spaced, have adequate margins, and be submitted in duplicate. Articles submitted in the form of an ASCII file on a floppy disk would be greatly appreciated. Photographs submitted with or without articles must be 5 x 7 inches (or larger), glossy, black & white prints. Data on the subject must accompany the photograph in a typed caption of less than 100 words.

Submission of articles and photographs gives the CHS the right to publish the material. Awards will be announced in the February 1990 *Bulletin*. All material should be submitted to: Publications Secretary, Chicago Herpetological Society, 2001 N. Clark Street, Chicago, IL 60614, USA. •

ARIZONA HERPETOLOGICAL ASSOCIATION

The Arizona Herpetological Association is celebrating its 20th Anniversary in 1989. The organization was founded in 1969 by a handful of hobbyists interested in the conservation of reptiles and amphibians.

The Association publishes a bi-monthly newsletter, provides (among other things) educational talks and slide shows for the public and furnishes a free reptile removal service. Currently, the Association has nearly 300 active members.

Memberships are: $12.00 per individual and $17.50 per family. Benefits include six newsletters per year and free admission to all meetings and events. Events sponsored by the Association include field trips, mall shows and swap meets.

To become a member, send your check with name and address to:

Arizona Herpetological Association
1433 West Huntington
Tempe, AZ 85282, USA •

HERPETOLOGICAL SOCIETIES MAILING LIST

The SSAR Regional Herpetological Societies Liaison Committee has compiled this updated list of mailing addresses for all known and active herpetological societies worldwide. We request that readers help us keep this list current by providing us with any changes, additions or deletions as they occur.

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c/o Dr. Walter Auffenberg
Florida Museum of Natural History
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Lakeside, CA 92040

American Society of Ichthyologists and Herpetologists
National Museum of Natural History
Washington, DC 20560

Arizona Herpetological Association
1433 West Huntington Drive
Tempe, AZ 85282

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Palo Alto Junior Museum
1451 Middlefield Road
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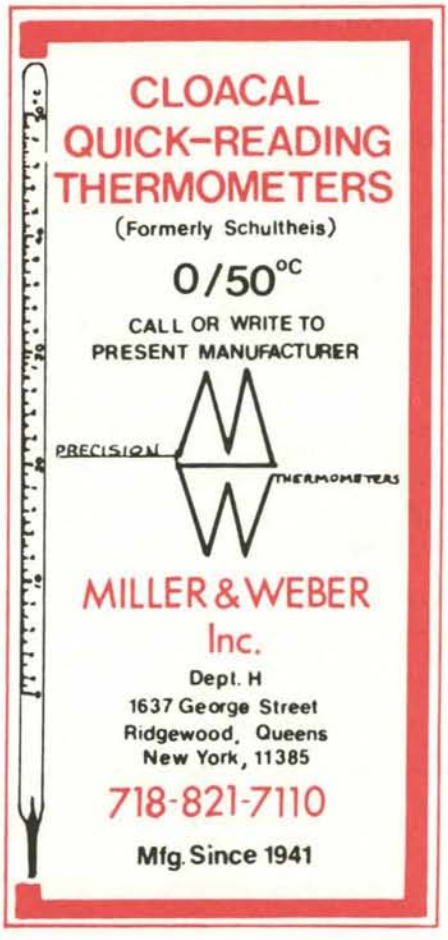
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FEATURES

NOTES ON LOUISIANA GOPHER TORTOISE *(Gopherus polyphemus)* REPRODUCTION

Several recent surveys of gopher tortoises *(Gopherus polyphemus)* in Louisiana (Auffenberg and Franz 1982; Lohoefener and Lohmeier 1984) concluded that the species is critically imperilled to functionally extinct in the state. In 1986, the Louisiana Natural Heritage Program initiated an active search for gopher tortoises in southeastern Louisiana. To date, we have located active burrows at 18 sites. Although most of our sites are relatively isolated and support only one to three individuals, we observed 16 active burrows at one site in a powerline right-of-way, and nine active burrows at a site on private farmland. Prior to 1988, we had observed no evidence of recent reproduction (e.g., hatchlings or small burrows); therefore, our concern about the ultimate fate of gopher tortoises in Louisiana mirrored those expressed by previous researchers.

In September 1988, I obtained the first documented evidence of recent reproduction by gopher tortoises in Louisiana. In north-central St. Tammany Parish, two recently-hatched tortoises were found by the owner of a site known to support two active, adult-sized tortoise burrows. The first hatchling emerged at approximately 1000 h, 5 September; the second emerged about 24 hours later.

The nest had been excavated in the soil mound at the entrance to the burrow that I assumed to be that of the female parent. Upon excavation of the soil mound, I determined that the eggs had been laid ca. 12 cm below the soil surface and ca. 25 cm from the entrance to the adult burrow. The dimensions of the adult female's burrow were 36 x 14 cm (base x height), measured at a distance of 5 cm within the entrance.

The clutch included four eggs, three of which had hatched; the fourth was in an advanced stage of decay (deposited at LSU Museum of Zoology, LSUMZ 47920). Measurements of the two available hatchlings, taken at ages of 3 and 2 days, were: 6.4 x 4.8 cm (maximum carapace length x maximum carapace width) and 5 x 4.8 cm,

respectively. The older hatchling appeared healthy, whereas the second hatchling had suffered damage to the right eye from bites inflicted by red imported fire ants *(Solenopsis invicta)*. Landers et al. (1980) also documented attacks by fire ants on hatchling gopher tortoises and theorized that they may be a significant mortality factor.

Because pet and free-ranging dogs were common in the vicinity of the nest, personnel of Audobon Zoological Garden in New Orleans agreed to head-start the hatchlings for 1.5 - 2 years. The young tortoises will be released into suitable habitat on a protected site in Louisiana.

In addition to the resident female, the owners of this site reported seeing another large tortoise in and near the burrow excavated by the female during late spring or early summer 1988. However, I thoroughly searched the area within 300 m of the female's burrow and was not able to locate any additional adult-sized burrows.

The second case of recent tortoise reproduction in Louisiana was documented from Bush, St. Tammany Parish. The owner of this site noted two young tortoises and three small burrows 23 September; two more small burrows were located the following day. On 14 October, I visited the site and confirmed her identifications. One active adult-sized burrow and several inactive burrows were located on the site. The dimensions of the active burrow, presumed to be that of the female parent, were 30 x 16 cm. During my visit, I observed five active hatchling burrows (mean entrance dimensions 6.3 x 2.5 cm. and one inactive start; young were present in at least four of the five active burrows. Three of the burrows had been excavated at the base of some large object, such as a wood pile; the other two burrows were in the open. Total burrow lengths were about 25 cm (two burrows), 30 cm, and 45 cm (two burrows). All burrows were excavated at a shallow angle (ca. 15 degrees); thus, the burrow terminus was generally only 2-4 cm below the soil surface. Distances from the adult burrow to the hatchling burrows were 5.0, 7.8, 17.5, 22.9, and 70.1 m. I was unable to locate egg shell fragments or any other sign of the nest site. The resident female was uniquely marked, and the owners of the site reported occasional observations of non-resident adult tortoises on their property. However, I was unable to locate any active adult-sized burrows within 300 m of the presumed female's burrow.

These observations indicate that the gopher tortoise is not functionally extinct in Louisiana. Discovery of reproduction by apparently isolated female tortoises raises questions about gopher tortoise biology in need of investigation. Studies are needed to determine home range sizes of male tortoises under low-density conditions, and whether gopher tortoise populations can persist in non-"colonial" situations.

I would like to acknowledge Gary Lester, Louisiana Natural Heritage Program, for initiating the recent gopher tortoise surveys in Louisiana.

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THE SAVANNAH RIVER ECOLOGY LABORATORY HERPETOLOGICAL MUSEUM

Herpetological research is a major emphasis at the University of Georgia's Savannah River Ecology Laboratory (SREL) in South Carolina (Gibbons 1977; Gibbons and Caldwell 1980; Gibbons and Patterson 1978). In recognition of the useful information that preserved reptiles and amphibians can provide for systematic, ecological and evolutionary studies, SREL maintains a representative museum collection of these animals. The scope of the collection is largely regional, but a variety of specimens from other states and countries are available. The purpose of the collection is three-fold. First, maintenance of a synoptic collection of reptiles and amphibians found on the Savannah River Plant (SRP). Second, to provide verification of important locality records with voucher specimens, and third, to provide interested researchers with a comprehensive regional collection for systematic, ecological and evolutionary study. The objective of this note is to familiarize the herpetological community with the amphibian and reptile collection at SREL.

Specimens entered into the collection date from 1950. However, specimens were not collected on the SRP and catalogued until 1968. Collection and preservation of specimens was in accordance with guidelines given in ASIH et al. (1987). Presently, the collection holds over 3000 catalogued alcoholic specimens representing 30 families, 80 genera, and 165 species. Of these, approximately 2000 are amphibians. The representation of major orders is shown in Figure 1. Major strengths of the collection include large series of local amphibians and small colubrid snakes, and an extensive collection of larval amphibians. Traffic volume on the 200 km of paved roads on the SRP is light, and road-killed specimens are rarely hit more than once. As a result, large numbers of freshly killed snakes have been collected and incorporated into the museum (Kaufman and Gibbons 1975). Regionally notable specimens include a significant range extension for *Rhadinaea flavilata* (Young 1988), and a collection of *Kinosternon baurii* from the western limit of their distribution in South Carolina (Lamb 1983a, b). Catalogued entries encompass 17 states with over 2600 records for South Carolina.

The entire collection was inventoried in 1988 and a computer file was created. Researchers interested in lists

of our holdings for various taxonomic groups or geographic regions can obtain them by writing to the Acting Curator of Herpetology. Loan policies are liberal, but visits are encouraged.

In short, we hope that research-oriented herpetologists will take advantage of the excellent regional collection maintained at SREL.

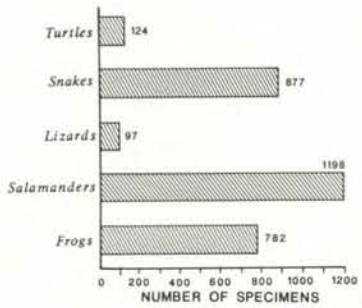


Figure 1. Number of catalogued entries for major orders of amphibians and reptiles in the Savannah River Ecology Laboratory Museum. Totals do not include lot catalogued entries.

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FLORIDA STATE MUSEUM CHANGES ITS NAME BUT KEEPS ITS ACRONYM

The Florida State Museum was founded in 1917 by an act of the state legislature as a department of the University of Florida. FSM became the official acronym for citing specimens in print and remained in effect until 1946, when the museum temporarily closed its doors upon the retirement of its long time director, Dr. T.H. van Hyning. In 1951 the museum reopened and almost immediately, several collections maintained by the Department of Biology were transferred to its care, greatly increasing the museum's holdings. As a result of these transfers, the acronym was changed to UF, which remains in effect to this day.

A sign outside the museum reads "J.C. Dickinson, Jr. Hall, Florida State Museum" (Dr. Dickinson was the third director). However, another sign on the building declares "State Museum of Florida." Dr. Peter Bennett, fifth and present director, noted this discrepancy and also began meeting people in his travels who thought the Florida State Museum was located in Tallahassee and was part of Florida State University. He resolved to stop this confusion and, in June, 1988, the governor signed a name change into law. The Florida State Museum will now be called the Florida Museum of Natural History.

The logical new replacement acronym for UF would be FMNH, but it is already in use by the Field Museum of Natural History. In any event, abandoning UF would only add to the diversity of incorrect acronyms already present in the literature. For example, authors still commonly use FSM. UF/FSM and, less frequently, UF-FSU are also seen. Leviton et al. (1985) list both UF and UF-FSU as official acronyms for the Florida State Museum. Unfortunately, they don't mention in either their Parts 1 or 2 that UF-FSU refers only to a part of the Ichthyology Division collection, which was received from Florida State University (the Ichthyology Division is presently computerizing its collection and has dropped the UF-FSU acronym).

The Florida Museum of Natural History is one of the few institutions for which its acronym does not match its name. Although the present acronym has been in effect for 38 years, the new museum name will undoubtedly result in new incorrect acronyms in the literature. Authors should read the institutional loan form, on which the correct acronym is written (until recently, UF/FSM was on the Herpetology Division form!) or, in general, consult the appropriate person at the institution before submitting a manuscript.

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UNUSUAL NEST SITE OF A SCINCID LIZARD *Sphenomorphus kinabalensis* FROM SABAH, MALAYSIA

Sphenomorphus kinabalensis is an endemic Bornean skink, known only from high altitude areas around Mt. Kinabalu, Sabah. Since Bartlett (1895) described this species, no information concerning its natural history has been published. In the present paper, we report an egg deposition site observed during a zoological survey in Sabah. Voucher specimens were deposited in the herpetological collection of the Department of Zoology, Kyoto University.

Sixteen eggs, covered by white parchment-like shells, were found in a nest of a ponerine ant, *Anochetus princeps*. The ant nest was made in tunnels (probably made by passalid beetles) in a fallen tree on the floor of the moss-forest at Ranau (near Mt. Kinabalu, alt. ca. 1300 m), Sabah, on 13 August 1987. All eggs were half-buried in the wet substrate of a brood chamber, where numerous larvae and pupae of the ant also were observed. We collected 14 eggs (elliptical, 9.8 X 7.9 - 13.8 X 9.4 mm), and kept them on wet paper in a plastic cup at an air temperature of 22° -32° C. Six of the eggs produced hatchlings, 20.1+ 27.5 - 21.5+28.3 mm snout to vent (SVL)+tail lengths, wheras the remainder molded. Exact dates of hatching were: 18 (N=1), 19(1), 24(1), 29(1), and 30(2) August 1987. We also examined five other fallen trees with similar tunnels in the same forest. However, neither lizard eggs nor ant nests were found.

We dissected seven adult female *S. kinabalensis* (SVL: 45.0-57.4 mm) collected near Mt. Kinabalu in August 1979, and examined their gonads. Of the seven animals, six possessed two oviducal eggs or yolked follicles, and the other a single oviducal egg.

The number of eggs found in the ant nest were probably the contribution of eight or more clutches, and thus, it is likely that the skinks specifically selected the ant nest as a communal oviposition site. The lack of eggs in other trees with similar tunnels but without ant nests support this assumption.

Among live lacertilian species, one teiid (*Teius teyou*) and one gekkonid (*Gonatodes humeralis*) are known to utilize ant nests as oviposition sites (Vaz-Ferreira et al. 1970, 1973; Gotwald 1984). However, no scincid species have ever been reported to lay eggs in any nests. Soldiers of *Anochetus princeps* are armed with stingers and large mandibles (Brown 1978), and therefore, it is likely that eggs of *S. kinabalensis* in their nests receive protection against small predators.

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PREY ITEMS OF 20 SPECIES OF THE NEOTROPICAL COLUBRID SNAKE GENUS *LIOPHIS*

Liophis occurs in southern Central America, several islands of the Lesser Antilles, and throughout most of South America (Dixon 1980). At present, there are 36 species recognized in this genus.

While the taxonomic status and systematic relationships of many of the species of *Liophis* have been elucidated (Dixon and Markezich 1979; Dixon 1980, 1981, 1983a,b,c,d, 1985a,b, 1987; Dixon and Thomas 1982, 1985; Cunha et al. 1985; Myers 1986; Michaud and Dixon 1987), there still exists a paucity of natural history information for the majority of these snakes. The purpose of this paper is to present an overview of the diet of *Liophis*.

All *Liophis* have opisthodont dentition with simple teeth. There are 10 to 30 teeth on the maxillary bone; the last two are usually enlarged and offset, and separated from the others by a slight to moderate diastema (Dixon 1980). All teeth are ungrooved, including the two enlarged postdiastemal teeth. However, these postdiastemal teeth are proximate to one another with a large tube-like space between them that ostensibly might function like a venom delivery system, although we have no evidence that this is the case (for more information on dentition see Dixon 1980, pp. 22-24; and Edmund 1969, p. 177, fig. 41).

The majority of the species of *Liophis* are terrestrial, but some are semifossorial or semiaquatic. All species are usually found associated with moist environments. "*Liophis* are generally found around bogs, swamps, marshes, ponds, and streams that are associated with rain forests, montane forests, deciduous forests, thorn forests, grassland, and paramo." (Dixon 1980).

The occurrence of *Liophis* in these mesic habitats is reflected in its diet which consists largely of anurans and their larvae, and also includes insects, earthworms, fish, salamanders, amphisbaenids, lizards, birds, and mice (Table 1). Table 1 includes: a summary of the literature, the present contribution of a total of 11 new prey items for eight species of *Liophis*, the first report of any prey taken by *L. almadensis* and *L. paucidens*, and the addition of *Bolitoglossa altamazonica* and *Cnemidophorus ocellifer* to the list of species preyed upon by the genus *Liophis*.

While the present study adds to our knowledge of the diet of *Liophis*, it is apparent that there remains much to be learned. We can safely assume that the prey items listed for these 20 species are incomplete in most cases, and there are 16 other species for which the diets are unknown (*Liophis andinus, L. cursor, L. elegantissimus, L. festae, L. frenatus, L. guentheri, L. juliae, L. longiven-*

Table 1. Prey items of 20 species of *Liophis*. All present contributions are from dissected stomachs of snakes in museum collections, all presumed to have fed in the wild. All other prey items listed are assumed to have been taken by snakes in the wild unless otherwise noted. Prey items followed by (c) indicate that the snake ate the prey while in captivity, (ac) the snake attempted to eat the prey in captivity, and (w,c) denotes prey items that were consumed both in the wild and in captivity. Current taxonomic status (Frost 1985) of prey items are listed in parentheses when appropriate.

Snake Taxon	Prey Item	Reference
Liophis almadensis	frog eggs, probably *Pleurodema* or *Physalaemus*	This study
L. anomalus	frogs	Freiberg 1957
	frogs, toads, worms, insects, spiders	Freiberg 1982
	insects, *Bufo arenarum, Bufo granulosus dorbignyi (B. dorbignyi), Ceratophrys ornata, Leptodactylus ocellatus*	Gallardo 1977
L. atraventer	*Eleutherodactylus* eggs	Dixon and Thomas 1985 (W.R. Heyer, in litt.)
L. breviceps	earthworms, myriapods, *Synbranchus*	Beebe 1946
L. carajasensis	*Hyla, Leptodactylus*	Cunha et al. 1985
L. cobella	*Colostethus trinitatis, Thecadactylus rapicaudus*	Mole and Urich 1894
	fish, frogs, a gecko	Mole 1924; Wehekind 1955
	frogs, lizards	Beebe 1946
L. dilepis	*Hyla rubra (Ololygon rubra)*, unidentified hylid, *Leptodactylus ocellatus, Leptodactylus fuscus, Physalaemus cuvieri*, unidentified leptodactylid	Vitt 1983; see Michaud and Dixon 1987

tris, L. maryellenae, L. meridionalis, L. ornatus, L. problematicus, L. taeniurus, L. triscalis, L. vanzolinii, and *L. williamsi*).

Our knowledge of the feeding ecology of snakes, particularly that of tropical snake communities, will benefit from continued investigation of this widely distributed, speciose genus.

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Table 1 Continued

L. epinephelus	*Bufo typhonius, Bufo marinus,*	
	Eleutherodactylus fitzingeri	Sexton and Heatwole 1965
	Phyllobates terribilis (c)	Myers et al 1978
L. epinephelus bimaculosus	frogs, salamanders	Dunn 1944
L. flavifrenatus	*Lysapsus mantidactylus* (c), *Hemidactylus mabouia* (ac),	
	Passer domesticus (ac)	Lema et al 1983
L. jaegeri	frogs	Gallardo 1977
	insects, frogs,	
	Pseudopaludicola falcipes (c)	Lema et al 1983
L. j. jaegeri	small frogs	Miranda et al 1982
L. lineatus	*Hyla rubra (Ololygon rubra)*	Beebe 1946
	insects	Freiberg 1982
	Leptodactylus fuscus, Elachistocleis sp.,	
	Hyla sp., cricetid rodent	This study
L. melanotus	frogs, lizards, small fish	Mole 1924
	small lizards, frogs,	
	tadpoles, frog eggs, fish	Wehekind 1955
	Gymnophthalmus speciosus	Test et al 1966
	Bufo sp., *Bufo granulosus*	This study
L. miliaris	*Hyla albomarginata* (c), *Hyla albopunctata* (c), *Hyla fuscovaria* (c) *(Ololygon fuscovaria),*	
	Phyllomedusa rohdei (c)	Sazima 1974
	fish,	
	Leptodactylus ocellatus	Gallardo 1977
	frogs, fish	Freiberg 1982
	Chthonerpeton indistinctum, Elachistocleis bicolor (w,c), *Leptodactylus, g. gracilis* (w,c), *Leptodactylus o. ocellatus* (w,c), *Gymnotus carapo* (c), *Lysapsus mantidactylus* (c), *Leptodactylus latinasus* (c), *Physalaemus gracilis* (c), *Physalaemus cuvieri* (c), *Rana catesbeiana* (c),	
	Teius t. teyou (no indication if w or c)	Lema et al. 1983
	Pipa carvalhoi, Leptodactylus ocellatus, unidentified leptodactylid	Vitt 1983; see Dixon 1983a
	Bufo granulosus	This study
L. paucidens	*Cnemidophorus* cf. *ocellifer*	This study
L. perfuscus	*Leptodactylus* sp. (c),	
	Anolis trinitatis	Emsley 1963

Table 1 Continued

L. poecilogyrus	frogs	Freiberg 1957
	fish, frogs, toads, lizards	Freiberg 1982
	Leptodactylus ocellatus, *Physalaemus fernandezae*, *Bufo arenarum*, *Hyla pulchella*, *Odontophrynus americanus*, *Teius teyou*,	
	Amphisbaena darwinii, fish insects, *Pygidium* sp., *Physalaemus* sp., *Bufo* sp., *Leptodactylus* sp., *Lysapsus* sp., *Hyla pulchella*, iguanid lizards, *Amphisbaena* sp., mice, canned meat	Gallardo 1977
	(no indication if all w or c)	Lema et al. 1983
	Bufo granulosus, unidentified *Bufo*, *Pipa carvalhoi*, *Hyla rubra (Ololygon rubra)*, *Leptodactylus ocellatus*, *Physalaemus cuvieri*, unidentified leptodactylid	Vitt 1983
L. poecilogyrus pictostriatus	*Phalloceros caudomaculatus*, *Bufo granulosus dorbignyi (Bufo dorbignyi)*, *Leptodactylus g. gracilis*, *Leptodactylus o. ocellatus* (w,c), *Lysapsus mantidactylus* (w,c), *Physalaemus* sp. (w,c), *Physalaemus gracilis*, *Liolaemus occipitalis*	Lema et al. 1983
L. poecilogyrus schottii	*Ameiva ameiva laeta*, *Cercosaura ocellata*, *Mabuya dorsivittata*, *Tupinambis teguixin*, (no indication if all w or c)	Lema et al. 1983
L. reginae	frogs, lizards, small fish	Mole 1924
	Hyla rubra (Ololygon rubra), frogs, *Ameiva* sp., small bird	Beebe 1946
	frogs, lizards, fish (c)	Wehekind 1955
	Prostherapis sp. (*Colostethus* sp.), *Prostherapis trinitatis* (w,c) (*Colostethus trinitatis*), *Prostherapis (C.) neblina* (c), *Eleutherodactylus terraebolivaris*, *E. cornutus maussi (E. maussi)*	Test et al. 1966; see Dixon 1983b
	fish, frogs	Dixon and Soini 1977
	Leptodactylus wagneri, *Hyla lanciformis* tadpole	Duellman 1978
	Leptodactylus sp., *Bufo typhonius*, *Bolitoglossa altamazonica*	This study
L. sagittifer	a frog	Abalos et al. 1965
	Leptodactylus ocellatus	This study
L. typhlus	frogs, *Leptodactylus mystacinus*	Beebe 1946
L. t. typhlus	*Bufo granulosus*	This study
L. viridis prasinus	*Hyla rubra (Ololygon rubra)*, *Physalaemus cuvieri*, unidentified leptodactylid	Vitt 1983

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TECHNIQUES

Hormonal Induction of Ovulation and Oviposition in the Salamander *Desmognathus ochrophaeus* (Plethodontidae)

There are two reasons for attempting to induce ovulation and oviposition in urodeles by endocrine manipulation. The first is to study these processes themselves; our understanding of the relevant endocrine events in urodeles is far from complete (for reviews, see Licht 1979; Licht and Porter 1987). The other reason is to obtain naturally fertilized eggs. Once eggs are available, it is possible to initiate studies of development and, if the eggs are the products of matings between different populations or species, of reproductive isolation and systematics.

In the Urodela, the endocrinology of ovulation and oviposition are best understood for the families Salamandridae and Ambystomatidae; plethodontid salamanders have received little attention (Licht and Porter 1987). However, a number of laboratories have induced ovulation in plethodontids, although not in any systematic manner. In this note, I describe an endocrine manipulation that safely and reliably induces ovulation and oviposition in the mountain dusky salamander *Desmognathus ochrophaeus*. Inseminated females of this species will lay eggs spontaneously in the laboratory, but only if they are left undisturbed for periods as long as six weeks (Houck, Tilley and Arnold 1985). Consequently, eggs may be at advanced developmental stages when removed from brooding females. The present protocol was devised so that eggs could be retrieved from females within hours of being laid.

Gravid female *D. ochrophaeus* (N=34) were collected from five localities in the southern Appalachian Mountains of North Carolina, Tennessee and Virginia during May and August 1987 and May 1988. In the laboratory, salamanders were kept at a temperature of 15±1° C on a natural (Chicago) photoperiod. They were housed individually in 9x17x31 cm plastic boxes, with a damp paper towel as a substrate and a crumpled damp towel for refuge. Each box contained two culture vials of *Drosphila*, replaced sufficiently often to ensure *ad libitum* access to food.

Female salamanders were paired with at least six conspecific males at irregular intervals from July 1987 until May 1988. They were used in a series of experiments conducted as part of an investigation of the evolution of sexual isolating mechanisms in the *D. ochrophaeus* complex (e.g., Verrell and Arnold, in press). The mating histories of all females were recorded, and each female had been inseminated by at least one male collected from her own population.

Attempts to induce oviposition were made in June and July of 1988. In the natural habitat, female *D. ochrophaeus* can be found brooding eggs from June to August, although some females may overwinter with their clutches (Tilley 1972, 1973). On the advice of several colleagues (Andrea Schmidt, Pere Alberch and Paul Licht, pers. comms.), an agonist of the hypothalamic releasing hormone LH-RH was obtained (Sigma Chemical Co., St. Louis, MO; des-Gly^{10}[im-Bzl-D-His^{6}]-LH-RH-ethylamide). This was dissolved in amphibian saline (of composition 102mM NaCl, 0.56 mM KCl, 0.23mM $CaCl_2$) to produce a hormone solution of concentration 50µg/ml. This solution was kept refrigerated.

Injections were given under ether anesthesia (1 part ether: 99 parts water). An intraperitoneal injection of 0.1 ml LH-RH agonist solution was administered through the ventral body wall, taking care not to puncture follicles. After injection, each female was placed individually in a clean plastic box as described above. Boxes were examined on subsequent days, and any eggs present were removed and placed in rearing containers (with careful husbandry, egg survival may approach 100%: Houck et al. 1985). Females that had not laid eggs after a first injection were given further injections of LH-RH agonist at various intervals (mean interval = 3 days, range 1-5 days).

Of the 34 females injected, all laid at least some eggs. Two females laid only partial clutches despite repeated injections; the other 32 (94%) laid complete clutches. In the former females, yolked eggs remained visible through the ventrolateral body wall after laying. The ovaries of spent females were visibly empty of yolked eggs. In the following analyses, only data collected from the 32 females that laid total clutches were considered (Table 1). No mortality was observed among these females.

The maximum number of injections of LH-RH agonist required to induce oviposition was six, although most females (91%) required no more than three injections. The maximum interval between the last injection given and the onset of egg laying was five days, although most females (94%) initiated laying after four days. The maximum time spent laying eggs (once laying had been initiated) was four days, although most females (97%) had laid a complete clutch after three days. Clutch size varied from 9-30 eggs (mean = 17.8, SD = 5.3, N = 32 clutches). The majority of females laid most of their eggs either between the leaves of the paper towel substrates, or between the towel and the box floor. Few eggs were recovered from the empty vials.

No formal controls (females injected only with amphibian saline) were used in this study. Over 100 uninjected females were present in the laboratory in June and July 1988, held for use in mating experiments in the fall. Most had mated with males from their own population at least once in May 1988. These females were examined ca. once every two weeks, and only one uninjected female was found to be brooding a clutch of eggs over the period during which injected females were laying.

Because of the considerable variability among females in their mating histories, no attempt can be made to correlate mating history with aspects of oviposition phenology or fertilization frequency. One hundred sixty eight eggs were subjected to the husbandry technique devised by Houck, et al. (1985). Of these eggs, 127 were from females that had not mated for at least two months before injection; 41 eggs were from females that had mated in early June 1988 (just weeks before injection). Respective percentages of eggs that developed to the prehatching stage in each of these two groups were 21.3% and 63.4%. Histological evidence indicates that female *D. ochrophaeus* may store sperm, in a viable state, for long periods (Houck and Schwenk 1984).

The LH-RH agonist used in the present study can safely and reliably induce ovulation and oviposition in *D. ochrophaeus* over relatively short periods of time. Assuming that this effect is mediated via the secretion of gonadotropin from the adenohypophysis, my results implicate a hypothalamic releasing-hormone as the fundamental regulator of gonadotropin release. In addition, an important role for this releasing-hormone in the control of egg laying is apparent. Eggs produced by this endocrine manipulation can be harvested from females shortly after they are laid, and thus are early in their development.

The data presented in Table 1 may be used to devise a standard protocol for the induction of ovulation and oviposition in *D. ochrophaeus*. These data indicate that a female should be

Monetary Values of U.S. Amphibians

Purpose

We herein provide a listing of monetary values of native amphibians that live or reproduce in aquatic habitats. These species are vulnerable to spills of oil and other hazardous materials. Until now there has been no scheme available to establish liability and economic compensation for the loss of this natural resource. Establishment of a system to quantify, in monetary terms, the loss of native amphibians from such an event may provide an incentive to industries and individuals to use greater caution when transporting, handling or using these materials. Financial penalties also may be useful in attempts to mitigate or repair some of the damage should such losses occur. It is, therefore, appropriate for the Society for the Study of Amphibians and Reptiles (SSAR), the world's largest organization of herpetologists, to publish and support these guidelines.

Background

Our society is finally realizing the fragile nature of wetlands and their value as a natural resource. Amphibians are a part of this complex habitat. It is hoped that from now on aquatic habitat quality and all wildlife associated with it—including native amphibians—will be taken into account when evaluating new projects or investigating chemical spills, unlawful sewage discharges or oil spills. The monetary value of the plants and animals that live in aquatic habitats must be considered as part of the cost of "doing business." Environmental law officers, lawyers and our courts need to recognize that the amphibians of the United States have a standing—a value in their own right and the right to exist.

Aquatic animals are especially susceptible to small quantities of hazardous materials that may be introduced into their habitat. Fish kills that result from such a circumstance can be very large and generate coverage by the news media at the state and or regional level. For a number of years, several state and federal fisheries agencies have investigated, evaluated and placed monetary values on the loss of fisheries resources following such fish kills. Although aquatic amphibians are often destroyed along with fish, little or nothing has been done to establish a dollar value for the lost resource. For example, a chemical spill in central Missouri during the fall of 1985 killed more than 17,000 fish in a two-mile section of stream. The chemical company that caused the spill and subsequent fish kill agreed to pay the state $47,792 for the accident. Of that, $3,131 was to cover the monetary value of the fish that were killed. A fisheries biologist investigating the damage also found 197 dead, adult green frogs *(Rana clamitans)*, but no attempt was made to add this loss to the final settlement because no monetary values were available for amphibians. The green frog is a game species in Missouri.

Since 1970, the American Fisheries Society (AFS) has published several lists, both on the regional and national levels, of fishes and their economic values. The organization's most recent publications, Monetary Values of Freshwater Fish and Fish-kill Counting Guidelines (1982, AFS Special Publication No. 13) and Fish Kill Investigation Procedures (1986), have served as the basis for establishing monetary values of lost fisheries resources resulting from non-natural fish kills nationwide. Resource biologists have expressed interest in a similar publication for native aquatic amphibians.

Data Collecting and Specimen Counting

Methods for collecting data and counting amphibians depend upon the type of habitat affected, the time of year, and the length of time that has passed since the chemical/oil spill. Investigation of a fish or amphibian kill must take place as soon as the accident or incident is reported. Larval or adult amphibians may sink to the bottom of a body of water and be lost if not collected or counted as soon as possible (especially during cold weather).

If the affected area is small and the quantity of animals is low, all dead specimens should be collected and preserved. If the size of the area and or the number of amphibians killed is large, an objective and defensible sampling technique should be used. This situation usually requires that sampling units be selected at random. The specimen-count area must be selected randomly to reduce the chance for biased results. It is recommended that the specimen-count guidelines specified in the American Fisheries Society publications cited above.

The final report of the resource damage caused by a chemical or oil spill should include a detailed account of the actual chemical or petroleum product(s) involved, size(s) of the total area(s) where counts were made, number of specimens estimated to have been killed in the entire area, the species involved, number of specimens counted or observed, and the total number of man-hours required to accomplish the investigation.

Specimen Identification

It is imperative that all amphibians collected or counted during a fish/amphibian kill investigation be positively identified. Every effort should be made to use the skills of a professional herpetologist for the proper identification of both adult and larval amphibians. If there is no herpetologist on staff with the resource agency, local universities or natural history museums may have someone available for such work.

Establishing Monetary Values

Our method used to establish monetary values for U.S. amphibians that are aquatic or breed in aquatic habitats is similar to that used for fishes by the AFS (1982 and 1986). Value was assigned to species based on wholesale prices (*i.e.*, retail price less 40%) given in commercial price lists of amphibian and reptile dealers. Values for some salamanders are from available price lists of wholesale dealers who sold them for fish bait. Normally, we selected the lowest price from the range of prices presented by dealers. We increased values for taxa that have limited distributions or which are rare or endangered. It was felt that these limited resources required additional monetary values because any attempt at mitigation would be more expensive for such species. In all cases the subcommittee attempted to reach a value that would establish fair and equitable compensation (wholesale market values or transaction evidence) if the local resource (amphibian population) were to be destroyed by human activity. For species not listed on available price lists, we derived a value from a similar or closely related species. Though not listed separately, values of larval amphibians should be calculated at a fraction of adult values, such as 2% of the value of an adult. However, the affected larvae need be identified only to genus.

Notice

Monetary values of U.S. amphibians can change according to the fluctuation of the market caused by demand for a certain species or inflation. It is unlikely that the values of these animals will ever decrease.

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Monetary Values of U.S. Amphibians

Species	Common Name	Value
SALAMANDERS		
Ambystoma annulatum	Ringed Salamander	$5.00
A. californiense	Calif. Tiger Salamander	$2.00
A. cingulatum	Flatwoods Salamander	$5.00
A. gracile & subsp	Northwestern Salamander	$1.00
A. jeffersonianum	Jefferson Salamander	$1.50
A. laterale	Blue-spotted Salamander	$3.00
A. mabeei	Mabee's Salamander	$5.00
A. macrodactylum & subsp	Long-toed Salamander	$1.50
A. maculatum	Spotted Salamander	$1.50
A. opacum	Marbled Salamander	$1.50
A. platineum	Silvery Salamander	$3.00
A. talpoideum	Mole Salamander	$1.50
A. texanum	Smallmouth Salamander	$1.50
A. tigrinum & subsp	Eastern Tiger Salamander	$1.50
A. tremblayi	Tremblay's Salamander	$3.00
Amphiuma means	Two-toed Amphiuma sm	$4.50
	lg	$6.00
A. pholeter	One-toed Amphiuma	$10.00
A. tridactylum	Three-toed Amphiuma sm	$4.50
	lg	$6.00
Cryptobranchus alleganiensis & subsp	Hellbender	$10.00
Desmognathus aeneus	Seepage Salamander	$0.35
D. auriculatus	Southern Dusky Salamander	$0.35
D. brimleyorum	Ouachita Dusky Salamander	$0.35
D. fuscus & subsp	Northern Dusky Salamander	$0.25
D. imitator	Imitator Salamander	$0.35
D. monticola & subsp	Appalachian Seal Salamander	$0.35
D. ochrophaeus	Mountain Dusky Salamander	$0.35
D. quadramaculatus	Blackbelly Salamander	$0.35
D. santeetlah	Santeetlah Dusky Salamander	$0.35
D. welteri	Black Mountain Salamander	$0.35
D. wrighti	Pigmy Salamander	$1.00
Dicamptodon copei	Cope's Giant Salamander	$12.50
D. ensatus	Pacific Giant Salamander	$0.25
Eurycea bislineata & subsp	Two-lined Salamander	$0.25
E. junaluska	Junaluska Salamander	$0.25
E. latitans	Cascade Caverns Salamander	$0.25
E. longicauda & subsp	Longtail Salamander	$0.25
E. lucifuga	Cave Salamander	$2.00
E. multiplicata & subsp	Many-ribbed Salamander	$0.25
E. nana	San Marcos Salamander	$3.00
E. neotens	Texas Salamander	$1.00
E. quadridigitata	Dwarf Salamander	$0.20
E. tridentifera	Comal Blind Salamander	$3.00
E. troglodytes	Valdina Farms Salamander	$3.00
E. tynerensis	Oklahoma Salamander	$3.00
Gyrinophilus palleucus & subsp	Pale Salamander	$10.00
G. subterraneus	West Virginia Spring Salamander	$3.00
G. porphyriticus & subsp	Spring Salamander	$2.00
Haideotriton wallacei	Georgia Blind Salamander	$10.00
Hemidactylium scutatum	Four-toed Salamander	$2.00
Leurognathus marmoratus	Shovelnose Salamander	$0.35
Necturus alabamensis	Alabama Waterdog sm	$0.50
	lg	$2.00
N. beyeri	Gulf Coast Waterdog sm	$0.50
	lg	$2.00
N. lewisi	Neuse River Waterdog sm	$1.00
	lg	$2.00
N. maculosus & subsp	Mudpuppy sm	$1.00
	lg	$2.00
N. punctatus & subsp	Dwarf Waterdog sm	$0.50
	lg	$2.00
Notophthalmus meridionalis	Black-spotted Newt	$10.00
N. perstriatus	Striped Newt	$3.00
N. viridescens & subsp	Red-spotted Newt	$0.75
Phaeognathus hubrichti	Red Hills Salamander	$20.00
Pseudobranchus striatus & subsp	Broad-striped Dwarf Siren sm	$0.50
	lg	$1.25
Pseudotriton montanus & subsp	Eastern Mud Salamander	$3.00
P. ruber & subsp	Northern Red Salamander	$1.00
Rhyacotriton olympicus & subsp	Olympic Slamander	$2.50
Siren intermedia & subsp	Eastern Lesser Siren. sm	$2.50
	lg	$4.50

Species	Common Name	Value
S. lacertina	Greater Siren sm	$2.50
	lg	$6.00
Stereochilus marginatus	Many-lined Salamander	$1.00
Taricha granulosa & subsp	Northern Roughskin Newt	$0.75
T. rivularis	Redbelly Newt	$2.50
T. torosa & subsp	Coast Range Newt	$1.50
Typhlomolge rathbuni	Texas Blind Salamander	$10.00
T. robusta	Blanco Blind Salamander	$10.00
Typhlotriton spelaeus	Grotto Salamander	$3.00
FROGS AND TOADS		
Acris crepitans & subsp	Northern Cricket Frog	$0.25
A. gryllus & subsp	Southern Cricket Frog	$0.25
Ascaphus truei	Tailed Frog	$15.00
Bufo alvarius	Colorado River Toad	$3.50
B. americanus & subsp	American Toad	$0.50
B. boreas & subsp	Boreal Toad	$0.75
B. canorus	Yosemite Toad	$7.50
B. cognatus	Great Plains Toad	$1.00
B. debilis & subsp	Eastern Green Toad	$2.00
B. exsul	Black Toad	$25.00
B. hemiophrys & subsp	Canadian Toad	$1.00
B. houstonensis	Houston Toad	$3.00
B. marinus	Giant Toad (Texas pop. only)	$1.50
B. microscaphus & subsp	Arizona Toad	$1.00
B. punctatus	Red-spotted Toad	$0.75
B. quercicus	Oak Toad	$0.25
B. retiformis	Sonoran Green Toad	$7.50
B. speciosus	Texas Toad	$0.75
B. terrestris	Southern Toad	$0.75
B. v. valliceps	Gulf Coast Toad	$0.75
B. woodhousii & subsp	Woodhouse's Toad	$0.50
Gastrophryne carolinensis	Eastern Narrowmouth Toad	$0.50
G. olivacea	Great Plains Narrowmouth Toad	$0.50
Hyla andersonii	Pine Barrens Treefrog	$5.00
H. arenicolor	Canyon Treefrog	$1.00
H. avivoca	Bird-voiced Treefrog	$0.75
H. cadaverina	California Treefrog	$1.00
H. chrysoscelis	Cope's Gray Treefrog	$1.00
H. cinerea	Green Treefrog	$1.00
H. eximia	Mountain Treefrog	$3.00
H. femoralis	Pine Woods Treefrog	$0.50
H. gratiosa	Barking Treefrog	$1.00
H. regilla	Pacific Treefrog	$0.75
H. squirella	Squirrel Treefrog	$0.25
H. versicolor	Gray Treefrog	$1.00
Hylactophryne augusti & subsp	Western Barking Frog	$10.00
Hypopachus variolosus	Sheep Frog	$5.00
Pseudacris brachyphona	Mountain Chorus Frog	$0.50
P. brimleyi	Brimley's Chorus Frog	$0.75
P. clarkii	Spotted Chorus Frog	$0.75
P. crucifer & subsp	Spring Peeper	$0.50
P. ocularis	Little Grass Frog	$0.10
P. nigrita & subsp	Southern Chorus Frog	$0.25
P. ornata	Ornate Chorus Frog	$0.50
P. streckeri & subsp	Strecker's Chorus Frog	$0.75
P. triseriata & subsp	Western Chorus Frog	$0.25
Pternohyla fodiens	Lowland Burrowing Treefrog	$10.00
Rana areolata & subsp	Southern Crawfish Frog	$5.00
R. aurora aurora	Northern Red-legged Frog	$2.00
R. berlandieri	Rio Grande Leopard Frog	$1.00
R. blairi	Plains Leopard Frog	$0.75
R. boylii	Foothill Yellow-legged Frog	$1.00
R. cascadae	Cascades Frog	$2.00
R. catesbeiana	Bullfrog	$2.00
R. chiricahuensis	Chiricahua Leopard Frog	$2.00
R. clamitans & subsp	Bronze Frog	$1.00
R. grylio	Pig Frog	$1.00
R. heckscheri	River Frog	$2.00
R. okaloosae	Florida Bog Frog	$10.00
R. muscosa	Mountain Yellow-legged Frog	$1.50
R. onca	Relict Leopard Frog	$25.00
R. palustris	Pickerel Frog	$0.50
R. pipiens	Northern Leopard Frog	$0.50
R. pretiosa	Spotted Frog	$1.25
R. septentrionalis	Mink Frog	$1.00
R. sphenocephala	Southern Leopard Frog	$1.00
R. sylvatica	Wood Frog	$1.00
R. virgatipes	Carpenter Frog	$1.00
Rhinophrynus dorsalis	Mexican Burrowing Toad	$15.00
Scaphiopus bombifrons	Plains Spadefoot	$0.75
S. couchii	Couch's Spadefoot	$0.75
S. hammondii	Western Spadefoot	$0.85
S. holbrookii & subsp	Eastern Spadefoot	$1.50
S. intermontanus	Great Basin Spadefoot	$0.75
S. multiplicatus	New Mexico Spadefoot	$0.75

checked to see if she is brooding eggs every day for four days after an initial injection of LH-RH agonist. If no eggs have been laid, a second injection should be given on the fifth day, this sequence of checking and re-injection being repeated until laying occurs. Laying should occur after no more than three injections and, once initiated, should be completed after no more than three days.

Table 1. Summary of the oviposition histories of the 32 female salamanders injected with LH-RH agonist and that laid complete clutches.

Number of:	Number of females
LH-RH agonist injections required to induce oviposition	
1	12
2	4
3	13
4	2
5	0
6	1
Days from last injection until laying began	
1	8
2	6
3	5
4	11
5	2
Days required to finish laying complete clutch	
1	9
2	15
3	7
4	1

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A Portable Device for Restraining Rattlesnakes in the Field

Field studies of rattlesnakes often require researchers to work alone and on foot in remote areas. Under such conditions, equipment used to handle and restrain rattlesnakes for data collection must be lightweight, durable, and easily transported, as well as safe for both snake and researcher.

A wide variety of devices have been described for restraining unanesthetized venomous snakes. These include squeeze boxes (Quinn and Jones 1974), modified buckets (Gillingham et al. 1983), and transparent tubes (Prestt 1971; King and Duvall 1984). Unfortunately, the first two methods are somewhat cumbersome for field use, and all three considerably restrict the researcher's access to some parts of the snake's body.

Perhaps the oldest type of tool for restraining poisonous snakes is the noose or strap stick (Schmidt and Davis 1941; Conant 1958; Bellairs 1967; Fowler 1978). The loop usually consists of leather, but King and Duvall (1984) use a nylon cord loop in conjunction with their plastic tubes. This sort of tool has received mixed reviews in the past. Ball and Bellairs (1972) drop it from their review of Bellairs' (1967) article, and Conant (1975) fails to mention it in the revised edition of his field guide. Chief criticisms of the strap stick are that the noosed animal may injure itself trying to escape and that it may be difficult to release the snake after examination (Conant 1958).

It is likely that there is no perfect device for immobilizing venomous snakes; each will vary in suitability according to circumstances. We have not tried all the methods described in the literature, but it seemed to us that the strap-stick or noose held promise as a portable field tool if it could be designed suitably. In this note, we describe an adjustable, padded loop (noose) that we believe

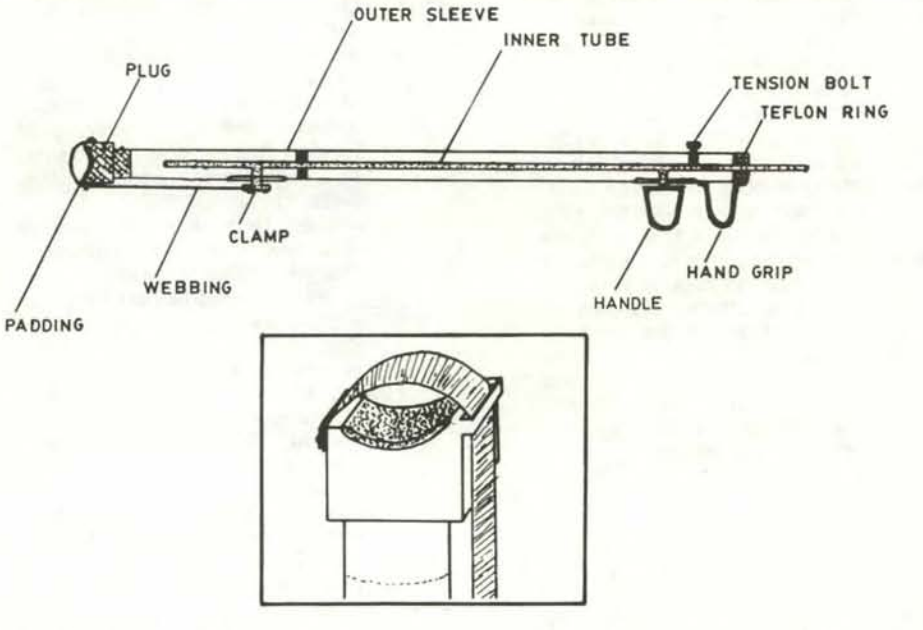


Figure 1. A cut-away view of an adjustable padded device for restraining rattlesnakes (not to scale; in our model the outer tube is about 90cm long and 2.5cm in diameter). Inset: a close up of the device's plug end (fuzzy part of Velcro used).

represents a considerable improvement over traditional strap sticks and nooses to immobilize rattlesnakes (and probably other venomous snakes).

The apparatus is constructed of an outer sleeve of aluminum tubing and a moveable inner aluminum tube (Fig. 1). The inner tube is joined at one end to a clamp and at the other to a sliding handle, both of which project outside the sleeve through longitudinal slits. At the loop end, a 2cm-wide piece of polypropylene webbing (such as that used on backpacks) is anchored to one side of a padded concave plug and is connected to the clamp projecting from the inner tube. The action of the sliding handle tightens the loop over the padded end, resulting in a constriction that is semi-circular rather than circular in cross-section. A bolt threaded through the outer sleeve at the handle end can be tightened against the inner tube to maintain the tension in the noose at the required level. This apparatus can be manufactured for about $15 in material costs by a competent machinist.

The entire apparatus weighs about 480g and can be carried comfortably in one hand along with Pillstrom tongs and meter stick. In our experience, the device will accommodate rattlesnakes of all sizes (350mm-1200mm SVL) except neonates. From a standing position, it is easy to pass the loop over the snake's head and tighten it around the neck directly behind the jaws. The dorsal scutes are held against the padded surface of the plug and the webbing presses against the ventrals. If a snake is particularly aggressive, tongs can be used to direct its head into the loop, but this usually is unnecessary. The semi-circular constriction of the broad webbing distributes the pressure over a large area and does not put undue pressure on the snake's trachea. Once restrained, an excitable snake can be prevented from injuring itself in the loop by steadying its body with a free hand. However, most snakes become quite inactive when restrained. In fact, we found that the only injuries caused by this device occur on large snakes that are frequently recaptured. The skin on the dorsal surface of the neck is sometimes abraded when these snakes struggle as they are stretched out against a meter stick for measurement. These injuries are apparently not serious and, to our knowledge, have not caused the death or disability of any individual.

With this apparatus, the researcher has access to the snake's entire body and one person can palpate for follicles, embryos, or food items with extremely low risk of injury. With practice, the average rattlesnake can be restrained and processed (sexed, measured, rattles counted, palpated, marked, and then released and weighed) within four minutes. Rattlesnakes can bite while in the device, but since the loop is controlled from the opposite end, the possibility of the researcher being bitten is remote. The apparatus can in fact be safely grasped quite close to the snake's head for careful measurement of SVL. One drawback we found was that large snakes (>800mm SVL) could move the apparatus, albeit slowly, if it were simply laid on the ground; therefore, when palpating or marking larger snakes, it is advisable to pin the apparatus against the ground with a knee or leg, which we found easy to do without loosing balance. Snakes are easily released from the loop by loosening the bolt at the handle end. Usually, the loop falls open by itself if the entire device is held vertically; rarely, the loop gets stuck and has to be loosened slightly with a small stick. Overall, this device is durable and trouble-free, although the padding on the plug and the webbing become abraded after many uses and need to be replaced occasionally. Its effectiveness was demonstrated during a three year mark-recapture study, in which approximately 1,700 individual rattlesnakes *(Crotalus viridis)* were marked and about 2,540 recaptures of these snakes were obtained (MacCartney 1985).

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NEUTRAL PARAFORMALDEHYDE SOLUTION FOR FIELD USE

Formalin fixatives and concentrates in liquid form are difficult to transport over long distances. It is legally difficult to ship formalin solution in most countries because of its corrosive nature and highly irritating fumes (Busack 1981).

Huheey (1963) modified Taub's (1962) procedure for the use of solid paraformaldehyde as a transportable form of fixative by adding sodium carbonate to counteract the formic acid that is generated. The mixture, however, is significantly alkaline and initiates specimen clearing in a relatively short time (weeks), particularly in hot weather and in specimens (e.g. frogs & geckos) with permeable skins.

I have modified Huheey's method by adding a neutralising system; solutions mixed in this manner have given satisfactory results under field and laboratory conditions for up to two years. As described, the following procedure will make up 2 l of neutralised 10% formalin solution.

In the laboratory prepare the following:

1. Add 21 g citric acid to a small plastic bag and seal;
2. Thoroughly mix 80 g flaked or powdered paraformaldehyde, 20 gm anhydrous sodium carbonate (or hydrated equivalent) and 0.5 g calgon or Pyroneg or other solid form wetting agent, in a larger plastic bag;
3. Place the *sealed* bag of citric acid in the larger bag and seal the larger bag (preferably hermetically);
4. Rebag this kit and seal again as a damage/spillage precaution. Alternatively, pack into a sealable drum (suitable for transporting large quantities of kits). These kits may be stored for at least 6 years without a decline in effectiveness.

In the field, prepare the solution as follows:

Add contents of large plastic bag to 2 l of water while stirring. Flakes dissolve in ca. 4 h (20-30° C) with occasional agitation. This is best done overnight, or several hours before the fixative is required. If the container is sealed, the sloshing caused by vehicular movements is ideal agitation. Initial stirring is necessary with paraformaldehyde powder to prevent sludging and caking of the powders on the bottom of the mixing vessel. Dissolution takes ca. 20 minutes.

When all the paraformaldehyde (flakes or powder) has dissolved, add citric acid and stir occasionally until no more carbon dioxide gas evolves (5 min). *Do not seal container;* allow gas escape for about one day. The neutralised (pH ca. 7) 10% formalin solution is now ready for use.

MODIFICATIONS

The concentration of formaldehyde can be increased or decreased, e.g. for 20% formalin use only one litre of water (the paraformaldehyde will take longer to dissolve); for 5% formalin use four litres of water.

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A TECHNIQUE FOR PERMANENTLY MARKING LIZARDS

Long-term population studies frequently use capture-recapture census procedures to estimate the size of populations. These procedures require marking individual animals when they are first captureed so that they can be identified in subsequent recaptures. Heretofore toe clipping has been the only proven method of marking individual lizards for permanent identification. However, toe clipping has significant drawbacks for capture-recapture studies that require frequent censuses and identification of individuals each time they are seen. A toe-clipped animal must be recaptured and handled to be identified, and frequent recaptures disrupt the normal activities of individuals. Lizards may also become "noose shy" and wary of census takers. Hence, as part of a long-term study of the population biology of *Uma inornata,* we developed a marking technique that enables us to identify individuals by resighting rather than recapturing.

Nace and Manders (1982) developed a technique for marking amphibians with colored beads. We modified their technique to mark lizards. The numbers 0 - 9 were assigned to ten different colors of plastic jewelry beads (Paramount Novelties, Los Angeles, California). Three beads (2 mm thick X 2.5 mm in diameter) were sutured through the tail with surgical steel monofilament. The resulting identification mark is about 6 mm long by 2.5 mm wide lying parallel to the long axis of the tail. By using only three beads and ten colors up to 1000 lizards can be given unique marks.

The marks are applied in the field using surgical steel monofilament strands that have been previously prepared in the lab (Fig. 1a). Strands of 15-cm-long 000 monofilament (32 gauge) are twisted around a 20 gauge hypodermic needle to form a loop in one end. Appropriately colored beads can be strung in the field as needed. Note that because the beads are "read" from front to back, the beads must be strung last number first.

A 22-gauge hypodermic needle is pushed through the ventral side of the lizard's tail at a point distal to the male's hemipenis and lateral to avoid the caudal vertebrae. After the monofilament is threaded through the needle from the top (Fig. 1b) the needle is removed leaving the wire, loop, and beads in place. The needle is then passed through the monofilament loop and pushed through the dorsal side of the tail, distal to the first insertion. The wire is threaded through the tip of the needle (Fig. 1c), so that when the needle is removed the end of the wire extends through the loop. The end of the wire is then bent back through the loop, pulled tight, then cut close to the loop leaving the beads securely fastened dorsolaterally to the tail (Fig. 1d). We recommend that the beads be sutured snugly to the surface of the tail to prevent snagging in vegetation. With practice the marking procedure can be accomplished by one person in about five minutes.

Before marking lizards in the field we recommend dissecting preserved specimens to locate the region where the tail autotomizes and to determine the position of the hemipenis, its retractor muscle and lymphatic chamber. Preserved specimens can be used for practice to determine if the method is suitable for species with heavy osteoderms in the tail.

All lizards in our study (572) were toe clipped when first captured and those larger than 6 cm snout-vent length were also marked with beads. A total of 357 lizards was "beaded" from March 1985 to September 1987. None of the lizards lost their beads during this period. A lost mark would have been evident in the capture of a toe-clipped lizard without beads. However, 18 marks (about 5%) required repair, due to the anterior suture pulling through the tail because it was placed too close to the lateral edge.

Some of the marks are known to be more than two years old. To date we have not observed necrosis or tail loss that can be attributed to this technique. Tails of animals marked as juveniles did not exhibit abnormal growth as they grew to adult size.

We have no indication that the beads interfere with the lizards' behavior. Marked males and females have been observed copulating and nearly all adult females have been recorded as gravid during three field seasons of the study.

The cryptic coloration of *U. inornata* probably contributes to its survivorship. We do not have any way of testing the hypothesis that colored beads significantly compromise the cryptic coloration and thus increase mortality. Such a test would require a control population with unmarked individuals that could be recognized. We are not aware of a means to accomplish this with small lizards. However, indirect observations indicate the marks probably do not affect survivorship adversely. Jones and Ferguson (1980), and Simon and Bissinger (1983) tested the effect of different colored paint markings on the survivorship of *Sceloporus undulatus* and *S. jarrovi.* These studies were unable to demonstrate an affect of color on survivorship. We have no a priori reason to believe that the situation would be different for *U. inornata.*

We also have some evidence from the recovery of carcasses in the field. Whereas nearly all adults on the site were beaded only one of eleven shrike kills that we recovered was a marked adult lizard. To our eyes the beads are less obvious than the intense orange breeding colors of both males and females.

We are not aware of any reasons that the beading technique can not be used with other species of lizards. We have marked and resighted *Phrynosoma mcalli* and *Gambelia wislizenii* on our study site and Allison Alberts (University of California, San Diego, Personal Communication) has successfully applied this technique to *Dipsosaurus dorsalis.* Thus, we recommend its use for long-term studies that require frequent recognition of individual animals.

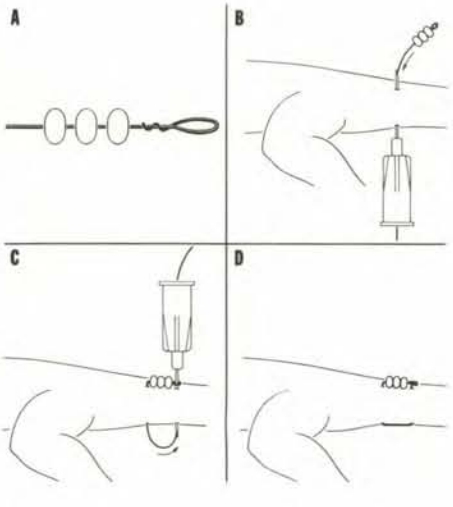


Figure 1. Representative stages in the described technique for marking a lizard with beads. See text for details.

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CORRECTING FOR MAGNIFICATION WHEN TAKING MEASUREMENTS DIRECTLY FROM RADIOGRAPHS

The collection of detailed life history information on turtles has received increased attention in recent years due to a general lack of adequate life history data on the long-lived iteroparous organisms (Wilbur 1975). One area of renewed interest is with turtle reproduction, which has resulted in an increased use of radiography to assess reproductive condition, patterns, and egg size of freshwater species (e.g. Gibbons et al. 1978; Gibbons and Greene 1979; Seigel 1980; Graham 1981; Gibbons 1982, 1983; Kofron and Schreiber 1985; Graham and Forsberg 1986; Turner et al. 1986; Christens and Bider 1987; Congdon et al. 1987). While it has been demonstrated that whole-body exposures of turtles to massive doses of X-irradiation are lethal (Altland et al. 1951; Cosgrove 1965, 1971), there is no empirical evidence to indicate that minimal dosages (such as those reported in this study and others on turtle clutch size) are destructive. Gibbons and Greene (1979) concluded that hatching success and frequency of abnormalities in young from eggs irradiated at 70 kV for 0.7 s at 200 mA were not significantly different from non-irradiated (control) eggs. Most turtle biologists appear to agree that judicious use of X-ray (at the low dosages normally used) provides a non-destructive way to gather data from living animals (such as clutch size) which are otherwise difficult to obtain. In addition, egg dimensions can be precisely determined from radiographs (Gibbons and Greene 1979).

During recent studies of turtle clutch size and egg dimensions (performed at 200 mA and 70 kV for 0.8 s) we noticed that images of turtles and oviducal eggs on radiographs were slightly enlarged. In a sample of 23 Blanding's turtles (*Emydoidea blandingi*), the radiographs of the turtles were enlarged an average of 12.8% (Range = 10.3-15.4%, SD=1.22). The reasons for this image enlargement are quite simple and we believe that researchers should be made aware of this effect and of the ways that it can be compensated for when measurements are taken directly from radiographs.

The degree of image enlargement is directly proportional to the distance between the film and the object being X-rayed. To assess the degree of magnification, a series of radiographs of coins (five-cent pieces) was taken with the coins at various distances from the radiography film using both table-top and bucky-loaded film cassettes. In the table-top procedure, the film cassette is placed directly beneath the object to be radiographed, whereas in the bucky-loaded procedure, the film cassette is positioned in a tray beneath the table surface. The resulting images showed enlargement of coin diameter from 0.9-11.4%. Of the two procedures, we found that the bucky-loaded cassette produced the greatest increase in coin diameter (8.1 and 11.4% at coin-film distances of 8.9 and 13.4 cm respectively). The smallest enlargement error (0.9%) resulted when the table-top film cassette was used and the coin was placed directly on it.

The distance between the X-ray source (focal spot) and the film is usually adjustable and can be varied from application to application. Our focus-to-film distance was 101.6 cm for bucky-load and 92.7 cm for table-top. Both focus-to-film and object-to-film distances are variables which directly influence the extent of image magnification. As long as focus-to-film distance is kept constant, a correction for object-to-film distance can easily be made.

$$\text{Image size} = [\text{OS}] \times [\text{F-f distance}/\text{F-O distance}] = \text{OS}\left[1 + \frac{\text{O-f distance}}{\text{F-O distance}}\right]$$

where [OS] = object size, O = object, F = focal spot, and f = film.

However, unlike coins, our turtles varied in size, which meant a different degree of magnification for each individual. For example, we found that the amount of magnification on radiographs of Blanding's turtles increased by 0.9% for each 10 mm increase in carapace length or 5 mm increase in shell depth. A simple way to correct for magnification would be to place an object of known size (e.g. a coin) on a block of foam beside the animal at the same distance from the film as the anatomical structure to be measured (e.g. the oviducal eggs). A ratio of known object size to the size of the object on the radiograph could then be used to adjust egg dimensions measured directly from that picture.

Another concern about radiographic magnification centers on whether or not turtles are radiographed upright or upside down. Turtles in an upright position would result in less enlargement and greater uniformity of magnification since oviducal eggs would likely lie more on the same plane - just above the plastron. Congdon et al. (1987) indicated that because the X-ray machine they used during 1978-1979 produced photographs that enlarged turtle egg size, they restricted their analysis to data obtained from a new X-ray machine used from 1980-1983. Their statement implies that the newer machine did not enlarge egg images, but we are confident that enlargement will occur with *any* X-ray machine. The data that they did not use might have been salvaged by a correction technique similar to the one we propose. In any case, workers using radiography to determine internal dimensions, such as egg diameter, should consider the caution and correction of magnification reported here.

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FISHING FOR "SPRING LIZARDS": A TECHNIQUE FOR COLLECTING BLACKBELLY SALAMANDERS

Salamanders of the genus *Desmognathus* are often important components of lotic ecosystems in the Appalachian region of the United States and, as such, have been the focus of a number of ecological and life history studies (Barbour et al. 1969; Huheey and Brandon 1973; Danstedt 1975; Hall 1977; Tilley 1977, 1980; Hom 1987). The most aquatic members of the genus, however, are some of the least studied because, in part, they are difficult to collect. Blackbelly salamanders, *Desmognathus quadramaculatus,* in particular are fast and elusive, and collecting a large series of them requires a great deal of time and energy (Tilley 1982). Conant (1975) likened collecting this species to ". . .going fishing with your bare hands." Other techniques have been suggested such as the use of flotation-type nets or electrofishing (Hall 1982), but these are often ineffective or expensive.

Considering the difficulties in collecting *D. quadramaculatus,* it is surprising that this is the major salamander species sold as "spring lizards" at bait stores throughout the southern Appalachians. In talking with bait store owners in northeastern Georgia, we learned that salamanders are purchased from local "lizard hunters" in amazing numbers. One store owner told us that she has purchased as many as 300-400 salamanders at a time from a single collector. Moreover, these numbers represent selective sampling of relatively small individuals (50-70 mm SVL) because larger ones are functionally useless as fishbait.

For "lizard hunting" to be cost effective, the collecting technique obviously must be far more efficient than collecting by traditional methods. Because this collecting tool may be valuable for field studies involving this and other salamanders, we present here a description of the technique as well as data on its relative efficiency.

A "fishing pole" is used that is both simple and inexpensive to construct. A short length of fishing line is tied to a loop at the end of a heavy wire ca. 40-50 cm long (the long side of a metal coathanger with a curl at one end is ideal). To the other end of this line is tied a fish hook (size 6 or 8) on which the barb has been flattened and the point has been dulled. The line should be sturdy enough to project 3-5 cm straight out from the end of the wire; we used 10 lb. test nylon line. The hook is baited by sliding it longitudinally through the body of a section of earthworm so that no part of the earthworm hangs freely, to ensure that salamanders will not be able to bite the bait without grasping the metal hook.

Collecting should be done at night when salamanders are easily found by observing their heads protruding from under rocks in the stream or from burrows along the bank. A salamander will generally bite the hook immediately when the bait is placed within 1 or 2 cm of its nose. When the hook is in the salamander's mouth, it should be steadily pulled, not jerked, until the salamander is suspended over an open bucket, at which time it can usually be gently shaken free. The hook is seldom embedded but can easily be backed out of the salamander's mouth by hand if it is. If the salamander drops free before it is over the bucket, it often readily takes the bait again if offered the chance.

We collected series of salamanders using this method and by hand collecting in order to compare capture efficiencies. We collected over 90% of all *D. quadramaculatus* seen using this technique but only a third of those seen when collecting by hand (Table 1).

This collecting technique has a number of advantages over more traditional methods:

1. It is much more efficient, as illustrated in Table 1.

2. It is less physically demanding; turning rocks, necessary for hand collecting, can be extremely laborious.

3. Habitat disturbance is minimal.

4. It is simple and inexpensive.

5. Individual salamanders suffer little trauma as evidenced by escapees' eagerness to take another bait.

6. There are usually several chances to capture a single individual, a rare experience for the hand collector.

7. Salamanders in deep narrow crevices can be readily caught. Such individuals are virtually impossible to catch by hand.

8. Extremely large individuals (100+ mm SVL) are often very difficult to capture by hand but are easily caught using this method.

Although this technique has been used for many years by natives of Appalachia, it has been used only rarely by members of the scientific community. E.D. Brodie, Jr. has used a very similar technique to collect desmognathine salamanders, except he soldered the hook directly to the coathanger and used crane fly larvae as bait (Brodie, pers. comm.). Mount and Schwaner (1970) described a method of fishing for *Phaeognathus* in Alabama. However, salamander collecting using fishing-type techniques has largely been restricted to obtaining such fully aquatic salamanders as *Necturus* and *Siren* (Mount 1975).

Table 1. Efficiencies of techniques for collecting *Desmognathus quadramaculatus.*

	NO. SEEN	NO. CAUGHT	% CAUGHT
Hand Collecting	104	35	33.6
Fishing	174	158	90.8

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LIFE HISTORY NOTES

Life History Notes is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which **best** describes the nature of their note (e.g., Reproduction, Longevity, Coloration, Morphology, etc.). Figures are permissible to illustrate any data, but should **replace** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose! Articles submitted to this section will be reviewed and edited prior to acceptance.

Standard format, for this section is as follows: SCIENTIFIC NAME (in caps), COMMON NAME (in parentheses) as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, (Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), KEYWORD (in caps). DATA on the animal (one, or at **most** two, references may be ***briefly*** cited in text—***DO NOT*** include complete literature reviews—use summary articles wherever possible). Place of deposition or intended deposition of specimen(s), and catalog number(s). Then, skip a line and close with SUBMITTED BY (Name(s) in caps, and address(es) in full -- no abbreviations).

(NCN) used for common name = no recognized common name.

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CAUDATA

AMPHIUMA TRIDACTYLUM (Three-toed Amphiuma). **Feeding.** The feeding habits of *Amphiuma tridactylum*, along with other life history characteristics of this species, are poorly known. Crayfish are presumed to be the primary prey item of *A. tridactylum*. However, it appears that a variety of food items are taken that are dependent on factors such as size of the *Amphiuma*, season, and local prey abundance (see Hamilton 1950. Nat. Hist. Misc. 62:1-3; Chaney 1951. Copeia 10:45-49). Here we give an account of a previously unreported prey item for *A. tridactylum*, the common snapping turtle *(Chelydra serpentina)*.

The *A. tridactylum* (adult female; 523mm SVL, 640mm TL) was collected on 28 February 1988 at 2300h from a ditch located in Hammond, Louisiana, using a wire mesh funnel trap. Examination of stomach contents revealed the remains of a juvenile snapping turtle (50mm est. CL) and several crayfish *(Procambarus* sp.*)*. Twenty-six *Amphiuma* stomachs were examined; no other contained a turtle.

We would like to thank R.A. Seigel for his critical review of this note. The new prey item has been deposited in the amphibian and reptile collection of Southeastern Louisiana University (SLU #766).

Submitted by CLIFFORD L. FONTENOT, JR. and LANCE W. FONTENOT, Department of Biological Sciences, Southeastern Louisiana University, P.O. Box 814, Hammond, LA 70402, USA •

PLETHODON VANDYKEI (Van Dyke's Salamander). **Reproduction.** *Plethodon vandykei* is one of the least-studied species of western salamander, and little is known about its habitat requirements or life history. Recently, Lynch and Wallace (1987. J. Herpetol. 21(4):337-340) described the courtship and spermatophore of *P. vandykei* from the Rocky Mountains, but only a single nest has been found in nature (Noble. 1925. Amer Mus. Novit. 166:1-10). Noble mentioned little pertinent biological information on the clutch.

On 21 May 1988, I found a second nest and eggs of *P. vandykei* near a tributary of Elk Creek, at the north end of Lake Cushman, Mason County, Washington (T23N, R5W, Sec 5, SE 1/4). The nest was located in the moist interstices of a partially rotted log (= decay class 3; Maser et al. 1979. In: Thomas (ed.). USDA For. Serv. Agric. Hnbk. No. 553, pp 78-95). The log, probably a Douglas fir, measured 85cm in diameter and about 5m in length. The nest was situated 9cm from the surface of the log, 30cm from the cut end of the log, about 1.5m above the ground, and about 2m from a small headwater stream. An adult female *P. vandykei* (98mm TL, 53mm SVL, and 2.2g) was found under the same slab, 4cm from the clutch. The egg mass consisted of 7 cream-colored eggs in a grape-like cluster measuring about 17.6mm by 11.8mm. No embryos were evident, suggesting that the eggs had only recently been deposited. The eggs were 5.3mm in diameter, and were covered by a thin jelly coat. The eggs did not appear to be suspended by a string, as mentioned by Noble (1925), but they might have been jarred loose when the slab covering the nest was removed. The temperature of the nest cavity was 11°C, considerably cooler than the outside temperature near the creek (29°C).

The surrounding forest was an old-growth stand of western red cedar *(Thuja plicata)*, Douglas fir *(Pseudotsuga menziesii)*, western hemlock *(Tsuga heterophylla)*, and grand fir *(Abies grandis)*. Some canopy trees had been cut down (including the nest log). Some of the logs had been bucked up, while others remained intact on the forest floor. The understory was composed of western hemlock, salal *(Gaultheria shallon)*, huckleberry *(Vaccinium* sp.*)*, and devil's club *(Oplopanax horridum)*. The forest floor had a thick carpet of moss and herbs. The nest log was located on a 14° slope facing NNE. Nine other *P. vandykei* were found in the stand, of which eight were found in or under large logs near the creek. *P. vandykei* is often associated with seeps and streamside talus (Nussbaum et al. 1983), but none was found in the splash zone of the creek, or the talus seep from which it had originated. Two *Plethodon vehiculum* and two *Rhyacotriton olympicus* were also found in the stand.

P. vandykei is protected in the State of Washington, so a photograph of the adult and egg clutch was deposited in the University of Washington Burke Museum (UWBM 2206).

I thank Keith B. Autry, R. Bruce Bury, and Richard L. Wallace for reviewing the manuscript. Contribution 106 of the Wildlife Habitat Relationships in Western Oregon and Washington Project, USDA Forest Service.

Submitted by LAWRENCE L. C. JONES, USDA Forest Service, Pacific Northwest Research Station, 3625 93rd Ave. SW, Olympia, WA 98502, USA •

PSEUDOEURYCEA BELLI SIERRAOCCIDENTALIS (Pine Oak Salamander). **Habitat.** On 24 June 1987, four *P. b. sierraoccidentalis* were observed at ca. 6km WNW Ocampo, Chihuahua, Mexico, in the Sierra Madre Occidental (VanDevender et al. in Press. SSAR Herp. Review). The salamanders (SVL ca. 70-85mm) were emerging from holes formed by rotted tree roots in a roadcut during a light, drizzling-misty rain in the first hours of dark. Emergence was stimulated by a heavy downpour in late afternoon that was probably the first major storm for the summer monsoon. However, the soil around the holes and the salamanders' skin was not wet, suggesting that the response was to very high humidity rather than moisture penetrating the soil. The only previous specimens of *P. b. sierraoccidentalis* (the type series) collected in September 1964 under logs and rocks in pine-oak woodland near Yecora, Sonora, were not active (Lowe et al. 1968. Los Angeles Co. Mus. Nat. Hist. Contr. Sci. 140:1-11). *Bufo occidentalis* (pine-oak toad) and *Halactophryne tarahumarensis* (Tarahumara barking frog) were also active; male *H. tarahumarensis* were calling.

The regional climax for the elevation is Madrean Pine-Oak Woodland. Oaks are very important at the locality, with *Quercus coccolobifolia* (Encino Verde), *Q. pennivenia* (handbasin or crackleleaf oak), and *Q. scytophylla* (silverleaf oak) as dominants. *Quercus arizonica*

(Arizona oak), *Arbutus arizonica*, *A. xalapensis* (Madronos), are common with occasional *Q. viminea* (willow oak) and *Juniperus deppeana* (alligator bark juniper). Pines in the area include *Pinus durangensis* (Durango pine) and *P. herrerai* (pino chino). The roadcut is on the northwest to southwest sides of a hill with volcanic boulders and deep leaf litter under a dense woodland. The canyon bottom is relatively mesic with abundant *Adiantum capillus-veneris* (southern maidenhair fern) and orchids, with permanent water in sections of the stream and at seeps. *Alnus oblongifolia* (Arizona alder) and *Prunus gentryi* (gentry plum) are common trees in the canyon. The habitat differs from the previous Sonoran locality in higher elevation (1830 versus 1525 m), less rock rubble in the substratum, a northwest-southeast rather than east-west canyon orientation, a smaller stream, and greater dominance by oaks in the woodland.

These secretive animals live in habitats that are difficult to survey, especially during the summer monsoonal activity period. Pine-oak forest or woodland habitat for *P. belli* is more or less continuous at middle to high elevations and in deep barrancas in the Sierra Madre from the disjunct Chihuahuan and Sonoran localities southward through Sinaloa to the nearest known locality for *P. b. belli* in the Sierra de Tepic, Nayarit (Gadow 1905. Proc Zool. Soc. London 1905(2):191-244). Photo vouchers deposited into the University of Arizona Herpetological Collection (UAZ 47824-25PSV).

Submitted by **THOMAS R. VAN DEVENDER**, Arizona-Sonora Desert Museum, 2021 N. Kinney Rd., Tucson, AZ 85743, **PETER A. HOLM** and **CHARLES H. LOWE**, Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, AZ 85721, USA •

SAURIA

AMEIVA TAENIURA (NCN). **Food Habits.** Prey selection and foraging behavior of this species have not been recorded, although teiids have been described as "intensive foragers" (Regal 1983. *In* Huey, Pianka, and Schoener. Lizard Ecology: Studies of a Model Organism. Harvard). Seven adult lizards (SVL 41-82mm, $\bar{X}$=66.3mm) were collected in coastal coconut palm debris near Paraiso, Provincia de Barahona, Republica Dominicana, on 16 and 17 August 1987 and 10 March 1988. Five of seven were foraging when first seen, two were encountered initially under litter. In addition, ca. 20 other animals were observed but not collected; all but three were moving in a pattern consistent with foraging behavior.

Stomach contents were analyzed and arthropods were identified to order. Volumes of all food were determined using methods of Milstead (1957. Texas J. Sci. 9:410-447). Five of seven specimens contained a total of eleven food items representing five insect orders. In addition, two individuals had (presumably adventitiously) ingested plant materials. Types, numbers, and volumes of food items are given in Table 1.

Table 1. Types, number and volumes (cm³), and frequencies of food items encountered in *Ameiva taeniura* from near Paraiso, Provincia de Barahona, Republica Dominicana (n=7).

Food Item	Nmbr.	Vol.	Freq.
Dictyoptera	4	0.0400	3
Diptera (larvae)	4	0.0350	2
Homoptera	1	0.0025	1
Lepidoptera (larva)	1	0.0050	1
Orthoptera	1	0.0100	2
Plant material	-	0.0450	2
Total	**11**	**0.1375**	**-**

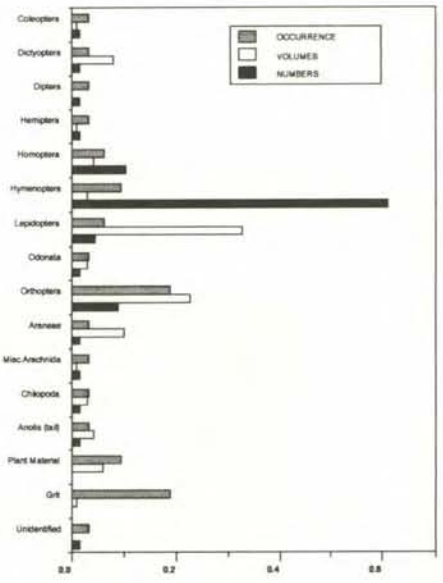
All specimens were deposited in the Bobby Witcher Memorial Collection at Avila College, Kansas City, MO (BWMC 2933-2937 and 3278-3279).

Submitted by **ROBERT POWELL, STEPHEN S. DUER, JOHN S. PARMERLEE, JR.** and **DONALD D. SMITH**, Department of Natural Sciences, Avila College, Kansas City, MO 64145, USA •

ANOLIS WHITEMANI WHITEMANI (NCN). **Food Habits.** Although Williams (1963. Breviora 197:1-8) briefly discussed the ecology of this lizard, food habits have not been recorded. Ten adults, one subadult and one juvenile, all females, were collected on 23 and 28 March 1986, 14 August 1987, and 6 March 1988 from three localities in the Dominican Republic. Though situated in three different biogeographic regions (Henderson and Schwartz. Milwaukee Publ. Mus. Spec. Publ. Biol. Geol. (4):1-70), all sites were xeric, consistent with the description of this species as the most xerophilic in the genus (Schwartz. 1980. J. Herpetol. 14(4):399-406). Sites were on the border between the Llanos de Azua and the Plateau Central (Provincia de Azua, 1km and 3km north of Villarpando, elevation 320m and 370m respectively), characterized by mixed agave-acacia scrub; in the easternmost portion of the Valle de Neiba (Provincia de Barahona, 26km north of Barahona, elevation 200m), dominated by agave scrub; and at the eastern edge of the Llanos de Azua (Provincia de Peravia, 8km west of Bani, elevation 140m), composed of acacia scrub.

Stomach contents were analyzed and arthropods were identified to order. Volumes of all food were determined using methods of Milstead (1957. Texas J. Sci. 9:410-447). No relationships between prey selection or food volumes and size, reproductive condition, or sites of collection were evident. Arthropods were found in all stomachs. Lepidopteran larvae represented the greatest volume (though this was due primarily to two large individuals found in one specimen), ants were present in greatest numbers (41 of 67 total arthropod food items), and orthopterans appeared most frequently (in six stomachs) and also represented the second largest component by volume. In addition, six lizards' stomachs contained grit and three contained plant matter (ingestion of both was presumably adventitious). Further, the largest specimen (SVL 53mm) had ingested the tail of an anoline lizard (probably *A. whitemani* as other species are unlikely sympatrics). Results are summarized in Figure 1.

Figure 1. Relative frequencies of food volumes, numbers, and occurrence in *Anolis w. whitemani* from the Dominican Republic.



These data indicate that prey choice by *A. whitemani* bears a great similarity to that of sympatric Hispaniolan xerophiles in the genera *Leiocephalus* and *Ameiva* (unpublished data). This would indicate that food selection is more dependent on availability (i.e., habitat) than preferences in diet.

Specimens were deposited in the Bobby Witcher Memorial Collection at Avila College, Kansas City, MO (BWMC 03141, 03176, 03236-7, and 03280-03286).

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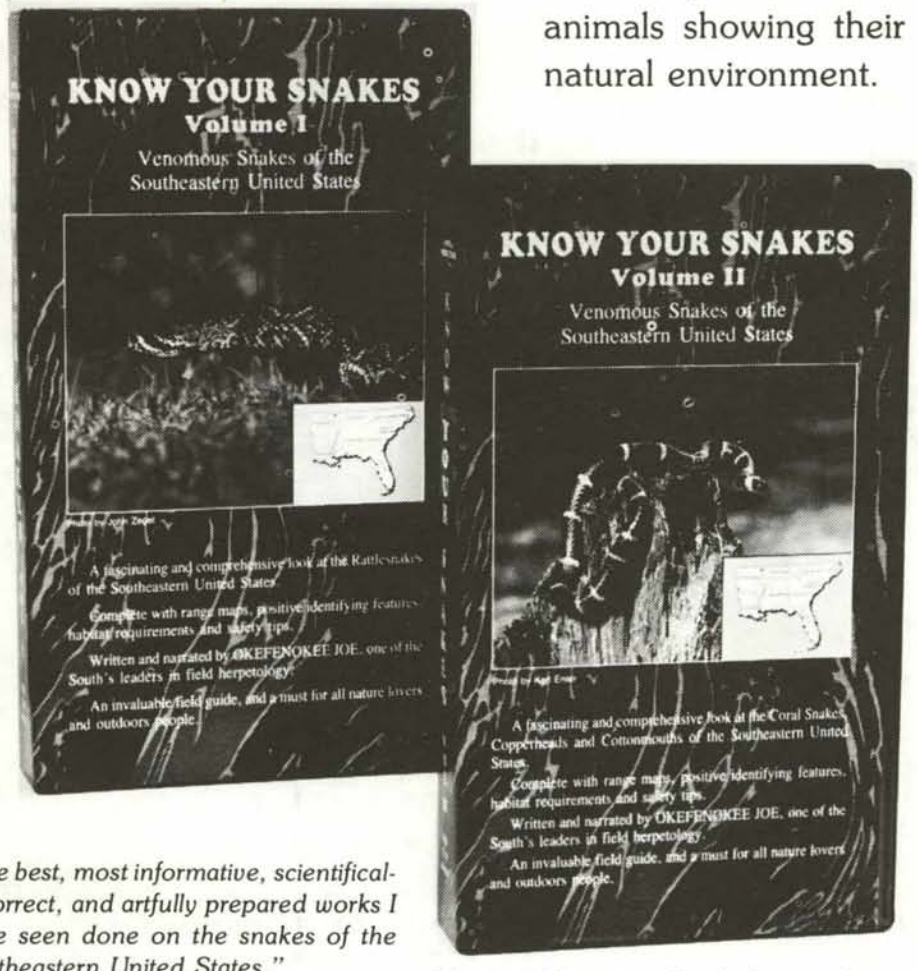
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CTENOSAURA SIMILIS (Spiny-tailed iguana). **Nest Emergence.** Most members of the subfamily Iguaninae are considered diurnal (Burghardt and Rand 1982. *In*: Burghardt and Rand, eds.; Iguanas of the World, pp. 1-4). Two exceptions to this behavior were reported recently. Mora (1986. Vida Silvestre Neotropical 1:82-83) reported nocturnal activity of nesting female ctenosaurs, and nocturnal nest emergence in hatchling *Iguana iguana* was reported by Drummond and Burghardt (1983. J. Herpetol. 17:290-292).

During a population study of *C. similis* inhabiting the Dr. Rafael Lucas Rodriguez National Wildlife Refuge (Palo Verde), Costa Rica (10°21'N; 85°21'W) some observations were made on nocturnal nest emergence in ctenosaurs.

On 17 May 1984 I observed 14 hatchling ctenosaurs active near nesting sites at night. Others were seen during the next three successive nights. During the following hatching season (May 1985) I captured hatchlings that were moving or asleep near the same nesting sites at night. Individuals actually hatching at night were not observed, but I excavated one nest on 14 May (2200h) and found 18 hatchlings only 2cm from the surface.

An enclosure was constructed at one nesting site in 1986 and 451 hatchlings were captured, most of them hatched at night. In addition, 23 individuals hatching from four different nests outside the enclosure were observed on the nights of 16-20 May 1986. At the same locality some green iguanas were also seen hatching and moving at night. Drummond and Burghardt (1983. op. cit.) pointed out the possibility that nocturnal emergence of green iguanas could be caused or enhanced by the visible presence of an aluminum wall around the nest site. This could also have occurred for hatchling ctenosaurs in this case, but I also observed hatchlings of the two species emerging at night on other nesting sites.

Fitch and Henderson (1978. Univ. Kans. Sci. Bull. 51:483-500) stated that adult ctenosaurs are not active at night or on rainy days, yet several incidents of nocturnal emergence of hatchlings in Palo Verde happened on rainy nights.

M.I. DiMare, J.R. Dixon and T. Qureshi made helpful comments on the manuscript. Financial and logistic support was provided by the Universidad Nacional, Heredia, Costa Rica; World Wildlife Fund; Organization for Tropical Studies (OTS); and the Subdirección de Vida Silvestre of the Ministerio de Agricultura y Gandería of Costa Rica.

Submitted by **JOSE M. MORA,** Rob and Bessie Welder Wildlife Refuge, P.O. Drawer 1400, Sinton, TX 78387, USA •

SERPENTES

BOTHROPS GODMANI (Godman's Viper). **Size.** A male *B. godmani* was found dead on a trail surrounded by cloud forest, Between El Triunfo and Finca Prusia, ca. 2km from El Triunfo, El Municipio de Angel Albino Corzo, Chiapas, Mexico, on 2 April 1988, Mario A. Ramos, collector. The specimen measured 822mm TL and 710mm SVL. The previous maximum recorded length for this species was 789mm TL for a specimen from Honduras (Wilson & Meyer 1982. Milwaukee Publ. Mus. Contrib. Biol. Geol. (6):1-159). The snake, deposited at INIREB's Herpetological Collection (INIRB-0508) exceeds the previous known size record by 33mm. Other *B. godmani* of similar size have been observed at El Triunfo Reserve near the site of collection (A. Thomas, pers. comm.).

Submitted by **MARCO A. LAZCANO-BARRERO** and **ANTONIO MUÑOZ-ALONSO,** Instituto Nacional de Investigaciones Sobre Recursos Bioticos (INIREB), Apdo. Postal 219, San Cristobal de las Casas, Chiapas 29200, Mexico •

MICRUROIDES EURYXANTHUS (Arizona Coral Snake). **Size.** A record length *M. euryxanthus* was collected on 6 August 1983 at 2125h MST on Highway 86 west of Tucson, Pima Co., Arizona by the authors after heavy rains that afternoon. The snake measured 615mm TL, 567mm SVL, was 9.7mm in diameter, and had a mass of 45.8g. The previous record for this species is 551mm TL and 10mm diameter recorded by Gates (1956. Herpetologica 12:155).

The specimen is now being maintained alive in the Animal Resource Center at Arizona State University, Tempe, Arizona, and will be deposited in the University's collection of lower vertebrates upon its death. A photograph of the living snake, showing its TL in March 1987, has been deposited at the Arizona State University Vertebrate Museum (ASU 23511).

Submitted by **RANDALL D. BABB,** 214 West Shannon St., Chandler, AZ 85224, **J. KEVIN AITKEN,** 3825 N. 50 Place, Phoenix, AZ 85018, and **DOROTHY DELISLE,** 74 Windmill Lane, Arlington, MA 02174, USA •

TESTUDINES

EMYDOIDEA BLANDINGI (Blanding's Turtle). **Longevity.** A large (ca. 217mm CL) female *E. blandingi* was collected on 30 July 1988 in Chisago Co., Minnesota (T36N, R21W, Sec 1) with two sets of initials and dates carved into its plastron (Fig. 1). The original initials were carved in the spring of 1926 (O. Larson, pers. comm.) and the second in the spring of 1946 (R. Larson, pers. comm.). There is no distortion in the initials that would be associated with growth. The turtle is assumed to have been mature when first captured in 1926. This turtle was captured in 1982 (East Central Minnesota Post Review, 10 June 1982, page 1) in early June while nesting. This would give the turtle a minimum reproductive period of 56 years (1926-1982).

Gibbons 1987 (BioScience 37:262-269) stated that the average maturity in this species is 15 years. His article also gives the oldest known Blanding's turtle as 48 years. The Chisago Co. turtle exceeds that age by 29 years and is a minimum of 77 years old. The turtle was marked with a Department of Natural Resources tag and released at the capture site.



Submitted by **BRUCE BRECKE,** 217 N. Cedar Lake Rd., Minneapolis, MN 55405, and **JOHN J. MORIARTY,** Minnesota County Biological Survey, Bell Museum, 10 Church St. SE, Minneapolis, MN 55455, USA •

GOPHERUS POLYPHEMUS (Gopher Tortoise). **Mortality.** An adult male *G. polyphemus* (CL 257mm, no discernable annuli) was found dead trapped in an underground chamber. The tortoise was one of 40 we relocated from pine flatwoods at the Windsor Parke develpment site in Duval County, Florida to a reclaimed molybdenum mine site in Clay County, Florida. This particular tortoise was captured 23 July 1987 at the development site, outfitted with a 61g radio transmitter, relocated, and released the same day. When tracked seven days later, it had left the mining site and moved approximately 1.1km south to a previously abandoned gopher tortoise burrow in a sandhill habitat. The transmitter was tracked to this same location regularly for the next twelve months. We saw no signs of activity at the burrow, however, and the odor of rotting flesh was detected.

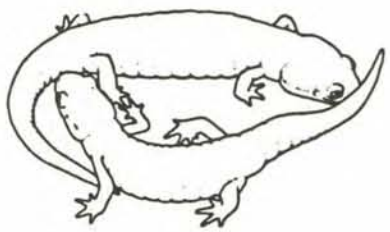
On 20 August 1988 we excavated the burrow. It was normal in appearance, but only 2m long. Another, discontinuous, tunnel began at the same depth as the end of the first tunnel (ca. 125cm) but approximately 40cm away. The tortoise and transmitter were in a circular chamber, diameter 50cm, discontinuous from the two tunnels, ca. 30 cm from the mouth of the burrow and 25cm deep. The carcass was well preserved and there was no indication of predation. We postulate that the tortoise was at least 125cm underground when the tunnel collapsed, and was burrowing upwards in the direction of the burrow mouth when it became exhausted. Although other relocated tortoises were also tracked, no other mortalities were detected, and we have no reason to believe that this was other than a natural event.

Evidence of natural mortality of adult gopher tortoises is relatively rare, unlike desert tortoises *(Gopherus agassizi)*. W. Auffenberg (pers. comm.) has suggested that armadillos *(Dasypus novemcinctus)* occasionally entomb gopher tortoises when modifying tortoise burrows, but no armadillo sign was detected in this case.

Submitted by RUSSELL L. BURKE, Tall Timbers Research Station, Route 1, Box 678, Tallahassee FL 32312, and



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GOPHERUS POLYPHEMUS (Gopher Tortoise). **Food.** Available data on *Gopherus polyphemus* diet are from the northern (Garner and Landers 1981. Proc. Ann. Conf. SE Assoc. Fish Wildl. Agencies 35:120-133) and central (MacDonald 1988. Herpetologica 44:345-353) parts of its geographic range, which extends through the southeastern coastal plain from Louisiana to South Carolina and southward through most of peninsular Florida (Auffenberg and Franz 1982. U.S. Fish Wildl. Serv., Wildl. Res. Rep. 12). *G polyphemus* is thought to serve as a seed dispersal vector for plants (Auffenberg 1969. Tortoise Behavior and Survival. Rand McNally, Chicago), but the capability of seeds to survive passage through its gut has not been demonstrated. We report here on the use of tallowwood fruits *(Ximenia americana)* by the gopher tortoise in the southern portion of its range, and on the ability of the seeds of tallowwood to germinate following ingestion by *G polyphemus*.

The study site is a sand pine scrub in Boca Raton, Palm Beach County, Florida; dense, scrubby oaks (mostly *Quercus geminata, Q. myrtifolia* and *Q. chapmanii*), sand pine *(Pinus clausa)*, and saw palmetto *(Serona repens)* dominate the site. *Ximenia americana*, which grows as a spine-bearing shrub on this site, represented only 0.45% of the shrubby vegetation in over 2,700m of linear transects sampled. *Ximenia americana*, which is toward the northern edge of its range at this site, is a highly polymorphic species with a broad, pantropical distribution (Tomlinson 1980. The Biology of Trees Native to Tropical Florida. Harvard Univ. Print Off.).

We obtained data on the diet of *G. polyphemus* through scat collections and observations. Scats were obtained either during the handling of tortoises or after their deposition. Scat samples collected in September and October of 1987 revealed the presence of large, tan-colored, suboval seeds (14.5-20.0mm in length, 9.0-14.5mm in maximum diameter, and 0.6-1.1mm in seed coat thickness) that matched the appearance of the solitary seeds found in *X. americana* fruit. Thirty-seven percent (13 of 35) seeds from both types of scats collections planted on 30 October 1987 germinated between 30 January and June 1988, confirming the identity of the seeds as those of *X. americana* as well as the ability of those seeds to survive passage through the gut of *G. polyphemus*.

X. americana bears large (ca. 3cm diameter), plum-like fruit that ripens yellow (Tomlinson 1980. op. cit.). Ripe fruits possess a substantial opalescent flesh that has an agreeable odor and a sweet-tart taste; we found most fruits were located within 35cm of the ground. Fruit set was not heavy (i.e., no plant we found had > 12 fruit; see also Tomlinson 1980. op. cit.), but *G. polyphemus* may preferentially select this species: four os seven of the October scat samples obtained directly from tortoises had *X. americana* seeds in them despite the fact that tallowwood represented < 5% of the individuals of species with fleshy fruits eaten by gopher tortoises. MacDonald (1988. op. cit.) found that *G. polyphemus* is selective with respect to most plant species in its diet.

This is the first evidence that *X. americana* fruits are used as food by *G. polyphemus*. *X. americana* ranges to around 30°N latitude in Florida (Little 1978. U.S. Dept. Agric. Misc. Publ. 1361), but workers in northern and central Florida having extensive field experience with *G. polyphemus* have not found evidence of *X. americana* fruits being used as food (J. Diemer and L. MacDonald, pers. comm.). This pattern probably results from the rarity of *X. americana* near the northern limit of its range (Wunderlin 1982. A Guide to the Vascular Plants of Central Florida. Univ. Presses of Florida).

Handling of tortoises was done under Florida Game and Freshwater Fish Commission permit W87107 issued to Ronald Gaby.

Submitted by **MARC P. HAYES, JOSIANE LE CORFF,** Department of Biology, P.O. Box 249118, University of

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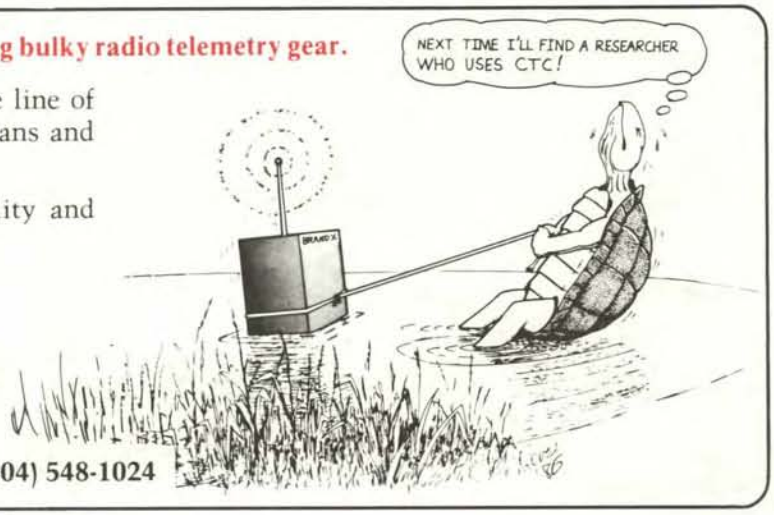
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TRIONYX SPINIFERUS (Spiny Softshell Turtle). **Fecundity.** An unusually large nest of a spiny softshell turtle was discovered 13 June 1988 on a sandbar in the South Platte River, Logan Co., CO. The nest contained 39 eggs of relatively uniform size ($\bar{X}$ mass = 11.324g, SD=0.425g) and appearance. All the eggs were contained within a single nest bowl, and all had white spots of similar size on their uppermost surface. We conclude from these observations that the eggs were laid by a single female, and that this is not an instance of two females depositing their eggs in essentially the same site.

Fitch (1985. Univ. Kans. Mus. Nat. Hist., Misc. Publ. 76) listed 27 as the maximum clutch size for this species, whereas Ernst and Barbour (1972. Turtles of the United States. The University Press of Kentucky, Lexington) reported clutches as large as 32 eggs. Our findings indicate that some individuals of this species may produce clutches of nearly 40 eggs.

Submitted by KIRK MILLER, Department of Biology, Franklin and Marshall College, Lancaster, PA 17604, GEOFFREY F. BIRCHARD, Department of Biology, George Mason University, Fairfax, VA 22030, MARY J. PACKARD and GARY C. PACKARD, Department of Biology, Colorado State University, Fort Collins, CO 80523, USA •

RECENT POPULATION CHANGES

This section provides an outlet for anecdotal or minimally documented information on local extinctions or regional population changes. These reports could be valuable historic indications that might enhance our understanding of very long term population trends (in excess of 20 years) and changes in distribution patterns.

Manuscripts should be submitted directly to the editor of this subsection: Ralph W. Axtell, Department of Biological Sciences, Southern Illinois University, Edwardsville, IL 62026, USA.

CHELONOIDES CARBONARIA (Red Footed Tortoise). In the Venezuelan Guayana, *Chelonoides carbonaria* potentially inhabits savannas and forests where there is a marked dry season, whereas *C. denticulata* is a forest species that occurs in areas of high rainfall (greater than 2,000 mm/y). *Chelonoides* are a popular food source for Indians, lumbermen and goldminers (*C. carbonaria* can weigh up to 10 kg and *C. denticulata* can reach 20 kg), and are also a typical dish during Easter week. They are routinely collected by hand and kept in a simple corral until needed. In savanna, hunting consists of burning the vegetation. This clears the terrain and increases visibility, and forces the tortoises to congregate in damp hollows and streams.

Over the past three decades the three principal towns (Ciudad Bolivar, Ciudad Guayana and Upata) have increased their population from less than 50,000 to over 500,000. Demand for *Chelonoides* is apparently no longer met by supply. In spite of a hunting ban imposed in 1974 and extensive control by the National Guard, there is a very intense illegal traffic in tortoises for the two months preceding Easter. Since 1974 the price of a pair of tortoises has increased from Bs 15 to Bs 200 and above. Examination of specimens confiscated by the National Guard indicates that the main hunting pressure is exerted on *C. carbonaria*, and information as to the sources of the contraband and field observations suggest that savanna populations of this species in the northern Estado Bolivar are virtually extinct.

STEFAN GORZULA
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ELEUTHERODACTYLUS JOHNSTONI (Coqui). This frog was apparently introduced from Puerto Rico to Caracas several decades ago. It is very common in residential areas where there are gardens. It is transported passively through the ornamental plant trade and viable populations are now established in Ciudad Bolivar, Ciudad Guayhana, Upata and Guri (Estado Bolivar, Venezuela). There is no evidence that the species has managed to establish itself in natural habitats.

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BOOK REVIEWS

Francesco Redi on Vipers, translated and annotated by Peter K. Knoefel. 1988. E. J. Brill, Leiden. xvii+86 pp., 2 figs.

Francesco Redi (1626-1698) first applied scientific method to the study of snake venom and refuted centuries of myth, folklore, and scholarly speculation. In an engrossing and attractive little book, Peter Knoefel makes available to zoologists and medical scientists a translation of Redi's observations on vipers and their venom. As supervisor of the Royal Pharmacy of Ferdinando de Medici, Grand Duke of Tuscany, Redi had access to large numbers of vipers used in preparation of theriac, one of the most valued pharmaceuticals of the time. In his *Osservazioni intorno alle vipere*, he describes the viper venom apparatus and recounts dozens of experiments that show the viper's ability to kill resides in a "yellow liquor" produced in cephalic glands and injected through the fangs. Other experiments show the fluid to be innocuous when given by mouth. Following the conventions of sixteenth century science, he acknowledges the works of earlier authorities dating back to Homer. In passing, he mentions some widely held beliefs about vipers and the treatment of their bites.

A chapter is devoted to the spirited correspondence between Redi and Moyse Charas who termed Redi's "yellow juice" a "simple and quite innocent saliva" and attributed the poisoning to the viper's "irritated spirits helped by the apertures made by the fangs." A third chapter is a brief excerpt from Redi's work on parasitology describing how severed heads of vipers can envenom animals even after many hours, and how viper venom retains toxicity after being dried on broom straws.

A preface gives a brief summary of Redi's life and works. There are 252 explanatory notes keyed to the text but in a separate section. This is a fine piece of scholarship highly recommended for all having an interest in venomous snakes and their venoms.

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HERPETOLOGICAL REVIEW EDITORIAL POLICY

The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to rteview herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology, and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations and photographs. Manuscripts submitted must be typed, double spaced, on 8.5X11 inch paper, and should be sent in duplicate. We encouerege submissions on Macintosh disks, though we can also work with TEXT (ASCII) files submitted on IBM and compatible floppies. **Herpetological Review** is composed on a Macintosh SE using Microsoft Word, which accepts files from several other word processor applications. Format your documents full-page width; we will fit to **HR** format. Unpublished photographs of an unusual nature or of uncommon amphibians or reptiles may also be submitted. These should be 8X10 inches black and white, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled lightly on the back of each print. Return of unsolicited photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs solicited by the Editor will be returned at our cost.

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Herpetological Review

Volume 20 March 1989 Number 1

SSAR BUSINESS

SSAR ELECTION RESULTS

The results of the 1988 SSAR election are as follows:

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Secretary .....James S. Jacob
Treasurer ..... Douglas H. Taylor
Board - Regular .....James L. Christiansen
Board - Zoological Parks ... A. Dale Belcher

A total of 543 members voted in this election.

The Society extends its gratitude to the Nominating Committee (George Pisani, Chair) and to the SSAR Elector (Ruth M. Zantzinger) for their hard work, and to the outgoing President and Board Members for their service during their terms.

SSAR COMMITTEES FOR 1988-1989

Following the annual meeting in Ann Arbor, Michigan, President Hugh Quinn appointed the following committees and coordinators for the current year, to report to the Board at the First World Congress of Herpetology, in Canterbury. Individuals with important matters pertaining to the activities of Society committees should contact the relevant committee chair. Addresses for committee chairs are included in the inside rear cover of each issue of *Herpetological Review*.

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AUCTION FOR THE CONSERVATION OF ENDANGERED HERPETOFAUNA FIRST WORLD CONGRESS OF HERPETOLOGY

Proposed by the Fauna & Flora Preservation Society and as part of the social activities, the organisers of the First World Congress of Herpetology have agreed that an auction will be held during the course of the congress, 11-19 September 1989. Books, paintings, carvings, amphibian and reptile films, videos and voice recordings, and herpetological curios, but not live animals, will be auctioned off to the highest bidders. The proceeds of the auction will go towards funding research and management for conservation of the world's endangered herpetofauna, since the Congress is committed to conservation with conservation of species as its main underlying theme.

With his many years' experience as auctioneer at the annual SSAR/HL meetings in the USA, it is anticipated that Joe Collins (Museum of Natural History, University of Kansas, Lawrence) will once again lead the festivities. Proposers of interesting, fundable projects will probably present short summaries to provide breaks and a change of pace as the auction progresses.

It is intended that the highlights of the auction will be listed in the brochure to be circulated in Spring 1989. One is an original watercolour by David Dennis of the Guatemalan beaded lizard (recently discovered and shortly to be described).

The organisation of the auction has fallen upon me, assisted by Mr. Richard Howard, a member of FFPS Council. This is an APPEAL TO ALL HERPETOLOGISTS and others interested in natural history TO DONATE ON BEHALF OF THE WORLD'S ENDANGERED HERPETOFAUNA any surplus items of herpetological interest listed above (amusing or otherwise) that they have in their possession for auctioning-off at the World Congress in 1989.

Please make contact with the Congress Office at the address below to inform them of the items that you intend either to bring or to send in advance so that these are properly listed with the names of the donors:

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ARNOLD G. KLUGE
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The University of Michigan
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MEETINGS

LATIN AMERICAN CONGRESS OF ECOLOGY

The First Latin American Congress of Ecology will be held in Montevideo, Uruguay 10-17 December 1989. The meeting is being organized by CIPFE (Centro de Investigación y Promoción Franciscano y Ecológico) and the major sponsor is INTECOL (International Association for Ecology). One of the symposia to be offered during this meeting is "Ecology and Biogeography of Latin American Herpetological Communities." Further information about and registration for this meeting may be obtained from:

Eduardo Gudynas
Coordinador, 1er CLAE
Grupo Ambiente y Desarrollo
CIPFE
Casilla de Correo 13125
Montevideo - Uruguay ●

ALL FLORIDA HERPETOLOGICAL CONFERENCE

The twelfth annual All Florida Herpetological Conference will be held 22 April 1989 at the University of Florida, Gainesville. "International and Florida Herpetological Conservation" will be the theme of the morning session and "Captive Breeding and Maintenance of Herptiles" will be the afternoon theme. A "Workshop for Young Herpetologists" and a dinner/program will be held. The conference is co-sponsored by the Florida Museum of Natural History and the Gainesville Herpetological Society.

Registration and program information is available from:

David Auth
Florida Museum of Natural History
University of Florida
Museum Road
Gainesville, FL 32611, USA
(904) 392-1721 ●

BRITISH HERPETOLOGICAL SOCIETY LONDON MEETINGS 1989

Meetings are held either in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1 (*), or in the Lecture Theatre of the Zoo Studies Centre, Zoological Society of London, Prince Albert Road (opposite Ormonde Terrace), London NW1 (**). They start at 7:00 pm, ending at 9:00 pm, unless indicated otherwise.

For further details, membership, information on publications and subscriptions to *The Herpetological Journal* and quarterly *BHS Bulletin*, please write to BHS, c/o Zoological Society of London, Regent's Park, London NW1 4RY, UK. As always, SSAR members and herpetologists from other countries are most welcome.

25 April * Mr. Daniel Bennett: Goannas, monitors and other varanid lizards in the world.
23 May * Dr. Christopher Raxworthy: Herpetofauna of the threatened rain forests of Madagascar — a unique habitat.
4 July ** *Amphibia and Reptilia worldwide: their care and breeding.* A discussion organised by the Captive Breeding Committee (Chairman: Mike Linley). Members are encouraged to bring live animals, preserved specimens, amphibian voice recordings and 35 mm colour slides for display and to illustrate discussions.
30 August ** Dr. William Branch (Port Elizabeth Museum, South Africa): Herpetofauna of southern Africa.
2 September ** *Care and breeding of amphibians and reptiles: an open meeting.* Contributions from members — live animal and photographic display. There will be the opportunity for the sale and exchange of members' private home-bred stock. A special Saturday afternoon meeting from 2:00 to 5:30.
10 October ** Dr. David Corke: Lizards in paradise — conservation on St. Lucia (Windward I., Lesser Antilles), West Indies.
29 November ** Dr. Clive Cummins: Effects of acid rain on amphibians.

M.R.K. LAMBERT
Chairman, British Herpetological Society ●

CONFERENCE ON GLOBAL CLIMATE CHANGE AND LIFE ON EARTH: EVIDENCE, PREDICTIONS, AND POLICY

The Edmund Niles Preserve and Biological Research Station and the New York State Museum have organized a conference on the potential effects of the climate change on natural and manmade systems. Speakers will examine the evidence which suggests that climate change will occur; discuss how changes may affect forests, wildlife, agriculture, disease and parasites, and extinction rates; and consider how policy may need to be changed.

The conference will be held at the New York State Museum, Albany, N.Y. on 24 and 25 April 1989. The conference is cosponsored by the New York State Museum Associates, Albany County Audubon Society, the Behavioral Ecology Group at SUNY-Albany, New York Chapter of the Wildlife Society, the New York Department of Environmental Conservation, the Atmospheric Sciences Research Center of SUNY-Albany, the Roger Tory Peterson Institute, and the Environmental Planning Lobby.

The Honorable Crispin Tickel, Ambassador to the United Nations from Great Britain, will deliver the keynote address.

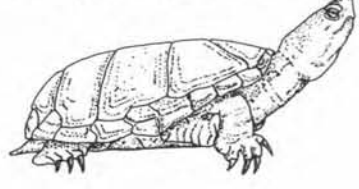
Speakers include Dr. Daniel Dudek of the Environmental Defense Fund, Dr. Janice Longstreth of ICF-Clement, Drs. Edward Cook and J. T. Overpeck of Lamont Doherty Geological Observatory, Dr. Richard L. Wyman of the E. N. Huyck Preserve and Biological Research Station, Drs. Peter J. Myers and Jan Beyea of the National Audubon Society, Drs. David Steadman and James Clark of the New York State Museum, Dr. Kathy Schneider of the Natural Heritage Foundation and Dr. David Houghton from Woods Hole Research Center. NYS Department of Environmental Conservation's Commissioner Thomas Jorling may participate in policy discussions.

For more information please contact Dr. Richard L. Wyman, Conference Organizer, E. N. Huyck Preserve and Biological Research Station, P.O. Box 188, Rensselaerville, NY 12147, USA (518) 797-3440. ●

SPNHC 4TH ANNUAL MEETING

Society for the Preservation of Natural History Collections will hold its 4th Annual Meeting, 23-28 July 1989, hosted by Tyrrell Museum of Palaeontology, Drumheller and the Biological Sciences Department, University of Calgary. The theme of the meeting is "Collections - Our Treasured Heritage" and will include technical and poster sessions, workshops, tours, a panel discussion, "Public vs. Research Access to Natural History Collections," and a day-long conservation symposium. The meeting is open to anyone with a professional interest in the management and preservation of natural history collections.

A circular, with abstract and registrations forms, was mailed 30 January 1989. Abstract deadline is 15 April 1989. For details contact: SPNHC Conference Secretary, Tyrrell Museum of Palaeontology, P.O. Box 7500, Drumheller, Alberta, Canada T0J 0Y0; Tel: (403) 823-7707; Fax: (403) 823-7131. ●



FEATURES

OOPHAGUS BEHAVIOR IN BROODING PRAIRIE SKINKS, *Eumeces septentrionalis*

Oophagus behavior in brooding lizards has been documented for *Eumeces anthracinus* (Hamilton 1958), *E. callicephalus* (Zweifel 1962), *E. fasciatus* (Cagle 1940; McCauley 1945; Fitch 1954; Vitt and Cooper 1986), *E. inexpectatus* (Hamilton 1958; Vitt and Cooper 1986), *E. laticeps* (Martof 1956; Vitt and Cooper 1985), *E. skiltonianus* (Tanner 1957) and *Ophisaurus attenuatus* (Fitch 1970; Vogt 1981). Many authors have attributed this behavior to hunger (Cagle 1940; Smith 1946; Hamilton 1958; Fitch 1967, 1970; Vitt and Cooper 1986). Although Martof (1956) suggested that this behavior resulted from causes other than hunger, none was specified. McCauley (1945) observed a brooding *E. fasciatus* ingest her eggs after they died. Greene (cited in Groves 1982) observed a brooding *Gerrhonotus liocephalus* remove rotten eggs from her nest, although he did not record if they were ingested. Recent experimental evidence employing brooding *E. fasciatus* suggests that oophagy is initiated by the attending female in order to remove rotten eggs from the clutch (Groves 1982).

During the summer of 1984, two gravid female *E. septentrionalis* were collected in June in Omaha, Nebraska. The skinks were housed separately in 26 x 16 x 13 cm plastic terraria filled with 1.5 cm of moist soil. Fluorescent and incandescent lamps provided a 14L:10D photothermal period. Temperature fluctuated between a high of 34° C during the day to a low of 26° C at night. Skinks were fed crickets (*Acheta domestica*) and mealworms (*Tenebrio moliter*) *ad libitum*; these were dusted with a 50/50 mixture of powdered bonemeal and a vitamin-mineral supplement prior to daily feedings. Drinking water was available in a glass culture dish.

A 15 x 15 cm plate of 0.64 cm thick transparent red acrylic was provided for both terraria. These plates allowed the skinks to be observed while under the shelter.

The two skinks began ovipositing eggs beneath the acrylic plates on 30 June and 8 July. Clutch sizes were 4 and 12, respectively. Toward the end of the incubation period, the following procedures were implemented on four consecutive days. On the first day, one egg in each of the two clutches was killed by destroying the embryonic disk with a needle. On the following day, one rotten egg from a clutch of eggs in another study was added to each clutch. On the third day, one egg in each clutch was heavily swabbed with the inner contents of a rotten egg. Finally, one viable egg from each clutch was removed and exchanged for one in the opposite clutch. All viable eggs were marked with a 6B soft lead pencil for identification. The response of the brooding females to each procedure was recorded on the day following each treatment before a new treatment was initiated. If an egg was missing it was presumed to have been ingested by the attending female.

Within one day following each treatment both females ingested those eggs that were mechanically killed, rotten or swabbed with the contents of a rotten egg. All of the viable eggs, including those from the other female's nest, were successfully brooded to yield healthy hatchlings after incubation periods of 16 (large clutch) and 20 (small clutch) days.

Because the female skinks in this experiment were fed daily until satiated, it seems unlikely that low nutritional status induced oophagy. Observations of *Eumeces* eating apparently viable eggs while brooding (Vitt and Cooper 1985, 1986) may represent species-specific differences in behavior or responses to undetected (by the observers) damaged or dead eggs.

Oophagy may prevent the spread of deleterious microorganisms from dead eggs to viable eggs (Tinkle and Gibbons 1977), and it also may prevent potential predators from finding the nest using olfactory cues (Groves 1982). The results of my observations on oophagy in brooding *E. septentrionalis* are consistent with these hypotheses. More quantitative data are needed to test them critically.

ACKNOWLEDGMENTS

I gratefully thank J.D. Fawcett, H.B. Lillywhite and L.J. Guillette for their comments on this manuscript. Special thanks go to Sam Wurster for his assistance in obtaining skinks for this study.

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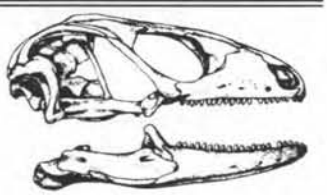
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Phylogenetic Relationships of the Lizard Families

ESSAYS COMMEMORATING
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Edited by Richard Estes and Gregory Pregill. Using modern analytical methods of phylogenetic systematics, this is the first comprehensive treatment of the relationships among lizard families to appear in over 50 years. In chapters by the leading experts on particular squamate taxa or anatomical systems, it brings together a vast body of information intended both for systematists and for biologists who know the value of interpreting organismal biology and evolution against a historical background. Illustrated with some 180 drawings and photographs. 648 pages. $75.00

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DEFENSIVE STANCES IN TURTLES

When approached by a potential predator, turtles respond with a variety of defensive posts (Hayes et al. 1988). One such posture, the defensive stance, occurs when the carapace is directed toward an aggressive conspecific or potential predator, thus reducing access to the head and limbs (Dodd and Brodie 1975; Dodd 1978; Hayes et al. 1988). Because turtles occupy a variety of habitats and are preyed upon by many different predators, interspecific variation may be expected to occur in the antipredator behavior of turtles. This study examines presumed defensive stances in a variety of turtle species, and attempts to explain differences between species by differences in ecology and morphology.

I examined the stances of turtles maintained in university, zoo, or nature center collections and in the wild. To elicit posturing, individual turtles were tapped on the anterior, lateral, and posterior margins of the carapace, and the responses were subsequently recorded. I also reviewed the literature on turtles for reports of stances in response to encounters with potential predators or agonistic turtles.

A variety of stances were observed or reported in 22 species comprising 7 of the 14 extant families of turtles (Table 1). The stances of captive turtles observed in this study were essentially the same as those of wild turtles receiving identical stimuli. The various stances are described below.

Frontal Stance. This stance, usually elicited when the front of the carapace was tapped (tactile stimuli) or during the approach of a human (visual stimuli), involved the extension of the rear legs, retraction of the foreparts, and tilting the carapace forward toward the predator. This display was the most commonly observed stance in turtles (91% of the species), perhaps due to the high priority in protecting the head. Biting lunges and hissing also accompanied this stance in some instances. At least two species of turtles used the tail to balance itself while maintaining this stance (Table 1).

Lateral Stance. In response to lateral stimuli, 59% of the species tilted the carapace laterally toward the observer by extending the legs on the opposite side of the shell and retracting the limbs facing the observer.

Rear Stance. When tapped on the rear portion of the carapace most turtles attempted to escape. A few, however, remained stationary (terrestrial species), while 36% of the species responded by extending the forelegs and retracting the posterior extremities. In young *Gopherus agassizii*, this stance was elicited by touching the tortoise anteriorly or placing a finger on the head, and even occurred when unprovoked (Berry 1986). Berry (1986) also noted that the response could be extinguished within a few days by repeatedly touching the tortoise near the head.

The stimuli required to elicit these responses varies among species (Table 1). Although stances were elicited by tactile stimuli in all species of turtles observed in this study, at least three species are reported to exhibit defensive stances when approached by humans (Dodd and Brodie 1975; Dodd 1978; Berry 1986). Of 50 wild *Geochelone elephantopus* approached by a human, none exhibited defensive stances prior to physical contact, suggesting that the display of defensive stances in this species is contingent upon tactile releasers (Hayes et al. 1988).

Interspecific and intraspecific variation occurred between the species in the frequency of stances displayed (Table 2). Because of the small sample sizes and confounding factors involved with captive animals, these differences need to be confirmed by field studies. Nevertheless, the data demonstrate that many captive animals are not completely habituated to aversive stimuli, and species-specific patterns of behavior may be apparent.

The intensity of defensive stances varied between species, apparently due to differences in the morphology and ecology of each species. Aquatic turtles with reduced plastron surfaces (e.g., Chelydridae) exhibited the most distinctive stances (high elevation above substrate, long duration) as well as the most aggressive active defense (i.e., biting). For example, captive *macroclemys temmincki* maintained these displays for periods of 10 sec or longer when touched with a stick and bit the stick whenever possible. Terrestrial turtles (e.g., Testudinidae), apparently relying primarily on their domed carapaces with relatively small external openings for defense, exhibited less distinctive defensive stances (Hayes et al. 1988). The displays exhibited by all *Geochelone* tortoises were short in duration (< 12 sec) and often appeared only after repeated tapping of the carapace. Aquatic

Table 1. Species of turtles for which defensive postures are reported. Nomenclature follows Iverson (1985). Behaviors: 1 = frontal posture; 2 = lateral posture; 3 = rear posture; 4 = tail balancing; 5 = bite accompanying posture. Stimuli: T = tactile; V = visual. Numbers in the source column refer to references in the Literature Cited section. Asterisks indicate observations made in captivity in this study. W refers to species observed in the wild in this study.

Family and Species	Behavior	Stimulus	Source
CHELYDRIDAE			
Chelydra serpentina	1,2,3,4,5	T, V	4,*,W
Macroclemys temmincki	1,2,3,4,5	T	*
EMYDIDAE			
Chrysemys picta	1	T	*,W
Emydoidea blandingii	1	T	*
Terrapene carolina	1	?	4
Trachemys scripta	1,2	T	2,7,12,*
Rhinoclemmys areolata	1,2	T	3
KINOSTERNIDAE			
Kinosternon flavescens	1	T	8
Kinosternon leucostomum	2	T	9
Sternotherus odoratus	1,2,3,5	T	*
Claudius angustatus	1,2,3,5	T, V	3
PLATYSTERNIDAE			
Platysternon megacephalum	2	T	11
TESTUDINIDAE			
Geochelone carbonaria	1	T	*,W
Geochelone chilensis	1	T	*
Geochelone elephantopus	1	T	6,*,W
Geochelone gigantea	1,2	T	*
Geochelone pardalis	1,2,3	T	*
Gopherus agassizii	1,2,3,5	T, V	1,*,W
Malacochersus tornieri	1,2,3	T	*
CHELIDAE			
Chelus fimbriatus	1,5	T	10,*
Platemys platycephala	1	T	*
PELOMEDUSIDAE			
Pelomedusa subrufra	1,2,3,5	?	5

turtles with intermediate shell protection (e.g., Emydidae) also lacked distinctive stances; for these turtles, escape into water and hiding are probably the most effective means of predator avoidance. The emydid turtles that I examined always exhibited vigorous escape behavior whether on land or in water; stances were displayed only momentarily (< 2 sec) when turtles were cornered and repeatedly tapped.

Although defensive stances were observed in young (3-8 cm straight carapace length) *Chrysemys picta, Sternotherus odoratus* and *Geochelone pardalis,* none of five young *Trachemys scripta* (3.3-3.6 cm) exhibited stances whereas five adults (ca. 15 cm) did. No discernable size differences occurred in the displays of 23 *Geochelone pardalis* ranging from 3 to ca. 30 cm. Whether these stances represent innate or learned avoidance behaviors remains to be learned.

Since these displays have been observed only in turtles approached or molested by humans and during aggressive encounters with other turtles, it is not known whether these stances are displayed during an encounter with an actual predator. The contexts of previous reports do, however, indicate that these behaviors serve an avoidance function to aversive stimuli, and a defensive purpose is therefore implied.

Dodd and Brodie (1975) suggested that defensive stances in turtles are similar to lateral defensive displays exhibited by many animals in which a particular surface, in this case the carapace, is directed toward a predator, thus reducing access to more vital portions of the body. Defensive posturing, especially if accompanied with hissing, may also serve a deimatic function by exaggerating the apparent size of the turtle and possibly frightening or discouraging potential predators.

This study demonstrates the widespread occurrence of presumably defensive stances in turtles. However, much information is still needed from a variety of species to properly assess the roles of interspecific and intraspecific variation, ontogeny, ecology and morphology in the defensive behavior of turtles.

ACKNOWLEDGMENTS

I thank D.L. Marcellini for permission and assistance in collecting data from turtles at the National Zoological Park in Washington, D.C.; R.A. Nussbaum for encouragement during this study; and W.K. Hayes, M.J. Rosenberg and anonymous reviewers for comments which helped improve this manuscript.

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TERMITE NEST INCUBATION OF THE EGGS OF THE MEXICAN COLUBRID SNAKE *Adelphicos quadrivirgatus*

The recent valuable review of formicarial and termitarial incubation of reptile eggs (Riley et al. 1985) reveals records for 33 species of reptiles throughout much of the tropical world. However, for the large tropical areas of México and Central America north of Panamá no records could be found, although several species might be expected to have exploited this niche.

It is therefore of considerable interest that one of us (GPH) discovered three eggs of *Adelphicos q. quadrivirgatus* Jan in a termite nest near El Acuyal, Catemaco, Veracruz, in June, 1984. The eggs were some 10 cm from the surface of a nest 70 cm in diameter, in a "palo mulato" tree (*Bursera cimaruba*), 1.0-1.5 m above ground. The tree was isolated in cultivated fields surrounded by hills covered by semivirgin tropical rain forest. When the tree was felled and the nest broken, hundreds of ants exploited the bonanza of exposed termites, suggesting that reptilian eggs laid in such nests would be liable to ant predation if exposed.

Two eggs failed to hatch, but one hatched almost two weeks after removal from the nest, at the beginning of the rainy season. It is UNAM-LT 3131 of the herpetological collection of the Estación de Biología Tropical Los Tuxtlas. Preserved shortly after hatching, the hatchling's S-V length is 86 mm, tail length 15 mm, and total length 101 mm.

As previously noted (Riley et al. 1985), access to termite nests for oviposition is difficult for most snakes; only small, burrowing species are likely to be successful. *Adelphicos,* with its small, pointed head, smooth scales, and small size, is admirably adapted to exploit termitaria as incubators. It remains to be seen, however, whether the genus as a whole, or even the species *A. quadrivirgatus,* the smallest of the genus, is facultative or largely obligatory in association with termite nests as incubators. We are not aware of any previous records of nests in the genus, nor is the current authority on the genus, Dr. Jonathan Campbell (see Campbell and Ford 1982) (pers. comm.). He also pointed out that the present species is the only representative of the genus inhabiting seasonally dry, lowland forests where termites seem to be more common, whereas the other species occur in the cooler, more mesic uplands.

Another Mexican candidate for formicarial or termitarial incubation of eggs is the lizard *Anelytropsis papillosus* Cope, a blind, legless

Table 2. Frequency of stances exhibited by captive turtles (N > 4).

Species	N	Frontal	Lateral	Rear	No Stance
Trachemys scripta	10	5	0	0	5
Geochelone pardalis	23	21	2	3	2
Malacochersus tornieri	5	5	5	5	0
Chelus fimbriatus	5	5	0	0	0
Platemys platycephalus	8	4	0	0	4

burrowing species found in association with ants and termites (Smith 1935).

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PROBABLE INTRODUCTION OF *Lygosoma bowringi* IN ZAMBOANGA CITY, PHILIPPINES

Lygosoma bowringi (following Greer 1977) is widely distributed through southeast Asia and the East Indies. In the Philippines it has been recorded only from islands in the Sulu Archipelago (Taylor 1922; Brown and Alcala 1980). During March 1979 and September 1980, I collected adult and juvenile *L. bowringi* at Ayala Barrio, Zamboanga City, Mindanao (U.S. National Museum of Natural History, Smithsonian Institution) USNM 212623-29, 229483.

Seven *L. bowringi* were collected in ca. one hour over two days, 17-18 March 1979, under, in, and around fallen coconut palm trunks along with *Kaloula picta, Gehyra mutilata, Lipinia quadrivittata* and *Ramphotyphlops braminus* in a small area (ca. 1 ha) of coconut plantation adjacent to a shipyard. In September 1980 at the same site with an equivalent effort, only one *L. bowringi* was collected along with *K. picta* and *R. braminus.*

Areas of identical habitat northwest of Ayala Barrio and northeast of the Port of Zamboanga were surveyed similarly for species of amphibians and reptiles during the same months. No *L. bowringi* were observed at any locality other than the coconut plantation adjacent to the shipyard in Ayala Barrio.

There is a large volume of barter trade between Zamboanga City and the Sulu Islands. Some of the small boats, "bancas," involved in this trade frequent the shipyard at Ayala Barrio. It is likely that *L. bowringi* was introduced into the Ayala area on the bancas and that the specimens collected were descendants of introduced individuals and do not represent a naturally occurring population.

During June 1984 *L. bowringi* was collected in disturbed habitat near Puerto Princesa Airport, Palawan Island, Philippines, by Angel C. Alcala and party (California Academy of Sciences, San Francisco) CAS 157380-81, 157396-400, and 157408-16. Again, it seems likely that *L. bowringi* was introduced into this area by man.

I wish to thank R.I. Crombie, G.R. Zug and R.W. McDiarmid for comments on drafts of this note, and, A.C. Alcala for making me aware of the CAS specimens.

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USE OF DIGGER BEE BURROWS BY THE TREE LIZARD (*Urosaurus ornatus*) FOR WINTER RETREATS

Lizards frequently use burrows created by other animals for nocturnal and/or winter retreats. Winter retreats of *U. ornatus* are commonly found underneath bark, in tree stumps, and in granite and limestone crevices, especially near stream courses (Vitt 1974, Worthington and Sabath 1966). Herein, we report the opportunistic use of insect burrows as retreats by *U. ornatus* and the possible thermal benefits.

On 8 March 1987, we observed about 20 active *Urosaurus ornatus* along an eroded stream bank of Alamosa Creek (elev. 6000 ft., T8S, R8W, Section 31, Socorro Co. N.M.). The composition of the bank was silty/sandy sediment and the bank face was uniform and vertical along most of its length with the exception of a three meter section which was pocked with inactive burrows of digger bees (family Anthophoridae). The bank had a predominantly southern exposure and the burrows allowed entrance of at least 15 cm into the sediment. When alarmed, *U. ornatus* quickly escaped into the burrows in addition to retreating into them at nightfall. *U. ornatus* were not observed anywhere else along the bank at this time. About 100 m downstream, the creek entered a steep-walled canyon where no active *U. ornatus* were observed though we noted what seemed to be suitable retreats. Lizards were observed active in both areas two months later.

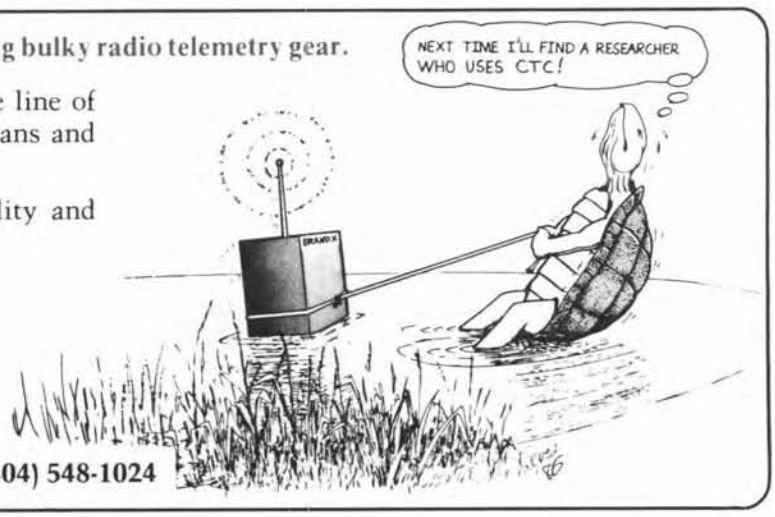
There is evidence in the literature that *Urosaurus ornatus* do not make the metabolic adjustments that other reptiles make during hibernation. *U. ornatus* do not acclimate to a lower temperature, attempting to maintain the same preferred body temperature throughout the year (Porter 1972). Growth is slowest during the winter season, but specimens have

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been observed active, when temperatures allow, year-round (Dunham 1982). Therefore, selection of warmer sites would allow longer activity and more growth. Because of the orientation of the bank and the availability of burrows, *U. ornatus* might gain a thermal advantage by selecting this site as a winter retreat.

To address this question, we compared nighttime temperatures of bank burrows and canyon cracks. Three temperatures were measured in each of 10 burrows, selected randomly from the bank. These were: air temperature, measured 10 cm from the hole; substrate temperature, measured at the burrow opening; and deep temperature, measured 10 cm into the hole. The same measurements were made at 10 cracks selected within the nearby canyon.

Air temperatures were significantly higher at the dirt bank than were those in the canyon ($T=2.636$, $P=0.017$). Deep temperatures were also significantly higher at the bank ($P<0.0001$, Kolmogorov-Smirnov two sample test), but substrate temperatures were not significantly different between the two sites ($T=1.507$, $P=0.149$). These results suggest that lizards in the bank burrows probably were subjected to less severe nocturnal temperatures than would have been experienced in the canyon cracks. Differences between the nighttime thermal environments of the two sites could have contributed to the differences in daytime activity of lizards (active vs. non-active) between the sites. During the evening, the ambient temperature dropped from 6.8° to 2.8° C. and continued to drop throughout the night. Anecdotally, snow was visible in the area, and during the night, heavy frost formed on the ground and a thick layer of ice formed on a bucket of water left in camp.

In addition to receiving more direct and longer duration sunlight during the day, *Urosaurus ornatus* in the bank may have an advantage over those using the canyon cracks, because of a reduced risk of freezing and of shortened warm-up time. Lizards in the dirt bank were seen only within or in close proximity to digger bee burrows, using them for protection from predation, and possibly gaining thermal advantages, thus allowing early spring emergence in relatively harsh conditions.

ACKNOWLEDGMENTS

We would like to thank Howard L. Snell and Randy Jennings for their support and Peter J. Tolson for his comments on the manuscript.

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PREDATION BY A CARABID BEETLE ON AUSTRALIAN FROGS

Although there have been many reports of aquatic invertebrates preying on anurans at all stages of their life history (e.g. Savage 1961), there have been few reports of terrestrial arthropods preying on adult frogs (McCormick and Polis 1982). Most of these reports have been based on indirect evidence such as dead or moribund frogs found in the webs or burrows of spiders (e.g. Main & Main 1956; Butler & Main 1959; Groves & Groves 1978), or observations of spiders and mantids eating frogs that they had presumably killed (e.g. McKeown 1952; Nash 1962; Ridpath 1977).

There have been very few observations of arthropods capturing and eating frogs. In Australia there have been observations of the large mantid, *Hierodula werneri*, capturing a green tree frog, *Litoria caerulea*, and then eating it (Ridpath 1977), and of another mantid, *Archimantis latistyla*, eating a live golden bell frog, *Litoria raniformis*. Similarly Littlejohn and Wainer (1978) on two occasions observed the large carabid beetle, *Catadromus lacordairei*, feeding on frogs, first on a live adult spotted marsh frog, *Limnodynastes tasmaniensis*, and second on a freshly dead juvenile brown tree frog, *Litoria ewingi*. In both cases the beetle was found eating the frog and the hunting behaviour was not observed.

During a three year study on the breeding biology of Andersson's toadlet, *Uperoleia laevigata* (formerly referred to as *U. rugosa* by Robertson 1984, 1986a,b, but taxonomically revised by Davies & Littlejohn 1986), I observed another species of carabid beetle, *Chlaenius darlingensis* (body length ca. 17 mm), attacking and eating two species of frogs at a small farm pond 22 km NE of Canberra (35°6' S, 149°19' W). The beetles were

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often observed systematically searching the bare mud around the margin of the pond with a sinusoidal walk pattern between the water's edge and vegetation (Fig. 1). On 15 December 1980, many recently metamorphosed juveniles of *Uperoleia laevigata* (total length ca. 22 mm) were emerging from the pond, and I observed two being found and attacked by two searching beetles. Similarly, on 19 December 1980, 5 February 1981, and 26 November 1985, I observed calling adult male ground frogs, *Ranidella signifera* (body length ca. 25 mm), being found and attacked by a searching beetle. The search and attack pattern was the same in all four cases. Upon encountering a frog the beetle immediately clasped it and began eating through the body wall. The frogs were apparently unable to detach from the beetle, though they struggled, jumped and attempted to escape. Within a few minutes of being attacked the frogs died, presumably through loss of blood or because the beetle attacked a vital organ. The beetles continued to eat until most of the fleshy parts and the viscera were consumed. Solitary nonvenomous arthropods usually attack smaller vertebrate prey (McCormick and Polis 1982), but in all cases *Chaenius darlingensis* attacked larger frogs, presumably because they were not dangerous prey and could be killed rapidly by the beetle.

Adult males of the leptodactylid frogs, *Ranidella signifera* and *R. parinsignifera*, commonly call in the region that the beetles systematically search and hence are the most likely prey. However, the juveniles of all the species of frogs in the area are vulnerable to this beetle because emerging metamorphosed juveniles must pass through the patrolled region. It is thus likely that this beetle is a significant anuran predator.

ACKNOWLEDGMENTS

I thank Dr. Barry P. Moore, Division of Entomology, C.S.I.R.O., Canberra for identifying the beetle, and Annika Roos for the drawing.

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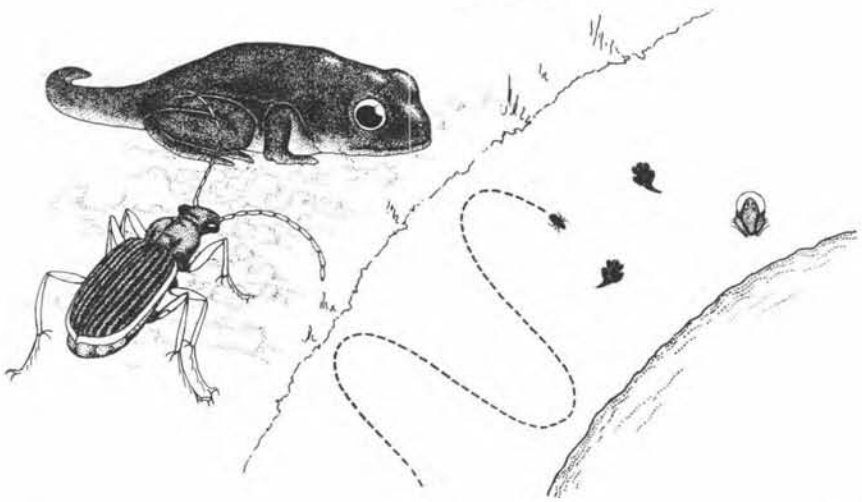


Figure 1. The search pattern of the carabid beetle, *Chlaenius darlingensis*, between the margin of the pond and the surrounding vegetation (right side). The left shows a detail of a juvenile of *Uperoleia laevigata* being approached by the beetle.

THE PATRONYM AND TYPE-LOCALITY OF *Pelophilus (Epicrates) fordii* GÜNTHER 1861 OF HISPANIOLA

Type-locality restrictions have no legal standing in zoological nomenclature; however, they are important for historical purposes and necessary for designating nominate subspecies. Recently, Wetherbee (1987) restricted the type-localities of *Epicrates fordii* Günther 1861, *Hypsirhynchus ferox* Günther 1858, and *Anolis semilineatus* Cope 1864 to República Dominicana, correcting restrictions of other authors. The new restrictions were made on the rationale that Auguste Sallé almost certainly was the collector of the type-specimens, and that Sallé was never in Haiti, the locality of previous restrictions.

The new restrictions were made based on a comprehensive study (Wetherbee 1985 and 1986) of the history of zoology in Haiti and República Dominicana. Although the patronym given by Günther for *E. fordii* was mysterious, I was confident that no collector named Ford ever worked on Hispaniola, where this species is endemic. Confirmation of that conviction has since been kindly furnished (pers. comm.) by A. F. Stimson of the British Museum: the patronym was for George H. Ford, illustrator of the plate accompanying the original description. Ford was a well known 19th century biological illustrator. This information removes any reasonable doubt that Sallé was the collector and my type-locality restrictions for the above taxa remain unchallenged.

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SEX DETERMINATION AND CLINICAL EXAMINATION IN REPTILES USING ENDOSCOPY

It is not possible to confirm the sex in many monomorphic reptiles with traditional methods like weighing, probing the hemipenis cavities or analysing the serum testosterone and estrogen values (Honegger 1978, Wallach and Boever 1983, Hitz 1984, Schildger and Wicker 1987).

Our purpose was to develop an accurate and reliable method of determining the sex of reptiles of the genera *Trachydosaurus, Tiliqua, Egernia, Corucia, Heloderma* and *Varanus*. To become familiar with the internal anatomy, we first dissected dead animals of these genera. We determined that males and females possess hemipenis cavities of similar depth, explaining why the probing of hemipenis cavities is unreliable (Figs. 1 and 2).

Eighty-six randomly selected live animals of various species were sexed by endoscopy (Table 1). This method is described in detail by Schildger and Wicker (1987). After subcutaneous local anaesthesia with 0.1 ml Lidocain 1%, the animal is placed in right facing position. The skin is incised and the intercostal muscles perforated with a blunt medical probe of 1.5 mm diameter. Filtered air (Millipore VCWP 100nm) is insufflated through a

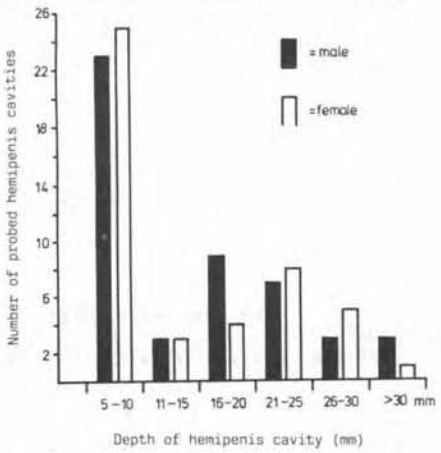


Figure 1. Depth of hemipenis cavities by probing in *Trachydosaurus rugosus.* (Male: Female = 24:25, as determined by endoscopy.)

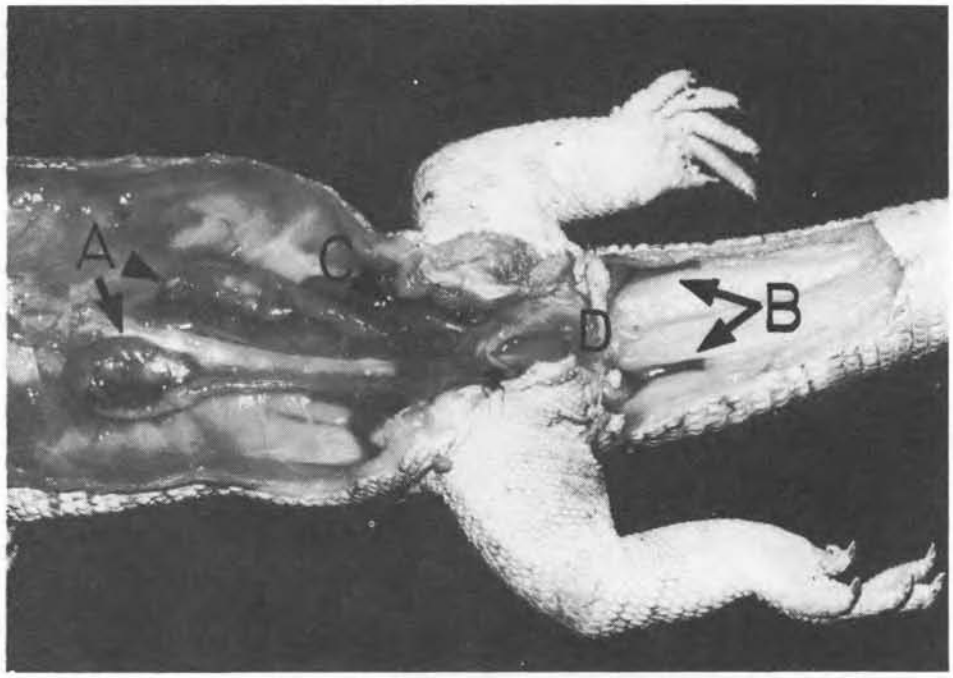


Figure 2. Female *Trachydosaurus rugosus.* A = ovaries. B = hemipenis cavities. C = rectum. D = cloaca.

blunt-ended needle and the endoscope is inserted. The intestines are pressed down by the resulting gas vesicle on the dorsal side. Because the gonads are attached dorsally, near the vertebral column, we now could inspect them through the endoscope which is built like a human arthroscope of 2.7 mm diameter. After endoscopy an antibiotic (Tetracycline 20 mg/ml) is instilled and the incision is closed by adhesive tape. No incidents occurred during or after the operations.

Using endoscopy we estimated the stage of sexual maturity in female animals. Both ovaries of juvenile females were of small size, light yellow color and with small bumps. The ovaries of adult females were large, yellow-reddish and with follicles of different sizes (Fig. 3a). The testicles were oval, yellow and covered with distinct blood vessels (Fig. 3b). In *Corucia*, both ovaries and testicles were of more whitish appearance. In *Varanus* the gonads were covered with black pigmented serosa.

Additionally, we used endoscopy to clinically examine the internal organs: lungs, liver, spleen, intestines and kidneys. As part of a complete clinical examination, we endoscoped dimorphic species of the genera *Dipsosaurus, Physignatus, Amphibolurus, Uromastix, Cordylus, Rhinoclemys* and *Testudo.* In four cases we diagnosed enteritis. In one case each we detected multiple abscesses on the intestinal serosa, an inner mycotic infection close to the ovaries and a scar formation on the liver surface which is typical for a chronic amoebiasis.

Reliable sexing of reptiles is the major prerequisite and a most important factor in captive breeding programs (Wallach and Boever 1983). Endoscopy is gaining importance as a method of clinical examination and we also recommend its use in determining gender in reptiles, when performed by qualified individuals.

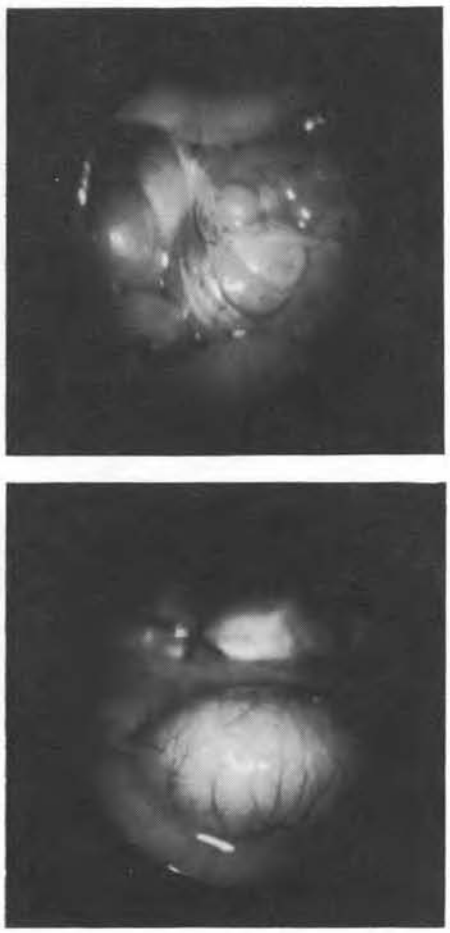


Figure 3. a. Top. Endoscopic view to the ovary of *Trachydosaurus rugosus.* b. Bottom. Endoscopic view to the testicle of *Trachydosaurus rugosus.*

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Table 1. Reptiles sexed by endocsopy.

NAME	NUMBER	MALE, FEMALE
Trachydosaurus rugosus	58	32,28
Tiliqua gigas	16	6,10
Tiliqua gerradii	2	2,0
Tiliqua intermedia	7	4,3
Tiliqua multifasciata	5	4,1
Tiliqua nigrolutea	2	1,1
Tiliqua occipetalis	5	4,1
Tiliqua scincoides	3	3,0
Egernia bungana	1	0,1
Egernia cunninghami	2	1,1
Egernia stokesii	1	1,0
Egernia major	3	0,3
Corucia zebrata	5	3,2
Heloderma suspectum	7	4,3
Heloderma horridum	2	1,1
Varanus exanthematicus	4	3,1
Dipsosaurus dorsalis	2	2,0
Physignatus cocincinus	2	0,2
Physignatus leseurii	1	0,1
Amphibolurus vitticeps	2	1,1
Amphibolurus nuchalis	1	1,0
Uromastix acanthinurus	2	1,1
Cordylus giganteus	1	0,1
Rhinoclemys pulcherima	2	1,1
Testudo hermanni	2	1,1
TOTAL	138	76,62

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Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged). Photographs may substitute for a preserved specimen only when the live specimen could not be collected (*e.g.*, it was a protected species or it was found in a protected area). Photographs must be deposited in a university or museum collection, and the catalog number(s)

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Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10 (1):1.

(NCN) = no recognized common name.

CAUDATA

AMBYSTOMA TALPOIDEUM (Mole Salamander) USA: ARKANSAS: Greene Co. 4.5km N Craighead Co. line (T16N, R5E,S22). 24 January 1988. W.E. Meshaka. Verified by S.E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 9562-9568). This new county record marks the fourth known Location of *A. talpoideum* in Arkansas (Meshaka and McLarty 1988. SSAR Herp. Review 19(1):17).

Submitted by **W.E. MESHAKA, B.P. BUTTERFIELD,** Department of Biological Sciences, Arkansas State University, State University, AR 72467, and **R.L. COX,** College of Nursing and Health Professions, Arkansas State University, State University, AR 72467, USA •

AMBYSTOMA TEXANUM (Smallmouth Salamander). USA: ARKANSAS: Izard Co: 2km E Oxford (T18N, R9W, S1). 28 February 1988; .25 km N Oxford (T18N, R9W, S11). 6 March 1988. C.D. Cochran, B. G. Cochran, B. R. McCollum, and M. D. Fletcher. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 9863, 9864, 10052). New county record; extends range further into the Ozark Mts. (60 km west)(Dellinger and Black 1938. Occ. Pap. Arkansas Mus. 1:1-47; Dowling 1957. Occ. Pap. Arkansas Mus. 3:1-51; Johnson 1987. The Amphibians and Reptiles of Missouri. Missouri Dept. of Conservation).

Submitted by **BETTY G. COCHRAN** and **CHRISTOPHER D. COCHRAN,** Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA •

AMBYSTOMA T. TIGRINUM (Eastern Tiger Salamander). USA: ARKANSAS: Randolph Co: 12.9km NE Ravenden Springs (T20N, R3W, S4).13 March 1987. B.P. Butterfield and M.K. Marks. Verified by S.E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 7075-7076). New county record (Dellinger and Black 1938. Occ. Pap. Univ. Arkansas Mus. 1:1-47; Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3: 1-51).

Submitted by **BRIAN.P. BUTTERFIELD** and **MITCHEL K. MARKS,** Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA •

ANEIDES FERREUS (Clouded Salamander). USA: CALIFORNIA: Trinity Co.: 9.3km N, 5.3km W Big Bar, 1158m. 16 November 1982. M. G. Raphael and L. L. C. Jones. Verified by D. Wake and S. Busack. Department of Forestry and Resource Management, University of California, Berkeley (MGR 193-194). Brown (1948, Copeia (2):136) and Stebbins (1951. Amphibians of Western North America. Univ. of Calif. Press, 539 pp.) reported *A. ferreus* from Trinity Co., but Bury (1970, J. Herpetol. 4(3-4):165-178) could find no museum specimens to document these records; he collected two specimens (MVZ 86968-69) at 4.2km E Salyer, Trinity Co. Our record extends the range 20km E (Bury op. cit.), representing the easternmost locality in California.

Submitted by **LAWRENCE L. C. JONES** and **MARTIN G. RAPHAEL,** Department of Forestry and Resource Management, University of California, Berkeley, CA 94720, USA present addresses: (LLCJ) Forestry Sciences Laboratory, 3625 -93rd Avenue SW, Olympia, WA 98502, USA; (MGR) Rocky Mountain Forest and Range Experiment Station, 222 South 22nd Street, Laramie, WY 82070, USA •

PLETHODON CINEREUS (Redback Salamander). USA: MAINE: Isles of Shoals, Appledore Island (42°59'N, 70°37'W). 12 September 1987. E. Lyman. Verified by J. Taylor. University of New Hampshire Vertebrate Collection (8000-8005). First record of an amphibian on the Isles of Shoals (Borror 1982. Checklist of Flora and Fauna. Shoals Marine Laboratory, Cornell University/University of New Hampshire. 44pp.) All specimens were redback phase.

Submitted by **JAMES TAYLOR,** Department of Zoology, University of New Hampshire, Durham, NH 03824, USA •

SIREN INTERMEDIA NETTINGI (Western Lesser Siren) USA: ILLINOIS: St. Clair Co.: near New Athens 0.4km SW new Hwy 13 bridge, W bank Kaskaskia River (revegetated dredged material disposal area). 3 September 1987. Leo G. Nico. Verified by M. A. Morris. Illinois Natural History Survey (INHS 10764). First record for lower Kaskaskia River, second for county (original record not supported by museum specimen; Hurter 1911. Herpetology of Missouri. St. Louis Acad. Sci. Trans. 20(5):59-274).

Submitted by **LEO G. NICO,** Department of Zoology, University of Florida, Gainesville, FL 32611, USA •

ANURA

RANA CATESBEIANA (Bullfrog). USA: TEXAS: Van Zandt Co: County Road 2908 crossing at Purtis Creek, 20 km SSW of Canton. 14 May 1987. D.J. Green and D.J. Thomas. Verified by J.R. Dixon. Texas A&M University (TCWC 66166). New county record (Dixon 1987. Amphibians and Reptiles of Texas, Texas A&M Univ. Press, College Station, Texas. 434 pp.).

Submitted by **DEREK GREEN** and **DAVID THOMAS,** Espey, Huston & Associates, Inc., PO Box 519, Austin, TX 78767, USA•

RANA C. CLAMITANS (Bronze Frog). USA: TEXAS: Camp Co: Unnamed county road crossing at Ellison Branch Creek, 7 km SW of Pittsburg. 28 April 1987. D.J. Green and D.J. Thomas. Verified by J.R. Dixon. Texas A&M University (TCWC 66167). New county record, fills hiatus among Wood, Upshur, and Morris counties (Dixon 1987. Amphibians and Reptiles of Texas, Texas

A&M Univ. Press, College Station, Texas. 434 pp.).

Submitted by **DEREK GREEN** and **DAVID THOMAS**, Espey, Huston & Associates, Inc., PO Box 519, Austin, TX 78767, USA•

SCAPHIOPUS BOMBIFRONS (Plains Spadefoot). USA: ARKANSAS; Conway Co.: 1.8 km SE Morrilton (T6N, R16W, S33). 2 April 1988. S.E. Trauth. Verified by S.E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 10396). New county record and second record for the state. Extends range 30 km E of other locality within the Arkansas River floodplain (Plummer and Turnipseed 1982. Geographic Distribution: *Scaphiopus bombifrons*. SSAR Herp. Review 13:80).

Submitted by **STANLEY E. TRAUTH, BRIAN P. BUTTERFIELD,** and **WALTER E. MESHAKA, JR.,** Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA •

SAURIA

ANADIA PAMPLONENSIS (Lagartija Altiandina de Tamá) (NCN). VENEZUELA: ESTADO TACHIRA: Distrito Junin: Villa Páez, region de Tamá. May 1976. Julio Barbera and Abdem R. Lancini. Verified by J. E. Garcia Pérez. Museo de Ciencias Naturales de Caracas, Venezuela (MCNC 6504, 6518). First record for Venezuela and the easternmost locality for the species, ca. 25km ENE from type locality. *A. pamplonensis* was previously known only from Colombian localities in the Cordillera Oriental de Colombia. The extension of the distribution is not surprising, since the new locality record lies on the Venezuelan spur of this Andean Cordillera. The two specimens generally agree with the descriptions provided by Dunn (1944. The lizard genera *Anadia* and *Ptychoglossus* in Colombia. Caldasia 3(11):63-68) and Harris and Ayala (1987. A new *Anadia* (Sauria: Teiidae) from Colombia and restoration of *Anadia pamplonensis* Dunn to specific status. Herpetologica 43(2):182-190). However, they may differ from the specimens reported by Harris and Ayala (op. cit.) in that the innermost femoral pores are located on the first scale of the most proximal portion of the thigh, instead of being located "preanally" (= precloacal pores?).

We thank Dr. A. R. Lancini and Lic. Pedro Delgado (MCNC) for loan of specimens under their care and Prof. Pascual Soriano for provision of working space in the Grupo de Ecologia Animal of the Universidad de Los Andes, Mérida.

Submitted by **JUAN ELIAS GARCIA PEREZ**, Departamento de Biologia Facultad de Ciencias, Universidad de Los Andes, Mérida 5101, Venezuela, and **ENRIQUE LA MARCA**, Facultad de Ciencias Forestales, Escuela de Geografia, (Area de Biogeografia), Universidad de Los Andes, Apartado 116, Mérida 5101-A, Venezuela•

ANNIELLA P. PULCHRA (Silvery Legless Lizard). USA: CALIFORNIA: Los Angeles Co., 6.4 km SSW Lancaster. 28 march 1988. David A. Mullen. Verified by Lawrence E. Hunt.University of California, Santa Barbara Vertebrate Museum (RCSBVM 21272-21274). Juvenile specimen observed but released 7.2 km W Lancaster, Mira Loma Detention Facility. 22 January 1988. Previously not known from desert floor of Antelope Valley. Probably represents eastern limit of this species range in the region as climatic conditions rapidly become limiting to the east in the Mojave Desert. Extends range 30 km N nearest recorded locality 8 km WSW Acton in Soledad Canyon Los Angeles County Museum.

Submitted by **DAVID A. MULLEN,** Senior Wildlife Biologist, EIP Associates, 150 Spear Street, Suite 1500, San Francisco, CA 94105, USA •

ANOLIS W. WHITEMANI (NCN). REPUBLICA DOMINICANA: AZUA: 1km and 3km NW Villarpando in xeric agave/acacia scrub along HW 2 (elev. 320m and 370m resp.). 12 March 1988. D. D. Smith, P. Ward, R. Powell, and J. S. Parmerlee, Jr. Verified by R. Powell. Bobby Witcher Memorial Collection, Avila College (BWMC 3236-7). These represent the first records from the Valle de San Juan, a different biogeographic region ca. 40km NW nearest previously-described locality in the Llanos de Azua (Schwartz and Henderson 1988. West Indian Amphibians and Reptiles: A Checklist. Milwaukee Publ. Mus. Contr. Biol. Geol. 74:1-264). Schwartz (1980. Variation in Hispaniolan *Anolis whitemani* Williams. J. Herpetol. 14(4):399-406) discussed discontinuities in the range of the species and their systematic implications. Assignment of these specimens to the nominate subspecies supports an association with the proximate populations to the southwest, rather than Haitian populations via the Plateau Central. The Valle de San Juan is more mesic than the remainder of the recorded range, but hillsides overlooking the valley floor provide, at least intermittently, suitable habitat for this xeric-adapted species. The most evident sympatric forms were *Ameiva lineolata* and *Leiocephalus semilineatus*, both noted xerophiles. It appears that these three species share very similar distributional patterns on Hispaniola.

Submitted by **ROBERT POWELL, JOHN S. PARMERLEE, JR.,** and **PAUL WARD,** Department of Natural Sciences, Avila College, Kansas City, MO 64145 USA, and **DONALD G. SMITH,** Department of Medicine 4035B, University of Kansas Medical Center, Kansas City, KS 66103 USA •

CNEMIDOPHORUS SEXLINEATUS (Racerunner). USA: TEXAS: Dimmit Co: 2.2 km W jct 2644 and State Hwy 277. 13-14 May 1988. J.M. Walker, J.E. Cordes and R.M. Abuhteba. Verified by J.M. Walker and J.E. Cordes. University of Arkansas, Department of Zoology (UADZ 2997-3012 & 3014-3021). New county record (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M Univ. Press, College Station, 434 pp.) filling hiatus between Webb, LaSalle and Maverick counties. Specimens collected under authority of Texas Parks and Wildlife permit no. 61.

Submitted by **JAMES M. WALKER, JAMES E. CORDES** and **RAMADAN M. ABUHTEBA,** Department of Zoology, University of Arkansas, Fayetteville, AR 72701, USA •

EUMECES ANTHRACINUS PLUVIALIS (Southern Coal Skink). USA: ARKANSAS: Fulton Co; 5.6 km SW Mammoth Spring (T21N, R6W, S13). 7 February 1987. C. Cochran and B.P. Butterfield. Verified by S.E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 6476). New county record (Dellinger and Black 1938. Occ. Pap. Univ. Arkansas Mus. 1:1-47; Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

Submitted by **BRIAN P. BUTTERFIELD,** Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA •

PHRYNOSOMA CORNUTUM (Texas Horned Lizard). USA: NORTH CAROLINA: Onslow Co: 5.6 km SW Swansboro. Lawrence R. Settle. Verified by A. L. Braswell and W. M Palmer. N. C. State Museum of Natural Sciences (NCSM 29247-29251). Juvenile and adult (not collected) in sandy residential lot near jct. State Road (SR) 1503 and SR 1546, and two adults DOR SR 1546, 15 May 1988. Two adults DOR SR 1546,18 May 1988. First records of an apparently established population of an introduced reptile in North Carolina (Martof, et al. 1980. Amphibians and Reptiles of the Carolinas and Virginia. Univ. N.C. Press, Chapel Hill. 264 pp.)

Submitted by **LAWRENCE R. SETTLE,** National Marine Fisheries Service, Division of Ecology, Beaufort Laboratory, Beaufort, NC 28516, USA •

SCELOPORUS LICKI (Cape Spiny Lizard). Mexico: Baja California Sur: Rancho Ancon. 10 November 1987. Victor M. Velazquez and L. Lee Grismer. Verified by L. Lee Grismer. Hospital Militar de la Paz, Baja California Sur, Mexico (HMLP 2448). Extends range 33 km N of nearest known locality at El Triunfo (Hall and Smith 1979. Breviora 452:1-26).

Submitted by **L. LEE GRISMER**, Department of Biology, San Diego State University, San Diego, CA 92182, USA •

SPHAERODACTYLUS A. ALTAVELENSIS (NCN). REPUBLICA DOMINICA: PEDERNALES: 15km NE Cabo Rojo. 25 March 1986. R. Powell. Verified by A. Schwartz. Bobby Witcher Memorial Collection, Avila College (BWMC 2684, n=2). These specimens represent the first records of the species in the province and on the lower Barahona Peninsula. Assignment to the nominate subspecies, previously restricted to Isla Alto Velo, expands its known range to Hispaniola proper (Schwartz and Henderson 1988. West Indian Amphibians and Reptiles: A Checklist. Milwaukee Publ. Mus. Contr. Biol. Geol. 74:1-264). Both specimens were found in the shallow root systems of bunch grasses in xeric lowland plains.

Submitted by **ROBERT POWELL** and **STEPHEN G. THORNHILL**, Department of Natural Sciences, Avila College, Kansas City, MO 64145 USA, and **DONALD G. SMITH**, Department of Medicine 4035B, University of Kansas Medical Center, Kansas City, KS 66103 USA •

UROSAURUS G. GRACIOSUS (Western Brush Lizard). Mexico; Baja California Norte: Bahia de San Luis Gonzaga. 10 May 1987. Victor M. Velasquez and L. Lee Grismer. Hospital Militar de la Paz, Baja California Sur, Mexico (HMLP 2533). Extends range 153 km S of nearest known locality at San Felipe (Rau 1980. Masters Thesis, California State University, Long Beach).

Submitted by **L. LEE GRISMER**, Department of Biology, San Diego State University, San Diego, CA 92182, USA •

SERPENTES

AGKISTRODON C. CONTORTRIX (Southern Copperhead). USA: TEXAS: Camp Co.: 2.4km N of Leesburg on unnamed county road. 5 May 1987. C. G. Ladd and G. L. Galbraith. Verified by J. M. Dixon. Texas A&M University (TCWC 66172). New county record. (Dixon 1987. Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, TX, 434pp.).

Submitted by **CLIFTON G. LADD** and **GARY G. GALBRAITH**, Espey, Huston & Associates, Inc., P.O. Box 519, Austin, TX 78767, USA •

CHIONACTIS OCCIPITALIS ANNULATA (Colorado Desert Shovelnose Snake). MEXICO: BAJA CALIFORNIA NORTE: 3.9km W Bahia Santa Maria. 6 February 1988. V. M. Velazquez and L. Lee Grismer. Verified by L. Lee Grismer. Hospital Militar de La Paz, Baja California Sur, Mexico (HMLP 2468). Extends range 34km S of nearest known locality at San Felipe (Cross 1970. Herpetologica 29:134-140).

Submitted by **L. LEE GRISMER**, Department of Biology, San Diego State University, San Diego, CA 92182, USA •

LAMPROPELTIS C. CALLIGASTER (Prairie Kingsnake). USA: NEBRASKA: Thayer Co.: Hubbell: unmarked section road ca. 0.4km S of State Hwy 8 (T1N, R1W, SW corner S29). 11 June 1988. L. A. Somma and J. F. Lokke. Verified by J. F. Lokke and L. A. Somma. University of Nebraska at Omaha Herpetological Collection c/o J. D. Fawcett (101-11-688). Road killed adult. New county record, extends range ca. 18.5km W of record in adjacent Jefferson Co. (Lynch 1985. Trans. Nebraska Acad. Sci. 13:33-57). Represents most northwesterly record in USA (Blaney 1979. Cat. Amer. Amph. Rept. (229):1-2).

Submitted by **LOUIS A. SOMMA**, Department of Zoology, University of Florida, Gainesville, FL 32611, and **JOHN F. LOKKE**, 6308 Charles Street, Omaha, NE 68131, USA •

LAMPROPELTIS GETULUS FLORIDANA (Florida Kingsnake). USA: FLORIDA: St. Johns Co.: Anastasia Island, St. Augustine Beach off SR312 (T7S, R30, S28). 17 April 1987. Carroll Hart. Verified by D. L. Auth. Florida State Museum (UF 66935). New county record (Ashton and Ashton 1981. Handbook of Reptiles and Amphibians of Florida. Part I — The Snakes. Windward Publ., Inc. Miami, FL, 176pp.).

Submitted by **MARK A. WISE** and **GREGORY C. LEPERA**, St. Augustine Alligator Farm, St. Augustine, FL 32085, USA •

REGINA GRAHAMI (Graham's Crayfish Snake). USA: ARKANSAS: Woodruff Co.: 4.2km SW Hunter (T5N, R1W, S22). 3 June 1986. W. W. Byrd, E. L. Hanebrink and C. Files. Verified by W. W. Byrd, Arkansas State University Museum of Zoology (ASUMZ 10742 and 10743). New county record (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

Submitted by **WILLIAM W. BYRD, EARL L. HANEBRINK** and **CHARLES FILES**, Department of Biological Sciences Arkansas State University, State University, AR 72467, USA •

SONORA SEMIANNULATA (Ground Snake). MEXICO: BAJA CALIFORNIA NORTE: 8.5km E (by Mexican Highway 3) of Valle de Trinidad. 7 February 1987. V. M. Velazquez and L. Lee Grismer. Verified by L. Lee Grismer. Hospital Militar de La Paz, Baja California Sur, Mexico (HMLP 2122). This specimen bridges a gap of nearly 130km in northern Baja California between desert and coastal populations in an area where its occurrence was questioned (Frost 1983. Cat. Amer. Amph. Rept. 333.1-333.4).

Submitted by **L. LEE GRISMER**, Department of Biology, San Diego State University, San Diego, CA 92182, USA •

STORERIA OCCIPITOMACULATA (Redbelly Snake). USA: NEBRASKA: Dawson Co.: 3km S, 2km E of Gothenburg. 31 August 1987 (Kearney State College 423, 424). 29 September 1987 [University of Nebraska at Lincoln (UNL 9290)]. Mark M. Peyton. Verified by C. True and J. Lynch. A total of 17 specimens were collected along a 2km stretch of a drainage ditch bank along the Platte River S of Gothenburg during the summer of 1987 and spring of 1988. Collins (1982. Amphibians and Reptiles in Kansas. Univ. Kansas Mus. Nat. Hist., Public Education Ser., 8:1-356) rejected records of *S. occipitomaculata* in western Kansas as being too far west of their range. The presence of a single specimen collected southwest of Kearney, Nebraska (Kearney State College Herptile Collection #161) in 1967, and now these specimens collected 100km W of Kearney may validate those Kansas records. The specimens collected most closely resemble the description of *S. o. pahasape* given by Stebbins (1966. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston), which are found in the Black Hills of South Dakota 640km NW of this collection site.

Submitted by **MARK. M PEYTON** 1105 17th, Gothenburg, NE 69138, USA •

TESTUDINES

CARETTA CARETTA (Loggerhead). GUYANA: NORTH-WEST DISTRICT (Region 1): Almond Beach, ca. 8km SE Waini Point. 17 April 1988. P. C. H. Pritchard. Verified by P. C. H. Pritchard. PCHP (private collection)

No. 2670, 2671; Oveido, Florida. Nearly complete bony shell of subadult (CL ca. 50cm) and plastral fragments of smaller specimen. First record of species from Guyana (Pritchard and Trebbau 1984. Turtles of Venezuela. SSAR).

Submitted by **PETER C. H. PRITCHARD**, Florida Audubon Society, 1101 Audubon Way, Maitland, FL 32751, USA •

CHELONIA MYDAS (Green Turtle). USA: TEXAS: Kenedy Co.: 69km S Malaquite Pavilion. 13 July 1987. D. J. Shaver. Verified by A. H. Chaney. Texas A&I University (TAIC 5784, embryo). Nesting turtle was not seen, but her tracks were found. Two eggs were laid. Both were collected and incubated in a polystyrene foam box. One hatched after 60 days of incubation and the other contained a well-developed, dead embryo. First confirmed record of nesting along the Texas coast, although historic nesting has been suspected (Neck 1978. J. Herpetol. 12:422-427).

Submitted by **DONNA J. SHAVER**, National Park Service, Padre Island National Seashore, 9405 S. Padre Island Drive, Corpus Christi, TX 78418-5597, USA •

CHELONOIDIS CARBONARIA (South American Red-footed Tortoise). ARGENTINA: SALTA: environs of Orán city. 12 March 1982. Antonio Arce. Verified by R. F. Laurent. Fundación Miguel Lillo (FML 0022). New province record (Frieberg 1967. Cienc. Invest., 23(8):351-363).

Submitted by **ENRIQUE RICHARD**, Programa de Herpetologia (CONICET), Fundación Miguel Lillo, Miguel Lillo 205, 4000 - Tucumán, and **JULIO NAKHLE**, Dirección General de Recursos Naturales Renovables, Departamento Protección de la Fauna, 4400 - Salta, ARGENTINA •

CHELYDRA S. SERPENTINA (Common Snapping Turtle). USA: TEXAS: Camp Co.: 7.6km SE of Leesburg, on Flag Pond. 23 October 1986. C. G. Ladd and G. L. Galbraith. Verified by J. M. Dixon. Texas A&M University (TCWC 66168). New county record. (Dixon 1987. Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, TX, 434pp.).

Submitted by **CLIFTON G. LADD** and **GARY G. GALBRAITH**, Espey, Huston & Associates, Inc., P.O. Box 519, Austin, TX 78767, USA •

KINOSTERNON F. FLAVESCENS (Yellow Mud Turtle). USA: TEXAS: Robertson Co.: May 1985. C. G. Ladd. Verified by J. M. Dixon. Texas A&M University (TCWC 66169). New county record, fills gap between Brazos and Falls counties (Dixon 1987. Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, TX, 434pp.).

Submitted by **CLIFTON G. LADD**, Espey, Huston & Associates, Inc., P.O. Box 519, Austin, TX 78767, USA •

KINOSTERNON S. SCORPIOIDES (Scorpion Mud Turtle). GUYANA: NORTHWEST DISTRICT (Region 1): open sea beach, 5km SE Waini Point. 10 June 1988. P. C. H. Pritchard. Verified by P. C. H. Pritchard. PCHP (private collection) No. 2669; Oveido, Florida. Freshly dead female, CL 12.9cm. Unusual habitat and first S. American coastal plain record between Edo. Sucre, Venezuela, and Pomeroon R., Guyana (Pritchard and Trebbau 1984. Turtles of Venezuela. SSAR).

Submitted by **PETER C. H. PRITCHARD**, Florida Audubon Society, 1101 Audubon Way, Maitland, FL 32751, USA •

STERNOTHERUS CARINATUS (Razorback Musk Turtle). USA: TEXAS: Upshur Co.: FM 2454 crossing at South Lilly Creek, 12km SSW of Pittsburg. 27 April 1987. D. J. Green and D. J. Thomas.Verified by J. M. Dixon. Texas A&M University (TCWC 66171). New county record, extends range by one county W of Marion and Harrison counties, and NE of Smith County (Dixon 1987. Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, TX, 434pp.).

Submitted by **DEREK GREEN** and **DAVID THOMAS**, Espey, Huston & Associates, Inc., PO Box 519, Austin, TX 78767, USA •

TRACHEMYS SCRIPTA ELEGANS (Red-eared Slider). USA: TEXAS: Comanche Co.: 12.1km SW Comanche on US 67. 21 April 1988. C. T. McAllister. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 10698). New county record (Dixon 1987. Amphibians and Reptiles of Texas, Texas A&M University Press, College Station, TX, 434pp.).Fills a distributional hiatus between Brown and Erath counties.

Submitted by **CHRIS T. MCALLISTER**, Renal Metabolic Lab (151-G), Veterans Administration Medical Center, 4500 S. Lancaster Rd., Dallas, TX 75216, and **BRIAN D. EARLE**, Science Division, Cedar Valley College, Lancaster, TX 75134, USA •

NEW SNAKE RECORDS FOR BOTSWANA, SOUTHERN AFRICA

Up-to-date information on snake distribution in Botswana is summarized in Broadley's "FitzSimons Snakes" (1983. Delta Books, Johannesburg). The authors have been collecting in southern Botswana from 1985 through March 1987. This paper details new records and range extensions in that area. Many of these species are listed from southeast Botswana (Auerbach 1985. The Reptiles of Gaborone. Botswana Book Centre. 48 pp.), but are speculative, without precise locality citations. To avoid repetition, coordinates of the two major localities are given here: Otse village (25°02'S, 25°45'E); Molepolole - Letlhakeng road = paved road running NW SE between Molepolole (24°26'S, 25°34'E) and Letlhakeng (24°03'S, 25°04'E). Specimens were deposited in the Natural History Museum of Zimbabwe (NMZB) and identifications were verified by D. G. Broadley, unless otherwise noted.

TYPHLOPS S. SCHLEGELII (Schlegel's Blind Snake). Moeding College, Otse. 17 March 1987. S. Spawls. (NMZB 8761). Southernmost record in Botswana, westernmost record in southern Africa, extends range 100 km SW.

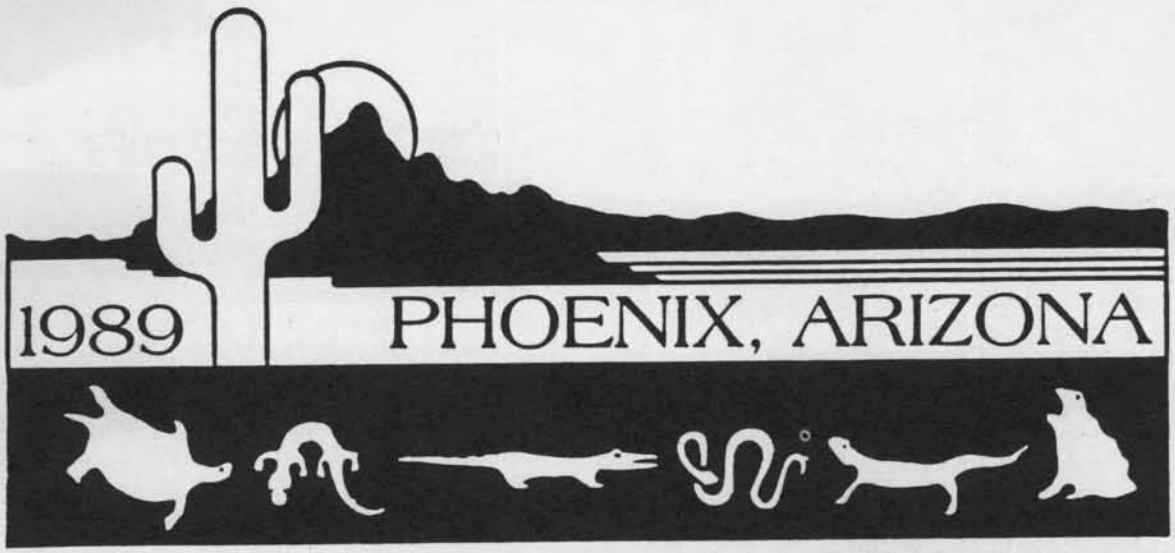
TYPHLOPS LALANDEI (Delalande's Blind Snake). Moeding College, Otse. 24 February 1985. S. Spawls. (NMZB 7849). First record for Botswana S of 23° S, fitting in the gap between the Mafeking, South Africa (80 km S) and Shoshong (250 km N) records.

TYPHLOPS BIBRONII (Bibron's Blind Snake) 5km S of Otse. 19 March 1986. S. Spawls. (NMZB 8401). First record for Botswana, extends range 100km N.

LYCOPHIDION C. CAPANSE (Cape Wolf Snake). 8km SSW of Otse. 10 December 1985. S. Spawls. Verified by R. C. Drewes. California Academy of Sciences(CAS 160793). First record for Botswana S of 25°S. Fits in the gap between the Madibogo, South Africa (150km S) and Molepolole (80km N) records.

MEHELYA C. CAPENSIS (Cape File Snake). Moeding College, Otse. 14 January 1986. S. Spawls. (NMZB 8582). First record S of 25°S in Botswana, extends range 80km S; 13km NW of Molepolole, Molepolole-Letlhakeng road. 20 November 1986. J. de Graff. (NMZB 8621). Extends range 50km W. First record for Kalahari sand area.

PSAMMOPHIS LEIGHTONI TRINASALIS (Fork-marked Sand Snake). Jwaneng (24°30'S, 24°50'E). 9 May 1985. S. Spawls. (NMZB 7831). Fits in the gap between the Pretoria, South Africa, area (300km SE) and western Kweneng (200km W); Molepolole village. 28 August 1986. J. de Graff. NMZB 8747). Extends range 100km NE from previous record.



INTERNATIONAL HERPETOLOGICAL SYMPOSIUM, INC.

Dear Fellow Herpetologist:

On behalf of the advisors and directors, I would like to invite all members of SSAR to attend "Phoenix '89," the 13th Annual Meeting of the International Herpetological Symposium, Inc. The IHS has long been one of the premiere forums for amateur and professional herpetologists to meet and share information and ideas. With the excellent program of papers, workshops, and sidetrips detailed on the following pages, attendance this year is expected to exceed 350. As you will note from the program, topics cover a wide range from husbandry and captive propagation to physiology, ecology, and veterinary medicine.

We hope to see you there.

Brian P. Backner, M.D.
President, IHS, Inc.

INTERNATIONAL HERPETOLOGICAL SYMPOSIUM, INC.

PHOENIX, ARIZONA
JUNE 20-24, 1989
Program

TUESDAY, JUNE 20

9:00 am - 4:00 pm	Registration
Noon - 4:00 pm	Workshops
6:00 pm - 8:00 pm	Ice breaker (2 hour open bar)

WEDNESDAY, JUNE 21

8:00 am - 9:00 pm	Registration
9:00 am - 3:00 pm	Trip to Arizona-Sonoran Desert Museum
3:30 pm - 5:00 pm	Tour Reid Park Zoo
5:00 pm - 7:00 pm	Mexican Buffet Dinner, Reid Park Zoo

THURSDAY, JUNE 22

8:00 am - 9:00 pm	Registration
9:00 am - 3:50 pm	General Sessions
4:00 pm - 5:30 pm	Tour World Wildlife Zoo
6:30 pm - 9:00 pm	Rawhide -- Cookout

FRIDAY, JUNE 23

8:00 am - 9:00 pm	Registration
9:00 am - 3:50 pm	General Sessions
4:30 pm - 5:30 pm	Tour Boyce Thompson Arboretum
6:00 pm - 8:00 pm	Cowboy Cookout at the Arboretum

SATURDAY, JUNE 24

9:00 am - ?	General Sessions, Workshops

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2. Husbandry and Breeding of Tortoises
   Brett Stearns, Institute for Herpetological Research, Stanford, CA
3. Husbandry and Breeding of Turtles
   Brett Stearns, Institute for Herpetological Research, Stanford, CA
4. Parasitology for the Serious Herpetoculturist
   Richard S. Funk, D.V.M., Knoxville, TN and Roger J. Klingenberg, D.V.M., Greeley, CO
5. Breeding Strategies for Colubrid Snakes
   Robert Applegate, Private Breeder, El Cajon, CA
6. Construction of Terrarium Environments Suitable for Amphibians
   Dale Bertram, M.D., Dendrobatid Society, Madison, WI
7. The Captive Breeding of Rare Pythons and Boas
   Donald Hamper, Private Breeder, Columbus Zoo
8. Antibiotic Usage in Reptiles
   Robert Wagner, D.V.M., Pittsburgh Zoo, Pittsburgh, PA and Megan Hilf, M.S., University of Pittsburgh, Pittsburgh, PA

PAPERS

Venomoid Surgery
-- Richard S. Funk, D.V.M., University of Tennessee, Knoxville, TN

A Safe, Practical Facility for Breeding Large Pythons
-- Ernie Wagner, Captive Bred Reptiles, Seattle, WA

Regurgitation Syndrome in Boids
-- Richard A. Ross, M.D., M.P.H., Institute for Herpetological Research, Stanford, CA

The First North American Breeding of the Mandarin Rat Snake, *Elaphe mandarina*
-- William B. Gillingham, Private Breeder, Stockton, CA

Reproductive Biology and Current Status of the Louisiana Pine Snake, *Pituophis melanoleucus ruthveni*
-- Steven B. Reichling, Assistant Curator, Memphis Zoo and Aquarium, Memphis, TN

Diagnostic Techniques in Reptile Medicine
-- Howard Martin, D.V.M., Assistant Professor of Zoological Medicine, Colorado State University, Fort Collins, CO

The Last Resort -- Techniques Used to Tube or Force Feed Chelonians
-- Ellen Nicol, Artist/Author/Reptile Breeder, Anthony, FL

Hibernation in Reptiles: A Review
-- Steven D. Garber, Department of Biology, Rutgers University, Piscataway, NJ

The Pathological Findings of Failed Reproduction in Kingsnakes: Ideas on Reproductive Medical Problems
-- Roger Klingenberg, D.V.M., Private Practitioner, Greeley, CO

The Care and Breeding of the Gargoyle Gecko, *Rhacodactylus auriculatus*, with Suggestions on Breeding *Rhacodactylus chahoua*
-- Jeffrey Nunan, San Diego, CA

Captive Behavior and Reproduction of the Burmese Mountain Tortoise
-- Richard Fife, Private Breeder, Phoenix, AZ

The Influence of Barometric Pressure on Reproduction in Reptiles
-- Richard Fife, Private Breeder, Phoenix, AZ

Captive Husbandry and Breeding of Dendrobatid Frogs
-- Erik Wevers, Wierden, Holland

Maintenance Strategies for Large Private Collections of Chelonians
-- Eric Olsen, Cleveland, OH

Captive Husbandry and Breeding of the Green Iguana
-- Roger Cogan, Phoenix, AZ

Breeding on Thin Ice -- Husbandry and Propagation of the Malagasy Tomato Frog
-- Phillipe de Vosjoli and Robert Mailloux, Private Breeders, Lakeside, CA

The Possible First Captive Breeding of *Rana ishikawae*, a Rare Ranid Frog from Okinawa
-- Phillipe de Vosjoli and Robert Mailloux, Private Breeders, Lakeside, CA

Captive Reproduction of the Banded Rock Rattlesnake, *Crotalus lepidus klauberi*
-- Gary Swinford, Chaparral, NM

Treatment of Dehydration and Starvation in Reptiles
-- Thomas H. Boyer, School of Veterinary Medicine, Colorado State University, Fort Collins, CO

On the Crawl! A Herpetological Look at Arizona
-- Cecil R. Schwalbe, Ph.D., Arizona State Herpetologist, Phoenix, AZ

Update on Pharmaceuticals Useful in Reptile Medicine
-- Scott J. Michaels, D.V.M., R.Ph.., Private Practitioner/Reptile Breeder, Urbana, IL

Thermoregulation in Reptiles -- Its Impact on Terrarius Design
-- Robert F. Mackin, Private Breeder, Bellevue, WA

Reproduction in Pythons at the Oklahoma City Zoo with Emphasis on *Liasis* and *Morelia*
-- Scott Wheeler, A.H.T.I., Oklahoma City Zoo, Oklahoma City, OK

Captive Propagation of the Black Eared Frog, *Leptodactylus melanonotus*
-- Craig Ivani, Arizona Sonoran Desert Museum, Tucson, AZ

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The Society for the Study of Amphibians and Reptiles Announces Two New Books
To Be Published in Fall 1989 to Commemorate the First World Congress of Herpetology

SNAKES OF THE *AGKISTRODON* COMPLEX

by the late Howard K. Gloyd and Roger Conant

THIS LONG-AWAITED WORK is the first monographic treatment of the poisonous snakes originally included in the genus *Agkistrodon* but now placed in four genera: *Agkistrodon* of Asia and America, *Calloselasma* of Southeast Asia and Java, *Deinagkistrodon* of China, and *Hypnale* of India and Sri Lanka. In all, 33 taxa are covered. For each taxon there is a chresonymy, followed by sections entitled Type Locality, Vernacular Names, Definition and Diagnosis, Scutellation, Hemipenis, Coloration and Pattern, Form and Size, Distribution, Specimens Examined, Natural History and Ecology.

The book is extensively illustrated, with a color frontispiece (from a watercolor by David M. Dennis), 32 color plates (247 separate photographs of animals and their habitats), 20 black-and-white plates (of skin patterns, heads, and entire animals), 60 text figures, and 28 maps showing distribution. There are also 14 tables and 6 charts.

The authors of the main text have been two of America's most respected authorities on snakes for over half a century and during that time have published numerous papers on snakes of the *Agkistrodon* complex. This book represents the culmination of decades of detailed study of more than 6200 specimens, field work by the authors in many parts of the range of these snakes, and the synthesis of everything that is known about their systematics and natural history. Their text includes a comprehensive bibliography of nearly 2000 titles.

This book is also packed with discussions of general interest, including the following:

• The Cantil, *Agkistrodon bilineatus*, which survives through a severe annual season of drought by aestivating, and should not be called the Mexican "water" moccasin. On the opposite side of the world the Malayan Pit Viper, *Calloselasma rhodostoma*, endures a similar quiescent period, and occurs only in regions that have an annual dry season of a month or more.

• Vipers, esteemed as "medicine" in the Orient, are believed to cure a variety of ailments ranging from impotence to serious diseases. A favorite way to obtain the greatest benefit is to kill a snake, remove the gall bladder, and swallow it at once with a glass of rice wine.

• The Himalayan Pit Viper, *Agkistrodon himalayanus*, has been reported from 16,000 feet (4877 m), probably the highest elevation ever recorded for a snake.

• A full dozen taxa of pit vipers, including subspecies, was swept for decades into a taxonomic "wastebasket," labelled *Agkistrodon halys*. The Asian snakes of the genus *Agkistrodon* are much smaller, in both length and bulk, than the American copperhead, *Agkistrodon contortrix*.

• Special essays included are "The Mamushi Industry in Japan" by Richard C. Goris and "American Copperhead in History, Folklore, and Religion" by Roger Conant.

Supplementing this main text are nine ancillary chapters, each written by leading specialists on various topics of relevance, including behavior, chromosomes, fossil history, literature on venoms and envenomation, osteology and myology, hemipenes, immunologic relationships, and historical biogeography.

A complete list of the book's contents and a specimen color plate are given on the following pages. The book is about 550 pages (8.5 x 11 inches or 21.5 x 28 cm) and is bound in library-grade buckram cloth.

CONTRIBUTIONS TO THE HISTORY OF HERPETOLOGY

by Kraig Adler, John S. Applegarth, and Ronald Altig

(FULL DETAILS ARE GIVEN ON PAGE FOUR OF THIS ADVERTISEMENT.)

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Both books will be published in Fall, 1989. The Society publishes *Journal of Herpetology, Herpetological Review, Facsimile Reprints in Herpetology, Herpetological Circulars, Contributions to Herpetology* (monographs), and *Catalogue of American Amphibians and Reptiles*. Pricelist and information on Society membership are available on request from Dr. Aldridge.

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SNAKES OF THE *AGKISTRODON* COMPLEX: A MONOGRAPHIC REVIEW

by the late Howard K. Gloyd and Roger Conant

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CONTRIBUTIONS TO THE HISTORY OF HERPETOLOGY

by Kraig Adler, John S. Applegarth, and Ronald Altig

THIS BOOK consists of three separate sections, each of them worldwide in coverage and including herpetologists of both past and present. **The first and longest section, by Kraig Adler,** is a series of detailed biographies of the leading contributors to herpetology -- each complete with a portrait, signature, and references to other biographical information -- followed by an extensive bibliography of historical works in herpetology. These biographies feature 140 persons, but also included in them is information about their colleagues and students, so that the effective coverage is more than 500 individuals. A wide range of personages is included, from gifted amateurs sometimes having no formal education at all to the most distinguished and influential people of their day: princes, counts, an ambassador, priests, university presidents, several museum directors, and a peer of France. Biographies are arranged chronologically in order that the development of the field of herpetology can be visualized. There is a comprehensive index.

The 140 biographies include these 98 persons:

• Leading herpetologists such as Boulenger, Cope, Daudin, the Duméril, Fitzinger, Merrem, Mertens, Noble, Wilhelm Peters, Schlegel, Schmidt, Stejneger, Strauch, Wagler, and Werner.

• Great naturalists who dabbled in herpetology: Agassiz, Cuvier, Gessner, and Linnaeus.

• The explorers Espada, Maximilian, Spix, and Tschudi.

• Collection builders Baird, Barbour, Boettger, Gray, Günther, Logier, Seba, Steindachner, and Van Denburgh.

• The popularizers Ditmars, Kauffeld, and Vogel, the terrarist Klingelhöffer, and serious amateurs Klauber and Malcolm Smith.

• Authors of herpetological textbooks (Goin, Terentjev), prominent teachers (Boring, Myers, Ruthven, Wright), anatomists (Baur, Bojanus, Camp, Haas, A. S. Romer), and ecologists (Blair, Cowles, Tinkle).

• The artists Roesel von Rosenhof and Sordelli.

The coverage is comprehensive, including:

• Geographic areas such as the USA (Cochran, Garman, Girard, Harlan, Holbrook, James Peters, Pope, Rafinesque, Say, Taylor), Australia (Glauert, Kinghorn, Krefft, Mitchell, Waite), Africa (Anderson, Bocage, FitzSimons, Loveridge, Pitman, A. Smith, Villiers), and Russia (Bedriaga, Chernov, Nikolsky).

• Experts on taxonomic groups such as frogs (Liu, Miranda Ribeiro, Okada), salamanders (Bishop, Dunn, Sato), turtles (Carr, Deraniyagala, Schöpf, Siebenrock), and snakes (do Amaral, Blanchard, Gloyd, Jan, Maki, Oshima, Russell, and Wall).

The second section, by John S. Applegarth, is an index of over 2400 authors in taxonomic herpetology, an unique reference for researchers, librarians, and historians. Included is everyone who has ever proposed a new taxon within the living families of amphibians and reptiles, as well as persons who were honored by such taxa *and* who authored at least one contribution to herpetology. Authors are identified by their full names, exact dates of birth (and, if applicable, death), countries of residence, and the taxonomic orders in which they proposed new names.

The third section, by Ronald Altig, is a listing of herpetologists giving the names of their university and major professor, and the date of their doctoral degree. The information is arranged in such a manner that the academic lineages of herpetologists can be followed from generation to generation. About 1300 names are included and fully indexed.

The book is about 200 pages long (8.5 x 11 inches or 21.5 x 28 cm) and is bound in library-grade buckram cloth. There is a color frontispiece and 140 photographs. The sample biography printed below is reduced in format from actual size in the book.

COPE, E. D. (1840-1897).

Edward Drinker Cope, vertebrate paleontologist, anatomist, and America's greatest herpetologist, was born in Philadelphia on 28 July 1840. In school he was drilled in the classics and later in languages by a private tutor, but it was Cope's father, a wealthy merchant, who fostered his interest in natural history but for an intended career in agriculture instead. During the summers of 1854-1860 young Cope was sent to work on the farms of various relatives and he spent his spare time in the fields and meadows collecting salamanders and snakes. Previously, in 1846, at the age of six, he had made a visit to the museum of the Academy of Natural Sciences in Philadelphia which, judging from his extensive notes about the trip, had a profound affect on him. By 1859 he was already a volunteer worker at the Academy, busily engaged in reorganizing the herpetological collection, and at the age of 18 he published his first paper, describing two new salamanders and proposing modifications in the classification of the group. Although Cope's interests later broadened to include all vertebrate groups, herpetology was his first love and favorite branch of study and it continued to occupy him for the rest of his life.

Cope pleaded with his father to let him attend the University of Pennsylvania to study comparative anatomy with Joseph Leidy, under the ruse that it would permit him to treat farm stock, and he finally was allowed to do so in 1860-1861. It was the only formal course in science that Cope ever had! It soon became clear that he would never be happy as a farmer. His father relented and permitted him to pursue his informal studies by spending the winters of the Civil War years of 1861-1863 in Washington, where he became the protégé of Spencer F. Baird. In 1863-1864 Cope travelled throughout Europe, where he had the opportunity to meet and work with some of the leading anatomists and herpetologists of the day, including John E. Gray and Albert



Edward D. Cope

but beginning 1872 their famous feud began, which eventually involved dirty tricks, spying, charges of plagiarism and, in 1890, sensational headlines in a series of articles in the New York *Herald* newspaper. The competition became so fierce that Cope got into the habit of hurriedly studying his newly- collected material in the field and then promptly telegraphing his descriptions to Eastern journals, but several times the telegraph operators got the names of his new species garbled--and for all posterity! The dispute ended only with Cope's death, but by that time the rivalry had engulfed America's leading scientific institutions and academies and many biologists and paleontologists, including the herpetologist Georg Baur, Marsh's chief assistant who was secretly Cope's ally.

Cope's father died in 1875 leaving him an inheritance in excess of a quarter million dollars. With such enormous

The checklists of North American (1875) and Central American and Mexican (1887) amphibians and reptiles were important catalogues for reference. His "Classification of the Ophidia" (1895, preliminary paper in 1894) introduced still another important and useful anatomical characteristic, snake hemipenes; those of lizards he published in 1896. Cope's most widely known books on herpetology, however, were published toward the end of his career but were begun many years before. "The Batrachia of North America" (1889, reprinted 1963) was based on a manuscript and drawings by Baird and Charles Girard, to which Cope added his own material, chiefly anatomical. Cope's last work, "The Crocodilians, Lizards, and Snakes of North America" (1900), was published posthumously. It, too, was partly based on a Baird manuscript (lizard section only), but the book was never fully completed due to Cope's premature death (the turtles, however, were omitted on account of Baur's intended, but never published monograph on the subject). Both books are still standard texts on North American herpetology, containing much information on external structure and anatomy and illustrated by numerous plates.

References: "Herpetological and Ichthyological Contributions," by T. Gill, p. 2-24. *In* Addresses in Memory of Edward Drinker Cope. Amer. Philos. Soc. Mem. Vol. 1, 1897 (partly preprinted in Amer. Nat., 31: 831-863, 1897); "Biographical Memoir of Edward Drinker Cope 1840-1897," by H. F. Osborn, Biogr. Mem. U.S. Natl. Acad. Sci., 13: 125-317, 1930; "Cope: Master Naturalist," by H. F. Osborn, Princeton Univ. Press, Princeton (New Jersey), xvi, 740 pages, 1931; "Edward Drinker Cope, Herpetologist," by W. H. Davis, Bull. Antivenin Inst. Amer., 5: 71-80, 1932; "The Fossil Feud," by E. N. Shore, Exposition Press, Hicksville (New York), xi, 340 pages, 1974; "Edward Drinker Cope," by J. M. Maline, Dict. Sci. Biogr., 15(suppl. 1): 91-93, 1978; Adler, 1979 (pp. 31-33). *Portrait:* Courtesy Historical Society of Pennsylvania. *Signature* (1860): Courtesy Library, Academy of Natural Sciences, Philadelphia.

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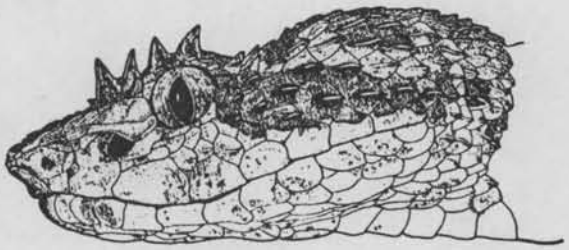
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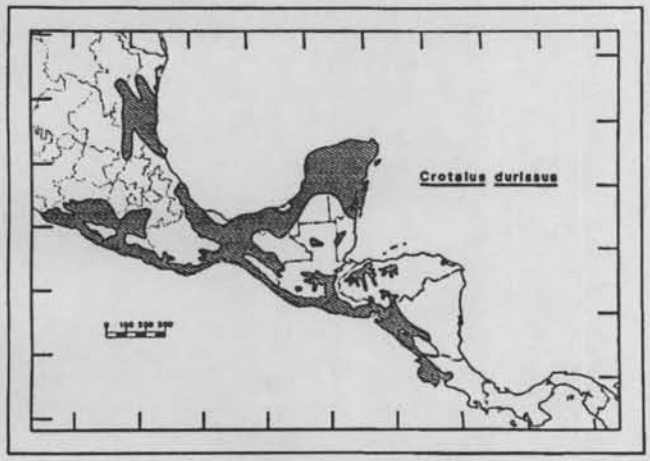
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APARALLACTUS CAPENSIS (Cape Centipede-eater). Maladiepe Hill, 1km NE of Otse village. 21 June 1985. S. Spawls. (NMZB 7844). First record S of 25°S in Botswana. Extends range 50km S.

AMBLYODIPSAS VENTRIMACULATA (Kalahari Purple-glossed Snake). 20km NW Molepolole, on Molepolole-Letlhakeng road. 30 October 1986. J. de Graff. (NMZB 8603). First record S of 23°S and E of 24°E in Botswana. Extends range 450km SE.

AMBLYODIPSAS P. POLYLEPIS (Common Purple-glossed Snake). 10km NW Molepolole, on Molepolole-Letlhakeng road. 5 November 1986. J. de Graff. (NMZB 8610). First record S of 21°S in Botswana; the only record between Okavango (500km NNW) and Pretoria, South Africa, (400km E).

XENOCALAMUS MECHOWII INORNATUS (Elongate Quill-snouted Snake). 22km NW Molepolole, on Molepolole-Letlhakeng road. 3 November 1986. J. de Graff. (NMZB 8612). First record S of 21°S in Africa; extends range 560km S.

XENOCALAMUS B. BICOLOR (Variable Quill-snouted Snake). 33km NW Molepolole, on Molepolole-Letlhakeng road. 25 October 1986. S. Spawls and J. de Graff. (NMZB 8672). Fits in the gap between Gaborone record (65km E) and the Kutse Pan record (130km NW).

ATRACTASPIS BIBRONII (Bibron's Stiletto Snake). 2km N of Otse. 17 October 1986. S. Spawls. (NMZB 8683). Fits in the gap between the Vryburg, South Africa, (250km S) and the Sikwane (80km NE) records 40km NW Molepolole, on Molepolole-Letlhakeng road. 25 October 1986. S. Spawls and J. de Graff. (NMZB 8593). Extends range 90km NNW of previous record.

PROSYMNA SUNDEVALLI LINEATA (Lineolate Shovel-snout). 20km N of Molepolole. J. de Graff.(NMZB 8306). First record for Botswana S of 21°S, extends range 500km SE; 55km NW Molepolole, on Molepolole-Letlhakeng road. 25 October 1986. S. Spawls and J. de Graff. (NMZB 8674). Extends range 40km W of previous record.

CROTAPHOPELTIS HOTAMBOEIA (Red-lipped Snake). 8km SSW of Otse. 24 March 1986. S. Spawls. Verified by R. C. Drewes. California Academy of Sciences(CAS 160777). First record from Botswana S of 20°S. Extends range 60km NW (from South Africa); 15km NW Molepolole, on Molepolole-Letlhakeng road. 29 October 1986. J. de Graff. (NMZB 8600). First record from Kalahari sand area in Botswana. Extends range 90km NNW.

DISPHOLIDUS TYPUS (Boomslang). Moeding College, Otse. 19 February 1985. S. Spawls. (NMZB 7798). First record for SE Botswana, although recorded ca. 20km E in South Africa.

THELOTORNIS C. CAPENSIS (Southern Vine Snake). 12km SSW of Otse. 20 April 1985. S. Spawls. (NMZB 7711). First record for SE Botswana S of the Tropic of Capricorn. Extends range in Botswana 300km SE.

DENDRASPIS POLYLEPIS (Black Mamba). Otse village. 23 March 1987. S. Spawls. (NMZB 8762). Southernmost record in Botswana. Extends range 50km S.

ACKNOWLEDGMENTS

Our thanks to D. G. Broadley, Natural History Museum of Zimbabwe, Bulawayo, for identifying the specimens and critically reading the manuscript, and to our wives Laura and Frieda for tolerating their snake-hunting husbands.

Submitted by **STEPHEN SPAWLS**, Moeding College, Private Bag 11, Lobatse, Botswana, and **JOB DE GRAFF**, Lutheran World Federation, P.O. Box 1645, Gaborone, Botswana. •

NEW STATE RECORDS FROM NORTHERN GUERRERO, MEXICO

While doing a survey of the herpetofauna of the Sierra de Taxco, Northern Guerrero, Mexico, we collected 42 species of herps belonging to that area from which 20 are new records for the Sierra de Taxco, and 9 are new state records (discussed below). Most of the new recorded species belong to the fauna of the Mexican Volcanic Axis; because of this, we consider the Sierra de Taxco as a part of that mountain system (Hernandez and Flores, unpublished data).

All specimens were collected by the second author (EHG), verified by Guillermo Lara Gongora, and are deposited in Museo de Zoologia Facultad de Ciencias (MZFC) at the National University of Mexico.

The species recorded for the first time from Sierra de Taxco are: *Pseudoeurycea b. belli,* Municipios de Tetipac, and Taxco (MZFC 3798, 3799); *Bufo occidentalis,* Municipios de Tetipac, Ixcateopan de Cuahutemoc, Taxco, and Almololoya de Alquiciras (MZFC 3749-51, 3755, 3759, 3752-53, 3760, 3754, 3756-57, 3761, 3758); *Hyla eximia,* Municipio de Tetipac, (MZFC 3786-90); *Tomodactylus dilatus,* Municipio de Ixcateopan de Cuahutemoc (MZFC 3765-67); *Anolis nebulosus,* Municipios de Tetipac, Ixcateopan de Cuahutemoc (MZFC 3831-33, 3838-40, 3843, 3834-37, 3841-42, 3844-56); *Sceloporus g. grammicus,* Municipios de Tetipac, Ixcateopan de Cuahutemoc, and Pedro Ascencio de Alquiciras (MZFC 3857, 3865-66, 3868, 3870-74, 3858, 3863-64, 3877-79, 3859-62, 3867, 3875, 3876); *S. mucronatus omiltemanus,* Municipios de Ixcateopan de Cuahutemoc, Pedro Ascencio de Alquiciras, and Tetipac (MZFC 3930, 3933-39, 3947-48, 3957-63, 3975-77, 3979, 3981, 3931, 3951, 3964, 3967, 3969-71, 3973-74, 3980, 3965-66, 3968, 3978, 3972); *Urosaurus b. bicarinatus,* Municipios de Tetipac (MZFC 3982-83); *Abronia deppei* Municipios de Tetipac, Ixcateopan de Cuahutemoc, and Pedro Ascencio de Alquiciras (MZFC 3993, 3992, 3991); *Gerrhonotus l. leiocephalus,* Municipios de Tetipac (MZFC 3602); *Cnemidophorus c. costatus,* Municipios de Tetipac, Ixcateopan de Cuahutemoc (MZFC 3913, 3915-16, 3919, 3914); *Drymarchon corais rubidus,* Municipio de Ixcateopan de Cuahutemoc (MZFC 3825); *Leptodeira splendida, bressoni,* Municipio de Ixcateopan de Cuahutemoc (MZFC 3819); *Masticophis mentovarius striolatus,* Municipios de Taxco, Tetipac, and Ixcateopan de Cuahutemoc (MZFC 3816, 3817, 3818); *Pituophis lineaticolis,* Municipios de Taxco and Tetipac (MZFC 3823, 3824); *Rhadinea hesperia,* Municipio de Ixcateopan de Cuahutemoc (MZFC 3815); *R. taeniata aemula,* Municipios de Taxco, Tetipac, and Pedro Ascencio de Alquiciras (MZFC 3811-12, 3814, 3813); *Salvadora bairdi,* Municipios de Taxco and Tetipac (MZFC3821, 3820); *Storeria storeroides,* Municipios de Taxco, Ixcateopan de Cuahutemoc, Pedro Ascencio de Alquiciras and Tetipac (MZFC 3801, 3800, 3803, 3805-10, 3804); and *Thamnophis cyrtopsis collaris* Municipio de Ixcateopan de Cuahutemoc (MZFC 3994).

The new State records are:

Rhyacosiredon rivularis; Municipio de Tetipac, 10 km by road from Taxco to Tetipac, Los Llanos; in cloud forest. June (day not recorded) 1986; 20 June, 21 July, 24 October 1986; 7 May 1987 (MZFC 3579-80; 3581-83; 3586-87; 3584-85; 3588-91). New record of the family Ambystomatidae for the State of Guerrero.

PSEUDOEURYCEA C. CEPHALICA; Municipio de Taxco, cerro Huizteco; in cloud forest. 7 June 1987. Municipio de Pedro Ascencio de Alquiciras, Cruz Alta; in cloud forest, 14 June 1987 (MZFC 3594-95, 3592-93).

ELEUTHERODACTYLUS HOBARTSMITHI; Municipio de Taxco, cerro Huizteco; in cloud forest. 8 and 9 June 1986, 27 April 1987. Municipio de Taxco, La Cascada; in cloud forest. 10 December 1986. Municipio de Ixcateopan de Cuahutemoc, las Peñas; in *Juniperus* forest. 8 November 1986. Municipio de Ixcateopan de Cuahutemoc, 1km W of Ixcateopan ; in *Juniperus* forest. 11 November 1986 (MZFC 3668, 3669, 3670, 3671, 3672, 3673 series of 11 specimens).

ELEUTHERODACTYLUS MEXICANUS; Municipio de Ixcateopan de Cuahutemoc, 1km W of Ixcateopan ; in *Juniperus* forest. 11 November 1986 Municipio de Tetipac, 10 km by road from Taxco to Tetipac; in cloud forest. 22 June 1986 (MZFC 3597, 3599, 3598). These specimens from Sierra de Taxco extend the range about 300km straight line from the nearest known locality at Cerro San Felipe, Oaxaca (Lynch 1965. Chicago Acad. Sci. Nat. Hist. Misc. (182): 12pp).

SCELOPORUS PALACIOSI; Municipio de Pedro Ascencio de Alquiciras, 500m SW Cruz Alta; in cloud forest. 11 September

1986. Municipio de Pedro Ascencio de Alquiciras, 1.5km SSW from Los Jarillos; in cloud forest. 12 September 1986 (MZFC 3600, 3601). This recently described species was previously recorded from Michoacan, Mexico, Morelos and Distrito Federal (Lara-Gongora 1983. Bull. Maryland Herp. Soc. 19:9).

CONOPSIS BISERIALIS; Municipio de Ixcateopan de Cuahutemoc, 26.5km by road from Taxco to Ixcateopan; in *Juniperus* forest. 26 July and 13 November 1986. Municipio de Taxco, cerro Huizteco; in cloud forest. 8 and 24 June 1986. Municipio de Tetipac, 10 km by road from Taxco to Tetipac, Los Llanos; in cloud forest. 20 June, 21 August, and 25 October 1986. Municipio de Pedro Ascencio de Alquiciras, Tres Cruces de Mamatla; in cloud forest. 7 December 1986 (MZFC 3606-7, 3614, 3611-12, 3604, 3608-10, 3603, 3605, 3613).

TANTILLA DEPPEI; Municipio de Ixcateopan de Cuahutemoc, El Salitre River; n *Juniperus* forest. 14 July 1986 (MZFC 3615). Very few precise localities, all of them in Morelos, are given for this taxon since the reassignment of the type locality by Davis and Smith (1953. Herpetologica 8:138).

CROTALUS T. TRISERIATUS; Municipio de Taxco, cerro Huizteco; in cloud forest. 22 and 23 August 1986. Municipio de Tetipac, 10 km by road from Taxco to Tetipac, Los Llanos; in cloud forest. 20 June 1986. Municipio de Tetipac, Arroyo las Damas; in cloud forest. No specific date (MZFC 3664, 3665, 3666, 3667).

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Submitted by OSCAR FLORES-VILLELA and EFRAIN HERNANDEZ-GARCIA, Museo de Zoologia Fac.de Ciencias UNAM Apdo. Post. 70-399, Mexico D.F. 04510, MEXICO •

NEW DEPARTMENTAL RECORDS FOR NORTHEASTERN HONDURAN HERPETOFAUNA

During field work in Honduras in 1985, a number of specimens representing first records for the Departmentos de Gracios A Dios and Colon were collected. All reptiles and photographs were verified by A. F. Stimson; *Eleutherodactylus* by J. M. Savage; *Bolitoglossa* by B. Clarke. All preserved material was deposited in the British Museum (Natural History) (BMNH).

Depto. de Gracios A Dios

SPHAERODACTYLUS MILLEPUNCTATUS. Palacios, Laguna Bacalar. 20 April (BMNH 1985.1280).(Meyer & Wilson 1973. Los Angeles.Co. Mus. Contrib. Sci. (244):1-39, *S. continentalis* syn. *S. millepunctatus*, fide Harris and Kluge 1984. Occ. Pap. Mus. Zool. Univ. Mich. 706:1-59).

THECADACTYLUS RAPICAUDA. Palacios, Laguna Bacalar. 21 April (BMNH 1985.1282). (Meyer & Wilson 1973. op. cit.).

ANOLIS BIPORCATUS. Palacios, Laguna Bacalar. 15 June (BMNH 1985.1102). Extends range 100km E Trujillo, Colon (Meyer & Wilson 1973. op. cit.).

ANOLIS PENTAPRION. Palacios, Laguna Bacalar. 6 June (BMNH1985.1121). Extends range 250km E Lancetilla and Guyamas District, Atlantida (Meyer & Wilson 1973. op. cit.).

ANOLIS TROPIDONOTUS. Palacios, Laguna Bacalar. 4 May (BMNH 1985.1123). 19 May (BMNH 1985.1124). (Meyer & Wilson 1973. op. cit.).

OXYBELIS FULGIDUS. Palacios, Laguna Bacalar. 19 May (photograph BMNH D/B 1987/152). First record for northeastern Honduras. Extends range 100km E Trujillo, Colon (Hahn & Wilson 1976. SSAR Herp. Review 7(4):179; Wilson & Meyer 1982 & 1985. Milwaukee Pub. Mus. Contrib. Biol. Geol. No.6).

SPILOTES PULLATUS. Palacios, Laguna Bacalar. 4 May (photograph BMNH D/B 1987/151). Extends range 100km E Trujillo, Colon and 125km NE San Esteban, Olancho (Wilson & Meyer 1982 & 1985. op. cit.).

Depto. de Colon

BOLITOGLOSSA RUFESCENS. Quebrada Limonceto, Rio Paulaya. 29 May (BMNH 1985.1228). Extends range 150km E Corozal, Atlantida (Dunn & Emlen 1932. Proc. Acad. Nat. Sci. Phila. 84:21-32), and 225 km NE Subirana Valley and Portillo Grande, Yoro (Meyer & Wilson 1971. Los Angeles.Co. Mus. Contrib. Sci. (218):1-47).

ELEUTHERODACTYLUS MILESI. Rio Guaraska. 9 May (BMNH 1985.1452). First record for northeastern Honduras. Extends range 175km ESE La Ceiba, Atlantida and 225km ENE Portillo Grande and Santa Marta, Yoro (Meyer & Wilson 1971. op. cit.).

ANOLIS CAPITO. Rio Guaraska. 12 May (BMNH 1985.1103). Tulito, Rio Tulito. 22-25 May (BMNH 1985.1104-1107). Extends range ca. 70km N locality ca. 40km E Catacamas, Olancho (Meyer & Wilson 1973. op. cit.).

CHIRONIUS GRANDISQUAMIS. Tulito, Rio Tulito. 20 May (BMNH 1985.1297). Extends range 150km E Corozal, Atlantida , 250km E Lancetilla, Atlantida and 200km NNE Arenal, El Paraiso (Wilson & Meyer 1982 & 1985. op. cit.).

CONIOPHANES FISSIDENS. Rio Guaraska. 8 May (BMNH 1985.1298). Extends range 100km NE Catacamas, Olancho and 150km E Coyoles, Yoro (Wilson & Meyer 1982 & 1985. op. cit.).

PSEUSTES POECILONOTUS. Las Champas, Rio Paulaya. 25 May (BMNH 1985.1311). 2km W Anzuelo Bridge Rio Paulaya. 31 May (BMNH 1987.891). Extends range 175km E locality 11.3km S La Ceiba, Atlantida (Wilson & Meyer 1982 & 1985. op. cit.).

BOTHROPS ATROX. Amarillo, Rio Paulaya. 29 April (BMNH 1986.50). Las Champas, Rio Paulaya. 31 May (BMNH 1986.51). Tulito, Rio Tulito. 22 May (BMNH 1986.52).(Wilson & Meyer 1982 & 1985. op. cit.).

BOTHROPS NASUTUS. Rio Guaraska. 9 May (BMNH 1986.54). Las Champas, Rio Paulaya. 22 May (BMNH 1986.53). Extends range 225km E western Atlantida (Wilson & Meyer 1982 & 1985. op. cit.) and 225km N Nicaraguan localities (Porras, McCranie & Wilson 1981. Tulane Stud. Zool. Bot. 22(2):85-107).

BOTHROPS SCHLEGELII. Rio Guaraska. 9 May (BMNH 1986.55). First record for northeastern Honduras. Extends range 250km E Lancetilla, western Atlantida and Mataderos Mts., central Yoro (Wilson & Meyer 1982 & 1985. op. cit.).

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The project field work for this project would not have been possible without the unstinting assistance of the Venturers and Staff on the Honduran phase of Operation Raleigh and to those people I am extremely grateful. Señor Wilberto Aquilar of RENARE gave permission for the project to take place in Honduras. I would also like to express thanks to Drs. Jay M. Savage, Larry David Wilson, and William E. Duellman for looking at some of my specimens and either confirming identification or reidentifying them. Thanks are also due to Mr. Andrew Stimson, Dr. Colin McCarthy and Mr. Barry Clarke at the British Museum (Natural History) for their advice and assistance and Dr. Larry David Wilson for reading and commenting on the manuscript.

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BOOK REVIEWS

Sistemática de *Podarcis* (Sauria, Lacertidae) Ibéricas y Norteafricanas Mediante Tecnicas Multidimensionales, by Valentin Perez Mellado and M^{a}.P. Galindo Villardon. 1986. x + 163 + 51 (appendix) pp. Bibliography (130 refs.). Ediciónes Universidad de Salamanca, Ser. Manuales Universitarios. Faculdad de Biologia. Must be ordered from the publisher: Ediciónes Universidad de Salamanca, Patio Escuelas 1, Apartado 325, SP-Salamanca (Spain).

People working in systematics know how difficult it can sometimes be to integrate, at once, all individual and environmental data. In this way, multidimensional analyses, of recent use,

seem able to be very helpful for taxonomy and biogeography.

In the present book, a biologist, Perez Mellado, and a mathematician, Galindo Villardon, have tried to apply multivariate analyses to the much debated question of Iberian *Podarcis* systematics. No fewer than 79 "variables," including patterns and colors as well as meristic and metric characters, have been fed to the computers, starting with 16 *P. hispanica*, 4 *P. bocagei* and 9 *P. muralis* so-called "populations," i.e. regional samples comprising 387 local samples in all. A key to recognized forms is given pp. 146-147.

Beyond analyses, computers have been used for typing the book and drawing figures. This has made for rapid publication—too rapid, actually. A little more time devoted to presentation could have rendered pleasant and easy a reading which turns out to be exceedingly hard. Exhausting mental (and finger) gymnastics is imposed on the attentive reader. For instance, suppose you want to study population 12 in results tabulated pp. 73-75. The introductory chapter "Metodología", which defines every "variable" and "population," has told you that population 12 is the Tunisia sample group of *P. hispanica*. Well, you are in for a painful mistake: unobtrusively, somewhere in the Results (p. 65), pop. 12 has become the Grand Atlas sample group. Now you are interested in variable 52 of *P. bocagei* males as tabulated pp. 27-30? Don't you believe what the introduction tells you about var. 52! You have to browse first, at the end of the book, through a long Appendix (not referred to). After some search there, you find on its p. 22 that 52 stands for variable 34 not 52. By that time, maybe you have lost the page you started from. In other tables, however, numbers are those of the original data. The reader's headache is compounded by further discrepancies between tables ***within*** the appendix.

To the authors' credit, every single raw datum is published. But if they had made the effort of printing a fair copy rather than a rough draft of their book, Perez Mellado and Galindo Villardon would have at once avoided the extraordinary complications just described and the innumerable errors and omissions that come in addition, some of them impossible to correct with the information at hand. Casualness reaches a climax with illustrations. Moreover, a unique model has been used, as a frame for sketching color patterns, for both sexes, in spite of pronounced sexual dimorphism.

However, readers can perfectly well concentrate on pages 102-153. Best in the book, they could be titled "General Considerations" and, as a discussion basis for European lacertid specialists, are undoubtedly interesting, whether you share the authors' viewpoints or not. Once these pages have been read, in fact, the impression is that this book is either the work of a good herpetologist to whom mathematics unnecessarily serves as a vindication, or that of a mathematician on whose results a biologist lays extrinsic conclusions. Never does the synthesis appear, and one may wonder whether all the calculations are of any help to taxonomy. A risk is that people who only read the conclusions, or glance through all the book without studying it thoroughly, may think that the proposed taxonomic changes proceed from mathematical analysis. We think the latter is largely irrelevant, for the following reasons.

1) The trap of subjectivity could not be escaped. At least, we feel that selecting qualitative variables and making up "populations" was influenced by preconceived taxonomy. Furthermore, distinguishing variables 1-3 from variables 4-7, i.e. brown from green, is simply impossible with certain museum specimens of *Podarcis*.

2) Perez Mellado had distinguished *P. b. bocagei* and *P. b. carbonelli* in previous publications. Nothing significant is added to their respective traits.

3) The authors synonymise *P. muralis sebastiani*, an insular form, with *P. h. hispanica*. However, insular forms have not been included in the study (whose title should have "continental" within it, incidentally). The taxonomic decision is made on extraneous, "classical" grounds. (A note in press in Revista Española de Herpetologia, 1, 1, by Bea, Gosà, Guillaume and Geniez, reëstablishes *sebastiani* as a subspecies of *P. hispanica*).

4) An important point is whether the form *vaucheri* from North Africa exists or not in southern Spain. Perez Mellado and Galindo Villardon conclude not (pp. 147, 150), but their conclusion is independent from the multivariate analysis since "population" 11(10) from *P. hispanica* (Andalusia and south central Spain), being very sparse, could not permit any definitive judgement on this matter (p.78).

5) Quite revealing of subjectiveness are statements that contradict results on which they are commenting. One example: p. 70, a matrix shows variables 58, 63, 57, 19, 2, 15, 20, 42, and 35, in this order, to have the highest values. Yet in the facing text we are told that "the variables of major importance" are 58, 57, 19, 2, 15, 20, 64 and 31. Actually, the latter two rank 14th and 12th, respectively, in the matrix. (The reason to disregard variables in between is not stated).

6) Eliminating as variables "means which probably are strongly influenced by ecological conditions" is sheer arbitrariness.

Is this a condemnation of the method as applied to the subject dealt with? We know that multivariate analyses can disclose unanticipated relationships. While it can be hard to get rid of preconceived ideas in selecting characters, it is a pity for **Sistemática de *Podarcis* Ibéricas y Norteafricanas** that the analysis was started from predetermined sample combinations when the power of the method does allow to start from individual data. You can hardly expect, then, to get sounder results than Boulenger and other lacertid experts obtained with unaided brains.

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Studies In Herpetology. Proceedings of the European Herpetological Meeting (3rd Ordinary General Meeting of the Societas Europaea Herpetologica) Prague 1985. Z. Rocek (ed.) Published by Charles University, Prague, for the Societas Europaea Herpetologica. 754 pp. Hardbound.

Almost 5 cm thick, nicely bound in signatures and entirely in English, this impressive volume summarizes the 1985 European herpetological meetings at Prague. An immense amount of effort went into the preparation of this tome. Loosely arranged into a dozen sections, the book includes 150 (!!!) concise scientific papers (4-5 pages each) covering a vast range of topics in herpetology including genetics, morphology, paleontology, physiology, behavior, biogeography, phylogeny and systematics, ecology, evolution, and conservation. Authors hail from literally dozens of countries, including Austria, Australia, Belgium, Brazil, Canada, Cuba, Czechoslovakia, Denmark, England, France, Germany, Greece, Hungary, Israel, Italy, the Netherlands, Nigeria, Norway, Poland, Romania, Russia, Spain, Sweden, Switzerland, the United States, and Yugoslavia.

A short review cannot do justice to all this research: my own favorite papers are several on Russian lizards, but there is a wealth of information here with something that will interest almost any herpetologist. Aside from offering a rare glimpse of contemporary European herpetology in English, perhaps the most important lesson to be gained from this volume is rather tragic. Habitat destruction in overpopulated Europe has reduced the herpetofauna to a mere vestige of what it must once have been — herpetologists in less-ruined countries must take heed immediately and begin working in earnest to halt human population growth and to preserve natural habitat in their own areas NOW.

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Interpretive Atlas of Texas Lizards, by Ralph W. Axtell. 1986-1988? Privately Printed (Ralph W. Axtell, 2814 Rock Hill Road, East Alton, Illinois 62024). Pages variable, 4-16 in the five parts so far published. Map with each part. Price $1.00 for each part of 10 pages or fewer, $2.00 for parts of over 10 pp., plus postage of $0.60 for one part, $0.80 for two, $1.10 for three or more.

A monumental undertaking is under way in this modestly entitled work. Fortunately it lends itself to serialized publication, thereby assuring potential users that its availability does not hinge first upon completion in its entirety. It sets a new high standard for thoroughness that will be difficult to equal in any regional study. It is of standard 8.5x11 in. format, the text reproduced from word processor output. The 1988 accounts are punched for 3-ring notebooks.

Each species account is issued separately, except that one map serves for two accounts in two cases among the five thus far issued, the first in April, 1986, the most recent two in March, 1988.

The heart of each account is the list of localities, arranged in tabular form alphabetically by county and, under each county, the place names, followed in numerical order by the distances of the collecting sites from those place names. Museum source is cited for each locality, or in the absence of museum material, the literature source. Each locality is plotted on a large scale detailed map of the state, and a small scale insert map shows the total range of the species as a whole. The spots on the maps are small (about 0.75 mm in diameter, equivalent to 2.9-3.7 mi.), and do not overlap; acceptable localities are enclosed by projected range limits. An attractive innovation is the use of two colors for the spots on maps depicting localities for two species.

The number of records is exhaustively overwhelming. Fifty-one museums were canvassed, at least for the most recent accounts, yielding staggering totals of specimens (± 1120 for *Coleonyx brevis*, 450 for *Sceloporus cyanogenys* (which Olson 1988, Bull. Md. Herp. Soc., 23:158-167, regards as a subspecies of *S. serrifer*), 1380 for *S. poinsettii*, 645 for *S. variabilis*, 76 for *S. graciosus*, just from Texas!). The lists of "locality vouchers" are equally impressive (respectively, 459, 110, 444, 185, 19), with much of the space of each account devoted to them (e.g. 10 of 13 pp. for *C. brevis*).

On the bases of the distributional data thus collected, examination of much material, and extensive field experience, the author has ingeniously interpreted the significance of the distribution of each species as now understood in Texas. Paragraphs are devoted standardly to fourteen topics: Taxonomic Status, Synthesis of Texas Distribution (a detailed, regional analysis of habitats), Differentiation in Texas Populations, Population Density (past and present), Elevational Range in Texas, Earliest Vouchers Taken, Fossil Records in Texas, Erroneous or Questionable Records, Extinction Prone Populations, Potential New County Records, Herptiles With Similar Distributions in Texas (of the five species for which the accounts are completed, only *S. graciosus* has no distributional parallels in Texas), Future Work, Map Symbols, and Locality Vouchers.

The work thus is not of taxonomic intent; basic nomenclatural data are cited (original description, holotype, type locality, first use of combination, major reviews), but there is no review of the literature, inasmuch as Dixon thoroughly covered that aspect in 1987, and no review of natural history or biology. Under special circumstances (e.g., *S. variabilis*), a brief paragraph of "Taxonomic Comments" is added (in this case to correct the interpretation of holotype for *S. v. marmoratus*). In consistency with precedent, the barbarous spelling *arenicolous* was perpetuated for the Texas subspecies of *S. graciosus*. That subspecific name was obviously derived from Latin (for "sand-dweller"), and the erroneously anglicized -ous ending implied that it was applied as an adjective ("sand-dwelling"), but the latinized ending (required by Art. 11(b) of the Code) for an adjective in the nominative singular (Art 11(b)) is -us. Arts. 25, 26,32(c)(i)(d)(ii) make it clear that the original spelling *arenicolous* is incorrect and should be corrected to *arenicolus* .

In any event, Axtell's study demonstrates the irreplaceable value of an initially intensive geographic sampling, and also of the necessity of visual rather than repeated voucher confirmations in the future, if deleterious human-based pressures on native biota are to be minimized. The painstaking documentation and inspired interpretation this atlas represents deserve the attention, appreciation and, where appropriate, the emulation of every biologist — not only herpetologists.

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The Evolution of Vertebrate Design, by Leonard B. Radinsky. University of Chicago Press, xi + 188 pp., 18 figs.; clothbound, $35.00; paperbound, $12.95.

It seems ever more important, in this dawning of the age of biotechnology, that students be educated to appreciate whole animals and their evolution. If your institution does not offer such a course to non-biology majors, this book provides both the vehicle and the incentive. Len Radinsky gave a course in vertebrate morphology, paleontology, and evolution for non-biologists at the University of Chicago, and his book is an outgrowth of that course. Len was a gifted teacher who loved teaching, and, if you know him, you find his grin, his intensity, and his concern for giving students a wealth of material in an engaging way emerging from the pages of the book.

The book is most admirable in its consistency of presentation. It is clearly written, with careful but succinct explanations. It presents a large body of information about animals, their histories, their structure, and their function. It introduces methods of research approaches and analyses, all in ways that non-scientists can understand and appreciate. The first chapter is the clearest non-specialist introduction to basic principles of phylogenetic analysis that I have read; specialists might examine it to see how they can incorporate such coherence. The second chapter is a fine discussion of pattern and process of evolution that assures without proselytizing. The third chapter presents the vertebrate body plan, the structural basis of vertebrate design. The remaining fifteen chapters discuss vertebrates in a general phylogenetic order. Most of the discussions are quite general, as is appropriate for a non-majors volume. However, each treatment presents information on the body plans of extinct taxa, and of extant forms, so that innovations, whether they persisted of not, are discussed in a framework of evolution of structure and function. Because of the book's relatively small size and emphasis on a careful but exciting presentation for non-scientists, some information that a vertebrate biologist might normally expect to be presented is omitted, and favorite major taxa are treated rather summarily. That is irrelevant to the purpose and focus of this book.

The illustrations are outstanding, virtually unique. The body plans of representative vertebrates are executed in a wonderfully consistent style, all as line drawings. External body shapes are clearly delineated and compared. Skeletons are presented in two forms: one being black structures within the body outline, the other beautifully rendered, stylized, quasi-biomechanical forms. The latter are particularly effective, for they permit a new and special kind of comparison of structure and function. Neither rendition of skeletons shows all the relevant bones, and many are never represented by the shapes they really have. This must not be criticized as lack of useful detail — they are perfect to make the points that the text treats. I consider them highly adaptable to use in more advanced courses as well. Feeding and locomotion are emphasized, and comparisons can be made among all the major groups of vertebrates, both extinct and extant. Many of the chapters also include simple, straightforward, up-to-date cladograms to illustrate

relationships and radiations within groups. The cladograms include small illustrations of skeletal morphology of representative taxa, further reinforcing the consistency of the theme of vertebrate design.

The book has much to offer vertebrate biologists as well. It would be excellent review for the general biology instructor; teachers of vertebrate morphology and paleontology will find many new ways of presenting concepts. Radinsky's framework allows more specific information about data and theory to be included, so it would work well in a diversity of more specialized courses. As already indicated, the illustrations are particularly innovative and useful, and in many contexts. The book is well priced and eminently suited to a diverse audience.

Len Radinsky has left the legacy of his teaching and research to students and colleagues through this delightful and conscientious little book, and we all owe Sharon Emerson our gratitude for seeing it to completion after Len's most untimely death. **The Evolution of Vertebrate Design** will serve students very well by introducing them to vertebrate animals through exploration of their structure, function, and history.

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The Venomous Reptiles of Arizona, by Charles H. Lowe, Cecil R. Schwalbe and Terry B. Johnson. 1986. Arizona Game and Fish Department, Phoenix. i-ix, 115 pp, 24 Figures, softbound. $7.50. Available from Information Branch, Arizona Game and Fish Department, 2222 W. Greenway Rd., Phoenix, AZ 85023, USA.

As more persons while away pleasant moments in the natural areas of Arizona, the likelihood that someone will encounter a venomous reptile increases, especially since Arizona has more venomous reptiles that any other state. For some, such an encounter is a delight, whereas for others, the experience is traumatic indeed. Sensitive to the extremes on both ends, Lowe, Schwalbe and Johnson have published a helpful, well-illustrated, portable guide to the venomous reptiles of Arizona.

The authors introduce the reader to the unique venomous taxa indigenous to Arizona and include definitions of terms used throughout the text. The State of Arizona has long been a pioneer in protecting wildlife and the legal status of the local reptiles is reviewed.

Each species account contains a description, with additional material on size, behavior, toxicity, prey, reproduction, habitat and abundance, distribution, and subspecies where applicable. The section on Gila monsters is particularly impressive and many of the ecological and behavioral observations reflect years of field work.

Introductory sections encapsulate information which treat the biology of elapid, crotalid and rear-fanged snakes. The western coral snake, the seventeen taxa of rattlesnakes and the six rear-fanged colubrid snakes are all covered. The accounts are liberally interspersed with interesting observations, both in the field and captivity, which contribute to a broader perspective regarding these creatures. Each taxon is represented by at least one color photograph and, almost without exception, the quality is superb. Three photographs taken in the field are particularly exquisite: fighting male Gila monsters, copulating Southwestern speckled rattlesnakes, and male Western diamondback rattlesnakes in combat. This latter photograph is one of the finest reptile photographs that I have ever seen. In addition to the 50 photographs, the book is illustrated with line drawings and maps of high quality.

A nicely rendered section with photographs depicting the habitats of Arizona was a nice touch which stimulated me to want to return to Arizona at the earliest moment. The comprehensive final section is entitled "The Bite and Its Treatment" and should prove to be especially helpful to those persons unfamiliar with venomous reptiles.

Systematists should take note that the authors recognize the polytypic nature of the Western diamondback rattlesnake by referring to the Arizona population as *Crotalus atrox atrox* and the taxon on Isla Tortuga as *C. a. tortugensis.*

This is a lively, well-written book in an attractive format which should prove to be a most successful publishing venture by the Arizona Game and Fish Commission. The taxpayers of the state should be commended for supporting this enterprise through voluntary contributions to the Nongame Income Tax Checkoff.

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Snakes of Western Australia, by G. M. Storr, L. A. Smith and R. E. Johnstone. 1986. Western Australian Museum (Frances Street, Perth, Western Australia 6000), 187 pp., 5 figs., 24 color plates, soft cover. $19.95 Australian.

This is the fourth in a series of books on the reptiles and amphibians of Western Australia produced by the Western Australian Museum. The stated purpose of this book is to enable the reader to identify the 102 species of snakes known from Western Australia. It accomplishes this with thoughtful organization, excellent illustrations, and a readable style.

The book starts off with four one-page sections: Forward, Acknowledgments, Introduction, and How To Use This Book. The latter section serves as a useful orientation to the reader that may be unfamiliar with taxonomic keys, species descriptions, and range maps. The authors then plunge directly into the systematic treatment of the suborder Serpentes. A one-page summary of the origin of Australian snakes is followed by a very clear and usable key to the families of the snakes of Western Australia. Each of seven families is treated in order, in a consistent format. Genera and species within families are considered in alphabetical order. Virtually all the text falls under these headings: diagnosis, description, distribution, remarks, derivation of name, and references. This is the case for the treatment of families, genera, and species. Taxonomic keys are provided at both the genus and species level. The keys are clear, and they are based on readily accessible external characters. The keys are accompanied by species descriptions that are well illustrated with clear line drawings of both dorsal and lateral views of head scalation. In addition, many descriptions are augmented by one of the 97 color photographs that are found in the plates. Overall, the quality of the color photos is excellent and none are poor. Distribution maps are included with each species description. The volume ends with a one-page first-aid section, a bibliography of more than 135 references, most of which are post-1960, an illustrated glossary, and separate indices for English and scientific names.

This book fully accomplishes its goal of providing a tool with which an interested student can identify the snakes of Western Australia in a field setting or laboratory.

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Amphibians and Reptiles in West Virginia, by N. Bayard Green and Thomas K. Pauley. 1987. xi + 241 pp. University of Pittsburgh Press, Pittsburgh, PA 15260. $29.95 cloth $14.95 paper.

This is a small book, 18.7 x 11.5 cm, that would easily fit into one's daypack or fieldbag. In this respect, the book well serves its second stated purpose, "to provide a manual for naturalists and students who have no previous experience with amphibians and reptiles." The chapters on history, physiography and climatology, how to locate and photograph herps, and collecting and caring for them are very brief and written simplistically — my twelve year-old could understand most of the material in

these chapters. The illustrated keys to adult groups and tadpoles (but not salamander larvae) will identify the most commonly encountered variations in color and pattern; the uncommon variations will be difficult to identify. The species accounts, preceded by descriptions of class and order, are structured similarly with common and scientific names, etymology, description, habitat and habits, breeding, remarks, and range. Range maps are postage stamp in size, with a single dot for each county recorded. The color photographs of adults are arranged as a single set of plates. There is a list of species of special concern (all protected by state law), a glossary, and a bibliography.

The book's first stated purpose, "to place on record a summary of available information concerning distribution, habitat, and seasonal activities of various species" is achieved by just that — brief summaries of distribution, habitats, and breeding biology. The most important contribution of the book is the inclusion of original observations on most West Virginia species. Literature references maintain a common base of information presented among accounts.

Several criticisms need to be mentioned because they detract from the usefulness of this book. The price is the most detrimental problem; I'd hesitate to buy it for just that reason. It has been my experience that non-biologists often equate subspecies with species. Separate subspecies accounts, as found in this book, only reinforce the misunderstanding of that taxon. Little is gained by illustrating distributions with single dots in counties. Authors of state-level faunal books should plot actual location records, thereby allowing a more accurate appraisal of distributional patterns. Cross-checking the literature could have avoided errors such as incorrect etymologies for the genus *Ambystoma* (compare with Tihen 1969) and northern water snake (see Brown 1956). Although most of the color photographs are well done, several (e.g., *Plethodon wehrlei, Rana catesbeiana, Nerodia sipedon, Pseudemys rubriventris*) are washed out and on a faded white background. The red-bellied turtle is obviously dead. I found the use of both inches and metric conversions for ***every*** measurement cumbersome. Total length only is given for salamanders, lizards and snakes, carapace length only for turtles, and snout-vent length for frogs. Most herpetologists report snout-vent lengths for salamanders, lizards and snakes, and plastron length for turtles. There is a short section on Poisonous Snakes and Snakebite, but I couldn't find anything on the latter in it. The bibliography has ***three*** sections: general, literature cited, and works consulted. Finding a particular reference is made difficult by the inclusion of the last section. More attention should have been paid to citation consistence; some authors are listed with full names, others with initials. My overall impression is that this is the first field guide undertaken by this press and that the book was done somewhat hurriedly.

If naturalists and students (and professionals) can afford this book, then it will fill a long-standing void. It is a usable field guide and I highly recommend it to anyone working with the herpetology of West Virginia and the immediate region.

LITERATURE CITED

Brown, R.M. 1956 Composition of Scientific Words. Smithsonian Institution Press, Washington, DC

Tihen, J.A. 1969. *Ambystoma*. SSAR Cat. Amer. Amph. Rept.75:1-4.

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•

Vertebrate Animals of Alabama in Need of Special Attention, edited by Robert H. Mount. 1986. Alabama Agricultural Experiment Station, Auburn University, AL 36830. 124 pp., numerous figures, 102 photographs, softbound. $12.00.

It will be no surprise to biologists familiar with Mount's 1975 treatment of Alabama's amphibians and reptiles to learn that this volume is in the same tradition — a work of exceptional scholarship and quality. This handsome, softbound book represents the combined efforts of participants in a 1983 conference concerning Alabama's nongame wildlife. As Mount notes in the preface, the conference was one of the first steps taken in implementing Alabama's Nongame Wildlife Program. This volume reviews the biology of poorly known or imperiled Alabama vertebrates. In all, 18 fish, 18 amphibian, 26 reptile, 29 bird, and 15 mammal species or subspecies are considered.

Each animal is classified as being poorly known, of special concern, threatened, or endangered. For the poorly known species, insufficient information is available to permit classification, and Mount believes work on these animals should be among the top candidates for research funding. The threatened and endangered classifications follow the federal guidelines, and species of special concern are defined as those that need continued monitoring to assess population trends. Each species account is comprised of brief paragraphs under the following categories: other names, description, range, habitat, life history and ecology, basis for status classification, recommendations, and selected references. The author of each account is identified. Ten southeastern biologists wrote the 43 amphibian and reptile accounts; Mount wrote 11, D. Bruce Means wrote 8, Dale Jackson wrote reviews for five turtles, and the other seven authors each contributed four or fewer reviews.

Five species (the eastern indigo snake, *Drymarchon corais*, and four sea turtles, all federally listed as threatened or endangered) are considered endangered species in Alabama. The Atlantic hawksbill (*Eretmochelys imbricata*) occasionally occurs on the northern Gulf coast and should probably be added to Alabama's endangered species. Two frogs (Pine Barrens treefrog, *Hyla andersoni*, and the dusky gopher frog, *Rana areolata sevosa*), two salamanders (eastern hellbender, *Cryptobranchus alleganiensis*, and Red Hills salamander, *Phaeognathus hubrichti*), three snakes (southern hognose, *Heterodon simus*, black, *Pituophis melanoleucus lodingi*, and Florida, *P. m. mugitus*, pine snakes), and four turtles (Barbour's map, *Graptemys barbouri*, Alabama red-bellied, *Pseudemys alabamensis*, and flattened musk, *Sternotherus minor depressus*, turtles and the gopher tortoise, *Gopherus polyphemus*) are considered threatened in the state. The alligator, two salamanders, three snakes, and four turtles are considered worthy of special concern. The other eleven salamanders, the coal skink (*Eumeces anthracinus*) and five snakes are poorly known in Alabama. Since publication, the flattened musk and red-bellied turtles and the gopher tortoise have gained federal protection.

Except for the sea turtles, most of the amphibian and reptile species accounts are accompanied by a state and national range map. Generally, the ranges are similar to those in Mount's 1975 book, but the Alabama range of the American alligator (*Alligator mississippiensis*) is shown greatly reduced. It is obvious that efforts have been made to update the distribution knowledge of Alabama's herpetofauna. Since Mount's 1975 book, the Pine Barrens treefrog, the one-toed amphiuma (*Amphiuma pholeter*) and the Black Warrior waterdog (*Necturus* sp.) have been added to Alabama's fauna. In addition, the southern dusky salamander (*Desmognathus auriculatus*) is recognized as a valid species.

All fish, amphibian, reptile, and nearly all of the bird and mammal accounts are accompanied by color photographs. The amphibian and reptile photographs, from many sources, are of excellent quality. There are other good treatments of regional threatened and endangered species, for instance, the Florida series. But this book must certainly be counted as one of the best if not the best. I highly recommend this volume to all those interested in preserving the Earth's fauna.

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Les Gerrhosaurinae de Madagascar. Sauria (Cordylidae), by E. R. Brygoo. 1985. Mém. Muséum Nationale d'Histoire Nat. Paris. Sér. A, Tome 134. 65pp, 18 figs. Price 100F.

Twelve species and 2 subspecies of gerrhosaurine lizards, consisting of two endemic genera, are recognized from Madagascar and the neighboring isles. Each is described in detail, and its distribution indicated on outline maps. Drawings depict either the general topography of the animal and/or enlarged aspects of selected regions of the body essential for proper identification. In spite of the two endemic genera and the 12 species, there has been little diversification on Madagascar in contrast to the species of the same family in South Africa. A key to the species of *Zonosaurus* is provided, lectotypes have been selected for a number of other species, and a new subspecies described.

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Metamorphosis, edited by M. Balls and M. Bounes. 1985. 439 + xii, illus.Oxford Press, New York. $65.00.

This symposium, held in 1983 and actually published in 1986, updates the progress of research on the problems of metamorphosis. Temporal, environmental, and endocrine factors are all intricately interrelated, and it is the untangling of this web that occupies the forefront of investigations. Over half of the 21 contributions to this symposium (The British Society for Developmental Biology, Symposium 8) are concerned with amphibian metamorphic problems, mostly involving *Xenopus* and *Ambystoma*. The remainder deal with insects.

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Zoology in the Middle East. Vol. 1, edited by R. Kinzelbach and M. Kasparek. 1986. Published by M. Kasparek Verlag, Bleichstr. 1, 6900 Heidelberg, West Germany. Price DM65.

This new journal is introduced to supply an outlet for short contributions in "classical" zoology which normally are not accepted by traditional zoology periodicals, but which are of sufficient interest beyond local publications of limited distribution. "We are therefore trying to establish an international forum ... on morphology, zoogeography, faunistics, systematics, animal biology, and ecology, serving both orientals and occidentals. To keep a certain standard, the contributions are refereed. Frequency and volume of subsequent editions depend solely on the interest and participation of authors as well as readers."

This first issue contains seven articles on Reptilia and five on Amphibia.

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Snakes of the World, by Chris Mattison. 1986. 190 pp., 100 plates (59 in color plus color frontispiece), 14 figures, 12 maps, 6 tables. 9 1/2 x 6 1/4 x 3/4 inches. Facts on File Publications. $17.95.

Any introductory text about snakes (and herps in general) faces an immediate obstacle in the diversity of experience and education of its intended audience. The needs of a ten-year old with his or her first garter snake are different from those of a college student in a herpetology course or a self-trained but experienced amateur. **Snakes of the World** by Chris Mattison is an interesting summary of snake natural history and taxonomy, but it suffers from some defects of tone in its often self-conscious effort to remain an introduction.

The book consists of nine chapters: What are Snakes?; Size, Shape and Function; Colour and Markings; Reproduction; Foods and Eating; Defense; Ecology and Behaviour; Snakes and Man; and, Snake Families. The contents of these are self-explanatory. The author writes from an admirable ethological perspective, using modern concepts of animal behavior and population ecology to discuss the habits, behaviors and reproductive strategies of typical snakes. (I was pleased to discover no group selection arguments.) Lengths of snakes are given in both English and metric units.

In the first eight chapters, wherein the basic concepts about snakes are elucidated, the anecdotal approach of the bestiary is avoided. Chapter 9 occupies the last third of the book and gives detailed descriptions of the eleven snake families and their genera, with range maps and photographs of representative species. The photographs, many in color, are one of the strongest assets of the book, although they undoubtedly contribute to the relatively high cost considering its size. The information presented is neither too cursory nor too detailed for the average reader. In general, **Snakes of the World** is a satisfactory effort.

My chief complaint about this book, however, is the inconsistency of the author's tone. He has the annoying habit of putting words he thinks are strange or unduly colloquial in quotation marks. Representative examples are: "giant" snakes (p. 19), "tentacles" of *Erpeton tentaculum* and rattlesnake "rattle" (p. 38), "cashing in" (p. 53), snake "design" (p. 96), and, "trade-off" (p. 97). Others are more technical terms, perhaps unfamiliar to the amateur, like "lingual fossa" (p. 32), vertebral "processes" (p. 47) and "ecdysis" (p. 73). In these latter cases, the words are followed by their definitions. Unfortunately, many other equally technical and probably more unfamiliar terms are mentioned in passing, without definition, or are defined parenthetically. These are not put in quotes. Many texts thoughtfully employ quotes or italic or boldface type when introducing new terms; but this must be done consistently and without affectation. Drawing such attention to rattlesnake "rattles" and snake "design" is condescending, even if the latter is supposed to mark a teleological concept.

There are several other defects of varying severity. This book lacks a glossary, a serious oversight for an introductory text. Figure 11 (p. 45), a line drawing of the internal anatomy of a snake, is poor and confuses the reader on two counts: the dorsal view obscures some of the organs, and unless one colors in the drawing, the organ boundaries cannot easily be identified. Plate 39 (p. 62) is a self-proclaimed "simulated photograph" of a *Thamnophis sirtalis parietalis* breeding aggregate. This probably means that a bunch of garter snakes were dumped in a pile and photographed. Even though "this re-creation depicts authenticated facts" (as the closing credits of Wild Kingdom used to say), I would rather see the real article. The author's argument that the so-called Mertensian coral snake mimicry is actually deimatic coloration (p. 53) perhaps needs more justification than he has given. Lastly, only one typographical error was found in the entire text: the caption for Plate 26 (p. 51) has "suberbly" for "superbly."

Snakes of the World fills the need for an intelligent compromise between **The How and Why Wonder Book of Snakes** and **Herpetologica.** It may prove too expensive to use as a college text, and the occasionally condescending tone may put off older or more learned readers. The material is succinctly surveyed and the interpretations up-to-date. I am not strongly against this book, but I am not strongly for it either. Its best audience is probably the interested amateur, high-school age and older.

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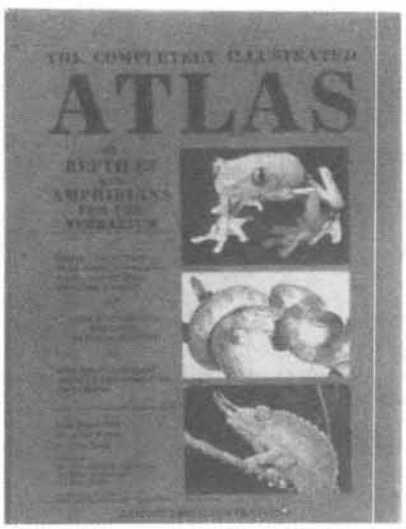
The Snakes of Australia, by Gerard Krefft. 1984 reprint of 1869 (publ. in Sydney) original. xxv + 100 pp, 12 color plates; clothbound. Price $55.00 Australian

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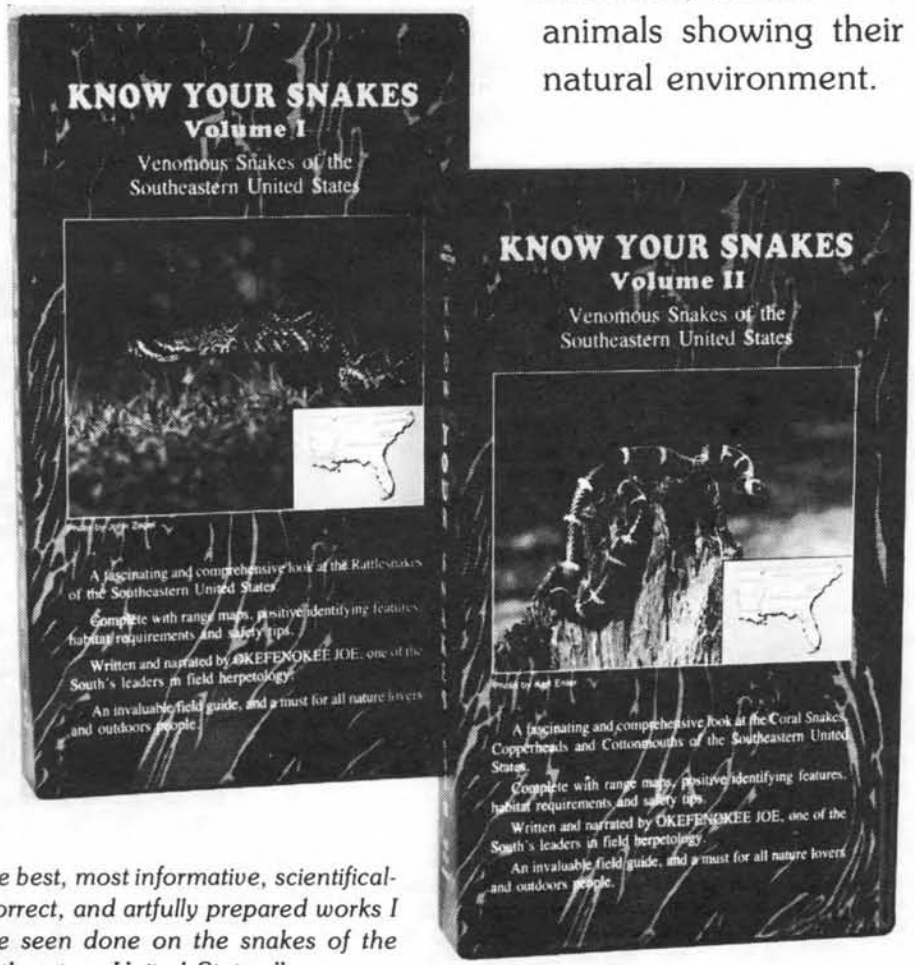
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(overseas). Published by Lookout Publications, GPO Box 1405, Brisbane, Queensland 4001, Australia.

This book was the first systematic review of Australia's popular snake fauna, and it covers all 82 species then known, including the 15 marine taxa. For each species, a synonymy and diagnosis are provided, together with descriptive and distributional information on specimens in The Australian Museum in Sydney, where Johann Ludwig Gerard Krefft (1830-1881), a German immigrant, was then curator. Many of the species are figured in the plates, although in most instances only the head is illustrated. Several of the plates depicting a whole animal are quite lifelike and real works of art. Krefft also went to considerable effort to categorize the various venomous species according to their degree of toxicity, through regular experimentation. In all, this is a useful review but with 160 species known as of 1983 it covers only half of Australia's snake fauna yet includes all of the most common or widespread species.

The original book was issued in an edition of 700 copies and only a few copies had colored plates. Understandably, an original is very costly today and a colored copy can bring in excess of $1000. Thus, this reprint fills an important need in making this historically important work available at a reasonable price. I recommend it.

It seems quite inappropriate to critique a book originally published 119 years ago, but a few technical comments on the reprint itself may be in order. In general the facsimile is faithful to the original. The color plates are fair reproductions, although the blues and especially the greens are not nearly as vibrant as in the original. Moreover, the book is printed on a paper having a rough surface that imitates the pattern of cloth. This presents no problem for the text, but it gives the illustrations a false sense of texture that almost resembles scutellation.

I do have one criticism, although some may see it as a quibble. To me, any book advertized as a facsimile ought to be exactly that, so that the user, without access to the original, can work with the reprint in full confidence that no changes have been made. If changes must be made, for technical or financial reasons, they ought to be noted explicitly in the reprint. In *The Snakes of Australia*, for example, all of the captions and numbering on the plates have been reset in type. True, those in the original book were somewhat crude, but in the resetting a few transcriptional errors were made, although in this instance they probably are not of any great importance.

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Gray's Monitor Lizard, by Walter Auffenberg. 1988. University of Florida Press, Gainesville, FL. xi + 419 pp. Hardbound. Price $39.00.

This is the remarkable story of a large lizard that for 130 years after its scientific description was known from just three specimens, only one with adequate locality data. In 1976, Walter Auffenberg rediscovered Gray's monitor (*Varanus olivaceus*) in southern Luzon, Philippine Islands, and this book summarizes his seven years of field and laboratory observations. Not often can one person write virtually all that is known of an animal and do it so well.

Gray's monitor inhabits limestone hills with numerous deep crevices and mixed dipterocarp forest at elevations below 500 m. Telemetry indicates the lizards move from the crevices into the trees and are difficult to observe. Its range is confined to seven provinces in southern Luzon and nearby Catanduanes Island, but some localities are within an hour drive from Manila.

Gray's monitor is unique among varanids in that it feed largely on fallen fruit of about a dozen species of trees and has a significant role in dispersing the seeds of some of them. Land snails (largely one species) and hermit crabs are the only other major items of diet. Although it eluded scientists for well over a century, this monitor is well known to inhabitants of the region where it lives, and they eat it regularly. However, the greatest threat it faces is deforestation which destroys both its refuge and its food supply.

These are but a few of the facts gleaned from Auffenberg's book which is a tribute to the author's talents as a herpetologist, ecologist, and all around naturalist. Ten chapters are devoted to the lizard's ecology and life history, all based on the author's research. There are numerous comparisons with other Asian varanids and, in some cases, with other large lizards. Many come from the authors well known studies of the Komodo dragon (*Varanus komodoensis*). I found sections dealing with food, feeding, and interactions with other animals in its habitat specially interesting; those on reproduction and related behavior rather less so. Other chapters are devoted to methodology, morphology, systematics, and conservation. The last contains some cogent comments on problems facing those trying to protect the native biota of overpopulated and economically distressed nations.

The list of literature references is long and covers topics as diverse as tick-host specificity, Tertiary geology of the Philippines, and seed shape as a factor in gut retention. There are numerous good quality drawings and maps; the few photos are not exceptional. Appendices contain annotated lists of plants, birds, and mammals mentioned in the text.

Although in all respects a scientific treatise, this is also quite a readable book. Any biologist contemplating study of vertebrates in a tropical forest setting should find this a most helpful and stimulating book and a model for reporting research results. Except for some whose interests are very narrowly focussed, herpetologists will find it engrossing and useful. One can hope others will do as well with their favorite animals.

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The Biology of Australasian Frogs and Reptiles, edited by Gordon Grigg, Richard Shine, and Harry Ehmann. 1985. Surrey Beatty & Sons, 43 Rickard Road, Chipping Norton, NSW 2170, Australia. xvi + 527 pp. $ Aus65.00, $ US59.00.

Herpetology is very much alive in the antipodes. This large and attractive book is a compilation of 63 papers presented at the Australasian Herpetological Conference in August, 1984. Participants came from several nations, but most of the papers are by workers in Australia or New Zealand. Following Ron Strahan's witty opening remarks and Carl Gans' keynote address, "In Praise of Diversity," the papers are grouped in seven subdivisions: Population Ecology, Ecological Biogeography, Reproductive Biology, Phylogeny of Elapid Snakes, Rare and Endangered Species, Husbandry and Snakebite. It is a tribute to the authors and editors that there are really no mediocre papers. With the wide selection offered, only the herpetologist whose interests are highly specialized or narrowly provincial will fail to find something that gets his attention. However, not all herptile groups get adequate treatment. The comparatively rich typhlopoid snake fauna of Australasia is barely mentioned. The pygopodids, Australia's only unique reptile family, are mentioned only with reference to certain endangered and rare species, and the pythons and varanids do not fare much better. Scientific nomenclature generally follows the **Zoological Catalogue of Australia** (Cogger, Cameron and Cogger, 1983) but be advised that the little frogs known as *Ranidella* to Watson and Littlejohn are once again *Crinia* to Roberts and Maxson.

It is obviously not possible to evaluate or even mention more than a few of the contributions, and my selections reflect personal bias. The 12 papers on Australasian elapid snakes include history (Cogger), external morphology (Storr), Chromosomes (Mengden), and amino acid sequences of enzymes and neurotoxins (Tamiya). All basically agree that

antipodean proteroglyphs, including sea snakes, comprise a reasonably homogeneous group quite distinct from the proteroglyphs of Africa, Asia, and America. Within Australasia, however, the number of lineages that can be recognized remains debatable.

This may well be the most current source of information on the biology of the New Zealand herpetofauna. Seven papers are devoted to that nation's unique frogs, lizards, and tuatara. J. H. Gibbons provides a good overview of Pacific island herptile biogeography with special emphasis on Fiji species.

Australia's frogs present some interesting puzzles. Leptodactylids show no less than eight reproductive patterns including that of *Assa darlingtoni* in which eyeless tadpoles find their way to the male's brood pouches, *Philoris frosti* with a free-living but non-feeding tadpole stage, and the unique gastric brooding of *Rheobatrachus silus*. The latter species also presents a cautionary tale for conservationists. At the time of its discovery in 1973, it was reported as abundant; since 1980, no specimens have been seen in the field and the last captive has died. It was protected almost from the time of its discovery, and reasons for its disappearance are a mystery. Meanwhile a new gastric-brooding *Rheobatrachus* has been discovered! Some species of the Australian herpetofauna clearly require protection, however Ehmann and Cogger are quite critical of current legislation and policies that discourage research and alienate amateur herpetologists.

The publishers have spared no effort to make this an elegant book. There are 12 color plates, all excellent, and numerous half-tones, maps, and other graphics. It is also an expensive book but worth the money. Any herpetologist going for the first time to the South Pacific is strongly advised to peruse it. For those who have been there, it will revive memories, while those who live there can point to it with pride.

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Handbook of Animal Diversity. Blackwelder, R.E. and G. S. Garoian 1986. CRC Press Inc, Boca Raton, FL. (5) +555 pp., figs, tabs. $165. (outside of US $190).

The preface to this book notes that it "summarizes the entire Kingdom Animalia." Its major sections deal with reproduction, development, structure of the adults, behavior, coloniality, death and classification (down to class level). The plan is fine, but the utility of the book is mainly to specialists who will be reminded of a diversity of topics that might not immediately jump to mind without suffering from the excessive omissions and errors. Furthermore, the treatment includes redefinition of many terms. The very scope suggests the unfortunate fact that no two zoologists could possibly have carried out this task because human limitations will inevitably make any treatment outdated.

Hence this volume is disappointing; indeed, one wonders what the publisher meant to achieve by pricing it at this level and not noting that there are almost no references past the 1970s, and most of the texts are referred to by editions a decade or more out of date. (Whatever personal judgment, it might have been nice to mention cladistics.) Diversity remains an issue of concern to all of us as teachers and as researchers. There is clear merit to having a single volume summary and perhaps a two-person judgment on standardization of terminology. However, such treatment, at the least, requires review of the manuscript by specialists (none such are acknowledged).

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Looking At Vertebrates: A Practical Guide to Vertebrate Adaptation, by Elizabeth Rogers. 1986. Longman. Distributed by John Wiley & Sons. xi + 195 pages. Photographs and sketches, cloth. $24.95.

This attractive book is apparently a hard-bound teaching manual, intended to provide a laboratory companion to the study of vertebrate biology. It was produced in the U.K. and has not been modified for the U.S. market, accounting for the usage mainly of European species. The book requires demonstration materials on monotremes but not on lungfishes or *Polypterus*, even though these animals might be much more easy to obtain. (Fishes are lumped together and several "designs" are contrasted; this causes one to dissect teleosts and elasmobranchs in parallel.) The approach is one of allowing the examination of numerous species, some as demonstrations and some as hands-on dissection material. Utilization of supplementary forms, such as road kills and commercially obtained specimens, is repeatedly suggested as keeping to a minimum the number of animals that need to be killed. For each group of organisms, pictures and general comments are followed by specific details organized by features. The text is written in the Socratic fashion, asking questions which are either answered immediately or referred to again on subsequent pages.

The basic idea is good, and this may be the sort of nook that a teacher of comparative anatomy may wish to have available in order to extract ideas selectively. However, the treatment is insufficient in that there are numerous errors and approaches which should not be presented unfiltered to undergraduates. Most important is a rather typological approach, for instance "the frog" is assumed to be typical for all frogs, and all salamanders are assumed to have four limbs. Even when there are allusions to interspecific differences, their nature is often left unclear. An even more critical item is the emphasis on adaptation as the exclusive source of diversity.

The material is organized in strictly classificatory scheme, but not even lip service is given to phylogenetic and developmental influences. Also, there are substantial small mistakes, explicit or by implication, such as that the larva of amphioxus has an atrial pore (a photo shows an arrow although the larva lacks an atrium), that the blastopore forms the anus, that *Branchiostoma* has a head, that gill ventilation in lampreys has a ciliary component, and that the integumentary water barrier of reptiles is proportional to the thickness of the keratin layer.

The approach of the volume is pleasant, but the text requires substantial modification to make it acceptable.

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Zoological Bibliography of Turkey: Pisces, Amphibia, Reptilia, by Ibrahim Baran, Brian Coad, Mustafa Kuru. 1986. Published and Edited by Max Kasparek, Heidelberg, F. R. Germany. No price stated.

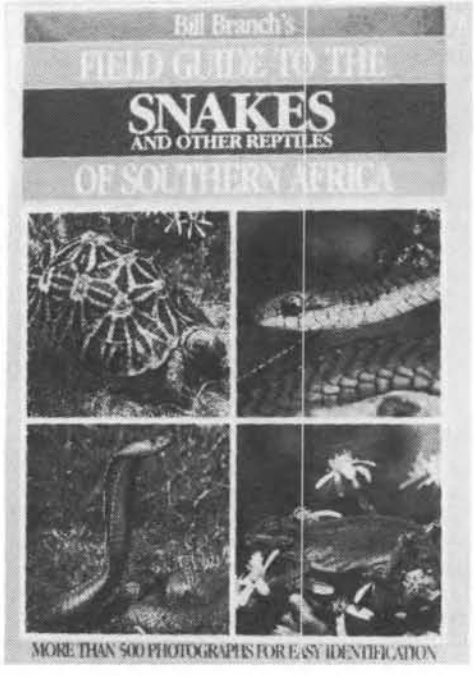
This bibliography will be extremely useful to the taxonomists and zoogeographers since it fills a major gap found in other similar publications. The land of Turkey can be classified either as part of Europe of part of various subdivisions of Asia, hence most reviews of the zoological literature of Turkey are inadequate. The fishes are listed separately (753 references) and the list includes an appendix of 11 papers on fossil fish. The reptiles and amphibians are listed together. This list is subdivided into 428 references specific to Turkey and 100 references specific to neighboring areas.

Concerning the herpetological references, this bibliography appears to be thorough, unlike other recent publications claiming to provide reference lists, for example, Welch's **Herpetology of Europe and Southwest Asia.** Welch included almost none of the many dozens of Turkish publications which are listed in the reviewed bibliography. Also, the authors have done an excellent job scanning the literature of the Soviet Union journals.

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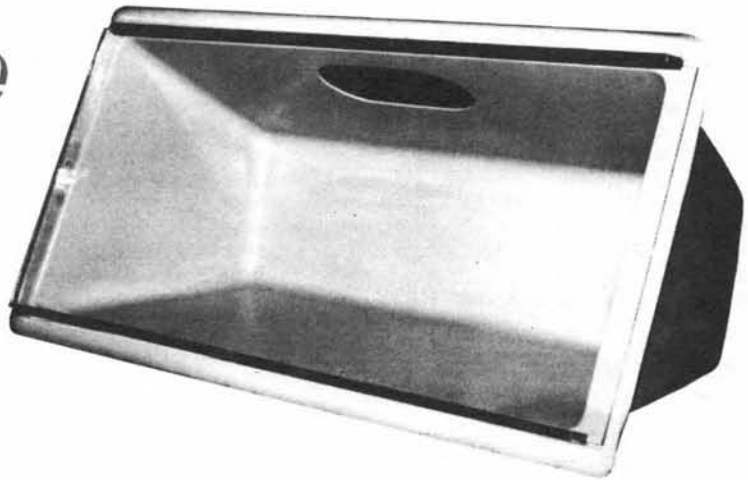
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Although the individual species contributions and their authors have been cited, the **Handbuch der Reptilien und Amphibien Europas**, edited by Wolfgang Böhme, should have been both cited and mentioned in the preface. This excellent encyclopedic series, which completely includes Turkey, had already covered all lizard families and genera (except *Lacerta* and *Podarcis*) in Volume 1 (1981) and *Lacerta* in Volume 2 (1984), within the time framework to have been included in the current bibliography. Volume 3, *Podarcis*, was published in 1986, and the remaining volumes on snakes, turtles, salamanders and frogs are being prepared. Böhme's Handbuch is exceptional in that it thoroughly treats the Turkish literature.

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Neotropical Ornithology. American Ornithologists' Union, Ornithological Monographs No. 36, 1985. xii + 1041 pp + 8 color plates, cloth bound. Obtainable from Frank R. Moore, Department of Biology, University of Southern Mississippi, Southern Station Box 5018, Hattiesburg, Mississippi 39406, USA. $70.

It may seem out of place to review an ornithological publication in *Herpetological Review*, but there are several papers in this well-produced volume that are pertinent to herpetologists, especially those persons working in the neotropics. This volume, edited by P.A. Buckley, Mercedes S. Foster, Eugene S. Morton, Robert S. Ridgely, and Francine G. Buckley, contains 63 papers. Except for an introduction by Thomas R. Howell and a final overview by Kenneth C. Parkes, the papers are grouped into sections — new taxa (5), zoogeography and distribution (11), systematics (9), evolution (10), community and population ecology (8), breeding biology (3), and conservation (5).

The papers that will be of major interest to herpetologists are in the sections on zoogeography, evolution, and ecology. Joel Cracraft provides a historical overview of the neotropical avifauna with emphasis on areas of endemism. Jurgen Haffer presents a thorough discussion of avian zoogeography of the neotropical lowlands with emphasis on climatic-vegetational changes in the late Tertiary and Holocene. These two papers provide an excellent review of the biogeography of the neotropical avifauna. More specific zoogeographic studies of interest to herpetologists include Helmut Sick's evidence for Andean-Patagonian elements in the avifauna of southeastern Brazil and Francois Vuilleumier's biogeographical analysis of the avifauna of the Patagonian forests.

Other papers of interest include P.R. Grant's discussion of the influence of climatic fluctuations in the Galapagos Islands on Darwin's finches and Lester L. Short's comparison of neotropical and African radiations of barbets and woodpeckers. The effects of habitat alteration on species composition and abundances are presented effectively in two papers — Stephen L. Hilty's work on Colombia and John H. Rappole and Eugene S. Morton's study in southern Veracruz, Mexico.

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RECENT PUBLICATIONS RECEIVED

Pelycosauria. Reisz, R. R. 1986. Handbuch der Paläoherpetologie 17A 102pp, 43 figs. In English. Gustav Fischer Verlag, Stuttgart, New York.

A comprehensive review and update of an important and interesting order of primitive reptiles.

Catalogue of the Neotropical Squamata. 1986. Part 1 Snakes, by J. A. Peters and R. Donoso-Barrios (347 pp), Part 2 Lizards and Amphisbaenians by J. A. Peters and B. Orejas-Miranda (293 pp) both with new material by V. E. Vanzolini. Price $29.95. Smithsonian Institution Press, 955 L'Enfant Plaza, Suite 2100, Washington, D.C. 20560.

Originally published in 1970, this new version includes revisions, additions and other changes from 1969 to 1984. Indispensable to herpetologists working with neotropical material.

Proceedings of the 1985 Workshop on Care and Maintenance of Natural History Collections, edited by J. Waddington and D. M. Rudkin. Life Sciences Miscellaneous Publications of the Royal Ontario Museum, 100 Queen's Park, Toronto M5S 2C6, Ontario, Canada.

A bit of something for everybody involved in museum curatorial work.

Manual of Exotic Pets - Revised Edition 1985. Edited by J. E. Cooper, M. F. Hutchinson, O. F. Jackson & R. J. Maurice. Published by British Small Animal Veterinary Association, 5 St. Georges Terrace, Cheltenham, Glos. GL50 3PT, England. 224 pp., illustrated and indexed. £15.75 (includes postage).

The Manual of Exotic Pets fills the needs of professionals and amateurs alike. It is well written and readable by people of all levels of expertise from hobbyists to veterinarians. The current state of the art is described in considerable detail in 25 chapters written by more than 20 contributors.

The book is divided into four main sections which deal with Mammals, Birds, Reptiles and Miscellaneous. The last category has chapters on Amphibians, Ornamental Fish, Invertebrates and Legislation. One gets the feeling that this book was written for Europeans, especially British readers, since it goes into such detail about their laws. Still, there is much to be learned about the care and treatment of exotic animals which readers on both sides of the Atlantic will enjoy and benefit from.

The section on Reptiles has separate chapters on Chelonians, Crocodiles, Lizards and Snakes. Each of them deals with Anatomy, Housing, Feeding, Handling, Sexing, Reproduction, Diseases (including parasites and nutritional disorders) plus details on Anesthesia and Surgery. There is also an Addendum on Anesthesia, Chemotherapy, Hematology and Blood Chemistry for Lizards and Snakes. It lists all of the different antibiotics and other drugs and their correct doses.

The authors of the chapter on Chelonians explain that the words tortoise, turtle and terrapin vary according to whether one is talking to a British, American or Australian herpetologist! To the British the terrestrial chelonian is a tortoise, a freshwater chelonian a terrapin and a marine chelonian a turtle. Australians call some terrapins tortoises while to the Americans everything is a turtle! After such a splendid beginning they lapse into terms of reference which are unfortunately parochial. Newly hatched chelonians, they say, are as big as a 50p piece, hardly an adequate term of reference for the non-British reader. I was impressed, however, by the extensive bibliography which follows each chapter and which is more international in scope than the above.

The section on Amphibians is concise and informative. After general considerations the author describes suitable housing, feeding, handling, and behavior and goes into sexing and reproduction. Under diseases and clinical conditions there are references to bacterial, viral, fungal and parasitic diseases and traumatic injuries. There are also suggestions for treatment. Considerable detail is given to management, drug administration, anesthesia, etc., complete with dosages, plus techniques for euthanasia and a small section on surgery.

The book is well illustrated throughout and includes tables, diagrams, photographs and even radiographs of animals like toads and lion fish!

There are other chapters on Chinchillas, Chipmunks, Gerbils, Guinea Pigs, Hamsters, Hedgehogs, Rabbits, Rats and Mice, Deer, Ferrets, Primates and Birds. All in all, if you or your family are into strange pets, or you are a practicing veterinarian, I believe that it is a worthwhile book to have on your library shelf.

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HERPETOLOGICAL REVIEW EDITORIAL POLICY

The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology, and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations and photographs. Manuscripts submitted must be typed, double spaced, on 8.5X11 inch paper, and should be sent in duplicate. We encourage submissions on Macintosh disks, though we can also work with TEXT files submitted on IBM and compatible floppies. **Herpetological Review** is composed on a Macintosh SE using Microsoft Word, which accepts files from several other word processor applications. Format your documents full-page width; we will fit to **HR** format.

Unpublished photographs of an unusual nature or of uncommon amphibians or reptiles may also be submitted. These should be 8X10 inches black and white, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled lightly on the back of each print. Return of unsolicited photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs solicited by the Editor will be returned at our cost.

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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (four issues per year), **Herpetological Review** (four issues per year), and occasional issues of **Facsimile Reprints in Herpetology.** Members may purchase other Society publications at reduced rates.

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Herpetological Review

Volume 19 December 1988 Number 4

SSAR BUSINESS

31st ANNUAL MEETING HELD AT UNIVERSITY OF MICHIGAN

The 1988 Annual Meeting of the Society for the Study of Amphibians and Reptiles was held jointly with the Herpetologists' League, American Society of Ichthyologists and Herpetologists, the American Elasmobranch Society, and Early Life History Section of American Fisheries Society. Local Committee Chair Gerald R. Smith hosted a large meeting of herpetologists and ichthyologists from many countries on the historic campus of the University of Michigan in Ann Arbor in celebration of the 75th anniversary of *Copeia*.

Board of Directors' Meeting

The annual meeting of the SSAR Board of Directors was held on 24 June under the chairmanship of Society President Hugh R. Quinn. All Board members and most editors were present plus many committee chairs and other SSAR members. The Board met for approximately 6.5 hours and reviewed annual reports submitted by all officers, editors, committee chairs and coordinators. The appointment of Robert D. Aldridge to the position of Publications Secretary was approved by the Board. Decisions of the Board were announced at the annual business meeting of the Society and are described in the following section.

Business Meeting

A. Call to Order

President Hugh Quinn convened the 1988 business meeting of the Society for the Study of Amphibians and Reptiles at 1806 h on 26 June in the Vandenberg Room of the Michigan League on the campus of the University of Michigan.

B. President's Report

President Quinn welcomed the assembled members and announced that the Society's financial outlook has improved significantly over the past year. He noted that *Journal of Herpetology* Editor Rodolfo Ruibal has submitted his resignation effective September 1988 and a search is being conducted for his replacement. *Herpetological Review* Editor Martin Rosenberg notified the SSAR Board of Directors that he will be resigning at the end of 1989. Kraig Adler, Editor of *Contributions to Herpetology*, also informed the Board of his intent to resign after publication of the Gloyd and Conant monograph "Snakes of the *Agkistrodon* Complex" in 1989. A search has begun to replace these long-serving editors. President Quinn asked that those interested in the positions contact him at their earliest convenience.

The use of desktop publishing by the Society was reviewed by President Quinn. He noted that the soon-to-be-published index to the Geographic Distribution Section of *Herpetological Review*, 13 pages in the March 1988 issue of *Herpetological Review*, SSAR letterhead, and this year's accounts for the *Catalogue of American Amphibians and Reptiles* were prepared using desktop publishing techniques. Considerable financial savings (40-50%) have resulted from these changes.

President Quinn noted that the 1989 meeting of Society for the Study of Amphibians and Reptiles will be held in conjunction with the World Congress of Herpetology during 11-19 September at the University of Kent in Canterbury, United Kingdom. He encouraged members planning on attending the World Congress to get air travel quotes from both of the official travel agents for World Congress, EcoSafaris and Holbrook Travel.

C. Treasurer's Report

Treasurer Doug Taylor announced that the Society is financially sound but noted that membership has plateaued since 1984. SSAR membership has fluctuated between 2,243 and 2,322 since that time. As the result of inflation, our budget has not been able to increase due to increased expenses. Taylor estimated expenses for 1988 to be $96,764 with an estimated income of $96,959, leaving a balance of $195. He noted that $9,000 was placed in an investment fund last year as a result of income received from the life membership program. These and other investments are being managed by James Christiansen, Chair of the Long-range Planning Committee.

Taylor announced that the Board of Directors approved the appointment of a Membership Secretary who will be responsible for a marketing campaign for next year. The Treasurer noted that Society book sales have been and continue to be a major source of revenue. We, however, still have a limited number of pages which can be published in the *Journal of Herpetology* and *Herpetological Review* with our current budget structure. As a result, it has become necessary to increase dues as follows:

Student Member	$25
Regular Member	$35
Sustaining Member	$50
Contributing Member	$75
U.S. Institutions	$60
Non-U.S. Institutions	$65
Life Member	$600

Life membership dues can be paid in three consecutive annual installments of $200. Other dues can be prepaid for up to three years. These increases will permit the dues structure to be maintained for some time.

D. Committee Reports

1. Kennedy Award

The Kennedy Award is given to the author of the best student paper published each year in the *Journal of Herpetology*. President Quinn announced that Charles C. Peterson of the Department of Biology at the University of California in Los Angeles received the 1988 award for his paper entitled "Thermal relations of hibernating painted turtles, *Chrysemys picta*" (*J. Herp.* 21:16-20).

2. Grants-in-Herpetology

Grants-in-Herpetology Committee member Dale Belcher announced that 16 proposals were received in the graduate student category and two were submitted in the conservation research area. No proposals were received in either the zoo or regional society categories. The committee recommended and the Board approved the award of grants to the following proposals for 1988: **Graduate Student Research in Herpetology:** Marion Preest, Section of Ecology and Systematics, Cornell University, Ithaca, New York, "Metabolic costs of feeding by the lizard *Scincella lateralis*," and Lyndon Ruhnke, School of Biological Sciences, University of Nebraska, Lincoln, Nebraska, "Hybridization of the leopard frogs *Rana pipiens* and *Rana blairi*." **Herpetologically Oriented Conservation:** Dawn S. Wilson, Biology Department, University of South

Florida, Tampa, Florida, "Activity patterns, home range size, and burrow usage of juvenile gopher tortoises (*Gopherus polyphemus*)."

3. Nominating Committee
President Quinn announced the following board-approved slate of candidates were presented by the Nominating Committee: **President Elect:** William S. Brown and Tom R. Johnson. **Director (representing general membership):** James L. Christiansen and Arthur C. Echternacht. **Director (representing zoo and aquaria membership):** Dale Belcher and Donal Boyer. Quinn asked for nominations from the floor for each of these positions. There being none, nominations were closed. The ballot will be mailed to SSAR members via first-class mail during the fall. The deadline for submission of ballots will be 15 December 1988.

4. Resolutions
President Quinn presented the following resolution of thanks prepared by Resolutions Committee Chair George Pisani:

Whereas, the following persons have devoted many hours to advancing the goals of the Society for the Study of Amphibians and Reptiles; and,
Whereas, several of these people have an especially long and distinguished record of service to the Society; and,
Whereas, the Society is most appreciative for the help and guidance received from all these persons; therefore,
Be it resolved that the Society for the Study of Amphibians and Reptiles express sincere thanks to the following persons who relinquished positions at the close of 1987:

Norman J. Scott, Jr. ..... President
Sherman Minton .... Immediate Past President
Henri C. Seibert ..... Treasurer
Douglas H. Taylor ..... Publications Secretary
John L. Behler ..... Director
Harold A. Dundee ..... Director
Kraig Adler .... Chair of Nominating Committee
William S. Brown ..... Chair of Conservation Committee

E. Other Business
President Quinn asked if there was any old business to be discussed. There being none, Quinn asked if anyone had new business to present. Vic Hutchison announced that Holbrook Travel has offered to provide eight half-rate fares or four full-rate fares to support student travel to the World Congress for each 100 regular airline tickets booked through the firm.

F. Transfer of Gavel and Adjournment
President Quinn asked President Elect Henri Seibert to come forward. Quinn, in keeping with the tradition of SSAR, transferred the historic SSAR gavel to Seibert. The President-elect noted that he accepted the gavel with a great deal of pride and acknowledged the honor which was being bestowed on him. He announced that his term as President does not begin until 1 January 1989 and that he expects all problems to be solved and all positions to be filled so he can have a peaceful year. He expressed his hopes to see everyone in Kent next year at the World Congress. Seibert declared the meeting adjourned at 1925 h.

Respectfully submitted,
James S. Jacob
SSAR Secretary ●

SSAR NEEDS MAC-TYPISTS

Our earlier search (see the June issue of *HR*) for a desktop publishing managing editor brought forth several volunteers, one of whom was selected to direct *HR's* transition to this new technology. We are now in need of volunteers to input raw copy from manuscripts (mailed to them by the managing editor) onto their own Macintosh computer (MacPlus with either MacWrite or Microsoft Word 3.01). Since each volunteer would be expected to input several articles over the course of a year, the time commitment will be only several hours per month. The discs would then be sent to the managing editor for formatting and final printing.

Interested? Please contact the editor by mail or telephone (216-368-3558). ●

IN MEMORIAM

NORMAN BAYARD GREEN (1905-1988)

Norman Bayard Green, known as "Bike" to friends, died in Huntington, West Virginia, on 23 May after a long period of declining health. Bike was an acclaimed herpetologist, a steadfast member of the Society for the Study of Amphibians and Reptiles (SSAR) and best known for his studies of the reptiles and amphibians of West Virginia. He was SSAR's second president (then called chairman) 1968-69 and served as Publications Secretary for American Society of Ichthyologists and Herpetologists 1952-64.

Born 15 November 1905 in Bloomington, Maryland, N. Bayard Green received his B.S. degree (Cum Laude) from Davis and Elkins College in 1926 and his M.S. degree from West Virginia University in 1931. He taught at Elkins (WV) High School 1926-38 after which he joined the faculty at Marshall University (then Marshall College). Bayard resumed graduate work at The Ohio State University where he studied under Charles F. Walker, completing a Ph.D degree in 1952 with a dissertation on life history of *Pseudacris brachyphona*. He continued on the Marshall faculty where he headed the zoology department until 1965, served as dean in 1968, and retired in 1971. Bayard authored more than

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forty scientific publications on amphibians and reptiles and recently (1988) co-authored with his former student, Thomas K. Pauley, a field guide to the "Amphibians and Reptiles of West Virginia" (241 pp). Over a period of 30 years he compiled and curated the largest herpetological collection for the State of West Virginia.

Although I joined the Marshall faculty three years after Bike had retired, he maintained such an active interest in herpetology that I soon came to know him as well as my teaching colleagues. In spite of the 40 years that separated our ages, we developed a close friendship. Bike's reputation as an outstanding teacher became very obvious to me from numerous comments from faculty and former students. Up until his health failed, he often presented lectures filled with anecdotes on Appalachian herpetology to community groups. These presentations always reflected a remarkably broad knowledge of natural history and a devotion to conservation.

Perhaps Bayard Green's most outstanding quality was his sincere generosity. When I arrived at Marshall, as a stranger to the Appalachian region, I was struck by his enthusiasm to share his wealth of information on West Virginia herpetology and his personal library, which included much unpublished work. There was never a trace of guarded or protective attitude which sometimes develops in herpetologists after years of "niche" competition. Typical of his intellectual curiosity and quiet confidence, in conversation Bike was likely to ask as many questions as he answered. Thanks to his expertise, my knowledge of Appalachian amphibians and reptiles grew quickly.

As Bike and I attended annual SSAR meetings together (1976-1981), I became acquainted with some of his friends and fellow officers of SSAR. Several of these individuals later confided to me that the SSAR may not have survived its tumultuous transformation from the Ohio Herpetological Society (OHS) had it not been for Bike's leadership and ability to make some very difficult and unpublicized decisions at a critical time. His devotion to the Society for the Study of Amphibians and Reptiles began in its early OHS phase in 1962. Few would ever know the significance of his real contributions to the society due to his quiet and modest nature. Many of us have lost a good friend and the herpetological community has lost a true professional.

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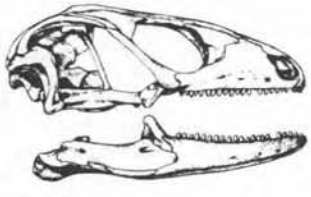
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The Edumund Niles Huyck Preserve and Biological Research Station announces the 1989-90 competition for research grants (max = $3,500) for biological research for investigations that utilize the resources of the Preserve. The 2000 acre Preserve is located in a hanging valley on the Helderberg Plateau, in the towns of Rensselaerville and Berne, 30 miles southwest of Albany, N.Y. Habitats include northeast hardwood-hemlock forests, conifer plantations, old fields, permanent and intermittent streams, 10 and 100 acre lakes and a 150 ft waterfall. Facilities include a wet and dry lab, small library, and six houses/cabins for researchers. Deadline = 1 February 1989. Application material may be obtained from Dr. Richard L. Wyman, Director and Resident Biologist, E.N. Huyck Preserve and Biological Research Station, P.O. Box 188, Rensselaerville, NY 12147, (518) 797-3440. ●

SPANISH HERPETOLOGICAL ASSOCIATION

The Asociación Herpetológica Española (Spanish Herpetological Association) was founded in 1984 with the goals of study and conservation of Spanish amphibians and reptiles. The headquarters of the Association is the National Museum of Natural Sciences, Madrid. Since 1986 the Association has published the journal *Revista Española de Herpetología*, which is oriented toward studies of Mediterranean region herpetology. The Association holds an annual meeting with scientific paper and poster presentations; the fourth annual meeting will be in Madrid in December, 1989.

Annual dues (which includes subscription to the journal) are $28.00 US (individuals and institutions). Back issues of *Revista Española de Herpetología* (Volume 1, 1986; Vol. 2, 1987; Vol. 3, 1988) are available for $28.00 US per volume. Membership dues and orders for back issues (payment in US Dollars) can be sent to C. J. McCoy, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Ave., Pittsburgh, PA 15213. ●



Phylogenetic Relationships of the Lizard Families

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Those interested in the study, breeding, or conservation of reptiles or amphibians can meet others on-line, ask questions, compare research, discuss the current literature, and exchange files. It is a great way to learn what others are doing in the field of herpetology.

Although currently in full operation as a messaging system, Herp-Net would still like to gather as much information as possible to provide a national resource of herpetological information. This would include an up-to-date listing of all local herp groups in North America, timely news and information, as well as the full text of newsletters from as many local groups as possible.

For more information or submission of news, please write to the Herpetology On-Line Network, P.O. Box 52261, Philadelphia, PA 19115, USA. ●

WISCONSIN HERPETOLOGICAL WORKING GROUP

The Wisconsin Herpetological Working Group, established in 1986, is an association of Wisconsin herpetologists, biologists, and naturalists that advises the Wisconsin Department of Natural Resources on conservation issues, research and management priorities, and proposed regulations. It also seeks to educate the general public about amphibians and reptiles and to provide members with information about current research activity within the state. Meetings have been held semi-annually. Further information may be obtained from chairperson David Ross, Wisconsin River Power Company, P.O. Box 50, Wisconsin Rapids, Wisconsin 54494. ●

BIOLOGY OF PLETHODONTID SALAMANDERS

Dr. Stephen G. Tilley of Smith College will teach a course on "Biology of Plethodontid Salamanders" at the Highlands Biological Station during the period 10 July-4 August 1989. The course will include lectures, laboratories, and field studies emphasizing systematics, ecology, and evolution of plethodontids. Credit (5 semester hours) is available through either the University of North Carolina at Chapel Hill or Western Carolina University. The course may be taken without credit. For further information and application forms write: Highlands Biological Station, P.O. Box 580, Highlands, NC 28741, USA. ●

IGUANA MANAGEMENT PROJECT

The Iguana Management Project, with previous headquarters in Panama, has been relocated to Costa Rica, effective October 1988. The Project is now administered by the Pro Iguana Verde Foundation. The core research area is located in the Wildlife Refuge La Avellana (near Orotina) in the buffer zone of Biological Reserve Carara. The office in Costa Rica is located in Heredia.

The Pro Iguana Verde Foundation will continue its activities in Panama as they relate to the projects initiated in Cabuya de Anton, Chupampa and Llano Grande de Ocu. The Costa Rican mailing address is: Fundacion Pro Iguana Verde, Apartado 1501, Heredia, Costa Rica. Tel. (506)37-1027.

DAGMAR I. WERNER
President, F.P.I.V. ●

VOLUNTEER PROGRAM AT AMNH SOUTHWESTERN RESEARCH STATION

Approximately 20 volunteer positions are open in 1989 at the Southwestern Research Station of the American Museum of Natural History in Portal, Arizona. The volunteer program is run annually and offers students in the biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging at the Station are provided to volunteers in exchange for four hours per day of routine work chores, with the remaining time available for research activities.

Volunteers are needed between 10 March and 1 December and are appointed for part of this period, with a minimum appointment of six weeks. Faculty knowing of promising students should alert them to this opportunity for professional experience toward, development of, and evaluation of their career goals.

Applicants for positions from March through May should submit forms by 15 February, summer volunteers, June through September, by 1 April. The program is open to both undergraduate and graduate students, who may pursue their own research projects.

For application forms, write: Resident Director, Southwestern Research Station of The American Museum of Natural History. Portal, Arizona 85632, USA. (602) 558-2396. ●

ALBERT SCHWARTZ HERPETOLOGICAL COLLECTION

Schwartz's extensive collection of amphibians and reptiles from the West Indies has been deposited in the Museum of Natural History, The University of Kansas, Lawrence, Kansas 66045-2454. As the collection is catalogued and integrated into the museum's collection, specimens will be available for study and loan. ●

MEETINGS

SYMPOSIUM ON VERTEBRATE BIOGEOGRAPHY AND SYSTEMATICS

The Zoologisches Forschungsinstitut and Museum Alexander Koenig will host the International Symposium on Vertebrate Biogeography and Systematics in the Tropics. The meeting will take place 5-8 June 1989. A substantial proportion of the presented papers will relate to amphibians and reptiles. For further information, contact: Dr. Gustav Peters, Vertebrate Symposium '89, Zoologisches Forschungsinstitut und Museum Alexander Koenig, Adenauerallee 150-164, D-5300 Bonn 1, West Germany. ●

WILDLIFE REHABILITATION SYMPOSIUM

The National Wildlife Rehabilitators' Association will hold its 8th annual symposium on 22-26 March 1989 at the Grand Hotel in Anaheim, California. Topics will include: veterinary advances in wild species; rescue, restraint and handling techniques; avian, reptile and mammal treatment and biology; captive breeding; wildlife urbanization; post programs; administration and project fundraising. Concurrent presentations will be offered for beginning, advanced and professional levels of expertise. Professional sessions will be limited to veterinarians and medical professionals. Those interested in submitting manuscripts contact: Richard H. Evans DVM.MS., NWRA Program Chair, P.O. Box 7673, Laguna Niguel, CA 92677, (714) 831-1178. For other information or registration materials contact the NWRA Host Committee at the above address. ●

FEATURES

CONSERVATION OF HERPETOFAUNA IN BRITAIN AND IN RELATION TO MAINLAND EUROPE

With His Royal Highness the Duke of Edinburgh, President of the World Wide Fund for Nature International (WWF) and Vice-President of the International Union for the Conservation of Nature and Natural Resources (IUCN) as Patron, the first World Congress of Herpetology is to be held in the UK at Canterbury in 1989. Conservation of amphibians and reptiles will be a strong underlying theme.

Three of the societies co-hosting the World Congress are involved with practical conservation of herpetofauna and their habitats in Europe. They are (alphabetically) the British Herpetological Society (BHS), Fauna & Flora

Preservation Society (FFPS) and Societas Europaea Herpetologica (SEH). Like the American Society of Ichthyologists and Herpetologists in the USA, they are, as non-governmental organizations (NGOs), members of IUCN (Headquarters: Gland, Switzerland). The BHS is a national member of IUCN and the FFPS and SEH are international members. The Jersey Wildlife Preservation Trust, the Zoological Society of London (another Co-host of the World Congress) and the British Ecological Society are also members.

IUCN's Conservation Monitoring Centre is situated in the UK at Cambridge, where Dr B. Groombridge (Compiler of the *Amphibia-Reptilia Red Data Book)* is based, and at Kew Gardens in London. A co-chairman of the IUCN Species Survival Commission (SSC) Tortoise and Freshwater Turtle Group (also director of the first World Congress of Herpetology), Dr I.R. Swingland (chairman of the Ecology Research Group at the University of Kent at Canterbury), is also based in the UK. The IUCN SSC Group, amongst other interests, is involved with the conservation of Mediterranean tortoises (initiated by Lambert, 1984) which in southern Europe is being coordinated by David Stubbs, under Ian Swingland's direction.

René Honegger, a vice-chairman of IUCN/SSC, is based in Switzerland (Zürich). He is well known in European conservation circles and has a long established involvement with the conservation of herpetofauna (e.g. Honegger 1968).

With BHS Conservation Committee, FFPS and SEH Conservation Committee acting in a concerted way, the conservation of amphibians and reptiles and their habitats in Europe is thus approached from a broad front (Lambert 1986), together with the initiatives of other voluntary organizations such as RANA (Group for the Protection and Study of **R**eptiles and **A**mphibians in **Na**ture) — with branches in Belgium and Italy (D. Ballasina, *in litt.*; Langton 1987b) — e.g. Project CARAPAX, and SOPTOM (Station d'Observation et de Protection des Tortues des Maures) in southern France (e.g. Devaux, Pouvreau, Stubbs and members of SOPTOM, 1986; Langton 1986c). There are in addition many other, often more local, voluntary and national bodies involved with wildlife protection generally which include species of herpetofauna and their habitats.

The problem of frog collection, especially in France, in relation to the well-known French culinary delicacy of frog-legs has been considered by Dubois (1983). Drs A. Dubois and J.-J. Morère, based in Paris, co-founded the Société Batrachologique de France (Société pour l'Etude et la Protection des Amphibiens) with conservation as a major aim (Morère 1982). A Europe-aimed frog-leg trade, from India, Bangladesh and Indonesia, has also developed and FFPS in the UK has taken an interest in this (Langton 1986b; Honegger 1981, 1984). The Royal Society for the Prevention of Cruelty to Animals (RSPCA), Horsham, has called for an indefinite ban on welfare grounds and the World Society for the Protection of Animals (WSPA), London, is also campaigning strongly against the trade because there are in addition links with pesticide problems and the association of collecting with human diseases in the tropical developing countries involved (Langton 1986d).

A report on herpetological activities in Europe 1983, which included much on conservation, was given earlier in *Herpetological Review* (Lambert 1985). The European Year of the Environment (21 March 1987 to 20 March 1988) has recently ended and it seems opportune that further information should be provided in this same publication on some of the herpetofaunal conservation work that is continuing to be carried out in Europe by NGO members associated with IUCN. Hopefully, this will keep members of SSAR and other herpetologists based in North America and elsewhere appraised of developments. It is important that such publicity should engender a wider appreciation of what so far has been achieved for it is a pertinent point that neither amphibians nor reptiles were considered at two recent significant meetings on a conservation/environmental theme in the UK. One meeting was the Bicentenary Joint Meeting of the Linnean Society of London and Royal Society for Nature Conservation (at the start of its 75th Anniversary Celebration), held in London on 19 March 1987 (only two days before the start of the European Year of the Environment). The other meeting was the British Crop Protection Council Symposium on Field Methods for the Study of Environmental Effects of Pesticides held in Cambridge, 28-30 March 1988 (only eight days after the European Year of the Environment).

Like SSAR in the USA, the BHS and SEH have Conservation Committees; FFPS, a conservation organization by definition, has employed a staff herpetologist. Since 1986, through the aegis of its Conservation Committee, the BHS has also employed a Conservation Officer to work alongside the Conservation Committee. He is also the Chairman of SEH's Conservation Committee. The FFPS staff herpetologist is secretary both of the SEH Conservation Committee and of a joint FFPS/SEH UK Herpetofauna Working Group. Rene Honegger and Brian Groombridge are also members of the SEH Conservation Committee. Amongst other functions, the FFPS staff herpetologist edits *Herpetofauna News,* which is published by FFPS (a member of IUCN since its inception) and circulated to FFPS members upon request and also with publications of UK-based ASRA (Association for the Study of Reptiles and Amphibians), the Asociacion Herpetologica Espanola and SEH. Within the context of the main society, the BHS conservation officer's main terms of reference are:

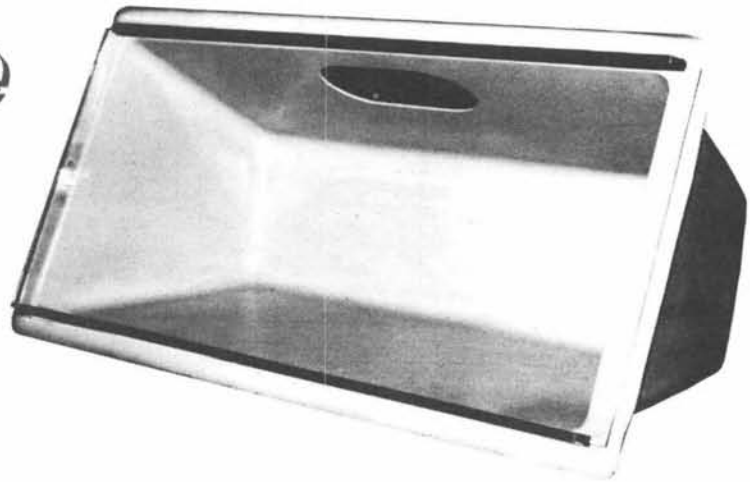
- preparation of site dossiers with the UK Government's statutory body, the Nature Conservancy Council (NCC), for the National Key-Sites of sand lizards (*Lacerta agilis*), smooth snakes (*Coronella austriaca*) and natterjacks (*Bufo calamita*), all of which are rare species in Britain, and to advise on habitat management needs where these are still lacking
- coordination of the BHS monitoring programme for these species, site protection, rescues from doomed sites, captive breeding and subsequent release
- organization of field surveys and restoration management of breeding sites of the great crested newt (*Triturus cristatus*), another rare species, involving liaison with a project funded by NCC, at Leicester Polytechnic.

Quite early on in the movement to conserve herpetofauna in Europe (although 66 years after FFPS was founded) and more particularly in the UK, the BHS Conservation Committee was founded in 1969. Its aim is to promote the conservation of all twelve native amphibians and reptiles in Britain, especially (as a priority) the four most endangered forms. Because amphibians and reptiles have very limited powers of movement and dispersal, they are particularly vulnerable to rapid changes in their habitats. Unlike other groups (e.g. seed plants, insects and even birds), they do not readily recolonise habitats over great distances. Even quite temporary disruption of an area can lead to irreversible loss of species (BHS Conservation Committee 1970). Amphibians and reptiles are also valuable indicators of the health of natural environments (Lambert 1987) and it has now become established that the Amphibia and Reptilia include the highest proportion of endangered species of any of the vertebrate groups. The BHS became an NGO member of IUCN in 1980 (SEH joined in 1984).

In Britain, it was clear by the late 1960s that many of the species of amphibians and reptiles were in marked decline. In addition, because of the widespread fear of snakes, the persecution of the adder (*Vipera berus*), Britain's only venomous species, was coupled with the destruction of creatures bearing any resemblance to it. These included two harmless snakes, the grass snake (*Natrix natrix*) and the rare and endangered smooth snake, and also the slow worm (*Anguis fragilis*), a legless lizard.

In consultation with the NCC, research into the detailed distribution initially of the natterjack, sand lizard and smooth snake indicated that these three species were more or less confined to two habitat types: lowland dry heath and coastal sand dunes. The loss of lowland heath, itself an endangered habitat, in southern England has been caused by vast afforestation programmes, agricultural reclamation, mineral extraction, building development and a number of (man-made) fires. This has resulted in an enormous decrease in the populations of the sand lizard and the smooth snake, while the natterjack is now virtually extinct on heathland for the same basic reasons, and also because so few non-acid breeding ponds remain. Conversely, natterjacks in their stronghold in NW England breed successfully in the slacks of coastal sand dunes, whose well vegetated frontal ridges and fixed dune habitats still support a few small remnant outrider populations of sand lizards. The coastal sand dunes in NW England have survived better than lowland dry heaths, but the despoliations of the holiday industry (holiday camps, trippers' motorcars) have taken their toll. Dune slacks tend to dry up more often than in former times, partly due to local drainage 'improvements' for building and human recreational (golf course) purposes, causing breeding failure (see also Tamarind 1975).

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Habitat management to improve the prospects of the three rare species in Britain has been carried out by BHS members and other volunteers. Heathland has been restored by brashing and the removal of encroaching birch and self-sown pine trees, and the herbicidal treatment with asulam of bracken (a fern, *Pteridium aquilinum*), often growing in the wake of fires and with which heathers (*Erica* spp. and *Calluna vulgaris*) are unable to compete. Small sand patches have been created, often by using rotivators, for egg-laying by sand lizards. On coastal dunes and inland heaths, ponds have been excavated using mechanical scrapers. Increases as a result of breeding have occurred in sand lizard (Corbett & Tamarind 1979) and probably smooth snake populations. Other heathland rarities like the Dartford warbler and nightjar, spiders and many other invertebrates have also increased.

With the agreement of NCC, BHS Conservation Committee members breed sand lizards in captivity and release progeny on suitable protected and managed heathland and dune sites. Due attention is paid to separation of genetically different races by means of an agreed translocation policy, to which argument the BHS Conservation Committee (1984) has contributed. A programme for the reintroduction of natterjacks to a series of heathland sites has also begun. Pond construction has enabled thousands of young natterjacks to metamorphose and successfully leave the water each year.

The success of this work has depended on funding and liaison with many other organizations, including WWF (UK), NCC, Vincent Wildlife Trust Fund, H.J. Heinz Ltd. and the Carnegie (UK) Trust Fund. Assistance has also been received from the British Petroleum Company plc. The full-time conservation officer of the BHS was employed as a result of grant aid to extend and consolidate the protection of the endangered British herpetofauna and their habitats.

With the passing of the UK's 1981 Wildlife and Countryside Act, partly ratifying the 1979 Berne Convention on the Conservation of European Wildlife and Natural Habitats, the great crested newt also became listed as a rare and endangered species. NCC are seeking information on this species and have appointed national survey coordinators on its distribution and status in Britain, especially since many ponds have become infilled, polluted or overgrown. In line with the much publicized 1983 European Year of the Water's Edge, a campaign was begun to manage and restore ponds for the continued survival of the great crested newt in Britain. Of the commoner species, there has been the widely publicized Toads-on-Roads Campaign (e.g. Clines 1987; Young 1988) following the precedent set in continental Europe. In 1984, over 20,000 toads (*Bufo bufo*) were rescued at reported sites; the figure for 1985 was 50,000, with many hundreds of people taking part. By 1987, over 100,000 toads were rescued at over 300 officially recognized toad migration routes.

In 1985, FFPS started a specifically herpetological programme; and, following a working group set up in the 1970s, the conservation of Britain's herpetofauna and their habitats received a further input when the UK Herpetofauna Working Group was established, under the aegis of FFPS (Langton, 1985a). The Group is affiliated (Langton 1985c) with the 1979-founded SEH, which became an IUCN NGO member in 1984. The reasoning behind the affiliation was:

A. to help raise funds for conservation projects of high priority in mainland Europe, especially involving expatriate British and nationals of other European countries, and also to increase SEH membership in the UK;

b. to select the UK for the formation of a semi-national group of this kind in recog-



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nition of the influence that such statutory UK bodies as the NCC and the Department of the Environment (DoE) have in official European conservation circles.

Organised by the staff herpetologist as part of FFPS's herpetofauna programme, which has a major educational and advisory function in the UK, the Working Group's objectives are to help coordinate herpetofauna conservation in Europe and overseas, and to liaise extensively with government and non-government representatives over policy and new initiatives. Five areas were identified as requiring special attention:

1. integrating the UK with the rest of Europe in terms of conservation policy and practice, and investigating the functioning of the European Community (EC), particularly in relation to nature conservation;
2. co-ordinating objectives for conserving amphibia and reptiles in the UK;
3. co-ordinating objectives for monitoring and influencing policies in matters relating to national and international trade in herpetofauna;
4. acting as a focus for liaison with NCC on important, especially international, issues and policies; and
5. assisting with the dissemination of ideas on conservation matters and the conclusions of the Working Group through such outlets as *Herpetofauna News*.

FFPS have instigated several projects and activities in the UK. These include:

- Toads-on-Roads (*Bufo bufo*) Campaign (Langton 1985b, 1985d, 1986a, 1987a). The installation of the first toad tunnel in the UK, opened by the Lord Skelmersdale in March 1987 (Clines 1987);
- Snakes Campaign, to establish the true incidence and effects of adder bites (leading to an education programme to counteract the unnecessary fear instilled in the general public). The use by grass snakes of various egg-laying substrates has been investigated;
- Pet shop enquiry (some sell native British and exotic species illegally, without a proper license from the UK Government's DoE) (Langton, 1986e); and
- County recording of amphibians and reptiles. The Annual Herpetofauna Recorders' Seminars instigated by FFPS in conjunction with the Biological Records Centre (e.g. Arnold 1986); 150 people attended in 1987.

The Zoological Society of London has undertaken several new herpetological projects (Langton 1986f), some in conjunction with FFPS. These are designed to complement the educational value of the collection in London Zoo's Reptile House and to improve public awareness and understanding of reptiles and amphibians. An exhibition on many aspects of snake venom was prepared, and a smaller exhibition shows examples of reptile skins and other products controlled by such international regulations as CITES (the Washington Convention 1973); another exhibit discourages the casual keeping of exotic species by the general public.

Britain and Ireland are offshore islands of NW Europe. The hard experience, not least the political experience, gained by BHS Conservation Committee members in conserving the rare herpetofauna in Britain is being complemented with initiatives for similar work in some parts of the continental mainland of Europe (Corbett 1981). One of the founding members of the BHS Conservation Committee has become Chairman of the 1981-founded Conservation Committee of SEH. Through the aegis of this Society (Corbett and Podloucky 1982), field investigations and conservation assessments have been initiated on the status of the rarest species of European amphibians and reptiles as the result of successfully presenting a strategy for the establishment of 'biogenetic reserves' (Corbettt 1986) to the Council of Europe (CoE) in Strasbourg.

In following the work of Honegger (1978) and the precedent set by the inclusion of all species of herpetofauna on the Appendices of the Berne Convention, CoE have recognised the particular vulnerability of the amphibians and reptiles. A priority rating has been given to all species in CoE countries based on the detailed results of a Europe-wide conservation mapping exercise carried out beforehand, combined with a review of available literature and existing field records. Species were given categories of rarity from 1-10, and most of 1 and some of 2 were selected. The work was funded by CoE and IUCN, with contributions from WWF (UK and Netherlands). Recommendations for biogenetic reserves were based on:

1. a selection of priority species for which sufficient information allowed meaningful reporting;
2. the identification of potential sites within particular areas resulting from field assessments carried out by SEH Conservation Committee members; and
3. a definition of key areas which contained an assemblage of herpetofaunal species, notably those of rarity categories 2, 3 and 4.

The **species** that have been covered by the recommendations are: *Proteus anguinus, Alytes muletensis, Bombina bombina, Pelobates (fuscus) insubricus, Rana latastei, Podarcis lilfordi/pityusensis* island complexes, *P. milesensis, P. hispanica atrata, Gallotia (aff.) simonyi, Vipera (ursinii) rakosiensis, V. (ursinii) ursinii, V. lebetina schweizeri* and the marine turtles, *Caretta caretta* and *Chelonia mydas*.

The **key areas** that have been identified which contain assemblages of species of high rarity category have so far been NE Greece and SE Sardinia (Italy). It is hoped that further areas will also be included. Interestingly, the selected sites and areas for certain species overlapped with those of other fauna and flora, e.g. the riverine forests of the Po Valley (Italy) and the endemic flora of the Balearic islands. The overlap also includes such species as the black vulture (*Coragyps atratus*), the osprey (*Pandion haliaetus*) and the monk seal (*Monachus monachus*).

The Council of Europe has recognised the problems facing the European herpetofauna and applied funding for the Biogenetic Reserve initiative. Hopefully, their action in funding such conservation work will set a precedent and be followed by the Commission of the European Communities in Brussels. There is a strong possibility that the SEH Conservation Committee will become IUCH's first regional SSC group, namely the European Herpetofaunal Group, and the Committee is already engaged in preparing an Action Plan.

ACKNOWLEDGMENTS

For kindly commenting on an earlier draft of this article, we would like to thank the following former Chairmen of the BHS Conservation Committee: Dr Trevor Beebee (1977-82) and Prof. G.A.D. Haslewood (1983-87). Mr John Burton (Executive Secretary until 1988 of FFPS) also commented on the manuscript.

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NOMENCLATURAL NOTES ON REPTILES OF THE UNITED STATES

We have discovered a number of nomenclatural anomalies that were perpetuated in "Standard Common and Current Scientific Names for North American Amphibians and Reptiles" (Collins et al. 1982). The corrections to scientific names presented here are required under the provisions of the third edition of the "International Code of Zoological Nomenclature" (1985).

The most common nomenclatural error involves the failure of an adjectival species-group name to agree in gender with the generic name as required under Articles 31(b) and 32(d) of the Code. These changes are:

1. *Elgaria panamintinus. Elgaria* (etymology unknown) is a feminine generic name that requires *panamintinus* (NL: belonging to the Panamint Mountains) to change from the masculine to the feminine form. The proper combination is *Elgaria panamintina.*

2. *Gambelia silus, G. wislizenii maculosus,* and *G. w. punctatus. Gambelia* (NL: commemorating W. Gambel) is a feminine generic name that requires *silus* (L: pug-nosed), *maculosus* (L: spotted), and *punctatus* (L: dotted) to change to feminine forms. The correct combinations are *Gambelia sila, G. wislizenii maculosa,* and *G. w. punctata.*

3. *Gyalopion quadrangularis. Gyalopion* (Gr: small hollow) is neuter; *quadrangularis* (L: having dorsal quadrangular blotches) must change to the neuter form. *Gyalopion quadrangulare* is the proper formation.

4. *Lampropeltis getulus* and *L. g. niger. Lampropeltis* (Gr: shiny shield) is a feminine generic name and requires the masculine adjective species-group names *getulus* (L: Getulian) and *niger* (L: black) to change to the feminine form. Although the change from *niger* to *nigra* is clear, the change from *getulus* to *getula* is less so. One could argue, under Article 31 (b) of the Code, that *getulus* should be considered a noun (L: a resident of Getulians). This position is analogous, however, to noting that "Kansan" could be used as a noun in the phrase "the Kansan," then using this as justification for saying it should be considered a noun in the phrase "the Kansan Glossy Snake." We do not accept this interpretation and regard *getulus* to be an adjective. The correct combinations are *Lampropeltis getula* and *L. g. nigra.*

Cope (1860) was the first to use *Lampropeltis* in combination with species names and was consistent in his treatment of the genus and species as feminine. However, subsequent authors (including Cope) have been remarkably inconsistent, frequently treating *Lampropeltis* as both masculine and feminine within one publication.

5. *Thamnophis sirtalis pallidula. Thamnophis* (Gr: bush snake) is a masculine genus that requires *pallidula* (L: somewhat pale) to change from the feminine to the masculine form. The correct combination is *Thamnophis sirtalis pallidulus.*

According to Articles 11(h)i of the 1985 Code [as well as Article 11(g)i of the 1961 Code], a Latin species-group name must be, or be treated as, an adjective or a noun. If necessary, names should be changed to conform with correct terminations as specified by Articles 31(c) and 32(d)ii. One example of this error was retained in the Common and Scientific Names checklist:

1. *Micrurus fulvius tenere. Tenere* (L: delicately) is an adverb and must be modified to the masculine adjectival form, *tener,* to agree with *Micrurus* (L: small tail). The correct combination, first made by Cope (1875), but ignored subsequently, is *Micrurus fulvius tener.*

Occasionally, authors have misinterpreted nouns to be adjectives. Nouns used as species-group names do not modify their spellings with changes in gender of generic names associated with them [Article 31(b)ii]. Two cases of this error were perpetuated in the checklist:

1. *Hypsiglena torquata ochrorhyncha.* As originally named by Cope (1860), the combination was *Hypsiglena ochrorhynchus.* It is clear that Cope intended *ochrorhynchus* (Gr: yellow nose) as a noun used in association with the feminine generic name *Hypsiglena* (Gr: high eye). Thus, the treatment of *ochrorhynchus* as an adjective is incorrect. The correct combination is *Hypsiglena torquata ochrorhynchus.*

2. *Nerodia rhombifera.* As originally formed by Hallowell (1852), the combination was *Tropidonotus rhombifer. Rhombifer* (NL: rhomb bearer or rhomb bearing) either can be considered a masculine adjective or a noun. In cases such as this, Article 31(b)i specifies that the species-group name must be considered as a noun. Regardless of its current placement in a genus with feminine gender, *rhombifer* does not change its spelling. The correct combination is *Nerodia rhombifer* (first used by Johnson 1987), an arrangement analogous to that in the combination *Pseudacris crucifer.*

In another case an unjustified emendation was retained in the checklist. [Note: the unjustified emendation of *platirhinos* in *Heterodon platirhinos* to *platyrhinos* has already been noted by Platt (1985)].

1. *Lampropeltis triangulum multistrata.* In the original description (Kennicott 1861) the name was formed as *Lampropeltis multistriata.* Although this was subsequently emended to *multistrata* (Cope 1861), this emendation was unjustified under the provisions of Art. 33. The correct formation of the name is *Lampropeltis triangulum multistriata.*

In another case a species-group name had inexplicably been emended from a correct to an incorrect form, and perpetuated in the checklist:

1. *Trionyx spiniferus asperus.* Originally, *Asper* (L: rough) was correctly formed (*Aspidonectes asper* Agassiz 1857). Its subsequent

emendation to *asperus* was wrong. The correct combination is *Trionyx spiniferus asper*.

Because *Iguana* has been reported as introduced and breeding in the United States (Wilson and Porras 1983), it is appropriate to comment here on the spelling of the species name. Linnaeus (1758: 206) named the green iguana *Lacerta igvana*. It is clear from his usage elsewhere on the page (e.g., *vulgaris, aquatica*) and his notation of pre-Linnaean names (e.g., Yvana, Igvana, Leguan) that the use of a "v" rather than a "u" in *igvana* was not as romanized "u." The correct spelling (under Art. 33) of the species name is *igvana*. Laurenti (1768) erected the generic name *Iguana*, spelled with a "u." Therefore, the correct combination should be *Iguana igvana*, analogous to *Gekko gecko* or *Mabuya mabouya*. However, in light of the fact that no one, other than Linnaeus, has ever used *igvana* we are preparing a petition to the International Commission of Zoological Nomenclature for conservation of the spelling *iguana*.

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NEW LOCALITY RECORDS IN ARGENTINA AND PARAGUAY FOR CHELID TURTLES, *Platemys pallidipectoris* (FREIBERG) AND *Platemys macrocephala* (RHODIN *ET AL.*)

A review of the chelonians deposited in the Museo Argentino de Ciencias Naturales Bernardino Rivadavia (MACN) in Buenos Aires revealed five heretofore unrecorded specimens of *Platemys pallidipectoris*, including two from a previously unrecorded province. Two specimens of *Platemys macrocephala* were also in the collection, representing the first specimens recorded from Paraguay. All specimens in question had been mislabelled *Platemys spixii* or *Hydromedusa tectifera;* the most recent identification of the MACN turtle collection had been accomplished by a visiting foreign herpetologist a few years prior to the author's visit in late 1985. No specimens of *P. spixii* were found in the collection.

PLATEMYS PALLIDIPECTORIS: Five previously unrecorded specimens of this rare chelid were examined at the MACN. Two of these, MACN 5.478 (shell only) and MACN 1.30483, an entire adult female, lacked data. The identification of the former specimen was assured by the presence of a bit of dried skin attached to the posterior carapace, on which the enlarged thigh tubercles were well preserved.

MACN 7.459 is an entire adult alcoholic specimen, collected by Marcos Freiberg around Resistencia, Chaco in 1940, and was included in the first series of Argentinian *spixii* (Freiberg 1940). This specimen bears a second tag with the number 2474 from the Museo de Entre Rios, where the other two specimens of the *spixii* series presumably remain. The presence of this animal at the MACN could not be explained by either the director of herpetology, Jorge Cranwell, nor by Dr. Freiberg (pers. comm.). The correct identity of this specimen as *pallidipectoris* had already been deduced from Freiberg's detailed description of this specimen in 1940 (Rhodin and Mittermeier 1984).

MACN 8626 is a complete male specimen, collected by Cranwell and Giai in 1945 at Estancia Las Guampitas, near Jobson, Depto. Vera, Santa Fé Province. According to the senior collector, this specimen was found in a pond (*estero*). This turtle extends the known range of *P. pallidipectoris* about 275 km to the south of the nearest recorded location, Resistencia, Chaco.

MACN 1.30482 was collected by Luis Guerrero in "northern Santa Fé Province," and was deposited in the MACN in 1980. This whole specimen is a female. The only other specimen of *P. pallidipectoris* in the MACN (housed separately) is the type, MACN 1731. In addition, an adult specimen of this turtle was collected near Castelli, Chaco and taken alive to the Buenos Aires Zoo in January 1985 according to Tomás Waller of the Fundación Vida Silvestre Argentina. On the author's visit to the Buenos Aires Zoo the turtle could not be located. Castelli lies ca. 60 km N-NW of the type locality, Roque Saenz-Peña, Chaco (Freiberg 1945).

PLATEMYS MACROCEPHALA: MACN 1.8287 and 1.8288 are the shells only of a juvenile and adult specimen from Estancia Palo Santo, Puerto Casado, Paraguay, collected by Cranwell in May 1946. He recorded having found these empty shells at the edge of a canebrake (*cañaveral*). The juvenile, with a carapace length of 93.1 mm, is the smallest recorded specimen of *P. macrocephala*. Some of the dorsal scutes are lacking on both shells, revealing the absence of neural bones. The juvenile's carapace readily exhibits the increased depth for which *P. macrocephala* is so distinct. The occurrence of *P. macrocephala* in the area of Puerto Casado, Paraguay reinforces the accuracy of the distribution map provided by Rhodin et al. (1984); Puerto Casado lies at the southernmost tip of the designated range. This record represents the first actual verification of the occurrence of *P. macrocephala* in Paraguay.

The author wishes to thank the following individuals for their assistance at the MACN: Jorge Cranwell, director of herpetology, and his colleagues Marcelo Canevari and Gustavo Carrizo. Dr. Anders Rhodin verified via photos the identity of the specimens photographed (four of the seven).

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NOCTURNAL ACTIVITY IN THE BOLSON TORTOISE (*Gopherus flavomarginatus*)

While studying the basic biology of Bolson tortoises, *Gopherus flavomarginatus,* at the Mapimí Biosphere Reserve's Laboratorio del Desierto in Durango, México (26°38'N/103°46'W), one of us (MAR) suggested that tortoises may emerge from their burrows after dark in response to rising soil temperatures. To ascertain whether emergence occurred routinely after field observations ceased (±2000 h), we re-wired an analog travel alarm clock so that a long tripwire extended from one pole of its 'AA' battery, across the burrow mouth of an adult female tortoise (#95, 7.3 kg BW), to the other pole. The clock was set at ±2000 h for ten nights between 17 July and 09 August 1980 and read the following morning at ±0700 h. In addition, one of us (MAR) observed the animal from 2000 h until 2340 h on 30 July 1980.

Tortoise #95 emerged every one of the ten nights after or about 2000 h (range = 1942-2326 h). On the evening of continuous monitoring, #95 emerged, reentered and reemerged from its burrow, and rested on either the burrow slide or mound. During the three hours and forty minutes of observation her T_b declined from 33.2 to to 29.6°C, as determined from deep body radiotelemetry. We believe this behavior may be related to elevated ambient temperatures. Figure 1 plots the temperatures of i) air in the shade ii) soil in the shade and iii) soil at 15 cm depth for the periods 09 July to 04 August (dry season) and 05 August to 20 August (rainy season) during 1980. In the dry season, both shaded air and soil temperatures peak at 1600-1700 h and by 2000 h are ≤ 34°C; in the wet season they are ≤ 26°C by 2000 h.

Deep soil temperature, however, follows a different pattern. Solar energy is stored increasingly during the day and refluxes as infrared radiation at night, so that temperatures reach ≥ 37°C between 1700-2000 h in the dry season and ≥ 31°C during the same times in the rainy season. All dry versus rainy season microclimatic temperatures were statistically different (ANOVA, df=139,2326; F= 129.35; p≤ .01). Similarly, temperature measurements made at night of the soil at 6 cm and 15 cm depth in the Mohave desert during July (MAR, unpublished observations) showed that soil temperatures exceeded 34°C between 2300 and 0100 h.

During the 23 days of this study, tortoise #95 had a daily average body temperature (T_b) of 30.2 ± 0.9°C (N=1,662). The average T_b at the initiation of diurnal foraging was 29.6 ± 1.7°C (N=21). Perhaps tortoises are activated nocturnally by elevated ambient burrow and/or soil temperatures, but are prevented from leaving the immediate vicinity of the burrow by their sensory (visual?) limitations. Luckenbach (1982) suggested that the desert tortoise, *Gopherus agassizii,* may emerge nocturnally during rainstorms, however, he provided no data. Our observations at Mapimí suggest that *G. flavomarginatus* does emerge during nocturnal rains. In contrast, Voigt (1975) reported that "in 3 years of close observation of the desert tortoise, nocturnal or pre-dawn activity was never observed in the field.' Similarly, Rose and Judd (1982) reported that *G. berlandieri* is diurnal and Douglass and Layne (1978) never detected nocturnal activity in *G. polyphemus.* The Aldabran tortoise, *Geochelone gigantea,* a non-burrowing species, apparently rests on the ground surface at night (Swingland and Frazier 1979), but is not active except when nesting.

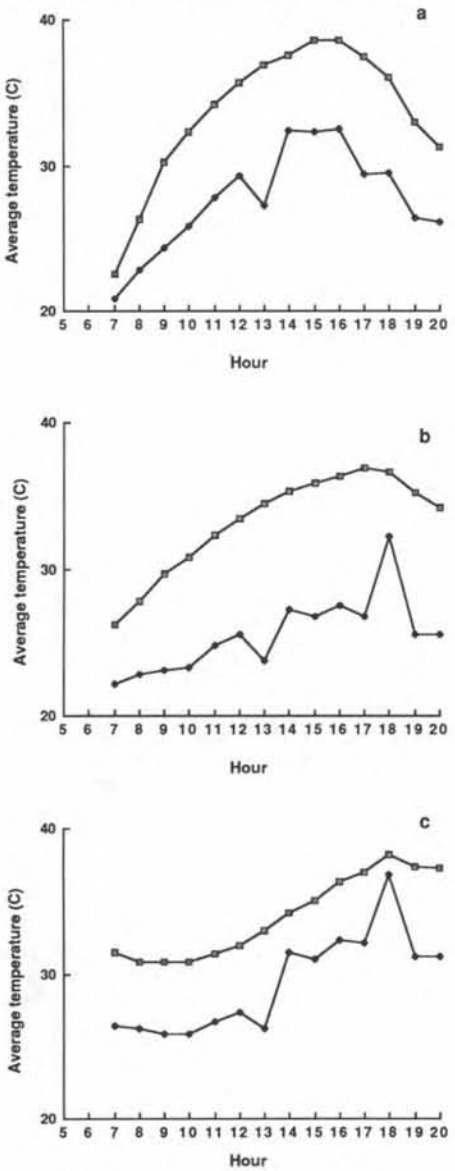


Figure 1. Average hourly temperature for dry season (upper curves) and wet season (lower curves) at Mapimí Biosphere Reserve during 1980. a= shaded air, b= shaded soil surface, c= soil at 15 cm depth.

Nocturnal activity by apparently diurnal iguanid lizards does occur. Mora (1986) reported nocturnal activity related to nesting in *Ctenosaura* and one of us (MAR) has radiotracked *Crotaphytus wislizenii* which were active and feeding at night during elevated temperatures in the Mohave Desert. We suspect that nocturnal emergence in diurnal reptiles occurs more widely, but has remained undocumented because most workers have not looked for it.

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ORIGIN OF THE POPULATION OF *Rana aurora draytonii* ON SANTA CRUZ ISLAND, CALIFORNIA

Sweet and Leviton (1983) reported the natural occurrence of the California red-legged frog (*Rana aurora draytonii*) on Santa Cruz Island, Santa Barbara County, California, based on three specimens (CAS 45230-32) collected by Joseph Richard Slevin on 17 May 1919 from the vicinity of Pelican Bay. Previously, Storer (1933) reported this population to be the result of transplanted frogs from mainland California. However, his statement was complicated by also indicating that the Southern Pacific rattlesnake (*Crotalus viridis helleri*) was introduced on Santa Catalina Island, California. Since *C. v. helleri* has been known from Santa Catalina Island since 1876 (USNM 9959), the reliability of Storer's comments was questioned.

Recently, I had the opportunity to examine Tracy Irwin Storer's field notes and personal files (housed at the California Academy of Sciences). Inspection of his file on "alien reptiles, amphibians, [and] fish [in] Calif[ornia]" revealed that Slevin informed Storer in September 1931 that *R. a. draytonii* had been introduced on Santa Cruz Island a short time prior to Slevin's 1919 collecting expedition. Additionally, Storer's notes revealed that reports by "old-timers" regarding the introduction of *C. v. helleri* on Santa Catalina Island, as cited by Bryant (1915), were erroneous and the subspecies was native to that locality.

Slevin (1928) probably omitted the Santa Cruz Island locality for *R. a. draytonii* because the frogs were an introduction. Slevin was notoriously lax at keeping detailed field notes and his field journals for the period (in a pocket diary marked "1917") provide no further details other than the collection of the specimens. According to testimony presented to Storer during meetings in Berkeley, California, from 19-23 July 1938, "frogs" were apparently also liberated on nearby Santa Barbara and San Miguel islands (Field Notebook #11, p. 2214b).

The origin of the *R. a. draytonii* stock on Santa Cruz Island remains unknown, but I speculate that it probably came from either Sigmund F. Beck and Company, San Francisco, or S.C. Coombes, South San Francisco, the two major frog dealers in the state between 1910 and 1920. The frogs were probably introduced by Basque or French workers on the island to provide a ready source of frog legs. Santa Cruz Island has had a working cattle and sheep ranch and an associated winery in Valle del Medio near Pelican Bay since the 1850s (Brumbaugh 1980).

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RECOVERY FROM ICE-ENTOMBMENT IN GARTER SNAKES

Snakes typically select hibernacula that 1) permit descent below the frostline, 2) exclude light, and 3) provide protection from predators (Gregory 1982). Moisture availability is one environmental aspect of snake dens that has received little attention in the literature. Although both wet and dry dens may be used by the same species, there is evidence that the former provide superior overwintering conditions. For example, snakes occupying well-drained hibernacula may lose more mass due to the combined effects of dehydration and nutrient consumption than do those in moister sites (Maple and Orr 1968; Aleksiuk and Stewart 1971); this undoubtedly affects survivorship adversely. Conversely, hibernating garter snakes (*Thamnophis sirtalis*) voluntarily submerged in water at 4° C remained fully hydrated (74.4% of fresh body weight) over a 165 day period during winter (Costanzo 1985). No mortality occurred in this laboratory study.

It is not widely appreciated that several terrestrial snake species physically enounter and occupy standing water within dens during winter (Criddle 1937; Owens 1949; Carpenter 1953; Zaremba 1978; Sexton and Hunt 1980; Costanzo 1986). Additionally, at least *T. sirtalis* prefer to hibernate underwater (rather than in air) in laboratory hibernacula when given a choice (Costanzo 1985, pers. obs.). Although this behavior may be physiologically advantageous (e.g. thermal buffering, maintenance of body water content), potential hazards such as drowning or freezing undoubtedly exist. This report relates observations on the survival of garter snakes that accidentally became entombed in ice while hibernating underwater in the laboratory.

Eastern garter snakes (*Thamnophis s. sirtalis*) were collected as they approached a communal hibernaculum in Portage County, Wisconsin on 6 October 1985. Thirty-seven snakes were placed in a darkened laboratory hibernaculum and slowly exposed to declining temperatures (15 to 4° C over a 13 day period) in a Freas 815 low-temperature incubator. The snakes were contained in a box (99 X 53 X 42 cm) with a wooden frame and pegboard walls. The bottom of the box enclosed a thick-walled (4 cm) styrofoam container (27 X 39 X 32 cm) that was filled with ca. 27 l deionized water. Several rocks and twigs were placed in the container to facilitate vertical movements and to serve as anchors for submerged hibernating snakes. Structure was provided in the upper region of the box by loosely packing it with crumpled paper. Thermistor probes fixed in the air and water spaces permitted periodic determinations of hibernaculum temperature using a telethermometer (Yellow Springs Instrument Co., Model 44); 4° C ± 0.5° C was maintained after the initial exposure regime.

On 20 November, many voluntarily-submerged snakes were observed to be entombed in a large block of ice that had formed as a result of incubator failure. Air and ice temperatures in the hibernaculum at this time were 2 and 0° C, respectively. Although the exact time of ice formation is unknown, the system was observed to be operating normally when checked on 14 November. Judging from the mass of the ice that had formed, crystallization had probably begun at least three or four days prior to its discovery. Examination of the ice block (using a drill) indicated that the ice extended to the bottom of the box at the sides, but may have contained a small amount of water near the center.

Nine of the snakes were grouped in a corner of the container and were clearly visible under the surface of the ice. The completely encased bodies of these snakes were generally outstretched and made physical contact with one another. No portion of any snake protruded from the ice block; the nearest individual was about 3 cm below its surface. Twenty other snakes were also trapped within the container but could not be readily observed.

Eight snakes that escaped ice-entombment were tightly intertwined in an upper corner of the box. The body mass of this group ($\bar{X} \pm SE = 38.6 \pm 3.4$ g) was significantly ($P < 0.05$, $t = 3.45$) smaller than that of the group encased in ice ($\bar{X} \pm SE = 92.3 \pm 8.1$ g; $N = 29$). This difference is not easily explained; however, it may have been easier for smaller individuals to climb out of the container at the onset of ice formation.

The snakes were freed by allowing the ice to melt slowly at room temperature for 2.7 d. Freed snakes were immediately placed in an environmental chamber at 15° C (9:15, L:D) and observed over a period of several days.

Of the 29 snakes removed from the melting ice block, 18 (62.1%) survived. There was no difference in body mass between these snakes ($\bar{X} \pm SE = 90.8 \pm 11.0$ g) and those that died ($\bar{X} \pm SE = 94.8 \pm 12.0$ g, N=11).

Most dead and dying animals had a localized greenish-yellow discoloration of the ventral scutes approximately half-way from the snout to the cloaca. Internal examination of several animals showed that the gall bladder was flattened (presumably ruptured) and that bile had produced the staining. The distal portion of the liver and adjacent fat bodies were similarly discolored. Although this condition was a prominent feature of those snakes that succumbed, it is unlikely to have been the ultimate cause of death; several surviving snakes also showed a minor discoloration of ventral scutes. It is also unlikely that low temperature and tissue freezing were involved in the observed mortality since *T. sirtalis* from this population tolerates substantial freezing of their body fluids (Costanzo et al. 1988).

Anoxia may conceivably have contributed to the demise of some of the snakes in this investigation. Gas diffusion in ice is greatly reduced, thus ice-encasement might effectively inhibit trans-integumentary (as well as pulmonary) exchange. Also, the pressure produced by crystal formation and the resulting expansion of the medium might have injured some snakes. It is not known at present how some of the animals were able to endure this combination of adverse conditions whereas others were not. It is clear, however, that the observed differential survivorship was independent of body size.

The use of abandoned farm wells as hibernacula is common for several snake species (*T. sirtalis, Elaphe vulpina, Storeria occipitomaculata*) in central Wisconsin (Costanzo 1986). Since these dens become partially filled with rainwater during autumn, it is probably not unusual for the inhabitants to encounter ice formation during the severe winter weather characteristic of this region. The probability of occurrence of this potentially lethal situation in dens should increase with frost depth (inversely related to snow cover), low ambient temperature, and decreasing den depth.

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HERPETOLOGICAL HUSBANDRY

See Herp. Review 19(1) for author's instructions.

REPRODUCTION IN CAPTIVE LOUISIANA PINE SNAKES, *Pituophis melanoleucus ruthveni*

Since its description 58 years ago (Stull 1929), the Louisiana pine snake, *Pituophis melanoleucus ruthveni* has remained a herpetological obscurity. Most literature accounts have been based on chance collections of single specimens (Clark 1949; Smith and Kennedy 1951; Mitchell and Tinkle 1960; Walker 1965; Tennant 1985). Thomas et al. (1976) found only 39 specimens extant in collections. *Pituophis m. ruthveni* occurs in western Louisiana and a small portion of adjacent Texas (Thomas et al. 1976), in an area that was once a disjunct portion of the pine forest belt that dominated much of the southeastern U.S. (Lohoefener and Lohmeier 1981). The original habitat association of longleaf pine/blackjack oak scrub forest was destroyed by logging in the 1920s (Maxwell 1973; Crocker 1979). The rapid and total destruction of the habitat of *P. m. ruthveni* has probably contributed in making it the most endangered and poorly known large colubrid snake in the U.S. (Reichling 1986). The tenuous condition of natural populations of *P. m. ruthveni* make captive breeding of this form especially important. Aspects of its reproductive biology are unknown, and the only literature report concerning captive reproduction is a brief note by Henley (1985). In this paper, I report details of a successful captive breeding of *P. m. ruthveni*.

MATERIALS AND METHODS

A male *P. m. ruthveni* (137 cm SVL) was obtained on 18 February 1986 from a commercial dealer. The specimen had reportedly been collected near Leesville, Louisiana, six years earlier as a hatchling. A second male (121 cm SVL) and a female (137 cm SVL) were received on 19 November 1986. This second male was acquired on a breeding loan from the Louisiana Purchase Gardens and Zoo in Monroe, Louisiana, and had been collected at Lucky, Louisiana (P. Lindsey, pers. comm.). The female was taken near Ringgold, Louisiana.

The snakes were maintained separately in 114-liter aquaria. Beechwood shavings were used as a substrate, and provided a medium into which they could burrow. A photoperiod that ranged from 7L:17D in December to 17L:7D in June was provided using two 40 watt fluorescent tubes. Two 200 watt incandescent bulbs provided higher light intensity and greater diel temperature range from March through November ($\bar{X}$ daily range = 23°-32° C). The snakes were maintained at lower temperatures ($\bar{X}$ daily range = 11°-15° C) from December through February, during which time they became inactive and did not feed.

The snakes fed exclusively on small rats, refusing day-old chicks. I have relied on feeding chicks to other subspecies of *P. melanoleucus* as an effective way of maintaining high body mass in females (Reichling 1982). Seven-to-ten small rats (ca. 40 g each), offered at 5-6 day intervals, were necessary to achieve the body condition required for successful captive reproduction in this species.

Introductions were made from mid-March through early May. Initially, the female was simply alternated between males for 24 h periods, but no courtship was observed. Beginning in April males were introduced in an effort to induce combat behavior and elicit breeding responses.

Eggs were incubated in 11-liter plastic boxes, in coarse grade vermiculite moistened with water following the method of Tryon



Figure 1. Juvenile *Pituophis melanoleucus ruthveni*, showing clearly defined anterior blotching. Numbered increments = 1 cm.

(1975). The box was opened for a few seconds every week, and was provided with tiny holes drilled around the sides to allow additional gas exchange. Incubation temperatures fluctuated in a diel pattern ($\bar{X}$ daily range = 25°-31° C).

RESULTS AND DISCUSSION

Male-male introductions immediately provoked bouts of ritualized combat as described by Shaw (1951) for *P. m. melanoleucus*. After thirty minutes of combat behavior, the males were separated and the female placed with one of them. Courtship behavior was observed from both males throughout April, following this procedure.

Courtship behavior agreed in most aspects with that described for *P. m. melanoleucus* (Shaw 1951). It differed from other accounts of *Pituophis* courtship, and from my observations of the subspecies *melanoleucus, mugitus* and *lodingi*, in the character of the caudocephalic waves exhibited by the males. These waves were directed more ventrally, and did not involve movement of the body. They consisted of a rippling motion visible only in the ventral scutes, repeated in a rapid series of waves flowing posteriorly. They occurred while the male's body was laid loosely over the female, with no neck biting, and while the snakes were otherwise motionless. The last observed courtship was on 5 May 1987, when the female appeared gravid. No copulations were observed.

Pre-parturition ecdysis took place on 20 May. Four very large eggs were laid during the afternoon of 26 May, in a nest box filled with damp sphagnum moss. Three shiny eggs (3 x 11.5 cm, 3 x 12.5 cm and 3.5 x 10 cm) with translucent shells did not develop. A fourth egg (4 x 11 cm) was white, with a dry, leathery shell covered with calcium crystals, and appeared fertile. The fourth egg hatched on 25 July after a 60 day incubation period, calculated using the method of Gutzke et al. (1984).

The single male hatchling was extraordinarily large (55 cm TL). It resembled the adults in most aspects of color and pattern, but differed in several respects (Fig. 1). The entire ground color had a bright orange wash, created by thin streaks of pigment forming a median longitudinal line across each unpatterned dorsal scale. The anterior pattern lacked the heavy suffusion of dark pigment that obscured the nuchal blotches in adults, leaving the anterior blotches distinct and definable as in *P. m. sayi*. The bold, black ventral blotching characteristic of *P. m. ruthveni* was paler in the neonate, with many ventral blotches being a cloudy pink color.

I am aware of three additional clutches of *P. m. ruthveni*. The female in my study laid two infertile ova in 1986, and two clutches of five and four eggs have been produced at the Ellen Trout Zoo in Lufkin, Texas (G. Henley, pers. comm.). Based on all available data, it appears that *P. m. ruthveni* lays the smallest clutches, but the largest eggs (in both an absolute and proportionate sense), of any large U.S. colubrid snake. Although all Gulf Coast *Pituophis* have been shown to produce relatively small clutches of large eggs (Reichling 1986), *P. m. ruthveni* appears to represent the extreme of this reproductive mode in a geographic cline of decreasing clutch size and increasing egg size from north to south and west along the eastern U.S. coast. The subspecies *melanoleucus* lays the largest clutches and smallest eggs (7-24 eggs; length 4.8-6.4 cm; width 2.6-4.5 cm) among eastern U.S. *Pituophis* (Wright and Wright 1957), with *mugitus* and *lodingi* (7-9 eggs; length 9.0-10.5 cm; width 2.7-3.5 cm) following a trend toward smaller clutches and larger eggs (pers. obsv.). This reproductive character reaches its extreme in *P. m. ruthveni. P. m. sayi* has been proposed to be a member of an eastern complex of *Pituophis* based on similar snout morphology of subspecies examined (*melanoleucus, mugitus, sayi*) (Knight 1986), yet *P. m. sayi* diverges from the other members of this grouping particularly the neighboring subspecies *ruthveni*, by laying large clutches of small eggs (5-22 eggs; length 4.2-5.7 cm; width 2.8-4.2 cm) (Wright and Wright 1957; Fitch 1970), and more closely resembles the western group (*affinis* and *deserticola;* 4-24 eggs; length 4.0-5.0 cm; width 2.5-3.5 cm) in this respect (Wright and Wright 1957; Fitch 1970).

It is hoped that a captive breeding program can be established for this form, and that additional founders can be added to the group to better measure its reproductive potential. Until data can be presented showing that *P. m. ruthveni* populations are stable, the subspecies should be considered endangered and captive breeding should be an immediate priority.

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TECHNIQUES

A SIMPLE METHOD TO MARK HATCHLING TURTLES

It is important to identify individuals reliably in long-term studies of growth, mortality, and reproduction. Here, we describe a method of tagging hatchling turtles in which wire rings are placed in the posterior marginal scutes. This method is inexpensive, easy to apply, can be used to identify a large number of turtles individually, and produces a tag that is retained over a long period.

The only materials required are a pair of needle-nosed pliers, wire cutters, and 35-lb steel trolling wire. Each tag consists of one or more 5-cm pieces of wire, each of which is passed through a posterior marginal scute

and bent to form a ring. By attaching each wire ring according to the scute numbering system of Cagle (1939), up to 1554 hatchlings can be identified individually. Color-coded plastic beads (e.g. Barriecraft Sales, 123 Dunlop Street East, Barrie, Ontario, Canada, L4M 1A6) can be added to the wire rings to increase the number of potential tags or to facilitate identification.

To attach the wire, one end of each 5-cm piece is sharpened by cutting it at a 45° angle. The sharpened end is pushed through the desired scute from the ventral side, close to, but not through, the skin (Fig. 1a). The ends are bent so that they overlap and the wire forms a double ring (Fig. 1b). The ring is tightened by drawing the ends anteriorly, leaving a small space for growth (Fig. 1c). The free ends are then cut and the ring adjusted so that no sharp points are protruding (Fig. 1d). The finished ring is approximately 3 mm in diameter. Although the rings could be made more secure by twisting or soldering the ends, this takes considerable time and would provide no significant improvement in retention of the rings because loss of rings is almost always by tearing through the scute (see below).

In the summer of 1985, 33 snapping turtles 1-2 years old were captured in the field, tagged with this method, and released. In October 1985, 281 hatchlings were tagged within 30 days of hatching. Of these, 130 hatchlings were tagged with wire only, and 151 others had colored beads strung onto the wire. The turtles were maintained in the laboratory until May 1986, when they were released into the wild.

In the eight months that these hatchlings spent in the laboratory, one of the 130 wire tags and nine of the 151 beaded tags were lost. Wires were ignored by the turtles, but some turtles snapped at the beads of others, especially pale-colored beads. No hatchlings suffered infection or damage from the rings, although on two occasions, two turtles locked rings.

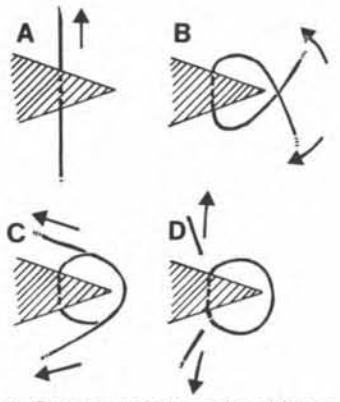


Figure 1. Steps in tagging a hatchling turtle with wire rings. Shaded area represents a section through a marginal scute of a hatchling. Anterior is to the left. A) A 5-cm piece of wire is sharpened and passed through the posterior marginal scute. B) Ends of the wire are bent over and under the carapace to form a ring. C) The double ring is tightened by pulling the ends anteriorly. D) The free ends are trimmed, and the remaining wire ring, about 3 mm in diameter, is tightened with pliers.

Of the 33 turtles tagged in the field in 1985, 10 were recaptured at least once that summer. Four were recaptured in 1986, three in 1987 and three in 1988. All retained the rings except two of the 1988 captures. These two animals had grown to over 100 g and could be notched. Of 22 unmarked hatchlings captured in 1986-1988, none had torn scutes that would indicate they had lost a tag.

The 130 turtles with wires only were weighed once a month and loose tags were adjusted when necessary. Therefore, tag losses in wild turtles may be higher than our observations on captives indicate. Conversely, the high density of hatchlings in our aquariums and their aggressive behavior during feeding may have made the loss rate higher for the beaded turtles than would occur in the wild. In the summer of 1986, we recovered 13 of the 281 turtles released in May 1986, and none of these had lost a tag. Therefore, it appears that these tags are reliably retained for two years in the hatchlings, and begin to be lost as the turtles reach a size at which they can be notched. The occasional loss of a ring in these first two years occurs when they are ripped out and this is readily detected. Loss after two years occurs because growth separates the tag ends. Initially this loss is revealed by the hole in the scute. Tags should be replaced by notches when turtles are large enough.

There are several other tagging techniques for small turtles now available (e.g. Miller 1955; Pough 1970; Schwartz 1981; Galbraith and Brooks 1984), and each has some advantages and disadvantages. Advantages of the technique we describe here are: the length of time the tags are retained; the speed with which tags can be applied; and the availability and low cost of the required materials.

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USE OF SUBCAUDAL SCALE ANOMALIES AS AN AID IN RECOGNIZING INDIVIDUAL SNAKES

Mark-recapture studies on snakes usually rely on scale-clipping for identification of individual animals (Brown and Parker 1976), although other techniques such as photography of colour patterns have also been used (Ferner 1979; Fitch 1987). Scales regenerate over time, so that long-term recaptures may be difficult to identify. Recent studies on Australian common blacksnakes (*Pseudechis porphyriacus,* Elapidae) and water pythons (*Liasis fuscus,* Boidae) revealed that the number and position of divided *vs* entire subcaudal scales varied among individuals, and hence offered a means of recognizing individual animals. In addition to clipping ventral scales, we now routinely record subcaudal formulae, from the anal plate posteriorly, counting on the snake's right-hand side. The degree of detail recorded depends on the extent of variability among specimens in the scale characters counted. If simple counts of entire and divided subcaudals are insufficient to uniquely identify specimens, one can record (i) positions of aberrant subcaudals divided into three rather than two segments; (ii) partly divided ("creased") subcaudals, where the division into two separate scales is incomplete; and (iii) anomalies between counts on the right- and left-hand sides of the tail.

The subcaudal count usually can be summarized in a short formula. For example, a snake with the first subcaudal entire, second divided, third partly divided, fourth and fifth entire, and remainder divided, would be scored as "1E, 1D, 1PD, 2E,∞D." Alternatively, scale anomalies can be added to predrawn diagrams on data sheets. In our experience with mark-recapture studies, many such formulae are unique to particular individuals within a population. Among 53 *P. porphyriacus* from Bubalahla Creek via Taralga, New South Wales (including one litter of 10), 41 (77%) had unique subcaudal formulae. One formula (5E,∞D) occurred in four snakes, and four other formulae in two snakes each. In combination with data on sex, body size, geographic location and ventral scaleclips, these subcaudal formulae enabled us to easily recognise recaptured snakes. There were no duplications in subcaudal counts among the ten neonates from the same litter. Similarly, data on 115 *L. fuscus* from Fogg Dam via Darwin, Northern Territory, showed that 56 (49%) had unique subcaudal formulae. A single pattern (∞D) was shown by 37 snakes (32%), another (3E,∞D) by 9 animals, and other duplications by five or fewer individuals. Three duplications (all∞D) were observed among a litter of six hatchling *L. fuscus.*

Routine recording of subcaudal formulae may prove to be useful in other mark-recapture studies of snakes, and in other situations (e.g. captive specimens in large collections) where individual recognition is required. It is particularly valuable for studies on small species or on neonatal snakes, where scale-clipping is difficult and potentially injurious to the animal. In such cases, recording subcaudal formulae may permit individual recognition with a reduced number of ventral scale-clips. When used in combination with ventral scale-clipping, subcaudal scale formulae may significantly improve the

investigator's ability to recognize specific animals on recapture.

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A METHOD FOR MANUAL VENTILATION OF TRANQUILIZED TORTOISES

Many modern clinical and field techniques in herpetology require the administration of anesthetic or chemical immobilizing agents. When the subject is immobilized, care must be taken to prevent prolonged apnea. During 1981, Bolson tortoises, *Gopherus flavomarginatus*, at the Mapimí Biosphere Reserve Laboratorio del Desierto in Durango, México were restrained for blood sampling via jugular venipuncture, cloacal palpation for sex determination, and the administration of oxytocin for induction of oviposition. Immobilization, accompanied by drooping of the upper eyelid (ptosis), and hind limb rigidity, resulted within 3-5 minutes after intramuscular injection of succinylcholine hydrochloride (0.50 mg/kg BW), a neuromuscular blocking agent. Body temperatures of tortoises examined ranged from 27-35° C.

During the course of these procedures, one of us (BB) developed a technique for maintaining adequate ventilation in immobilized tortoises without the need for tracheal intubation. The procedure consists of elevation and extension of the forelimbs while the subject is in a prone position, followed by direct rearward compression of the forelimbs alongside the head and into the axillary space (Figure 1). During this motion the humeri are kept parallel to the long axis of the body and the elbows are flexed at 90°. As a result, the lungs are filled as the pleuroperitoneum expands with the extension of the limbs, and emptied (through the nares) as compression occurs. The rigidity of the hind limbs augments this effect by preventing pressure relief through expansion of the abdominal cavity via the inguinal region. One to two complete cycles per minute are sufficient to perfuse adequately immobilized tortoises. We applied the technique continuously during the course of our examination (5-30 minutes) and once every 15 minutes for the next hour. In 6 years of experience since the technique was developed we have never experienced a fatality or complication in hundreds of uses involving more than 50 animals. The authors believe that the technique would be effective in all tortoises.

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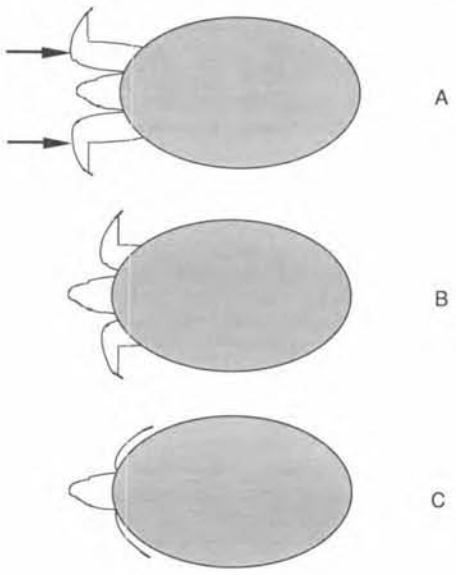


Figure 1. Dorsal diagrammatic view of limb positions during manual ventilation. A. Beginning technique with humeri extended, parallel to the head; arrows showing points and direction to exert pressure. B. Halfway through technique with humeri retracted. C. Ending position of technique with forelimbs pressed into the shell openings.

TECHNIQUES FOR PHOTOGRAPHIC SIZE ESTIMATIONS OF CROCODILIANS

Making accurate size estimates of subjects is often required during herpetological field work. Magnusson (1983) demonstrated that size estimations of crocodilians could not be made accurately by inexperienced observers from direct observation. Such difficulties are likely to be as acute, or worse, for other taxa.

Here I report on a generally applicable photographic method for improving the accuracy of size estimations. This method, developed during work on the black caiman *Melanosuchus niger* in Peru, allows direct calculation of the subject size from the image size in a photographic negative. Another method for photographic size estimations based on the same basic principle has been arrived at independently by Grahame Webb and coworkers for use with the estuarine crocodile *Crocodylus porosus* in the Northern Territory of Australia (Choquenot and Webb 1987). Both methods depend for their validity on the mathematical relationship between the variables in an image-producing (photographic) lens system. This relationship is expressed in Equation 1 below, which is derived from the lens formula

$$\text{(Equation 1)}\ H = \frac{U - F}{F} \times h$$

where: H = Subject size
U = Camera-to-subject distance
F = Focal length of lens
h = Image size in photographic negative

The convergence of the two methods perhaps emphasizes the practicality of what is essentially the same technique. The technique as developed for use with *M. niger* in Peru uses Equation 1 explicitly in its calculations, so I will call it the Lens Formula Method. Webb and colleagues' methodology depends on the basic truth of the formula, but does not use it directly. Rather their method employs an empirically derived calibration curve for each lens. I shall refer to it as the Calibration Curve Method.

LENS FORMULA METHOD

For the methodology developed with *M. niger* a series of photographs is taken perpendicular to the dimension to be measured. For each photograph the focal length of the lens used is noted together with the camera-to-subject distance. Camera-to-subject distance is read from an accurately calibrated real distance scale on the lens focusing ring. I found it necessary to recalibrate the distance scale etched by the lens manufacturer on the focusing ring for this purpose.

Given these values, and the size of the image in the resulting photographic negative, the actual size of the subject photographed can be calculated directly using Equation 1 above. Only sharply focused photographs should be used for this purpose, since poorly focused photographs indicate that the camera to subject distance read from the focusing ring was inaccurate. Special care must also be taken when measuring the image size in the photographic negative. As the multiplier in Equation 1, it can be an important source of error. Accurate measurement is not easy direct from the negatives, but it can be achieved by projecting the negative at a

standard magnification and calculating the original size of the image in the negative from the projected image. If only the head of the crocodile is photographed, the snout-vent length can still be estimated since the relationship between the two dimensions is well documented for a variety of crocodilians (e.g. Kramer and Medem 1955; Webb and Messel 1978; Montague 1984).

CALIBRATION CURVE METHOD

This method, developed by Webb and colleagues, involves taking a series of photographs of a standard metre rule at various distances recorded from an arbitary distance scale on the lens focusing ring. These data are used to scale the long axis of the photographic negative to real size at that distance. If for example the image of a one metre rule was X mm in a 2X-mm-long negative at a distance measured on the arbitary scale as Y, then the total length of the negative can be scaled to a real negative width of 2X metres at that distance. A series of such real negative widths plotted against their corresponding arbitary distances gives a calibration curve for the lens used. Thus, if during a survey a perpendicular photograph of a crocodile's head is taken at the distance Y, and the image occupies one quarter of the frame length, then its real length is simply calculated as the proportion of the negative length occupied by the image multiplied by the real negative width obtained from the calibration curve. In the example above where the real negative width was 2X m at distance Y, the head length is 0.25 x 2X m = 0.5X m. As a point of detail, Webb and co-workers measure the proportion of the negative's long axis occupied by the image using the graticule on the eyepiece of a dissecting binocular microscope.

It is worth noting that the calibration curve which Choquenot and Webb (1987) derive empirically could also be derived mathematically for each lens with the lens formula provided the relationship between the arbitrary distance scale and real distance is known. The advantage of deriving the curve empirically is that it compensates for lenses not being to the manufacturer's stated focal length. The disadvantage is that it introduces the possibility of experimental error into the calibration exercise.

A COMPARISON BETWEEN THE METHODS AND EQUIPMENT

The accuracy obtained with the two methods is similar. Both give estimates ± 5-8% of the real subject size (head lengths of crocodilians, 6-45 cm), using a 200 mm lens within the optimal distances range of about seven m. The methods are also more or less equivalent in terms of ease of use. Both require an initial calibration exercise, one to derive a calibration curve, the other to derive an accurate real distance scale. One possible advantage of retaining the lens formula in the calculation rather than deriving a calibration curve is that the former can accommodate variation in the focal length of the lens. This potentially allows a variable focal length (zoom) lens to be used for the surveys, an advantage when the likely range of subject sizes and approach distances is great. It should be noted, however, that in practice the introduction of the lens focal length as an additional variable produced an error in excess of 10% in laboratory trials on a model subject. Considerable refinement of the zoom lens technique would be required to improve the accuracy, and for the present at least a fixed telephoto lens appears a better choice.

With regard to equipment in general, I found the best combination to be a 35 mm format single lens reflex camera together with a powerful dedicated flash with telephoto adaptor and a 200 mm lens (with rotating polarizing filter to improve image clarity of submerged parts of the subject). It is important that the lens have a long infinity rating and a shallow depth of field at maximum aperture to allow the camera-to-subject distance to be accurately recorded. A drum extension on the focusing ring enables the scale to be more finely graduated and easier to read. The accuracy of the distance scale should be checked before surveys since the focusing ring of a damaged or inferior quality lens may be prone to 'slipping'. Slipping occurs when the lens focusing ring is free to move to some extent without actually changing the focus distance of the lens. This introduces error into the camera-to-subject distance reading. In general there is room for improvement on simply measuring the camera-to-subject distance from the lens focusing ring. Possibly a more sophisticated light beam range finder could be employed for this purpose. The dedicated telephoto flash should ideally have a fast recycling time to allow a series of photographs to be taken in rapid succession during night surveys. Good 'off-flash' rechargeable battery packs provide almost instantaneous recycling and are also more economical for long term studies.

OTHER PHOTOGRAPHIC TECNHIQUES FOR SIZE ESTIMATION

Earlier authors have proposed contrasting techniques for estimating subject sizes with the aid of photography. Unlike the Lens Formula Method and the Calibration Curve Method, these techniques do not depend on the relationship expressed in the lens formula for their basic validity. Parker and Watson (1970) for example used pre-positioned anchored reference markers to calibrate aerial photographs of *Crocodilus niloticus* individuals in the same frame. This technique is excellent for aerial surveys which are essentially "two dimensional" but is not immediately applicable in the many situations where a boat survey is required.

I experimented on a variation of Parker et al.'s technique employing a horizontal rule suspended below a long lightweight pole and positioned over the heads of *M. niger* individuals encountered during night canoe surveys. The method helped place the caiman in broad size class categories during direct observation and could also be used to calibrate photographs in the manner of Parker and Watson. The equipment was unwieldy, however, and it was often hard to place the rule in the same focusing plane as the black caiman. Attempts to use the technique with the more wary spectacled caiman, *Caiman crocodilus*, in Peru, and the Nile crocodile, *Crocodilus niloticus*, in Madagascar were also hindered by the subject frequently submerging in response to the disturbance and even occasionally lunging at the rule!

Gorzula (1984) outlines another type of photographic size estimation technique using snout-length/total-head-length ratios calculated from field photographs to estimate the total snout-vent length of the individual photographed. The technique was suggested for use with *C. crocodilus* but as Webb and Messel (1978) point out, the relationship between these morphometric dimensions appears to change unpredictably with age for a variety of other crocodile species so far studied. It remains to be seen whether morphometric ratios calculated from photographs of other herpetological subjects could be successfully used to estimate the actual size or age of an individual.

OBLIQUE IMAGES - A PROBLEM

An important problem common to all the photographic techniques described is that of length attenuation of dimensions not photographed at right angles to the subject-to-camera line. For *M. niger* it proved easy to approach individuals during surveys and to obtain good photographs perpendicular to the subject-to-camera line using the caiman eyes to align the camera. For other subjects this may be impracticable and Choquenot and Webb (1987) use reference templates of a preserved head photographed at various angles in order to derive a correction factor for non-perpendicular photographs. As they point out, the development of "3D" computer graphics suggests both the possibility and direction of future improvements in this field.

CONCLUSION

The Lens Formula and Calibration Curve methods of photographic size estimation have proved to be practical ways of estimating the size of *M. niger* in Peru, and *C. porosus* in Northern Australia, respectively. The basic principle which underlies these two methods, that of deriving the actual subject size from its image size in the negative given the camera-to-subject distance and lens focal length, is in no way dependent on any feature particular to these species. The general technique is, therefore, applicable to any subject, crocodilian or otherwise. The ultimate choice of lens and accuracy of the technique depends very much on the size and ease of approach of the subject.

For *M. niger* the photographic technique has proved to have an added advantage in that juveniles and sub-adults are individually recognizable from the configuration of large black pigment spots on the lower jaw. Perhaps individuals of other reptilian species will prove to be individually identifiable as well. The ability to recognize individuals without resorting to mark/recapture techniques is especially valuable for crocodilian species which often learn to avoid recapture (Cocroft pers. comm., Webb and Messel 1979). Work is planned to determine how the pattern changes for *M. niger* individuals with age, and whether photographic files of individuals in a

population can be used to identify specimens in long term ecological studies.

ACKNOWLEDGMENTS

I would like to thank Dr. Max Gunther of Peruvian Safaris S.A. for logistical support during my work in Peru; Dr. Grahame Webb for his helpful comments which allowed the first draft of this report to be improved; and two anonymous reviewers.

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LIFE HISTORY NOTES

See Herp. Review *19(2) for author's instructions.*

ANURA

BUFO MARINUS (Marine Toad). **PREDATION.** On 31 October 1987 in savanna woodland close to Alter do Chão Pará, Brasil (2°31'S, 55°00'W) at 0813 h I intercepted a grissón (*Galictis vittata)* entering the forest from the savanna, with a large (ca. 25 cm TL) *Bufo marinus* hanging from its mouth. The grissón stopped within five m of me for about 20 sec. The frog was not collected but as *B. marinus* is the only large bufonid in the area there can be no doubt as to its identity. *Bufo marinus* are extremely common in the area and it is unlikely that the adult grissón had not been exposed to toads before. Rather, it seems that the potent skin toxins of *B. marinus* are not an effective defense against grissóns.

Submitted by **RENATO CINTRA,** Departamento de Ecologia, Instituto Nacional de Pesquisas da Amazonia (INPA) CN 478 Manaus, 69000, Brasil. ●

RANA AREOLATA AESOPUS (Florida Gopher Frog). **MOVEMENT.** An adult female *Rana areolata aesopus* (84 mm SVL), marked at the Breezeway Pond on the Katharine Ordway Preserve/Swisher Memorial Sanctuary, four km E of Melrose, Putnam Co., Florida, on 30 March 1987, was caught in a Sherman live trap set at the mouth of an active gopher tortoise burrow on 26 July 1987. The recapture occurred 2.0 km WSW of the Breezeway breeding pond on a disturbed longleaf pine-turkey oak site dominated by planted slash pine. We believe this to be the first documented observation of a long-distance movement for this species. Carr (1940. Herpetology of Florida, p. 64) states these frogs ". . .travel some distance to congregate at widely separated ponds, since I have found them a mile (1.6 km) from water."

Submitted by **RICHARD FRANZ,** Florida State Museum, University of Florida, Gainesville, FL 32611, **C. KENNETH DODD JR.,** National Ecology Center, U.S. Fish and Wildlife Service, 412 N.E. 16th Avenue, Rm. 250, Gainesville, FL 32609, and **CHERI JONES,** Department of Zoology, University of Florida, Gainesville, FL 32611, USA ●



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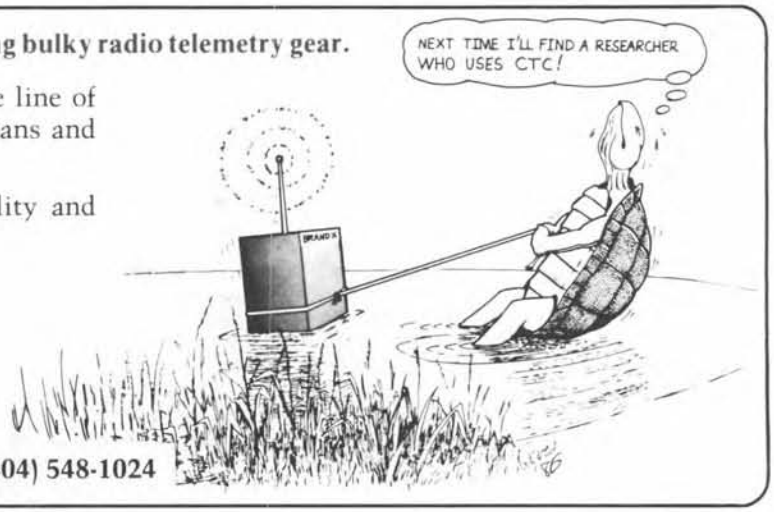
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CROCODILIA

CROCODYLUS ACUTUS (American Crocodile). **NEST DEFENSE.** In Panama, American crocodiles are known to nest in clearings and to defend their nests from green iguanas (*Iguana iguana*) that sometimes excavate crocodile eggs while nesting (Dugan et al. 1981. J. Herpetol. 15:409-414). Slider turtles (*Trachemys scripta)* occasionally nest in these clearings too, but construct much shallower nests than do iguanas or crocodiles (Drummond 1983. Copeia 1983:529-530). Here we report observations of aggressive behavior by a ca. 3 m crocodile towards *Trachemys* that neared its nest on the small island of Slothia adjacent to Barro Colorado Island, Panama.

Between 4 and 24 February 1988 we observed four instances of nest-defense through a telescope at a distance of 400 m. In the first, the crocodile entered the clearing from the lake and attacked a large *Trachemys*, as the latter moved rapidly out of the clearing into the forest. In a second incident the crocodile entered the clearing, grasped a turtle by the carapace in its mouth, and shook it. The turtle moved a short distance after its release and the crocodile repeated this behavior. Following the second release, the turtle moved at greater speed into the water. In the third case, the crocodile entered the clearing to interrupt a digging turtle by flipping it onto its back. During the next five min, the crocodile bit at the turtle four times while the turtle struggled to right itself. The turtle regained its feet and fled unpursued to the water. In the final incident we noticed a turtle in the clearing moving towards the shoreline. As it slid down the bank, the crocodile surfaced, grasped the turtle in its mouth, and thrashed it back and forth in the water for a period of ca. one min. At this time, another large crocodile (presumably the mate) surfaced and swam toward the first crocodile, which entered the clearing. When we arrived at the nest site by boat several minutes later, the second crocodile swam away and the crocodile in the clearing entered the water and followed. There was no sign of a dead or injured turtle along the shoreline, although three seemingly undisturbed large turtles were visible in the water nearby.

It is curious that despite ample opportunity, the crocodile failed to seriously injure any of these turtles. Unlike iguanas, which nest-defending crocodiles do occasionally kill, nesting slider turtles probably rarely if ever disturb crocodile nests. Apparently, crocodiles defend their nests rather indiscriminately against many intruders. However, both iguanas and turtles that succeed in laying near a crocodile nest may benefit from the crocodile's general defense of the area.

Submitted by **VIVIAN P. PAEZ** and **BRIAN C. BOCK,** Smithsonian Tropical Research Institute, Apdo. 2072, Balboa, Panama ●

SAURIA

CALLISAURUS DRACONOIDES. (Zebra-tailed Lizard). **FEEDING.** In the state of Sonora, Mexico, populations of zebra-tailed lizards are common in coast areas. Stebbins (1985. Western Reptiles and Amphibians. Houghton Mifflin Company, Boston) mentioned that *Callisaurus* feed upon insects, spiders, other lizards and occasionally plants.

I captured a reproductive male lizard (SVL = 74.05 mm) during the morning in the intertidal zone of the "El Choyudo" beach 107 km SW Hermosillo City on 15 June 1987. This lizard was killed and his stomach examined for food. I found 42 beach hoppers (Amphipoda) and a young crab (Ocypodidae). These items represented 62.5% of the volume of total stomach contents. The lizard and stomach contents have been deposited in the Herpetological Collection of the Ecological Center of Sonora.

I thank Guillermo Lara of the Ecological Center of Sonora for providing information and support for this and other related reports and to Carlos Tena for his encouragement.

Submitted by **ADRIAN QUIJADA,** Escuela Superior de Ecología. Centro de Estudios Superiores del Estado de Sonora, Ley Federal del Trabajo, prolongación Col. Apolo, C.P. 83200, Hermosillo, Sonora, MÉXICO ●

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SCELOPORUS UNDULATUS HYACINTHINUS (Northern Fence Lizard). **FEEDING.** Prescribed fire is employed as a principal management tool for hazardous fuel reduction, control of undesirable species, wildlife habitat improvement, range improvement and silvicultural treatments on southern national forests. In the Ouachita National Forest in Arkansas and Oklahoma, cool or backing fires are employed in fall, winter and early spring months to enhance habitat for wildlife. These fires typically consume about one-half of the leaf litter, leaving behind the more moist, deeper layer of duff.

On 21 March 1985, during a prescribed burn under a mature shortleaf pine (*Pinus echinata*) and mixed hardwood (*Quercus/Carya*) canopy, an adult northern fence lizard was observed to repeatedly prey on crickets (Gryllidae) advancing a meter ahead of the slow moving backing fire. The lizard, undaunted by the approaching flames, would "perch" on fallen limbs and twigs on the forest floor which provided an elevated view, 10-20 cm above the substrate of the immediate area. Upon observing a cricket emerge from the leaf litter, the lizard would climb down from the perch and seize and consume its prey. The lizard immediately returned to the perch and repeated the process. When flames approached that perch, it was abandoned for a decaying stump. The lizard fed twice more in the same manner and, apparently satiated, retreated to the trunk of a large tree outside the burn area where it remained for ca. 5 minutes before moving out of sight.

Observations of similar opportunistic feeding along the front of a fire by various species of wildlife was summarized by Komarek (1969. Proc., Tall Timbers Fire Ecology Conference, Tallahassee, FL, pp 161-207).

Submitted by **DAVID A. SAUGEY,** Wildlife Biologist, U.S. Forest Service, Ouachita National Forest, P.O. Box 1270, Hot Springs AR 71902, USA ●

SERPENTES

DRYMARCHON CORAIS COUPERI (Eastern Indigo Snake). **ECDYSIS.** Although aspects of shedding, such as its frequency in captivity, have been reported for many species of snakes, descriptions of ecdysis under field conditions are exceedingly scarce (e.g., Gibbs 1892. Forest and Stream 39(1):7-8). At 1200 h on 8 February 1987, I observed a radiotagged male eastern indigo snake (1170 mm SVL, mass = 520 g) shedding on the Katharine Ordway Preserve-Swisher Memorial Sanctuary, Putnam Co, Florida, in longleaf pine-turkey oak sandhills habitat. The weather was clear and breezy with an air temperature of 25° C.

The snake first was observed crawling slowly through a small brush pile. It moved in rectilinear fashion and did not deliberately use objects to snag or hold the shed skin, which was pulled behind the body. Instead, a series of spasmodic jerks at the point of detachment provided traction with the substrate and allowed the skin to loosen and to fold back and off. When the body moved around or under surface debris, the debris did not provide an anchor to the shed skin. The rest of the body moved in smooth continuous motion, and the snake was alert and tongue-flicking. The shedding sequence took 8 min from when observations began, and I estimate 20-24 min for completion. As shedding neared completion, the snake moved toward and entered a gopher tortoise (*Gopherus polyphemus*) burrow near where he had first been seen; as such, he had traveled in a circuitous loop to a point 5 m from the burrow.

Klauber (1972. Rattlesnakes. Univ. Calif. Press, Berkeley, pp. 355-356) gives probably the best description of the process of ecdysis although the circumstances are not stated. He also noted rectilinear progression during shedding and described a film in which *Crotalus atrox* loosened the skin "by a rippling or caterpillar movement produced by the subsurface muscles at the point where it was being turned back." This may be comparable to my observations of spasmodic jerks, but more observations in natural or natural-like settings are required to determine precise comparative terminology. In captivity, close proximity to stationary objects and general lack of room for horizontal movement may give the impression that snakes require objects to assist ecdysis. This may not be the case under natural conditions, although rubbing the snout on stationary objects may facilitate initial stages of shedding.

Submitted by **C. KENNETH DODD, JR.,** National Ecology Research Center, 412 N.E. 16th Avenue, Room 250, Gainesville, FL 32601, USA ●

ELAPHE CARINATA (Keeled Rat Snake). **REPRODUCTION.** A sexual pair of *E. carinata,* hatched from eggs laid by recently imported specimens, was obtained by the Columbus Zoo 19 February 1984. At accession both were ca. 40 cm SVL. Courtship and attempted copulation were observed intermittently from 13 March through 10 May 1987, with observed copulations occurring on 18 and 24 April and 3 May 1987. At this time the animals had grown to ca. 125 cm SVL (male) and 110 cm SVL (female).

A clutch of 10 eggs laid 20 May 1987 ranged from 62-86 mm along the long axis and from 30-34 mm along the short axis ($\bar{X}$ = 72 x 32 mm). The clutch, which adhered into a single mass shortly after laying, had a total mass of 429 g. A second clutch laid by the same female 15 July 1987 ranged from 53-70 mm x 25-28 mm (n = 8, $\bar{X}$ = 63 x 27 mm) with a total mass of 223 g. Four of the first clutch hatched 7 - 11 July 1987 after 48-52 days incubation at a minimum of 28° C. One of these hatchlings survived less than 72 hours. Four additional eggs opened 12 July 1987 contained dead but fully formed neonates, all of which had cut the eggshell to some extent.

Seven of the eggs from the second clutch hatched 1-3 September 1987 after 48-50 days incubation, also at a minimum of 28° C. The three viable hatchlings from the first clutch ranged from 274-284 SVL (350-363 TL). With the inclusion of non-hatching and non-viable specimens, the eight specimens from the first clutch ranged from 252-284 SVL ($\bar{X}$ = 272.8 mm) 319-364 mm TL, $\bar{X}$ = 347.5 mm). The seven hatchlings from the second clutch ranged from 265-285 mm SVL ($\bar{X}$ = 273.6 mm) and from 338-362 mm TL ($\bar{X}$ = 347.5 mm).

Submitted by **MIKE GOODE,** Reptile Department, Columbus Zoo, 9990 Riverside Dr., Powell OH 43065, USA ●

ELAPHE OBSOLETA OBSOLETA (Black Rat Snake). **ANTIPREDATOR BEHAVIOR.** The presence of snakes in the diet of the red-shouldered hawk, *Buteo lineatus,* is well known (May, J.B. 1935. The Hawks of North America. Nat. Assoc. of Audubon Societies, N.Y.). In addition, hawks are known to be major predators of adult rat snakes (Johnson, T.R. 1987. The Amphibians and Reptiles of Missouri. Missouri Dept. of Conservation, Jefferson City, Mo.). The following describes an antipredatory response by a young *E. o. obsoleta* during an attack by a red-shouldered hawk on 19 March 1988 in Fargo, Monroe County, Arkansas.

While we were driving along the levee of a fish pond (T4N,R2W,S23) at 1310 h, an immature red-shouldered hawk was observed landing on the ground at the forest edge. The hawk was opposite the levee which is separated by a ditch. At 1312 h we were ca. 27 m from the hawk and for five minutes observed no movement. Unable to identify the snake from that distance, we decided to rob the bird of its prey. When approached, the hawk made no movement. Closer inspection revealed the anterior quarter of a male *E. o. obsoleta* (90 cm SVL) entwined in the bird's feet.

The snake's neck and head were free and swaying from side to side with its mouth fully gaped. The posterior third of the snake was wrapped twice around the hawk's neck. The bird's mouth was open and its head was drawn close to its feet. The hawk was clearly fatigued and did not struggle as both were disengaged.

In attempts to separate the pair, the snake twice rewrapped itself around the hawk's neck in similar fashion while chewing on the bird's leg. Once separated, the hawk assumed a defensive posture on the ground. After we left, the bird perched nearby. The only visible wound on the snake was a skin tear ca. 4.5 cm behind its head.

The apparent success of this young *E. o. obsoleta* to at least partially deflect a hawk attack may be due to a combination of the inexperience of the immature hawk and the use of constriction as a defense by the snake.

Submitted by **W. E. MESHAKA, S.E. TRAUTH** and **C. FILES.** WEM and SET: Department of Biological Sciences, Arkansas State University, State University, AR 72467. CF: P.O. Box 193, Hunter, AR 72074, USA ●

HYPSIGLENA TORQUATA JANI (Texas Night Snake). **BEHAVIOR.** Various antipredator behaviors have been described for *Hypsiglena torquata* (Mitchell 1985. Herp.

Review 16(2): 54, 56; Hayes 1985. Herp. Review 16(3):79, 81; Price 1987. Herp. Review 18(1):16). A male *H. t. jani* (293 mm SVL) from near Santa Rosa, Guadalupe Co., New Mexico, has been maintained in captivity since May 1986 and has exhibited protean behavior unreported for the species.

When initially startled the snake usually assumes a rigid, sigmoid posture, often with short segments of its body slightly elevated above the substrate. Motion or physical contact by the observer causes the snake in this posture to flex violently ("snap") its body once, reversing the orientation of its body curves. The action is often accompanied by a brief hiss and occasionally by cloacal discharge, and is often sufficiently forceful to lift the snake from the substrate. The rigid, sigmoid posture is usually reattained and additional stimuli often yield several repetitions of the behavior. More typical defense behavior (thrashing) is initiated after prolonged disturbance or if the snake is grasped.

This "body snapping" is comparable to act systems #62-63 of Carpenter and Ferguson (1977. pp. 378-399, *In:* Gans and Tinkle, Biology of the Reptilia 7, Academic Press). Similar behavior has been reported for *Micrurus fulvius* (Gehlbach 1970. Herpetologica 26(1): 24-34), and may occur with varying frequency in many snake species with diverse defense behaviors (Humphries and Driver 1970. Oecologia 5(4):285-302).

Submitted by **JAMES N. STUART,** U.S. Army Corps of Engineers, Environmental and Evaluation Section, P.O. Box 1580, Albuquerque, NM 87103, USA ●

MEHELYA CAPENSIS CAPENSIS (Cape File Snake). **BEHAVIOR.** This snake virtually never bites and its only documented form of defence is the voiding of the foul-smelling contents of the cloacal glands (Broadley and Cock 1975. Snakes of Zimbabwe. Longman, Zimbabwe. 152 pp.). Another form of defence is detailed here.

On 22 May 1987, at Moeding College, Otse, Botswana (25.02 S: 25.45 E), at 1750 h, ca. 3 min before sundown, a juvenile *M. c. capensis* was observed crossing a path in savanna (this is itself unusual as *M. c. capensis* is regarded as a nocturnal snake; see Broadley 1983. Fitzsimons' Snakes. Delta Books, Cape Town. 376 pp.). When approached, it coiled up suddenly, hiding the head under the coils, and refused to emerge when prodded with a finger, although it vibrated the coils. Similar behavior has been noted in snakes of the genus *Prosymna* (Broadley 1983, op. cit.) but not *Mehelya*. The snake was deposited in the collection of the Department of Wildlife and National Parks, Gaborone, (H 5370).

Submitted by **STEPHEN SPAWLS,** Moeding College, Private Bag 11, Lobatse, Botswana. ●

OPHEODRYS AESTIVUS (Rough Green Snake). **ANTIPREDATOR BEHAVIOR.** On 25 February 1986 at 1015 h I observed an object fall from the tree canopy in Mahogany Hammock, Everglades National Park, Florida. The object, a small *O. aestivus*, had fallen from a height of at least 4 m. Immediately a blue jay (*Cyanocitta cristata*) flew from where the snake had fallen and landed on the ground next to the snake. The jay pecked repeatedly at the snake, which thrashed vigorously, apparently attempting to crawl away. Periodically the snake turned and struck at the jay. After 1-2 min the snake wrapped itself tightly around a stick (ca. 20 cm long) that was lying nearby. The jay continued its attack by biting the snake's head several times. A red-bellied woodpecker (*Melanerpes carolinus*) landed next to the jay, which then grasped the stick in its bill and flew ca. 20-25 m and landed on the ground. The snake remained wrapped around the stick during the flight. After landing, the jay dropped the stick and renewed its attack, pecking strongly at the snake (still wrapped around the stick). The jay's pecking moved the stick and snake several cm into dense vegetation so I could not observe the outcome of the attack. No blood was evident on the snake's body when it was last seen.

By wrapping itself around an object or by forming a "knot" in its body (Yeatman 1983. Herp. Review 14:22), a snake may prolong the predatory attempt and enhance its probability of survival under certain circumstances. My field experience in capturing snakes suggests to me that knotting the body around an object after being grasped may be a widespread behavior in both constricting and nonconstricting species.

Submitted by **GEOFFREY A. HAMMERSON,** 46 Kelsey St., Middletown, CT 06457, USA ●

OXYBELIS AENEUS (Brown Vine Snake). **BEHAVIOR.** Distribution of *O. aeneus* in the United States is limited to the Pajarito and Patagonia Mountains in extreme southern Arizona, and recent records of this species are rare. Here we report a sight observation and unusual predatory behavior of *O. aeneus* with *Sceloporus clarkii* and *Urosaurus ornatus* in Sycamore Canyon, Pajarito Mountains, Santa Cruz County, Arizona.

On 20 May 1988 at 0900 h, 0.16 km downstream from the trailhead at Hank and Yank Spring in Sycamore Canyon ca. 1216 m elevation, we observed an *O. aeneus* draped in a tangle of *Quercus* sp. branches 1.7 m above ground. Most of the 53 cm (SVL) snake was entwined among branches, but anteriorly, 30 cm was horizontally suspended in midair. In its jaws was the head of a live 5 cm (SVL) *U. ornatus*, whose hindlimbs were in the jaws of a 10 cm (SVL) *S. clarkii* perched on a nearby branch. The trio remained frozen in this position 10 min, with the *O. aeneus* and *S. clarkii* on separate branches and the *Urosaurus* bridging the two.

The *Sceloporus* finally moved to the back side of its branch, taking the *Urosaurus* and pulling with it the suspended portion of the snake. Out of view, the *Sceloporus* lost its grip on the *Urosaurus*, and the snake returned to its original position with the motionless *Urosaurus* dangling from its mouth, now enveloped to the ears. They remained in this position when we left 10 min later. The *S. clarkii* did not return during this time, nor did we ever observe any antagonistic behavior between it and the snake. It appeared that the snake had eaten earlier as it had a small bolus in the upper third of the digestive tract.

Submitted by **KATHLEEN GROSCHUPF,** 5605 S. Spinnaker Road, Tempe, AZ 85283 and **SUSIE LOWER,** 2920 Carrizo Creek, Nacogdoches, TX 75961, USA ●

TYPHLOPS BRAMINUS (Brahminy Blind Snake). **RATTLING.** Many tropical Asian snakes rattle effectively by vibrating their tails just as do their American counterparts. I have observed tail vibration in Asian viperid *Trimeresurus* and colubrid *Elaphe* and *Coluber* ("Ptyas"). Rattling and its evolutionary significance are discussed by Carr (1963. Reptiles. Time-Life Inc., New York. pp. 61-62). Because of its remote phylogenetic position, fossorial habits, and miniscule size I was taken aback to repeatedly observe an adult female *Typhlops braminus*, ca. 14 cm SVL, vibrate its tail in typical rattling form at Keung Shan catchwater, Lantau, Hong Kong Territory, 17 April 1987. In my field catalog (p. 117) I note that this individual vibrated its tail so strongly as to shake the entire posterior third of the body. Others observing this behavior included herpetologists S.J. Karsen and M. Wai-neng Lau, mammalogist N.C. Goodyear, and six Earthwatch participants. Locally this is the "most abundant of all snake species" and "extraordinarily abundant" (Karsen, Lau, and Bogadek 1986. Hong Kong Amphibians and Reptiles, Urban Council, Hong Kong. p. 68). We have a large series at Museum of Comparative Zoology from Lantau and therefore did not collect this specimen. My field work was supported by Earthwatch and The Conservation Agency.

Submitted by **JAMES D. LAZELL,** The Conservation Agency, 6 Swinburne St., Jamestown, Rhode Island 02835, USA ●

TESTUDINES

CHRYSEMYS PICTA (Painted Turtle). **PREDATION.** Predation of juvenile and adult freshwater turtles has been little studied and is generally considered a normal source of population loss. In certain cases, predation of juveniles and adults may represent a substantial loss to a population.

On 15 April 1987, I collected 44 *Chrysemys picta* and one *Chelydra serpentina* carcasses within 15 m of the perimeter of four small (total 0.9 ha) wetlands in the Petenwell Wildlife Area (T18N, R4E, Sec. 2 and 10), Adams County, Wisconsin. Habitat descriptions are found in Ross (1985. M.S. Thesis Univ. Wis.-Stevens Point). All turtles appeared to have been killed and most were eaten by raccoons (*Procyon lotor*) in the manner described by Wilbur (1975. Ecology 56:64-77.) Many individuals (24, 55%) were juveniles ≤80 mm PL. Many individuals were freshly killed, other carcasses may have been one to three weeks old. A two-year study estimated the population at 164 (range = 138-201) *Chrysemys.*

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These wetlands are deeper (0.5-1.8 m) than most of the surrounding wetlands and both *C. picta* and *Emydoidea blandingi* appear to congregate within them for overwintering; thus, a concentrated population is present upon spring emergence. Perhaps the concentrated nature of the population causes predators, such as raccoons, to home in on the area. Removal of 26% of the *Chrysemys* population over such a short period is greater than that estimated in other studies. Wilbur (op. cit.) and Tinkle et al. (1981. Ecology. 62:1425-1432), studying the same Michigan population, believed mortality of post-nest juveniles and adults was <10% and near 15%, respectively. Nest predation and mortality, however, are important sources of population loss and are usually higher than that of post-nest juveniles (Snow 1982. Can. J. Zool. 60:3290-3292, Breitenbach et al. 1984. Herpetologica 40:76-81). An early spring in central Wisconsin may have permitted *Chrysemys* to begin activity early and their basking on the banks of the wetlands (few basking sites disjunct from shore exist) probably permitted easy predation by raccoons. Also, during late March and early April, less food resources are available to raccoons, and turtles are a locally abundant alternate food source.

I thank J.D. Congdon for comments on this note.

Submitted by **DAVID A. ROSS,** Wisconsin River Power Company, P.O. Box 8050, Wisconsin Rapids, Wisconsin 54495-8050, USA

●

CLEMMYS MARMORATA (Western Pond Turtle). **BEHAVIOR.** Information on aspects of reproductive activity in *Clemmys marmorata* is confined to incidental notes on oviposition (Storer 1930. Univ. Calif. Publ. Zool. 32:429-441; Feldman 1982. Herp. Review 13:10-11). Copulation has been observed in the field in mid-June in Southern California and in captive specimens in late August and early September. Herein I report on possible courtship behavior in this species.

Observations were made at Arroyo de la Cruz, San Luis Obispo Co., California from 1242-1247 h on 30 August 1987. Two turtles, a 159 mm CL male and a 147 mm CL female were observed in 2 m of water (surface temp. 19° C, bottom temp. 16° C). When first observed, both turtles were moving slowly along the bottom. The female had retracted the head and the limbs were partially extended. The male swam to one side 4-5 cm behind and slightly (2-3 cm) above the female, with the head and limbs fully extended. The male made several scratching motions at the anterior left edge of the female's carapace with his right front foot. The female stopped, retracted the front limbs and elevated the posterior portion of the shell 2-3 cm off the substrate by extension of the hind limbs. The male swam to the front and facing the female, made 17 scratchings at the anterior edge of the carapace with one or both front limbs. The head was extended and came in contact with the female's carapace four times, although biting was not observed. The male then moved to a position 15-20 cm in front of and slightly to the left of the female, fully extended the head and partially extended the left front and left rear legs. Several short (<2 cm) horizontal

Herpetological Circular No. 17

Prepublication Announcement

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BY

Marc P. Hayes, J. Alan Pounds and Walter W. Timmerman

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coordinated sweeping/fanning movements were observed. This behavior lasted approximately 25 sec. The scratching behavior previously described was repeated, with 22 movements of one or both limbs. The male again swam to the same position in front of the female and repeated the limb-sweeping behavior for a period of 15 sec. The male then elevated the entire body at a 45° angle directly in front of the female and fully extended the head and all limbs. This behavior lasted ca. 20 sec.

At the termination of this activity, the male surfaced for air within 1 m of the observer. After 35 sec he dove to the bottom a short distance from the female and swam off a distance of 1 m, then returned to the female briefly (<10 sec) before turning and swimming to within 40 cm of the observer, whereupon he turned rapidly and attempted to escape.

Submitted by **DAN C. HOLLAND,** Department of Biology, University of Southwestern Louisiana, Lafayette, Louisiana 70504-2451, USA ●

DERMOCHELYS CORIACEA (Leatherback Sea Turtle). **MIGRATION.** The leatherback sea turtle is the largest and most pelagic of extant sea turtles. It is also distinguished by the most extensive geographic range of any reptile, with the northernmost recorded latitude being approximately 71° N, and the southernmost approximately 27° S (Pritchard and Trebbau 1984. Turtles of Venezuela. Society for the Study of Amphibians and Reptiles.). Nonetheless, our knowledge of the distribution and movement of leatherbacks is scant. Records of adult leatherbacks away from known nesting grounds consist of opportunistic sightings at sea, incidental catch in fishing gear, and the stranding of dead or dying animals in coastal areas.

The paucity of information regarding the migratory movements of adults makes any stranding of a tagged individual particularly valuable. The first such record is available from Hughes (1974. The sea turtles of southeast Africa II. Investigational Report 36, Oceanographic Research Institute, Durban, South Africa), who reported that an adult female leatherback traveled some 1000 km north to Mozambique after nesting in Tongaland, Natal, 369 days earlier. Pritchard (1976. Copeia 4:749-754) provided additional evidence of long-distance movement when six leatherbacks tagged in French Guiana and Suriname were recaptured as far away as New Jersey (USA) and Ghana (West Africa). Five of these individuals had traveled distances exceeding 5000 km, thus marking the longest migrations on record for any reptile (Pritchard 1976. Copeia 4:749-754).

More recently, a leatherback tagged "T 16" while nesting at Matura Beach, Trinidad, in May 1970, was later recorded nesting at Tacarib Bay, Trinidad, in April 1975 and then reported dead in September 1977 on Rockaway Beach, New York (Lambie 1983. Marine Turtle Newsletter 24:17). This stranding lends credence to the contention that Caribbean-nesting leatherbacks journey into temperate latitudes (e.g., Bleakney 1965. Can. Field-Nat. 79:120-128; Lazell 1980. Copeia 1980 (2):290-295). However, since the stranding occurred more than two years after the last documented nesting, the incident offers no direct evidence of post-nesting movement.

We now provide the first direct evidence that leatherbacks nesting in the West Indies may engage in migratory movements northward immediately following the nesting season. A 245 kg leatherback tagged "AAG 313" on Sandy Point, St. Croix, United States Virgin Islands, was last seen nesting on Sandy Point on 8 June 1981. She was recovered 85 days later on 1 September 1981 in Surf City, New Jersey, an intervening distance of 1680 nautical miles (3113 km). Death was attributed to blockage of the ileocaecal valve by a large, clay-like mass (enterolith) (R.C. Schoelkopf, pers. comm.).

Submitted by **RALF BOULON, JR., KAREN ECKERT,** and **SCOTT ECKERT,** Division of Fish and Wildlife, 101 Estate Nazareth, St. Thomas, U.S. Virgin Islands, 00802. ●

PSEUDEMYS NELSONI (Florida Red-bellied Slider). **MUTUALISM.** Control of epizoophytic growth on the carapace of turtles may be achieved by basking or, as in some cases, the turtle may actively bite algae off its own shell (Reilly 1983. Herp. Review 14(3):76). The following documents an instance in which algal growth is removed by the actions of a conspecific.

On 28 December 1987 at 1330 h along a canal parallel to SW 344 St. 2 km E of US Hwy 1, Miami, Dade County, Florida, a female *P. nelsoni* was observed eating algae from the carapace of a male conspecific for ca. four min. before being startled. The male and female were ca. 22.0 and 28.0 cm CL, respectively. Both were nearly horizontal and just under the surface of the water 0.5 m from the shore. The male remained passive, clinging to floating debris with head above water while periodically changing his direction of view. The female behind the male, at all times held the male's carapace with her forelegs. Algae was seen only on the posterior region of the carapace and was sheared with bites by the right side of the female's mouth. Twice, the male was pulled under the water by the actions of the female. The male readjusted his position making no attempt to leave. During the course of my observation, the female surfaced twice and only momentarily. After being detected, the male quickly swam away leaving the female to remain motionless for ca. one min. before surfacing a third time. Shortly after, she slowly swam away.

While algal growth may afford turtles a certain amount of camouflage, in excess, shell deterioration and death can occur (Neil and Allen 1954. Ecology 35:581-584). The behavior reported here suggests a mutualistic relationship. By utilizing a convenient food source, both turtles benefited. This might be particularly beneficial in situations where turtles are unable to bask enough to adequately control algal growth.

Submitted by **WALTER E. MESHAKA JR.,** Department of Biology, Arkansas State University, State University, AR 72467, USA ●

BOOK REVIEWS

The Cold-blooded Australians, by Gunther Schmida. 1985. Doubleday Australia Pty. Limited. 208 pp. $24.95 Australian.

"Exemplary" is the single word that best describes the photography in this all color "coffee-table" book.

Until now the author has, perhaps, been best known to enthusiasts of the aquarium industry through his pictorial contributions to the various aquarium journals. In *The Cold-blooded Australians* he has continued with his pictorial concept. However, to the fish, represented by some 65 photos, he has added another 165 photos of the herpetofauna and more than 40 photos of their various habitats.

Rather than using systematic groupings, Schmida has opted for a geographic approach, dividing the country into eight drainage regions. While a taxonomist might take exception to such an unwieldy format, those for whom the book was primarily designed (laymen to advanced amateurs) are unlikely to complain. Certain of the inevitable overlaps have been discussed both in the introduction and respective chapters.

Intended as a "unique photographic study," the book accomplishes this and more. While the captions are often short, they include common and scientific names, size, food, and the most noticeable characteristics of the species being discussed. The final chapter is a rather cursory explanation of Schmida's photographic techniques and the equipment used.

Given the confused state of the Australian herpetofaunal taxonomy, the nomenclatorial designations for both these and the fish are remarkably current. However, a request to suppress the generic name *"Bothrochilus,"* used in the book and current for the members of what has long been known as "*Liasis*," has been tendered to the International Commission on Zoological Nomenclature. Similarly, a request to return the various carpet snakes and amethystine python (and certain others) to the genus "*Morelia*" (which Schmida has used, somewhat prematurely, in his book) from the current designation of *Python* is being currently entertained. And it would have been better to say "this morph" rather than "this species" in the caption concerning the Atherton Tableland carpet snake (p. 44) when mentioning its currently questionable taxonomic status. Finally, the name *"praelongus,"* recently resurrected from the synonymy of *antarticus* upon very tenuous characteristics, now seems likely to soon be again relegated to obscurity.

The above criticisms are minimal when the book is viewed in its entirety. Certainly it is worthy of a place in the library of any professional or amateur naturalist who has even a cursory interest in these, *The Cold-blooded Australians*.

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LIFE MEMBERSHIPS

SSAR is once again offering two membership plans which benefit both the Society and participating members.

Life memberships are now available for U.S. $600. This may be paid in a lump sum or distributed over three years, at $200 per year.

Three-year memberships are also available, guaranteeing membership at 1989 rates in the event of a subsequent dues increase.

Both options will appear on the dues envelope which you should receive shortly. ●

SPONSORSHIP OF NON-U.S. MEMBERS

SSAR is expanding its sponsorship of non-U.S. members by requesting contributions to a fund established to defray the membership dues of herpetologists in countries that face difficulties with exchange of foreign currency. We encourage your participation in this program. Your 1989 dues envelope will afford you the opportunity of supporting a specific individual or the general program. You may also contact our Treasurer, Douglas Taylor, if you can assist in the identification of colleagues who can benefit from this program. ●

WANTED: MEMBERSHIP SECRETARY

The Society is embarking on a major membership campaign to attract new members from the large pool of individuals at colleges, universities, secondary schools, museums, zoos, nature centers, and regional herpetological societies. A "Membership Secretary" is being sought to coordinate this effort. The volunteer will receive financial and logistical support from the Society as well as assistance from the officers and directors. Further information is available from Hugh Quinn, SSAR President. ●

SSAR CONSERVATION COMMITTEE

The Conservation Committee for 1988-89 consists of the following persons: Nat B. Frazer (Chair), John L. Behler, William S. Brown, William E. Cooper, Dale R. Jackson, Tom Johnson, Tom Langston, Paul E. Moler, and Rich Seigel. Conservation-related matters should be sent to the Chairman at: Department of Biology, Mercer University, Macon, GA 31207, USA. ●

SSAR GRANTS-IN-HERPETOLOGY

The Society for the Study of Amphibians and Reptiles announces that proposals are now being accepted for the 1989 Grants-in-Herpetology Program. This program is designed to provide financial support for deserving individuals or organizations involved in herpetological research, education, or conservation. In keeping with the Society's goal of encouraging participation of the broadest possible community, preference may be given to individuals who might not have access to other funding sources. All applicants must be members of the SSAR. Applicants are limited to submission of one proposal in one category per year. Further, if proposals in any of the categories are not forthcoming, or are judged not to be sufficiently high quality, the funds in those categories may be transferred to the remaining categories.

Grant proposals will be considered in the following categories:

1. REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS. Proposals may address educational projects, speaker's fees, regional research, defrayment of one-time-only costs (e.g., money to complete the purchase of a word processor for improvement of a society newsletter), or other purposes that would strengthen regional societies. Proposals may be submitted by regional herpetological societies or by individual members and must be accompanied by a letter of support from the current president of the regional society.

2. HERPETOLOGICAL RESEARCH OR EDUCATION IN ZOOS. Proposals may address any herpetological endeavor conducted in zoos, such as improvement of displays, husbandry, or behavioral research. A letter from the director or herpetological curator of the sponsoring zoo must accompany the proposal.

3. CONSERVATION OF AMPHIBIANS AND/OR REPTILES. Proposals should address research on species endangered or threatened at the state, national, or international level, or address research on potentially threatened habitats or species. Proposals must be from individuals only and must be accompanied by a letter of support from another member of the SSAR.

4. GRADUATE STUDENT RESEARCH IN HERPETOLOGY. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only. Applications must be accompanied by a letter of support from the student's major advisor or committee chairperson.

Each proposal must include the following: (A) BACKGROUND AND OBJECTIVES of the proposed project; (B) METHODS of carrying out the project; (C) BUDGET, which should not exceed $500; (D) BRIEF RESUME of the applicant or project coordinator; and (E) LETTER OF SUPPORT. The proposal must be typed, double spaced, and must not exceed five pages, excluding resume and budget.

Applicants must designate to which of the four categories their proposal is submitted. All proposals must be submitted in duplicate and postmarked no later than 31 January 1989. Failure to meet the guidelines may result in elimination of a proposal from consideration. The awards will be announced by 1 April 1989. Successful applicants will be expected to submit to the SSAR a written report of the result of this support within a reasonable amount of time after the project year is completed. They are also encouraged to submit the results of research projects for publication in the *Journal of Herpetology* or *Herpetological Review* or to present their findings at the annual meeting of the SSAR.

Financial contributions by SSAR members, institutions, and other benefactors support this program significantly and can increase the number of awards in this program. Your tax-deductible contribution to this program will benefit directly meritorious research and education in herpetology. Contact the President of SSAR for additional information on contributing to the Grants-in-Herpetology Program. If you are employed by an organization that will match donations made to nonprofit organizations, please notify your employer that you have made a donation to

the Grants-in-Herpetology Program.

Submit proposals or questions regarding application procedures to:

DARREL FROST, CHAIR
SSAR Grants-in-Herpetology Committee
Museum of Natural History
University of Kansas
Lawrence, Kansas 66045, USA
(913) 864-3439 ●

NEWSNOTES

SUPPORT FOR GRADUATE STUDENT TRAVEL TO THE FIRST WORLD CONGRESS OF HERPETOLOGY

The Student Travel Fund Committee (representing The Herpetologists' League, American Society of Ichthyologists and Herpetologists, and Society for the Study of Amphibians and Reptiles) solicits applications for travel grants from doctoral students in herpetology who are currently members of one of the three societies listed above. These travel grants must be used for attendance at the First World Congress of Herpetology and will amount to the equivalent of round-trip air fare from New York to London

The application must be accompanied by a letter of endorsement from the student's advisor. That letter should include a brief evaluation of the past academic record, current status and future potential of the applicant.

Interested students must submit a short proposal (no more than three double-spaced typed pages) indicating: nature of graduate research, career goals, benefits expected from attending the Congress, availability of other supporting funds, and the title and abstract of the poster to be presented at the Congress. Letters of endorsement and student proposals must be received no later than 2 November 1988. Announcements of awards will be made by 15 January 1989. Application materials should be sent to:

Student Travel Fund Committee
c/o David Cundall
Biology Department, #31
Lehigh University
Bethlehem, PA 18015, USA ●

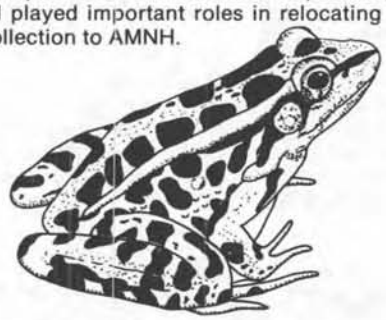
COLLECTIONS TRANSFERRED TO AMERICAN MUSEUM OF NATURAL HISTORY

One of the responsibilities of major museums is to accept and incorporate worthwhile systematic collections from other institutions when such collections are deemed out of scope or otherwise surplus by a current repository. With the burgeoning bureaucracy making it ever more difficult to obtain specimens in the field, it is important to see that no specimens of value are lost due to indifference or neglect.

In recent years the AMNH has accessioned and cataloged two important collections donated by institutions whose authorities recognized that the potential for continued care, greater accessibility and future usefulness to systematics would be enhanced by transfer to AMNH. The purpose of this newsnote is to announce that these transfers have been completed, with all specimens cataloged and incorporated in the AMNH collection.

The Newark Museum, Newark, New Jersey: 2860 amphibian and 109 reptile numbers. The eastern United States and New Jersey in particular are best represented, with the collection being rich in larval anurans documenting publications by Kenneth L. Gosner and Irving H. Black. Mr. Gosner (formerly Curator of Zoology, Newark Museum) and Director Samuel C. Miller are gratefully acknowledged for arranging this transfer.

Virginia Polytechnic Institute and State University, Blacksburg: 3523 amphibian and 390 reptile numbers. This varied collection emphasizes Virginia and the southeast. Prof. E. R. Stout (head, Department of Biology), Dr. Joseph Mitchell and Mr. Christopher Pague all played important roles in relocating the collection to AMNH. ●



SNAKE ECOLOGY GROUP

The Snake Ecology Group is an informal network of persons working with snakes in some professional capacity (e.g. governmental agencies, museums, universities, and zoological parks). For our purposes, "snake ecology" has been defined quite broadly, so as to include related areas of behavior, functional morphology, and physiology. The main objective of the Snake Ecology Group is to facilitate and encourage communication among its members.

The first step taken towards this objective has been the compilation of a Directory containing members' names, addresses, phone numbers, areas of interest, current projects, and recent publications. The 34-page Directory was mailed to over 130 participants worldwide in November 1987. As a second step, a more typical "newsletter" was distributed in June 1988. Included in the newsletter are about 30 additions to the Directory, a request for information on underwater hibernation, an open letter on conservation, and two informal discussions (one on radiotelemetry, another on reproductive ecology).

If the Snake Ecology Group is of interest to you, or if you wish more information, please contact A. Ralph Gibson, Department of Biology, Cleveland State University, Cleveland OH 44115-2403, USA [phone (216) 687-2438] or Charles R. Peterson, Department of Biological Sciences, Idaho State University, Pocatello, ID 83209, USA [phone (208) 236-3765]. ●

Important New Book

DICTIONARY OF AMPHIBIANS AND REPTILES

by Natalia B. Ananjeva, Leo P. Borkin, Ilja S. Darevsky and Nikolai L. Orlov

This outstanding new dictionary was issued in Moscow in June 1988. The largest section (370 pages) is a **complete list of the world's amphibians and reptiles** (over 12,000 entries), giving for each family, genus and species the scientific name, author, a brief statement of distribution, and the common names in several languages. There are detailed indexes in Russian (60 pages), English (30 pages), German (20 pages), and French (10 pages), plus an extensive index to the Latin names, both generic and specific (60 pages). The book is excellently printed and is clothbound in a handsome edition; total length 560 pages.

This book contains the only complete listing of the world's herpetofauna available in any language and is an invaluable index for professional herpetologists and serious amateurs alike. Only a limited number of copies are available and are being offered as a contribution to the World Congress of Herpetology by Soviet herpetologists. While supplies last, they may be ordered from *Kraig Adler, Cornell University, Mudd Hall, Ithaca, New York 14853, USA*. Cost is $30 including surface postage. Make checks to "World Congress of Herpetology"; payment in advance.

IN MEMORIAM

THE ROZELLA SMITH FELLOWSHIP FUND

Rozella Pearl Blood Smith, well known figure among herpetologists, died 15 December 1987, after a protracted illness.

Diversely talented, Rozella Smith was an outstanding expert in many fields of thought and endeavor—she was a most catholic scholar with many skills. Her quick wit, articulate expression, energy and vivacity made memorable every association with her. In every way she was a very special person.

Rozella Smith's manual dexterity and logical, mathematical mind were phenomenal, and were applied in many ways. Although her direct and indirect contributions to knowledge were many, through numerous associates, certainly her greatest impact was upon herpetology, in which field she contributed some 72 articles and books (see the Great Basin Naturalist 1988, 48:180-187); others are in press or in final stages of preparation.



Dr. Smith (she received an honorary D.Sc. degree from the University of Colorado in 1982) developed probably the most effective data-retrieval system ever utilized in herpetology or related fields, and applied it with great originality, enthusiasm, and energy to the massive files accumulated by her husband on the herpetofauna of Mexico. Only through her diligent and innovative manipulation of some 150,000 basic index cards derived from about 11,000-12,000 works were the six volumes of the Synopsis of the Herpetofauna of Mexico produced from 1971 to 1980. In that process she prepared literally millions of punch cards; many analyses were never published or used. Her system was applied in a few other contexts, but its full potential was never realized because her deteriorating health coincided with the demise of punch cards, which were the primary vehicle for her system.

Rozella was probably handicapped during her life, in realization of and recognition for her capabilities, through the same social structure that limits many talented women. Therefore, a unique and perpetual academic memorial to Rozella Smith has been established at the University of Colorado. This memorial, which consists of a named graduate fellowship, will be administered by the University of Colorado. In harmony with Rozella Smith's own principles and achievements, this Fellowship will be dedicated to academic excellence. Commitment of institutional and private funds has already been substantial, and promises to make the Rozella Smith Fund the largest and most prestigious of endowments in environmental biology at the University of Colorado.

We solicit contributions to the Rozella Smith Fund from friends and admirers of Rozella Smith, or from those who would support this worthy project. Contributions can be sent to the Rozella Smith Fund at the address given below.

Rozella Smith Fund Committee
Department of Environmental, Population and Organismic Biology
122 Ramaley
Campus Box 334
Boulder, Colorado 80309, USA. ●

LEGISLATIVE ALERT

The following species have been declared Endangered in Virginia by the Department of Game and Inland Fisheries: *Ambystoma tigrinum, Plethodon shenandoah, Clemmys muhlenbergii,* and *Deirochelys reticularia.* This protection is effective as of 1 October 1987. Virginia law prohibits the collection, possession, transportation, and selling of any individuals of any designated Endangered species, without the appropriate permit. ●

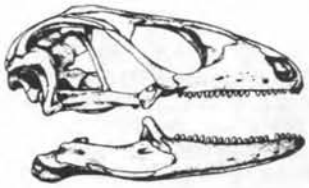
MEETINGS

FIRST WORLD CONGRESS

The First World Congress of Herpetology, to be held at the University of Kent at Canterbury, 11-29 September 1989, promises to be the largest herpetological meeting ever held, with over 2000 enquiries from over 60 countries. Many people have provisionally registered already, but *if you want to be sure of a place, please complete the registration form now* and mail it without delay. There are places for 1000 delegates and 600 accompanying partners and there is every indication that we will easily exceed this number of applications.

Every conceivable topic is covered by our scientific programme whether you are most concerned about conservation, taxonomy, advances in behavioural and evolutionary ecology, or the problems facing herpetological field research, to name but a few areas in the 44 symposia, roundtables and workshops. The poster sessions are a prominent and

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Phylogenetic Relationships of the Lizard Families

ESSAYS COMMEMORATING CHARLES L. CAMP

Edited by Richard Estes and Gregory Pregill. Using modern analytical methods of phylogenetic systematics, this is the first comprehensive treatment of the relationships among lizard families to appear in over 50 years. In chapters by the leading experts on particular squamate taxa or anatomical systems, it brings together a vast body of information intended both for systematists and for biologists who know the value of interpreting organismal biology and evolution against a historical background. Illustrated with some 180 drawings and photographs. 648 pages. $75.00

Stanford University Press
STANFORD, CA 94305

important part of the Congress and I do urge you to consider sending a completed abstract form to the posters manager. If you want to present a spoken paper, send the abstract form to the senior convenor of the appropriate symposium (addresses given inside the meeting booklet which was provided at the annual meeting and in response to inquiries). *The deadline for volunteering to present an oral paper is 1 November 1988.*

Many trips and tours are planned for those who want to see the U.K., Europe, and other parts of the world, and the Congress has an extensive social programme. Everybody will find something relevant to their interests and concerns, and all will be welcome.

The (in)famous SSAR auction, Joseph T. Collins, presiding, will also be part of the programme. In order to save on baggage costs, please *mail* all auction items directly to me well in advance of the meeting. Due to time limitations, only three hundred items will be offered so please restrict your contributions to those you consider most valuable or saleable.

Complete registration circulars, for those residing in North, Central or South America, may be obtained by writing to the editor of *Herpetological Review*. Inquiries from other parts of the world may be sent directly to me.

IAN R. SWINGLAND
Ecology Research Group
Rutheford College
University of Kent
Canterbury, Kent CT2 7NY
United Kingdom

SOCIETY FOR RESEARCH ON AMPHIBIANS AND REPTILES IN NEW ZEALAND

The inaugural meeting of The Society for Research on Amphibians and Reptiles in New Zealand (SRARNZ) was held on 17-18 October 1987 in Wellington, New Zealand. Thirty-four people attended and apologies were received from 29 in New Zealand and 12 from overseas. Participants gave five-minute presentations about themselves and their interests and many spoke longer on their recent research. The meeting approved a constitution and aims of the Society, which are to:

1. Promote the scientific study of all aspects of the biology of the amphibians and reptiles in the New Zealand region; and
2. Promote the conservation of the indigenous amphibians and reptiles of the New Zealand region.

Two invited addresses were presented before the dinner: Dr Phil Millener, National Museum of New Zealand: "The Latest in N.Z. Paleoherpetology." Dr Michael Thompson, Victoria University of Wellington: "The Latest in Tuatara Research."

The meeting was followed by a field trip to Cape Turakarae, the site of long-term research on lizards, and a barbeque at Rimutaka State Park.

Membership is open to anyone and further details can be obtained from Dr Charles H. Daugherty, President, Zoology Department, Victoria University of Wellington, Private Bag, Wellington, New Zealand; or Mr Donald G. Newman, Secretary, c/- Science Directorate, Department of Conservation, P.O. Box 10420, Wellington, New Zealand. ●

SOCIETIES

CENTRAL FLORIDA HERPETOLOGICAL SOCIETY SCHOLARSHIP

The Central Florida Herpetological Society and the Santa Fe Community College Endowment Corporation Board of Directors have established a major scholarship program in the Biological Parks Training Program at Santa Fe Community College. The purpose of this scholarship program is to assist selected students in the pursuit of an Associate of Science degree in Biological Parks Management Technology. The Santa Fe Community College Endowment Corporation is the recipient and administrator of this scholarship program established by the Central Florida Herpetological Society.

Students interested in enrolling in the Biological Parks Management Program and who demonstrate an interest in herpetology are encouraged to apply. Students must have good grades, an interest in zoo training, and some degree of financial need. The scholarship consists of $800 for one school year, covering tuition and books.

Additional information may be obtained by contacting: Central Florida Herpetological Society, P.O. Box 3277, Winter Haven, FL 33881, USA. The deadline for scholarship applications is 15 April of each year. ●

REGIONAL HERPETOLOGICAL PUBLICATIONS HAVE PERMANENT HOME

It is common knowledge that interesting and valuable herpetological information is printed in the numerous regional society newsletters. The herpetological community has a centralized location where regional works are housed and where copies of particular articles can be secured. Ms. Nina J. Root, librarian at the American Museum of Natural History, gladly receives all past, present and future newsletters, bulletins, and other publications from regional societies throughout the world.

The library at AMNH catalogues all materials into their permanent collection and provides photocopies of articles at a nominal fee upon request. It is vitally important that all regional herpetological societies furnish the

World Congress of Herpetology

NOMINATIONS SOLICITED FOR NEW OFFICERS AND MEETING SITE

Pursuant to the WCH Constitution *pro tem*, nominations of persons are hereby solicited for election to the Executive Committee (EC) and International Herpetological Committee (IHC) of WCH, as well as proposals for the venue of the Second Congress. All persons are eligible to nominate.

EC. Nominations to the EC must be seconded by any two present members of the EC or IHC (list printed in the Registration Circular available from the Secretariat, WCH, Ecology Research Group, Rutherford College, University of Kent, Canterbury, Kent CT2 7NY, UK; or Telex 965449 UKCLIB G).

IHC. Nominations to the IHC must be seconded by any two present members of the EC or IHC or by the governing body of an Affiliated Organization (list also printed in Registration Circular). In addition, the governing bodies of Affiliated Organizations may nominate to the IHC.

Venue. Individuals or groups who wish to propose sites for the Second Congress (to be held 1992 to 1994) should submit one-page-maximum proposals indicating meeting and housing facilities, names of persons who might serve on local Organizing Committee, and special attractions of the site.

Deadlines. All seconded nominations and venue proposals should be submitted to the Secretary-General: Professor Kraig Adler, Cornell University, Seeley G. Mudd Hall, Ithaca, New York 14853, USA; or Telex WUI 6713054). *Nominations must be received by 1 June 1989*; venue proposals should be received no later than 1 September 1989 so they can be copied for distribution and voting at the Canterbury Congress.

museum with *complete* volumes of past publications and that the museum library be permenently placed on their mailing lists. The address is:

NINA J. ROOT
The Library
American Museum of Natural History
Central Park West at 79th Street
New York, NY 10024 USA

FEATURES

HERPETOLOGY IN SOUTH CHINA

In the not distant past South China provided a broad and continuous corridor between equatorial rain forests and temperate and boreal forests. This forest corridor led not only to the heart of Eurasia, but also directly to the Bering Land Bridge. Today that forest is reduced to scattered fragments and relicts, usually in remote areas and rugged terrain. The process of biogeographic reconstruction is now not unlike a paleontological effort.

From about 1936 to 1976 there was little opportunity for herpetological study of this biogeographically critical region. Notable exceptions include Liu et al. (1960, 1973) and Liu and Hu (1975).

During the last decade there has been a rejuvenation of herpetological activity in South China. The purpose of this report is to review important published works, either new or not readily accessible to westerners, and note new locality records and work in progress.

The most important work to date is Karsen, Lau, and Bogadek (1986): Hong Kong Amphibians and Reptiles. The territory includes Hong Kong island itself (ca. 81 km^2), much larger Lantau (ca. 138 km^2), about 100 other islands and rocks, and more than 700 km^2 of the South China mainland, totalling ca. 1013 km^2. Most of the original forest of the area was gone by the time Europeans saw the territory, but patches of *fung shui* woods remained and formed nuclei for the regeneration of the extensive forests which exist today (La Touche 1934; Viney and Phillipps 1983).

Karsen et al. (1986) provide the most useful and up-to-date work on the herpetology of tropical China available today. Each of the 99 species is illustrated, usually with a color photograph of a living specimen (drawings must suffice for some rarities not seen in the last few years). Each species account includes a general description, remarks on distribution and abundance, economic and medical comments where appropriate (e.g. edible frogs and turtles, venomous snakes), and all the authors know about life history, ecology, and reproduction. These last comments are especially useful because the authors are astute naturalists and maintained a large captive collection. I found in this work data on breeding seasons, clutch sizes, and diet I have never read elsewhere.

The flaws are minor. Tighter species diagnoses would have permitted more certain identifications. These were originally included, but were stricken by the publisher as detracting from the popular appeal of the book. The more complete version would have allowed one to fully resolve all specimens in such look-alike genera as *Opisthotropis* and *Enhydris* (Colubridae).

The work is dedicated to the late J.D. Romer, economic entomologist, whose hobby and passion was herpetology. Romer's works on the Hong Kong herpetofauna (keys and brief guides) are cited. The dependence of Karsen, Lau, and Bogadek on Romer's work leads to a second category of flaws or minor problems: identification and taxonomy. Romer accepted some taxonomic changes uncritically, and was unaware of others; his names persist. The most obvious cases involve the genus *Natrix sensu lato.*

Karsen, Lau, and Bogadek did not include the gecko *Hemidactylus frenatus* in the Hong Kong fauna, although it was recorded there by Smith (1935). Bogadek has since confirmed the presence of a population in Victoria (MCZ Z-36169).

Matsui (1986) examined specimens of *Bufo gargarizans* putatively taken in Hong Kong and stored at the U.S. National Museum of Natural History (USNM). This species was not known to Romer or Karsen, Lau, and Bogadek. I do not believe it occurs in Hong Kong. R. Crombie, USNM, reports (*in litt.*) that these specimens of *Bufo gargarizans* were received from Smithsonian "attache" Pierre Louis Jouy in the early 1880s. One, USNM 37510, was variously logged as "Japan" and "China, Hong Kong?" The others, USNM 46486-95, are associated with specimens of other species of dubious Hong Kong provenance. Crombie suggests Hong Kong was merely the shipping port, and I agree.

In this connection, a second major work deserves comment and review: Pan, Liu, and Qian (1985), a broad-brush review of the amphibians of Guangdong Province. Pan et al. include *Bufo gargarizans* in Guangdong only from north of the divide in the Nanlingshan (mountains of the border region with Hunan Province), to elevations exceeding 700 m. Pan, Liu, and Qian partition the Province two ways: terrestrially and aquatically—in terms of drainage. Their terrestrial zones are mapped. Roughly, the first is the northern, north of the Tropic of Cancer. The second is an inland, eastern region; the third an inland, western region. By far the largest zone is the south coast, including Hainan Dao and all other coastal islands, and the North Pearl River (Bei Jiang) valley to nearly the Tropic. All of this zone is within the tropics *sensu stricto.*

The drainage zones of Pan, Liu, and Qian are also four, but in two major groups. Group



Figure 1. South China, showing localities mentioned in the text: hatching = Hengduanshan and the Dianxi Plateau; star = Huaping forest; and solid dot (with arrow) = Dinghushan.

one, containing no subdivisions, is the drainage north out of the Nanlingshan to (eventually) the Chang Jiang (Yangtze River). This drainage contains three species not found elsewhere in the Province by these authors: *Bufo gargarizans* already noted, the giant salamander *Andrias davidianus*, and the edible frog *Rana nigromaculata*. This last species is of interest because Karsen, Lau, and Bogadek (1986) have recorded it in the wild in the New Territories of Hong Kong in 1966 and 1981. They suggest these individuals represent escaped market imports.

Group two, the remaining three drainage zones, are all part of the Eastern Oceanic Drainage. The first of these, the South, includes drainages to the sea south and west of the west branch of the Pearl—the Xi Jiang—and the Xi Jiang itself. The second, called Central, includes the north branch of the Pearl, the Bei Jiang, and all drainages east of it. A nebulous third zone combines South and Central components. It is not clear from their paper why this exists, but it may reflect human-altered drainage patterns in the recent past.

Pan, Liu, and Qian list 41 species of amphibians in Guangdong Province. Six constitute major range extensions. The salamander *Pachytriton labiatum* was found in the northern zone; this range was included in the major work on Caudata by Zhao and Hu (1984). The whiskered frog, *Vibrissophora yaoshanensis*, was taken in the equivocal, combined South and Central drainage of the northern zone at 750 m. *Rhacophorus mutus* was found from 100 to 300 m in the southern drainage of the southern and western zones. The burrowing frog *Kaloula pulchra hainana* is shown to occur in extreme southern mainland Guangdong; the nominate form occurs throughout most of the rest of the Province.

Two frogs round out the list of new records from Pan, Liu, and Qian. *Rana versabilis* is added from both northern and western zones, in the combined South-Central drainage, at 400-500 m. *Rana latouchii* was found in the Central drainage of the northern region at 500-1200 m. While this may be a new record for Guangdong *sensu stricto*, *R. latouchii* was found in February 1984, breeding in stream pools at ca. 150 m in forest near Tai Po, New Territories of Hong Kong (Karsen, Lau, and Bogadek, 1986). It is most unlikely that this small species, not normally utilized for food, could have been introduced to this natural area by human agency. There are fresh specimens: Museum of Comparative Zoology (MCZ) 108687-8.

Pan et al. did not visit Hainan Dao. Their list leaves out 18 amphibians recorded from that large island by Liu et al. (1973), in a total list of 37 species. Omitting *Kaloula pulchra hainana* which Pan et al. found on the southern mainland, Hainan Dao has at least ten endemic species. Not endemic, *Rana tiannensis* has been added to the list for Hainan Dao, and thus Guangdong Province, by Li, Qian, and Wu (1986).

Two frogs, *Philautus romeri* and *Amolops hongkongensis*, beautifully depicted and well described in Karsen, Lau, and Bogadek (1986) remain known only from Hong Kong and have yet to be collected in Guangdong Province *sensu stricto*.

Thus, there are at least 62 species of amphibians in Guangdong *sensu lato* (including Hainan Dao and Hong Kong).

Another important paper on Guangdong amphibians is provided by Su (1985) on feeding habits. The bulk of the paper details the stomach contents of the common paddy frog, *Rana limnocharis*, and consists primarily of tables listing insects and other arthropods. Thirty other species are also listed on the basis of stomach content analysis, including the enigmatic *Rana nigromaculata*, noted above. Su (1985) notes no geographic provenance for the Guangdong specimens, but found 100 percent Orthoptera as the contents of five stomachs. Because crickets (Orthoptera) are the standard food given *Rana* held captive for eventual human consumption, Su's data contribute to our suspicion that most Guangdong *R. nigromaculata* are imported. Su ranks the six most economically important amphibians as being *Rana tigrina, R. limnocharis, R. spinosa, R. guentheri, R. nigromaculata*, and *Bufo melanostictus*.

Perhaps the best studied region in South China lies some distance from Guangdong and Hong Kong. This is Hengduanshan (Hengduan Mountains) of Yunnan. Yang, Su, and Li (1983) provide the fundamental biogeographic paper on this region. It lies between 24° and 29° N, and 98° and 100° E, just north of the Tropic of Cancer. Elevations vary from about 450 to 3,850 m for the area studied by Yang et al., which includes the Dianxi Plateau and its southward decline. Within this area the authors record a total of 138 species. Yang and Su (1984) subsequently log 139 by adding a new flying frog, *Rhacophorus gongshanensis*.

In a study concentrating on amphibians of high altitudes (especially those ranging over 3,000 m) and primitive forms (especially in the genera *Batrachuperus, Andrias, Tylototriton, Bombina, Megophrys*, and *Oreolalax*), Hu, Jiang, and Zhao (1985) add at least 24 more species. Most recently (I will not say finally) Wu and Zhao (1985) add four more species of frogs of the genus *Amolops* in a karyotypic study of biogeographic import. This brings to at least 83 the number of known amphibians in this area. Some species questions remain unresolved and Li, Yang, and Su (1984) did not do high altitude (over 3,000 m) work, but on present evidence Hengduanshan supports the greatest amphibian diversity in China.

A forest remnant on the Guangxi side of the Nanlingshan, at Huaping, just north of the Tropic (25° 31' - 25° 39') was studied by Wen, Li, and Xu (1984). They note that the area is cool and moist, with mean temperatures varying from 12° -14° C, annual rainfall 2000-2200 mm, and average humidity 80 percent. They found 76 species (Table 1).

My own work has been concentrated at Dinghushan, Guangdong, well south of the Tropic, ca. 80 km west of Guangzhou (Canton): Lazell and Liao (1986). This area is small, ca. 1,200 ha, but rugged, rising to just over 1,000 m. In our list *"Leiolopisma" reevesi* should be *Scincella modesta* (*S. reevesi* occurs at Dinghushan too: Zhou et al. 1981). Perhaps our most signal failure at Dinghushan has been with salamanders. Zhao and Hu (1984) have summarized knowledge of Chinese salamanders and record seven from Guangdong Province: *Andrias davidianus, Pachytriton brevipes, P. labiatum, Tylototriton asperrinus, Paramesotriton chinensis, P. hongkongensis*, and *Cynops orphicus*. Of these, *Andrias* and both *Pachytriton* are unlikely for coastal zone and southern drainage, but any of the others, or species as yet unknown, might well occur at Dinghushan. Certainly *Paramesotriton hongkongensis* is the most obvious candidate.

A number of new locality records may be appropriately listed here. Common names in English are from Karsen, Lau, and Bogadek (who also provide Chinese names). Collection abbreviations are Guangdong Institute of Entomology, Guangzhou (GIE) and Museum of Comparative Zoology, Harvard University (MCZ).

Megophrys brachykolos (Short-legged toad). Hong Kong: Lantau (Lan Island): Keung Shan Tunnel. S. Karsen and J. Lazell coll. 11 March 1987. Michael Lau Wai Neng det. MCZ 109077.

Philautus romeri (Romer's tree frog). Hong Kong: Lantau (Lan Island): Keung Shan Tunnel. Fung Chi-fai and A. Bogadek coll. 13 April 1986. A. Bogadek and J. Lazell det. MCZ 108700. First record off Lamma Island.

Lygosoma indicum (Brown forest skink). Guangdong: Dinghushan, 50-220m. S. Eagle and A. Cleveland coll., 23-25 May, 1986. J. Lazell det. GIE 30305-7, 30309.

Pareas margaritophorus (White-spotted slug snake). Guangdong: Dinghushan, 70-185 m. K. Richardson and C. Henderson coll., 10 May and 27 May, 1986. J. Lazell det. GIE 30292 and 30319.

Achalinus rufescens (Rufous burrowing snake). Guangdong: Dinghushan, ca. 320 m. N. Goodyear coll., 26 May, 1986. J. Lazell det. GIE 30312.

Natrix percarinata (Mountain water snake). Guangdong, Dinghushan, 125-200 m. J.

Table 1. Areas and known species numbers in South China. Sources of data are varied and cited in the text. New records noted in the text are included, but a refuted record (*Bufo gargarizans*, Hong Kong) is not.

	Area, km²	Elevation, m	Amphibians	Reptiles
Dinghushan	12	20-1,000	14	37
Huaping	139	500-1,600	26	50
Hong Kong[1]	1,013	0-958	22	78
Hengduanshan	85,500	450-4,950	83	84
South Yunnan	126,000	100-2,850	77	--
Guangdong	210,000	0-1,500	62	--

[1]Hong Kong includes not just the island of that name but ca. 100 other islands and ca. 700 km² of mainland.

Lazell and K. Richardson coll., 11 May, 1983 and 7 May, 1986. J. Lazell det. MCZ 166906 and GIE 30289.

Boiga multimaculata (Many-spotted catsnake). Guangdong: Dinghushan, 220 m. S. Karsen and N. Goodyear coll. 14 April 1987. S. Karsen det. MCZ 172042.

Micrurus macclellandi (MacClelland's coral snake). Guangdong, Dinghushan, ca. 240 m. N. Goodyear coll., 26 May, 1986. J. Lazell det. GIE 30310. *Micrurus* is preferred over *"Calliophis"* as a generic name based on McDowell (1986).

Natrix sauteri (Sauter's keelback). Hong Kong: New Territories: Shek Kong. Fung Chi-fai coll., September, 1985. A. Bogadek and J. Lazell det. MCZ 171462.

There is a tremendous amount of herpetological work to be done in China. The rewards are truly impressive. As previously stated (Lazell and Liao 1986): "We believe we have only begun our compilation. . ."

I am especially indebted to Liao Wei-ping, Zhao Ermi, and Hu Shu-chin for their help and hospitality in China, and to Fr. Anthony Bogadek in Hong Kong. My work has been supported by The Conservation Agency and Earthwatch, the Center for Field Research. Both have provided many colleagues and able assistants in the field. Jose Rosado and Franklin Ross curated considerable fresh material now at MCZ.

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WESTERN SPOTTED FROG *(Rana pretiosa)* MORTALITY FOLLOWING FOREST SPRAYING OF DDT

In June and July of 1974, 172,695 hectares of forest in Oregon, Washington, and Idaho were sprayed with 1,1,1-trichloro-2,2-bis-(p-chlorophenyl) ethane (DDT) for control of the Douglas fir tussock moth, *Orgyia pseudotsugata* (Graham et al. 1975). State and federal agencies undertook an extensive environmental monitoring program in connection with the DDT application (U.S. Department of Agriculture 1981). That program included no planned monitoring of amphibians. I made routine observations of western spotted frogs, *Rana pretiosa,* prior to the DDT application, and discovered dead frogs after the DDT application. The decision to sample frogs was not made until the dead frogs had been discovered. The requirements of the planned monitoring severely limited the field and laboratory resources that could be devoted to studying frogs.

METHODS

On 28 May 1974, I heard and saw *R. pretiosa* at a 0.05 ha pond behind a man-made dam on Mill Creek at 45°32'53" N latitude, 118°22'32" W longitude, Umatilla County, Oregon. On 12 June 1974, I captured and released 14 of those frogs.

The vicinity of the pond was sprayed on 25-26 June 1974 with DDT in auxiliary solvent and fuel oil at a nominal rate of 0.72 kg DDT/ha, and a nearby area was sprayed on 26-27 June 1974 at a nominal rate of 0.65 kg DDT/ha (Graham et al. 1975).

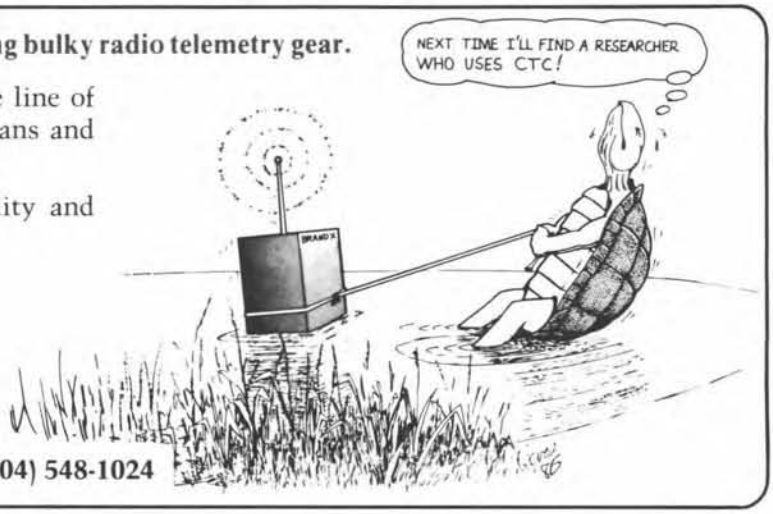
On 20 July 1974 I collected 20 dead frogs (all that I found) and six live frogs (not all that I saw) from the pond. The dead frogs were on the bottom, concentrated in and around a small "spring box" near the pond inlet. The

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dead frogs were intact, but showed some "bloating" from decomposition. I put the live frogs in three acetone-washed metal cans in pairs and the dead frogs in three acetone-washed cans in groups of six, seven, and seven, and froze them on dry ice in the field. The frogs were kept frozen during shipment to the laboratory.

The Oregon Department of Agriculture Laboratory Services used a modified Mills, Onley, Gaither procedure (Anon. 1972) to measure DDT and DDT analog residues in 25-gram samples from each can (17.5 g from one can). The analytical chemist drew the samples from each can by taking enough frog tissue to give the desired weight. Not all frogs in each can were tested.

On 8, 9, and 10 June 1976, I walked around the pond and counted 10, 6, and 10 live *R. pretiosa*, respectively. I visited the pond on a number of occasions before and after the DDT application; the only time I found dead frogs was on the first visit after the DDT application.

RESULTS

The results of the DDT residue analyses appear in Table 1. The sample sizes are too small and the sampling scheme was too haphazard to warrant the assumptions necessary for meaningful statistical analysis.

DISCUSSION

Laboratory studies (Ellis et al. 1944; Logier 1949; Boyd et al. 1963; Ferguson and Gilbert 1967; Sanders 1970; Tucker and Crabtree 1970) establish that DDT is toxic to frogs, but are not otherwise helpful in evaluating the data reported here because none relates DDT tissue residue levels in frogs to DDT mortality.

The application rate of DDT that preceded the frog mortality I observed was lower than that associated with frog mortality observed by others in the field (Lackey and Steinle 1945; Tiller and Cory 1947; Logier 1949; Fashingbauer 1957).

The frogs I collected presumably had background levels of DDT in their tissues prior to the DDT application. All of the species (fish, birds, and mammals) for which prespray residue data were collected in the course of the monitoring program showed prespray "background" levels of DDT in their tissues (U.S. Department of Agriculture 1981). Cory et al. (1970) found background levels of DDT in frogs from remote areas of the California Sierra Nevada that had never been treated with DDT. Kuhr (1974) found DDT residues in frogs from a stream near an orchard that had not been treated with DDT for 12 years.

The residue levels reported here probably were above prespray background levels, although the absence of prespray residue data precludes knowing that with certainty. Every species monitored as part of the planned monitoring program showed substantial increases in residue levels following the DDT application (U.S. Department of Agriculture 1981). Meeks (1968) found a similar increase in *Rana pipiens* after an experimental application of DDT.

Conclusions based upon comparison of DDT levels between the live and dead frogs must be drawn with caution. In addition to the uncertainty due to the small sample sizes and the haphazard sampling scheme, the situation is further confused by possible postmortem changes in tissue density, by the unknown effect of death upon the movement of DDT and its analogs into or out of a frog's body, and by the possible contribution to residues by contaminated food in a frog's gut. The relatively higher levels of DDD in dead frogs may be the result of postmortem microbial conversion of DDT to DDD (Spencer 1967) and should not be assigned any toxicological significance without further investigation.

Notwithstanding the uncertainty regarding the residue data, the data and observations reported here constitute circumstantial evidence suggesting that application of DDT at a nominal rate of 0.7 kg/ha caused some mortality in *Rana pretiosa*.

R. pretiosa is protected in Oregon by administrative rules of the Oregon Fish and Wildlife Commission. It may be absent from its former range in western Oregon and Washington and has a spotty distribution in the Cascade Mountains (Nussbaum et al. 1983; Storm 1986). Given that status and the observations reported here, *R. pretiosa* should be presumed for decision-making purposes to be sensitive to DDT, and possibly to other insecticides, when chemical pest control is being contemplated near *R. pretiosa* habitat.

Table 1. Residues (parts per million) of DDT and its analogs in western spotted frogs, *Rana pretiosa*, approximately three weeks after DDT application.

		Live Frog Samples			Dead Frog Samples		
		1	2	3	1	2	3
	p,p'-DDD	20.1	16.6	30.5	487	247	155
Lipid	p,p'-DDE	10.0	9.60	9.70	26.7	15.3	7.74
Basis	p,p'-DDT	96.4	56.3	132	413	13.2	14.5
(ppm)	tot DDT	127	82.5	172	927	276	177
Wet	p,p'-DDD	0.346	0.166	0.403	6.67	2.27	1.92
Weight	p,p'-DDE	0.173	0.096	0.128	0.366	0.141	0.096
Basis	p,p'-DDT	1.66	0.563	1.75	5.67	0.122	0.179
(ppm)	tot DDT	2.18	0.825	2.28	12.7	2.53	2.20
Percent	p,p'-DDD	15.9	20.1	17.7	52.5	89.6	87.4
of	p,p'-DDE	7.9	11.6	5.6	2.9	5.6	4.4
Total	p,p'-DDT	76.2	68.2	76.7	44.6	4.8	8.2
	tot DDT	100.0	100.0	100.0	100.0	100.0	100.0

ACKNOWLEDGMENTS

My observations were made while I was engaged in monitoring DDT residues in small mammals as an employee of the Oregon State Department of Human Resources Health Division. The Health Division conducted that monitoring with financial assistance under Environmental Protection Agency contracts 68-02-0708 and 68-01-3130. Residue analyses were performed by the Oregon State Department of Agriculture Laboratory Services with financial assistance from the U.S. Department of Agriculture Forest Service. Brent Frazier assisted in the field. Dr. Michael Wehr read and commented on an early draft of the manuscript.

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Ambystoma tigrinum LOCALITY RECORDS—BE WARY

The tiger salamander, *Ambystoma tigrinum,* has a puzzling distribution in Louisiana and Mississippi. There is a huge hiatus in the continuity of the species from central Alabama to Texas, from what can be determined as valid records. Old records from Mississippi are ambiguous or questionable, but Boyd and Vickers (1963) reported specimens collected at Starkville, Oktibbeha County, that were deposited at the Mississippi State University Museum. I commented on the distribution of the species in Louisiana (Dundee 1974), citing modern records for extreme western Louisiana in Vernon and Beauregard parishes, and adding a new record for extreme southeastern Louisiana (St. Tammany Parish). The latter locality has subsequently been extremely modified by commercial tree farms. Cope (1889) mentioned two specimens from Grand Coteau, St. Landry Parish (USNM 4706), giving details for one that he said was an immature stage. Neither I in 1973, nor Percy Viosca at an earlier time, could find these specimens at the National Museum of Natural History. At least one earlier worker (Beyer 1900) maintained (without listing voucher specimens) that *Ambystoma tigrinum* was common in Louisiana and occupied much of the same range as *A. punctatum (= A. maculatum),* a species he claimed was one of the most common in the state.

On a recent visit to the Northeast Louisiana State University Museum of Zoology I examined tiger salamanders collected in May 1978 just north of Rayne, Acadia Parish, Louisiana. This surprising record seemed to confirm that the USNM St. Landry Parish record probably was indeed valid. The locale obviously was worth visiting to learn more about the biology of this poorly known Louisiana salamander species.

A remarkable detective story now emerges, with a surprise ending. The collection-site data did not quite tally with the actual road directions and distances. After querying several local residents as to whether they had ever seen tiger salamanders or where there might be a pond (rice paddies were the only pooled water observable) I discovered that one of the local residents, Mr. Sidney Arceneaux, had undertaken a commercial venture raising salamanders. He had obtained breeding stock from a person in Tulsa, Oklahoma, who was promoting aquaculture of tiger salamanders for fish bait. The Acadia Parish stock had allegedly come from a site in Oklahoma near the Missouri border (I am not aware of any records for that region of Oklahoma—the species is uncommon in nearby sections of Kansas, Missouri, and Arkansas). The salamanders, fed a commercially prepared food, reproduced well in a 30-acre impoundment for about four years until heavy rains washed out the operation, which has since been abandoned.

With the advent of such commercial enterprises as that described above we may expect more introductions of tiger salamanders into areas outside their natural range, and we may begin to find specimens unrepresentative of the race endemic to that region. Although herpetologists may object to such introductions, in all likelihood the practice will continue with the blessings of many state wildlife and fisheries departments, especially if they see potential economic benefits.

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OBSERVATIONS ON THE FEEDING HABITS OF *Ameiva ameiva*

Little is known of the ecology of lizards from Argentina. In spite of information on the trophic biology of semidesert lizard communities (Sage 1974) and on general aspects of the diet of some species (Gallardo 1977; di Tada 1982) very little is known about their feeding ecology.

The objective of this study was to determine the trophic spectrum for the terrestrial teiid lizard *Ameiva ameiva* from the Chaco forest community. This lizard's distribution extends from Panama to northern Argentina, east of the Andean Mountains (Vanzolini et al. 1980). We provide information on diet composition and on the trophic position of the species within the Chaco forest lizard community.

The area of study fits into the Occidental Chaco District of the Chaco Province, with dry weather and xerophilous, deciduous forest with a herbaceous gramineous stratum as the dominant vegetation (Cabrera and Willink 1973). The sample, made up of 40 specimens of *Ameiva ameiva* was collected with firearms (Chani 1980) from December 1959 to October 1972 in two departments N.E. of Tucuman Province and in one department N. of Salta Province in the Occidental Chaco Subregion. Capture areas were demarcated within the scarce original natural forest remains, relatively unaltered by human activity.

Analyses of stomach contents were made for each specimen. Prey was classified to the level of order or family in addition to life history stages (larvae, chrysalis, adults). For each food type, number, volume and frequency were calculated (Pianka 1971); absolute frequencies were the total number of lizards that contained at least one specimen of a particular item in their stomachs, and relative frequencies were based on the total number of lizards in the sample.

Table 1 lists the observed organisms: Twelve taxonomic groups in addition to cocoons, eggs and vegetative remains. Ninety-five percent of the total diet volume consisted of animal matter and only five percent was plant matter. Sixty percent of the latter were fruits and the remaining 40% were vegetative, and to a lesser extent floral, remains.

Isoptera were the most important prey numerically (60%), but relatively unimportant volumetrically (6%). Adult coleopterans were significant prey in volume as well as in number, followed by spiders, and lepidopteran and coleopteran larvae. Of the less-represented items, Gryllidae, Blataria and chrysalis stand out in numbers. Ants were only important numerically. The high deviation values with regard to the numerical and volumetric means of the various categories could reveal different individual selective lizard response to the same item, or the preys' distribution type in the environment.

Relative frequencies of the prey categories provide insight into the general foraging patterns of the lizards; adult coleopterans (80%), spiders (66%), isopterans (50%), lepidopteran larvae and plant remains, were most important in this respect.

Foraging mode is related to the type of prey eaten by lizards (Huey and Pianka 1981): the

higher frequency of prey of relatively difficult access, such as isopterans, spiders and larvae, suggests a wide foraging strategy as a means of obtaining food. This appears to be a common feature of teiid lizards (Pianka 1970, 1973; Vanzolini 1980).

From the foregoing analysis, *Ameiva ameiva* is a generalist predator that preys on small and medium size arthropods, as well as plant material (leaves, stems, flowers and fruits). Arthropod prey consists mainly of insects and arachnids, including primarily Coleoptera (adults and larvae), Araneida, Isoptera and Lepidoptera (larvae). Because of their high number, volume and frequency they constitute the basic food of *Ameiva ameiva* diet. In contrast, the other food items were of very low frequency, suggesting they are occasional or complementary food.

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CATEGORIES	NUMBER				VOLUME				FREQUENCY	
INSECTA	Total	X	S.D.	% of Total Number	Total	$\bar{X}$	S	% of Total Volume	Absolute	Relative %
Isoptera	521	13.35	30.03	60.51	2.57	0.06	0.13	6.11	19	0.48
Coleoptera										
adults	71	1.82	1.39	8.24	10.90	0.27	0.22	25.92	31	0.79
larvae	38	0.97	2.28	4.41	3.93	0.10	0.30	9.34	9	0.23
Lepidoptera										
adults	1	0.02	0.16	0.11	0.20	0.00	0.03	0.47	1	0.02
chrysalis	8	0.20	0.46	0.92	1.70	0.04	0.11	4.04	7	0.17
larvae	23	0.58	0.93	2.67	6.12	0.15	0.30	14.55	15	0.38
Orthoptera										
Gryllidae	9	0.23	0.48	1.04	1.65	0.04	0.11	3.92	8	0.20
Acrididae	4	0.10	0.30	0.46	0.65	0.01	0.05	1.54	4	0.10
Tettigonidae	1	0.02	0.16	0.11	0.30	0.00	0.04	0.71	1	0.02
Hymenoptera										
Formicidae	9	0.23	0.53	1.04	0.09	0.00	0.00	0.21	7	0.17
Blataria	9	0.23	1.01	1.04	0.90	0.02	0.10	2.14	2	0.05
Fasmodea	1	0.02	0.16	0.11	0.10	0.00	0.16	0.23	1	0.02
Unidentified	3	0.07	0.35	0.34	0.25	0.00	0.02	0.59	2	0.05
ARACHNIDA										
Araneida	53	1.35	1.47	6.15	8.61	0.22	0.32	20.48	26	0.66
Scorpionida	1	0.02	0.16	0.11	0.50	0.21	0.08	1.18	1	0.02
MYRIAPODA										
Diplopoda	2	0.05	0.22	0.23	0.15	0.00	0.01	0.35	2	0.05
Cocoons	1	0.02	0.16	0.11	0.40	0.01	0.06	0.95	1	0.02
Eggs	1	0.02	0.16	0.11	1.00	0.02	0.16	2.37	1	0.02
Vegetative and floral remains	78	2.00	6.38	9.05	0.82	0.02	0.03	1.95	15	0.38
Fruits	27	0.69	1.05	3.13	1.20	0.03	0.04	2.85	15	0.38
TOTAL	861				42.04					

Table 1. Summary of the stomach contents of forty *Ameiva ameiva*. One stomach was empty. Frequencies were based on 39. Volumes were measured in cm^3.

CLEANING OF THE HAWKSBILL TURTLE *(Eretmochelys imbricata)* BY ADULT FRENCH ANGELFISH *(Pomacanthus paru).*

Cleaning symbiosis between various aquatic organisms has been widely referenced in both scientific and lay literature for over three decades. Most reports involve interspecific interactions between marine fishes, with fewer descriptions involving fish and crustaceans. Although marine turtles in general, and the hawksbill *(Eretmochelys imbricata)* in particular, are known to carry a diverse variety of ectoparasites or commensals (Frazier et al. 1985, Hubbs 1977, Ernst and Barbour 1972, Carr et al. 1966 and others), I am aware of only one brief report of the cleaning of a marine turtle in the wild (Booth and Peters 1972). That interaction occurred off Australia, involved green turtles *(Chelonia mydas)* with two species of fish, moon wrasses *(Thalassoma lunare)* and damselfish *(Abudefduf sexfasciatus).*

The following discussion describes a cleaning interaction between a hawksbill *(Eretmochelys imbricata)* and two French angelfish *(Pomacanthus paru).* It should be noted that juvenile angelfishes are widely reported to occasionally clean other fishes (Boschung et al. 1983, Randall 1968, Marshall 1966). Limbaugh (1962) reported adult French angelfish being cleaned by the neon goby *(Elecantinus oceanops).* However, there are no reports of adult French angelfish acting as cleaners or of hawksbills being cleaned by other organisms.

The interaction occurred on 13 November 1985 in 22 m of water off the southwest tip of Grand Cayman Island, B.W.I. The location is atypical of most of Cayman's reefs; it consists of a flat rock bottom with a thin veneer of sand and low relief (1 m) coral spurs and large numbers of gorgonians. For two minutes, observations were made (from a distance of 3 m) of two French angelfish in proximity to a hawksbill turtle, then from 1 m for an additional minute. When I moved closer than 0.6 m, the turtle suddenly swam off. The French angelfish remained in the area 15 min, but the turtle was not seen again.

While being cleaned the hawksbill, tentatively judged to be a female between 75-85 cm total length (TL) with an estimated carapace length of 55-65 cm, was positioned on the sand. The front flippers were extended downward and to the side at approximately 60° to the long axis of the carapace; the rear flippers were extended nearly straight back with a gap between their inner margins. Front flipper placement resulted in the hawksbill being propped, head up, off the sand at an angle of about 45°.

Two large adult French angelfish (ca. 40 cm TL) were actively swimming over the hawksbill and biting at it. The two fish nibbled simultaneously at the right and left front flippers, respectively. Independently the fish would turn on their sides and swim under the anterior portion of the plastron and push their mouths into the pectoral axillae. Hubbs (1977) noted the presence of pelagic crabs *(Planes cyaneus)* in the pectoral axillae of a Pacific ridley *(Lepidochelys olivacea)* off California. No ectoparasites, lesions or abnormalities of any kind could be seen in the axilla or any place else on the hawksbill, with the exception of a thin film of algae on the lateral margins of the posterior half of the carapace.

The French angelfish moved up and down over the front flippers, under the plastron and around the turtle's mouth. Unlike many fishes who are cleaned, the turtle did not jerk, twitch or open its mouth. In fact, the hawksbill remained perfectly still and did not turn or stretch, in apparent accommodation to the cleaners, as discussed by Booth and Peters (1972) for the green turtle. Of course the elevation of the carapace by extension of the front limbs may have enhanced exposure to the cleaner fish.

Frazier (1985) shows that cheloniid turtles are suitable substrates for mollusks and other organisms and comments that the rareness of turtle epizoa needs explaining. Despite the paucity of observations regarding the cleaning of sea turtles it seems possible that these creatures often utilize the services of cleaner fish to rid themselves of ectoparasites. It seems less likely that adult French angelfish regularly clean hawksbills, or any other sea turtles, because although these species are regularly sighted in the same areas cleaning behaviour has never been reported.

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HERPETOLOGICAL HUSBANDRY

See Herp. Review 19(1) for author's instructions.

THREE GENERATIONS OF CAPTIVE-HATCHED DESERT TORTOISES, *Xerobates agassizii*

There are few records of achieving an F2 generation among chelonians (Coakley & Klemens 1983; Kirsche 1985). The hatching of three desert tortoises in September 1985 marks the first documented F3 generation among terrestrial chelonians.

An adult male and female *Xerobates (Gopherus) agassizii* came into the senior author's possession in 1935. Precise geographical origin is uncertain but was probably central San Bernardino County, California. Nesting by the female was first observed 27-29 June 1956. The subsequent hatching in September of two eggs incubated artificially was heralded at the time as a first in chelonian husbandry (Booth 1958). While two other artificially incubated eggs failed to hatch, three others removed from the nest in early September hatched by 19 September. In November 1956, the remaining eggs in the nest were found to have spoiled. The two original F1 tortoises are still alive, as are the parent tortoises, which continue to produce offspring yearly or twice yearly until the present day.

INCUBATION TECHNIQUE

Eggs removed from outdoor nests are placed in a plastic bowl filled with one cm of washed sand. Indentations are made for each egg; after these are placed in the sand the bowl is covered with a damp cloth. Heat is provided with a 40 watt incandescent bulb suspended over the bowl. The temperature of the sand surface is kept at 26-27° C. Every few days the cloth cover is dampened.

Once actual hatching begins, the egg is removed to a sheet of waxed paper to prevent sand from adhering to the yolk sac. The gestation period under such conditions has varied from ninety to one-hundred fifteen days.

Hatchlings sometimes have appeared in August through October from undetected nests. The gestation period for such nests is not known.

RESULTS

Tables 1-3 summarize the reproductive output of artificially incubated eggs produced by F1 and F2 tortoises. Data are lacking for 1972 as neither nesting nor hatchlings were observed, and for 1984 because eggs from both generations were incubated together. Records were not suitably kept between 1978 and 1982. The reproductive failure in 1986 can be attributed to an electrical failure; the single 1986 hatchling emerged from an undetected nest. Three hatchlings from unde-

Table 1. Reproductive output of F1 tortoises (hatched in 1956 & 1957).

YEAR	# EGGS	# HATCHLINGS
1970	7	4
1971	9	3
1973	5	1
1974	4	2
1975	6	5
1977	6	5

Table 2. Reproductive output of F2 tortoises (hatched 1974).

YEAR	# EGGS	# HATCHLINGS
1983	8	0
1985	7	3
1986	8	0

Table 3. Estimated total egg yield of parental, F1, and F2 tortoises.

GENERATION	TOTAL # EGGS	AVG. CLUTCH	CLUTCH RANGE
Parental	280	5-8	3-15
F1	120	4-6	4-9
F2	32	8	7-8

tected F2 nests appeared in 1976. Among the total of eight hatchlings produced that year were four xanthic tortoises. The first clutch of F2 eggs (1983) failed to hatch and was apparently infertile.

It is estimated that about 60% of eggs left in the ground eventually hatch. Many young tortoises produced by either incubation method have been placed in other people's possession, and there is no way to document their reproductive accomplishments.

In addition to the xanthic young previously mentioned, several F2 tortoises with mandibular malocclusion (possibly related to a deformed hyoid bone) have appeared. Inbreeding is certainly responsible for this problem. Knoll formation of the carapace is more marked in the F1 generation than in the succeeding tortoises, and may be related to the relative lack of essential nutrients in the F1 juvenile diet. Supernumerary scutes have appeared in some hatchlings.

DIET

Food for three generations of captive-bred desert tortoises has consisted of garden produce (especially iceberg lettuce) and grass. Since 1976, they have been given chick starter and ground oyster shell as supplements.

HUSBANDRY

Tortoises are kept outside most of the year, segregated by size in enclosures. Hibernation is accomplished by taking the animals indoors for closer supervision in an ambient temperature of 10-15° C. Tortoises under the age of two years are not allowed to hibernate fully, nor are tortoises younger than four or five years left outside overnight. Occasionally post-hatchling tortoises show a strong inclination to hibernate but are not permitted to remain dormant longer than two weeks.

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THE REPRODUCTION OF *Natrix tessellata* IN ISRAEL

The diced water snake *Natrix tessellata* is common in the central and northern parts of Israel, especially near water sources such as streams and fish ponds. Although fish are a major part of its diet this snake is too small to eat large carp and cyclids, the chief types of fish kept in fish ponds in Israel. Claims of it causing significant damage are, therefore, erroneous. An alarming reduction in numbers has recently been noted for this species (Werner 1988), perhaps in part as a result of deliberate mass killings by fish growers.

Although it is commonly kept as a pet, little has been published about its reproduction.

While doing research on the physiology of reptile eggs, a considerable body of information concerning the reproduction of this snake has been collected in our laboratory and is summarized in Table 1, together with the little information that has appeared in the literature about its reproduction in Israel.

Much of the information about clutch size was collected in the summers of 1986-87, when we were fortunate enough to receive some 350 specimens from kibbutz HaZorea, where it is considered a major pest in the fisheries. Each year, the 35 largest specimens were retained and housed in four large terrariums, eight to nine specimens per cage, on the assumption that a large proportion of them would be gravid females. Sawdust ca. 4 cm deep) was used to cover the bottom and provide a laying substrate. Water was given freely, in a dish large enough for total immersion of several snakes, and shelter was provided by several broken, hollow bricks. The snakes were fed on green toads (*Bufo viridis*) and dead fish.

In two reproductive seasons (13 July-25 August 1986 and 24 July-29 September 1987) 59 females laid a total of 678 eggs. Mean number of eggs per clutch was 12.3±4.58, and mean egg mass was 7.2±1.42 g. While normal eggs were oval and white, one early clutch (four eggs) and some of the eggs in the largest clutch (eight of 22) were teardrop shaped, yellow in color, half the normal size, and did not hatch.

Eggs were incubated on wet sand (5% to 20% water content), at 30°±1.5° C. Air humidity was kept at a high level by putting a water dish inside the incubator. Hatching success was over 85% for eggs used as control and in non-destructive experiments. One clutch (12 eggs) was spoiled three days after laying, and another (13 eggs) was attacked by an unidentified nematode.

Due to its docile nature, this species is an

Table 1. Data on incubation and hatchlings of *Natrix tessellata* in Israel.

Year	No. of eggs	Inc. temp. (°C)	Incub. period (days)	Hatch. mass (g)	Hatch. length (mm)	Hatching success (%)	Source
1955	8		44		220	100	Werner 1966
1969	79	30	37	5.1±1.3	228±11.2		Dmi el 1970
1976	11		42			100	Pesach 1984
1981	6	27.5	42				unpublished data
1982	6	27	44			100	Ar et al.
	16	30	37			95	1983
1983	10		42			80	Hoffmann
	12		39			25	1984
1984	10		49			100	Pesach
	17						1986
1986	22	30				100	present
	31	31.5	34±1.3			84	study
	34	30		5.6±0.70	210.4±12	100	
1987	5	26.5	46			100	present
	31	31.5	34±2.7	5.1±0.75		84	study

ideal captive. Establishment of captive breeding colonies should be easy, and could solve some of the conservation problems caused by uncontrolled killing by fishermen, on one hand, and by overcollecting by reptile enthusiasts, on the other.

ACKNOWLEDGMENTS

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TECHNIQUES

VOLUNTARY INGESTION OF RADIOTRANSMITTERS BY SNAKES IN THE FIELD

Most radiotelemetric studies of snakes in the field have used either surgically-inserted or force-fed transmitters (e.g. Parker and Brown 1972; Madsen 1984; Reinert 1984). One major disadvantage of both techniques has been disturbance to the animal, which may result in modified behavior (e.g. decreased locomotor activity, greater tendency to flee from humans) for some unknown time period following implantation. These problems are exacerbated if study is brief in duration, due to equipment malfunction or limitations of battery-life in the transmitters.

We attempted to overcome these problems in a study of free-ranging blacksnakes (*Pseudechis porphyriacus,* Elapidae) in the Macquarie Marshes of central New South Wales, Australia (Shine 1987). Live white laboratory mice were carried in the field. When a foraging or basking blacksnake was sighted, we killed a mouse by cervical dislocation, disembowelled the mouse and inserted a radio-transmitter (J. Stuart Enterprises, model # TT-IU-160: 55 x 20 mm, 38 g). The abdomen of the mouse was then sutured closed with cotton thread. A 2 m lengthof fine nylon fishing line was passed through a fold of skin near the base of the mouse's tail (using a sewing needle), and a single knot was tied at the end of the line to prevent the mouse from slipping off. The free end of the fishing line was attached to a 4 m fibreglass fishing pole. The entire procedure took less than two minutes.

The mouse was then dragged along the ground ca. 1 m in front of the snake's head, and in most cases was immediately seized (Fig. 1). When the mouse was securely held by the snake, a hard jerk on the fishing line pulled the knot through the mouse's skin, freeing the mouse to be swallowed by the snake. Thirteen snakes were implanted in this way. The only failures of the technique were (1) snakes too small to swallow the transmitter, despite repeated attempts; and (2) snakes frightened by our approach. We also used the technique successfully on an eastern brownsnake, *Pseudonaja textilis,* and on many other blacksnakes (for practice rather than transmitter insertion). Snakes generally took longer to swallow the unit than would have been required to ingest a similarly-sized mouse without the transmitter.

Our success using the voluntary ingestion technique is surprising in view of the open nature of the terrain (we were clearly visible to each snake when offering the mouse), and the unnatural type and presentation of the prey. Mammals constitute only a small proportion of the diet in *P. porphyriacus* (Shine 1977) and have never been recorded in gut contents of Macquarie Marshes specimens (Shine, unpublished data). Success of the technique was probably due to the fact that blacksnakes are voracious feeders: freshly captured specimens have consumed other reptiles while in collecting bags (personal observation), and one blacksnake was seen to eat a desiccated, flattened road-killed frog (D. Wotherspoon, personal communication). We found that blacksnakes ate mouse-transmitter packages larger than we thought possible, and certainly larger than we would have considered force-feeding. On later dissection, one small snake sacrificed at the end of the study showed lesions at the hind end of the stomach, at the point where the transmitter lay against the gut epithelium. These lesions may have resulted from internal physical trauma when the snake tried to crawl through an opening too small to allow passage of the transmitter; on one occasion we saw this animal reverse direction from a crack in a log after the protruding bulge of the transmitter prevented its repeated attempts at forward movement. Whether digested food could pass around the transmitter in these smaller animals is not known. The technique may be applicable to other large snakes and lizards (Christian et al. 1983), and is particularly worth considering for short-term studies where disturbance artifacts may be major problems.



Figure 1. A blacksnake seizing a dead mouse with an implanted radiotransmitter; note open nature of vegetation in study area.

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ANURA

CENTROLENELLA COLYMBIPHYLLUM (Glass Frog). PANAMA: PROVINCIA DE COLON: Distrito de Colón: Parque Nacional Soberania, Pipeline Rd., along the Río Frijoles, 9°09'06" N, 79°43'58" W, elev. 45 m. 16 January 1982. R. Ibáñez, J. R. Ibáñez, T. Jacobs, C. A. Jaramillo and F. E. Jaramillo. Verified by R. Ibáñez, C. A. Jaramillo and F. E. Jaramillo. Círculo Herpetológico de Panamá (CH 0961-0962). Known only from Costa Rica; however, a broader geographic range was suspected for *C. colymbiphyllum* (Starrett and Savage 1973. Bull. So. Calif. Acad. Sci. 72:57-78). New country record, confirms the presence of this species in Panamá and extends the range ca. 363 km (airline) E of Las Cruces, Costa Rica (Starrett and Savage 1973 op. cit.).

Submitted by **CESAR A. JARAMILLO, FIDEL E. JARAMILLO,** Circulo Herpetológico de Panamá, Apdo. 10762, Estafeta Universitaria, Panamá, Rep. de Panamá, and **ROBERTO IBAÑEZ D.,** The University of Connecticut, Box U-43, Storrs, CT 06268, USA ●

CENTROLENELLA PULVERATA (Glass Frog). PANAMA: PROVINCIA DE COLON: Distrito de Colón: Parque Nacional Soberania, Pipeline Rd., approx. 100 m downstream from the bridge on the Rio Frijoles, 9°09'03" N, 79°44'07" W, elev. 45 m. 3 July 1987. R Ibáñez, F. Crastz and L. A. B. de Crastz. Verified by C. A. Jaramillo. Círculo Herpetológico de Panamá (CH 1725). Known in Panamá from three localities only (Starrett and Savage 1973. Bull. So. Calif. Acad. Sci. 72:57-78). New province record, partially fills the gap between previous records.

Submitted by **ROBERTO IBAÑEZ D.,** Circulo Herpetológico de Panamá, Apdo. 10762, Estafeta Universitaria, Panamá, Rep. de Panamá ●

CENTROLENELLA VIREOVITTATA (Glass Frog). PANAMA: PROVINCIA DE PANAMA: Distrito de Capira: Parque Nacional Altos de Campana, along stream undercrossing road to Chicá, 5.7 km from the InterAmerican Highway, 8°41'10" N, 79°54'58" W, elev. 630 m. 25 August 1981. R. Ibáñez, C. A. Jaramillo and F. E. Jaramillo. Verified by R. Ibáñez, C. A. Jaramillo and F. E. Jaramillo. Círculo Herpetológico de Panamá (CH 0649-0651). Known only from three localities in Costa Rica (Starrett and Savage 1973. Bull. So. Calif. Acad. Sci. 72:57-78; Hayes and Krempels 1985. SSAR Herp. Review 16:31). New country record, located ca. 438 km (airline) E of the type locality reported by Starrett and Savage (1973 op. cit.).

Submitted by **FIDEL E. JARAMILLO, CESAR A. JARAMILLO,** Circulo Herpetológico de Panamá, Apdo. 10762. Estafeta Universitaria, Panamá, Rep. de Panamá, and **ROBERTO IBAÑEZ D.,** The University of Connecticut, Box U-43, Storrs, CT 06268, USA ●

HYLA VERSICOLOR (Gray Treefrog). USA: MISSISSIPPI: Warren Co: 13 km SE Vicksburg. 18 May 1987. H. A. Dundee. Verified by H. A. Dundee using cell size measurements and voice recognition. Tulane University (TU 20664). New state record. Extends range 230 km N and NNE of nearest records, which are in Louisiana (Dundee and Rossman, in press. The Amphibians and Reptiles of Louisiana).

Submitted by **HAROLD A. DUNDEE,** Department of Biology, Tulane University, New Orleans, LA 70118, USA ●

RANA TEMPORARIA (Common Frog). GREECE: Mountain Rodope Co: West Rodope, altitude 1350 m, near village Livadites, along Soouk-Sou stream. July 1986. I. Chrysopoulos, N. Eleuftheriades, M. Hatsiioanou. Verified by Th. S. Sofianidou. Aristoteleion University of Thessaloniki, Department of Zoology (AUTDZ 2548). First record for Greece; southernmost locality for the species.

Submitted by **THEODORA S. SOFIANIDOU,** Department of Zoology, Aristoteleion University of Thessaloniki, 54006 Thessaloniki-GREECE ●

PHRYNOHYAS VENULOSA. ARGENTINA: SANTIAGO DEL ESTERO: Copo Department: Monte Quemado (25°48'S, 62°52'W). 20 December 1986. E. Lavilla and G. Scrocchi. Verified by G. Scrocchi and E. Lavilla. Herpetological collection Fundaciõn Miguel Lillo (FML, Amphibians 03707). New Province Record. The specimen and others not collected were found in a dry, chacoan area at the margin of a semipermanent pond. Previously known in Argentina from forested, humid areas of Jujuy, Salta, Formosa, Chaco, Entre Rios and Corrientes Provinces (Cei, J.M. 1980. Monitore Zool. Ital. (N.S.) Monogr. 2:447).

Submitted by **GUSTAVO J. SCROCCHI** and **ESTEBAN LAVILLA,** PRHERP-CONICET, Fundación Miguel Lillo, Miguel Lillo 251, 4000 Tucumán, República Argentina ●

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander). USA: MICHIGAN: Leelanau Co.: North Manitou Island, logging road (45°05'44" N, 85°00'09" W). 3 August 1987. L. B. KATS, R. A. Linton, and M. C. Linton. Verified by L. B. Kats. Photo deposited University of Kentucky Museum of Zoology (UKEN AP-1000). New record (for both species and genus) for Manitou Islands in Lake Michigan (Scharf

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and Jorae 1980. Jack Pine Warbler 58:4-15; Case and Scharf 1985. Jack Pine Warbler 63:17-23).

We would like to thank Max Holden and the staff of Sleeping Bear Dunes National Lakeshore for logistic support during our study.

Submitted by **LEE B. KATS** and **MARY C. LINTON,** T. H. Morgan School of Biological Sciences, University of Kentucky, Lexington, KY 40506-0225, and **REBECCA A. LINTON,** Marion, IN 46952, USA

AMBYSTOMA OPACUM (Marbled Salamander). USA: MISSOURI: Christian Co: 1.6 km N Garrison, State Hwy 125. 5 September 1987. B. D. Greene. Verified by R. F. Wilkinson. Southwest Missouri State University (SMSU 2492). Extends range ca. 45 km W of closest existing record in Missouri (Johnson 1987. The Amphibians and Reptiles of Missouri. Missouri Dept. of Cons. 368 pp.).

Submitted by **BRIAN D. GREENE,** Department of Biology, Southwest Missouri State University, Springfield, MO 65804, USA

SAURIA

CNEMIDOPHORUS OCELLIFER. ARGENTINA: TUCUMAN: Trancas Department: Vipos (26°29' S, 65°22' W). 12 December 1986. G. Scrocchi and S. Scrocchi. Verified by G. Scrocchi. Herpetological Collection Fundación Miguel Lillo (FML 01801). First record for the Province. The species was previously recorded from Argentine Provinces of Jujuy, Salta, Córdoba and Santiago del Estero. (Tio Vallejo and Miranda 1984. PHYSIS (Bs.As.) 42(103): 81-82).

Submitted by **GUSTAVO SCROCCHI,** PRHERP - CONICET, Fundación Miguel Lillo, Miguel Lillo 251, 4000 Tucumán, República Argentina

CNEMIDOPHORUS OCELLIFER. ARGENTINA: SANTIAGO DEL ESTERO: Figueroa Department: Caspi Corral (27°22' S, 63°32' W). 27 November to 3 December 1982. O. Pagaburo et al. Herpetological Collection Fundación Miguel Lillo (FML 01346) and 27 October 1986. G. Scrocchi. (FML 01800); Copo Department: Monte Quemado (25°48' S, 62°52' W). 19 December 1986. G. Scrocchi. (FML 01802). All verified by G. Scrocchi. New Department records.

Submitted by **GUSTAVO J. SCROCCHI** PRHERP - CONICET, Fundación Miguel Lillo, Miguel Lillo 251, 4000 Tucumán, República Argentina

GERRHONOTUS LIOCEPHALUS INFERNALIS (Texas Alligator Lizard). USA: TEXAS: Brewster Co.: Del Norte Mts., Seale Altuda Ranch, ca. 20.1 km E of Alpine off US Hwy 90. 29 August 1987. J. M. Carignan. Verified by J. F. Scudday. Sul Ross State University (SRSU 5817). Only prior known Brewster Co. population in Chisos Mts., Big Bend National Park (J. F. Scudday, pers. comm.). Extends range ca. 161 km N of Big Bend National Park and verifies hypothetical range connecting specimens from Big Bend National Park with specimens from east of the Pecos River (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M Univ. Press. 434 pp.)

Submitted by **JEANETTE M. CARIGNAN,** Department of Biology, Sul Ross State University, Alpine, TX 79832, USA

HOMONOTA BORELLII (Neotropical Gecko). ARGENTINA: MENDOZA: Ciudad: Manuela Saez 400. February 1987. M. N. de Richard. Fundación Miguel Lillo (FML 0816); MENDOZA: Dorrego-Guaymallén: Pedro Vargas 847. December 1986. J. P. Richard. Museo Zoologico, Universita di Torino (MZUT R3308). Verified by J. M. Cei (MZUT) and R. F. Laurent (FML). First province records. Extends range 440 km SW Córdoba (Williams and Ghilini 1979. Neotropica 25(74):155-160). The species is locally known as "gepeto." Its distribution is important because in the observed population the association of *H. borellii* with *Triatoma infestans* (Hemiptera: Reduviidae; a Chagas-Mazza disease vector, commonly known as "vinchuca") was evident, a fact already described by Williams and Ghilini (1979 op. cit.) for *Homonota* populations in non-urban areas in Córdoba province. According to that paper, the nymphs of "vinchucas" seem to be an important item in the gecko's diet, and further studies about this lizard's role in the biological control of those bugs are needed.

We wish to thank Mrs. Marta Richard and J. P. Richard for material cited, and Dr. Raymond Laurent and Dr. J. M. Cei for offering valuable suggestions during preparation of this manuscript.

Submitted by **ENRIQUE RICHARD** and **VIRGINIA ABDALA,** PREHERP-CONICET, Fundación Miguel Lillo, Miguel Lillo 251, 4000-San Miguel de Tucumán, Argentina

SERPENTES

AGKISTRODON PISCIVORUS LEUCOSTOMA (Western Cottonmouth). USA: MISSOURI: Pulaski Co: Bald Ridge Creek, 4.21 km S - 1.61 km E of crossroads in Big Piney. 3 May 1986. Brian Murphy and Jeff Ettling. Verified by Ralph W. Axtell. Southern Illinois University at Edwardsville (SIUE 2679). New county record (Johnson, T. R. 1987. The Amphibians and Reptiles of Missouri. Missouri Dept. Cons. 368 pp.).

Submitted by **JEFF ETTLING,** Department of Biology, Southern Illinois University at Edwardsville, Edwardsville, IL 62026, USA

GYALOPION CANUM (Western Hooknose Snake). USA: NEW MEXICO: Sandoval Co: 6.5 km N and 4 km E Peña Blanca, (T16N, R6E, S10), 1675 m elev. 21 August 1987. J. N. Stuart. Verified by W. G. Degenhardt. Museum of Southwestern Biology, University of New Mexico (MSB 48735). Extends range ca. 40 km N in Rio Grande Valley (Hardy 1975. J. Herpetol. 9(1):107-132).

Submitted by **JAMES N. STUART,** U. S. Army Corps of Engineers, Environmental and Evaluation Section, P. O. Box 1580, Albuquerque, NM 87103, USA

REGINA RIGIDA RIGIDA (Glossy Crayfish Snake). USA: NORTH CAROLINA: Hoke Co: 2.9 km SSE Antioch. 13 December 1987. S. L. Alford and J. C. Beane. Verified by W. M. Palmer. North Carolina State Museum of Natural Sciences (NCSM 28978). New county record; extends range ca. 8.8 km WSW of nearest record in Robeson Co. (NCSM files). Specimen collected in seasonally flooded Carolina Bay with no stream connection.

Submitted by **JEFFREY C. BEANE,** North Carolina State Museum of Natural Sciences, Raleigh, NC 27611, USA

REGINA SEPTEMVITTATA (Queen Snake). USA: MISSISSIPPI: Amite Co: Forster Creek off Hwy 33 (T4N, R1E, S33). 18 March 1981. D. Ebert. Verified by R. A. Young and T. L. Vandeventer. Mississippi Museum of Natural Science (MMNS AR2812). New county record representing an isolated population or range extension ca. 135 km SW Covington Co. (MMNS AR2676).

Submitted by **R. A. YOUNG,** University of Mississippi Medical Center, Jackson, MS 39216, **T. L. VANDEVENTER,** Living Reptile Museum, Clinton, MS, and **R. JONES,** Mississippi Museum of Natural Science, Jackson, MS 39202, USA

TYPHLOPS ATER. PHILIPPINES: BOHOL ISLAND: Abachanan (= Abacajan) Barrio, 9 km E of Sierra Bullones. 15 April 1981. Charles A. Ross. Verified by Alan E. Leviton. U.S. National Museum of Natural History (USNM 229285). MARINDUQUE ISLAND: Boac, Amoingon. February 1972 and May 1971. R. M. Lumawig. Verified by Addison H. Wynn. Carnegie Museum of Natural History (CM 90432, 90527-28). First Phillippine records of *T. ater* (*T. hedraeus* of Savage 1950. Proc. California Zool. Club 1(10):49-54) outside of Negros Island. Although the Marinduque Island specimens are typical of *T. ater* from Negros Island (Savage 1950. op. cit.; McDowell 1974. J. Herpetol. 8 (1):1-57), the Bohol Island specimen differs by lacking the usual contact between the postnasals posterior to the rostral.

I am grateful for the help and advice of Ronald I. Crombie and George R. Zug, and to C. J. McCoy and Ellen J. Censky for kindly loaning specimens.

Submitted by **ADDISON H. WYNN,** Department of Vertebrate Zoology (Amphibians & Reptiles), National Museum of Natural History, Washington, D. C. 20560, USA

UNGALIOPHIS PANAMENSIS. COSTA RICA: Province Puntarenas: Parrita; 80 km S San José. 12 November 1985. H. Geiser. Verified by P. Siegfried. Photo deposited in the Zool. Inst., University of Zurich, Switzerland (No. 128535). First record for the Pacific coast, extends range ca. 120 km S of Rio Frio [Corn, M.J. 1974. Report on the first certain collection of *Ungaliophis panamensis* from Costa Rica. Carib. J. Sci. 14(3-4):167-175].

Submitted by **GEORGE MERAHTZAKIS,** Riedhofstr. 73, CH-8049 Zurich, Switzerland

TESTUDINES

CHRYSEMYS PICTA BELLI (Western Painted Turtle). USA:WASHINGTON:Thurston Co.:5 km SW of Olympia (T17N, R2W, center of Sec 5) elev. 49 m. 30 June 1987. M.G. Carey. Verified by K.B. Aubry. Photographs deposited in University of Washington Burke Museum (UWBM 2205). Verification of sight record for this county reported by Nussbaum et al. (1983. Amphibians and Reptiles of the Pacific Northwest, Univ. Press, Idaho, 332 pp.).

Submitted by **MARION G. CAREY,** USDA Animal Plant Inspection Service, Olympia, WA 98502 and **KEITH B. AUBRY,** USDA Forest Service, Pacific Northwest Research Station, Olympia, WA 98502, USA ●

DISTRIBUTIONAL RECORDS OF AMPHIBIANS AND REPTILES FROM COLORADO

Specimens listed in this note represent county records (Hammerson 1982. Amphibians and Reptiles in Colorado. Colorado Div. Wildl. Pub. 131 pp.) Specimens or photographs are deposited in the University of Colorado Museum (UCM).

BUFO DEBILIS (Green Toad). Bent Co: 17 km N, 3 km W Toonerville near Hwy 101. 22 July 1986. M. Cage and J. Detweiler. Verified by L. J. Livo. Photo deposited in UCM. New record for county.

PSEUDACRIS TRISERIATA (Striped Chorus Frog). Teller Co: 6 km S, 3.5 km W Florissant. 26 May 1985. L. J. Livo. Verified by H. M. Smith. (UCM 55842-55843). New record for county.

COLUBER CONSTRICTOR (Racer). Huerfano Co: 2 km S, 7.5 km E Sandy. 23 August 1986. L. J. Livo. Verified by H. M. Smith (UCM 55847). New record for county.

HYPSIGLENA TORQUATA (Night Snake). Las Animas Co: Pinon Canyon (precise locality not recorded). September 1983. W. J. Whatley, Jr. Verified by L. J. Livo. (UCM 55607). New record for county.

MASTICOPHIS FLAGELLUM (Coachwhip). Huerfano Co: 2 km S, 7.5 km E Sandy, Hwy 10. 22 August 1986. L. J. Livo. Custer Co: 4.5 km S, 2 km W Wetmore, Hwy 96. 24 August 1986. L. J. Livo. Both verified by H. M. Smith. Photos deposited in UCM. New records for counties.

TROPIDOCLONION LINEATUM (Lined Snake). Jefferson Co: Lakewood, Dry Gulch and Harlan Street. 28 March 1986. L. J. Livo. Verified by H. M. Smith. (UCM 55846). New record for county. Locality is 0.8 km W locality in W Denver in same gulch.

Submitted by **LAUREN J. LIVO,** 1215 S. Osceola Street, Denver, Colorado 80219, USA ●

NEW REPTILE RECORDS FOR PAKISTAN

A recent review of the material housed in the herpetological collections of the Zoological Survey of Pakistan has disclosed the presence of two reptile species previously unknown or poorly represented in collections from that country. The latest faunal reviews are by Minton (1969. A contribution to the herpetology of West Pakistan. Bull. Amer. Mus. Nat. Hist. 134:27-184) and Mertens 1969. Die amphibien Und reptilien West-Pakistans. Stuttgarter Beitr. z. Nat. 197:1-96), in which neither species is listed.

SAURIA

AGAMA MINOR (Short-tailed Agama). PAKISTAN: SIND PROVINCE: Thatta District, 20 km N Jungshahi, at Karo Uro. 6 August 1982. Verified by W. Auffenberg. Zoological Survey of Pakistan Collection, Karachi (ZSP 1052). A single adult male (SVL 85, tail 92 mm) of this apparently rare lizard in Pakistan was taken, and is the first definite record with precise locality data known for the country. This species has previously been reported from several scattered localities in northern India (in the states of Maharushtra, Uttar Pradesh, and Gujarat). The only record presumably from Pakistan is without definite locality and simply listed as "Sind" (Smith, M.A. 1935. Fauna of British India. Reptilia and Amphibia, Vol. 2, Sauria. Taylor and Brancis: London). However, within this area Smith lists "Cutch" and "Kathiawar," both of which are clearly in what is now extreme western India near the Pakistan border. Therefore the presence of this species in Pakistan as now conceived is of some importance.

SERPENTES

HYDROPHIS ORNATUS ORNATUS (Cochin Banded Sea Snake). PAKISTAN: SIND PROVINCE: 10 km SW Karachi, in the stunted mangrove forest inland of the barrier beach known as Sand-spit. 9 September 1983. Verified by W. Auffenberg. (ZSP 1923). This species was for many years thought to be restricted to the west coast of India. Mertens (1969, op. cit.) described a single juvenile from Astola Island, near Pasni, Mekkran Coast, Baluchistan, Pakistan. Our specimen is from an area 350 km east of this island and links the Persian Gulf populations (previously thought to be disjunct) with those of western India. It is an adult female with SVL 1635, tail 189 mm.

Submitted by **ZAHIDA PERVEEN,** Zoological Survey of Pakistan, Block 61, PAKISTAN, **FEHMIDA IFFAT,** Secretariate, Shahran-i-Iraq, Karachi 1, PAKISTAN, and **WALTER AUFFENBERG,** Florida State Museum, University of Florida, Gainesville, FL 32611, USA ●



NEW COUNTY RECORDS FOR AMPHIBIANS AND REPTILES OF NORTH CENTRAL TEXAS

Dixon (1987. Amphibians and Reptiles of Texas. Texas A&M Univ. Press, College Station. 434 pp.) provided a revision of Raun and Gehlbach's (1972. Amphibians and Reptiles in Texas: taxonomic synopsis, bibliography, and county distributional maps. Bull. Dallas Mus. Nat. Hist. 2:1-61) treatise on the herpetofauna of Texas. This extensive and much-needed updating greatly enhances our current knowledge of the distributional patterns of much of the state's 204 species of amphibians and reptiles. Yet, many distributional gaps remain for some well known taxa. Herein I report exclusively new county records (Dixon op. cit.) for seven species of amphibians and reptiles from three counties of north central Texas. Voucher specimens have been deposited in the Arkansas State University Museum of Zoology (ASUMZ). All specimens were collected by the author and identifications were verified by S.E. Trauth.

CAUDATA

AMBYSTOMA TEXANUM (Smallmouth Salamander). Somervell Co: 11.3 km NE Glen Rose, off County Rd 406. 21 March 1987. (ASUMZ 6893-6899). 12.5 km NE Glen Rose, off County Rd 407. 1 May 1987. (ASUMZ 8597). Partly fills hiatus in a four-county area of north central Texas.

ANURA

PSEUDACRIS CLARKII (Spotted Chorus Frog). Hood Co: 19.3 km SE Granbury, off FM 2174 at Russell Ranch. 10 April 1987. (ASUMZ 7069-7072). 18.5 km SE Granbury, off FM 2174 at Hinton-Parker Ranch. 8 May 1987. (ASUMZ 8578). Fills gap between Erath and Johnson counties (Carl 1980. Herp. Rev. 11:116-117).

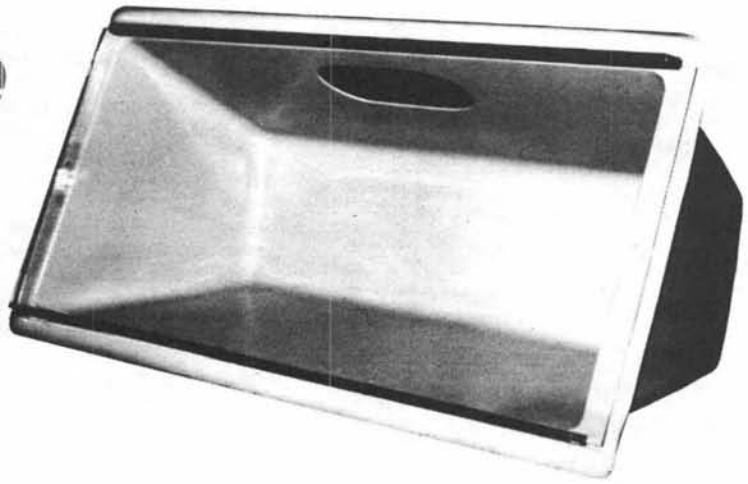
RANA CATESBEIANA (Bullfrog). Johnson Co: 14.5 km SSW Cleburne on US 67. 17 May 1987. (ASUMZ 8078). 1.6 km SSW Cleburne on US 67 at Lake Pat Cleburne-Nolan River. 13 June 1987. (ASUMZ 8476). Fills hiatus between Ellis, Hood and Somervell counties.

TESTUDINES

CHELYDRA SERPENTINA SERPENTINA (Common Snapping Turtle). Johnson Co: 17.5 km SW Cleburne, off US 67 on County Rd 1120 at Georges Creek Ranch. 2 October 1987. (ASUMZ 9103). Partly fills hiatus between Ellis, Parker and Tarrant counties.

KINOSTERNON FLAVESCENS FLAVESCENS (Yellow Mud Turtle). Somervell Co: 2.9 km E Nemo on County Rd 406, near Buck Creek. 16 May 1987. (ASUMZ 8079-8080). 11.3 km NNE Glen Rose on FM 2174, vic. Georges Creek. 17 May 1987. (ASUMZ 8081).

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Fills gap in Brazos River watershed between Bosque and Hood counties.

TERRAPENE CAROLINA TRIUNGUIS (Three-toed Box Turtle). Johnson Co: 4.8 km NNE Keene on US 67. 2 May 1987. (ASUMZ 7658). Extends range ca. 56 km E of Ellis Co. record (McAllister and Ward 1986. Herp. Rev. 17:28-30).

SERPENTES

MASTICOPHIS FLAGELLUM TESTACEUS (Western Coachwhip). Hood Co: 19.3 km SE Granbury, off FM 2174 at Russell Ranch. 17 April and 8 May 1987. (ASUMZ 7657, 8572). Fills hiatus in central part of state.

ACKNOWLEDGMENTS

I thank K.L. Fry, E.W. Lewis, C. Russell and employees of Georges Creek Ranch for allowing me to collect on their properties, S.E. Trauth for curatorial assistance and the Texas Parks and Wildlife Department for Scientific Collecting Permit SP044-1.

Submitted by **CHRIS T. McALLISTER,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203, USA ●

BOOK REVIEWS

Guía de Campo de los Anfibios y Reptiles de la Peninsula Ibérica, Islas Baleares y Canarias, by Alfredo Salvador (Apartado 1.062, 24.080 León, Spain). 1985. Published by the author. $20 (postage included).

I learned to read from Schmidt and Davis' 1941 *Field Book of Snakes* a few years after it appeared and have since considered field guides an important genre. As a teenager in Spain a decade later, I found that there were no comparable guides and that I had to resort to experts—especially Doris Cochran and her Madrid counterpart Ernesto Cusi—and the technical literature to identify species. Spain got its first usable herpetofauna guide in 1974, and now the same author has written one of the finest guides I have seen. There are 128 good half-page color photographs, including at least one of each species (77 plus 6 marine turtles). The text is profusely illustrated with excellent line drawings and halftones which include the larvae of all 8 salamanders and 15 frogs, and virtually every character state used in the keys. Species receive about one page of text each; treatment of autecology and reproduction is thorough. The bibliography includes approximately 1200 citations (but not Boulenger's 1920-21 *Monograph of the Lacertidae* or Mertens and Wermuth's 1960 *Die Amphibien und Reptilien Europas),* which are well cross-referenced to the species discussions. There are 78 clear distribution maps which show known localities, rather than inferred ranges.

Alfredo Salvador told me that he was disappointed in the way his 1974 guide came out and that he was publishing this one himself to retain editorial control. If he had used a commercial publisher, the 40 page bibliography would have been cut drastically, there would have been many fewer color photographs, and the species discussions would probably have been shortened. The text would have benefitted from careful editing, which few commercial publishers provide. I was irritated by interchangeable use of scientific and capitalized common names. Scientific names were usually italicized, but there are several lapses, as on page 9. Cross-referencing is quite good, except that plate and map numbers are not given in the text, and drawings are not referenced at all, not even in the index. Variation, always a difficult area in popular writing, was not dealt with consistently or effectively; two subspecies of *Gallotia simonyi,* from the Canary Islands, are treated separately, while the more diverse populations of the Balearic *Podarcis lilfordi* and *P. pityusensis* are given capsule descriptions (not because names are lacking). There is a brief statement on variation under each species, but there is no general discussion of population biology. Other topics usually discussed in field guides are here given short shrift (e.g. conservation) or are absent (preservation, snakebite, husbandry). Salvador has achieved the central objectives of a field guide admirably and was not distracted by secondary objectives; the result is very usable, albeit terse. His earlier guide was undoubtedly a factor in the recent renaissance of Spanish herpetology, and this new book will nurture greater interest and facilitate research. Herpetologists elsewhere will find this a useful reference to a diverse and interesting fauna and an entrée to the rapidly growing literature in Spanish and Catalan.

WILLIAM P. MacLEAN
College of the Virgin Islands
St Thomas, U.S.V.I. 00802 ●

A Naturalist in the Environmental Crisis, by Philip W. Smith. 1986. Carlton Press, Inc., New York. 1-131 pp., 16 figures, hardbound. $9.75.

The first seven chapters (74 pages) of this slim volume will be enjoyed by all herpetologists, especially those of us who were fortunate enough to spend our adolescence in the midwest, collecting and observing all the flora and fauna but with a special fondness for herps. Even those who did not have the benefit of coming of age in the prairie peninsula, however, should readily identify with Smith's conclusion as a youth that the books by Raymond Ditmars "were the most interesting. . .ever written" (p. 31). Still, I cannot help but believe that early portions of the text will have more meaning to the native naturalists of the region than to others. For example, in Chapter One Smith has us imagine southern Illinois in the 1920s, when "farms were interspersed among tracts of so-called second-growth forests, locally known as 'woods'. . ." When I read this, I can still recall my mother asking, "Have you been out in the woods again?" with the unsaid concern being, "Oh Lord, what has he brought home this time!"

P.W. Smith, of course, is one of the leading figures in the study of cold-blooded vertebrates in the north-central states. His books, *The Amphibians and Reptiles of Illinois* (1961) and the *Fishes of Illinois* (1979) are model faunistic studies for a state.

Chapters Six and Seven are largely concerned with the period when work on the amphibian and reptile report was in progress.

Herpetologists with a weakness toward any aspect of ichthyology will enjoy Chapters Nine and Ten, the only ones specifically dealing with the Illinois fish report. Anyone with much experience in systematic ichthyology can identify with Smith's reflection that the "sorting was as enjoyable as the collecting, and I wondered why I had resisted the fish survey initially" (p. 104).

Chapter Eight, which mostly concerns collecting in the southwestern United States and Mexico, and Chapter Eleven, in which Smith relates some of his experiences with mammals in this country and abroad, are of general interest to any biologist who has been in those areas or ever hopes to be. What comes through especially in these chapters is the fact that P.W. Smith and his wife Dorothy are students of natural history in the broadest sense.

The final Chapter Twelve is called the "Epilogue," and in these few pages (pp. 117-122) Smith justifies what at first seems a rather curious title for the book. Curious, because, as Smith himself points out, through the late 1950s "the terms 'environmentalist' and 'environmental crisis' were not even in the dictionary" (p. 74). Thus, a good portion of the book consists of episodes that took place during a time when the damage being done to our biota was, if not recognized, at least not widely acknowledged. Smith relates tale after tale of collecting trips in the '40s and '50s where large numbers of animals were collected and sacrificed for museum specimens. He points out that many biologists of the period faced a conflict. "They were reluctant to take more than one or two specimens from a population, but the thinking of the time. . . was that long series (big samples) should be secured" (p. 74). Finally, after completing the fish survey in the 1960s, Smith states, "I had no inclination to convert more live animals into museum specimens" (p. 107).

In the years after World War II, "natural habitats and wildlife were declining, but the trend was so gradual as to be almost imperceptible" (p. 100) and many species even seemed to be increasing in numbers. To a naturalist who had observed changes in extent of habitats over time, however, apparent increase in numbers of a species could often be related to the fact that "wildlife was being concentrated into small areas as the habitats were being fragmented" (p. 74). For this reason, a biologist preparing a faunal survey during the decade or so following World War II probably had "many advantages over those done earlier or later" (p. 74). Earlier, collecting "efforts were rather unproductive and frustrating because there were so many areas of suitable habitat to be sampled and so many hiding places for animals in the undisturbed habitats" (p. 117). The reasons why future surveys may be less productive than those of the postwar era are associated by Smith with continued habitat destruction (pp. 120-121).

Smith, of course, is not the first one to espouse these beliefs. His greatest service in writing this book, and the reason for the title, I

believe, is to show how one naturalist, who grew up in an area which at the time appeared "little exploited" (p. 11) came to the slow but sure realization that he was a witness to and an active participant in the passage of the golden era of natural history studies. Can we not imagine in our nightmares that the role of the biologists who will revise the state faunal reports fifty years hence simply will be to document the continued extinction of the wildlife, using surveys such as Smith's for their baseline data? Smith, reflecting on the relative increase over the years in the numbers of a few ecologically tolerant and aggressive species of fish, could foresee a time "that when most other wildlife was gone from the earth there would still be people and a few species of fishes" (p. 95).

I found a number of typographical errors in this short book: "particualrly" on p. 40, "Horsehose" (= Horseshoe) on p. 67, 'cuntry" on p. 70, "visitd" on p. 113, and "accuratley" on p. 120. Other curiosities include the fact that Smith's birth year (1921 according to the cover of *Fishes*. . .) is never stated, although the birth of his sister in 1933 is mentioned in the only sentence that reference to her is made in the book (p. 22). On p. 23, Smith writes about the period in the Depression when his "mother was a widow again" which surprised me because the fact that his mother had been widowed previously had not been mentioned.

These minor criticisms do not detract from this book of personal reminiscences by a noted biologist on a productive career that spanned an important era of the ongoing "environmental crisis." All students of natural history and conservation could benefit from reading this book, and, of course, herpetologists and ichthyologists everywhere should obtain a copy.

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Editor's Note: This review of P.W. Smith's last book was written and submitted prior to Smith's death.

●



Handbuch der Reptilien und Amphibien Europas (in German). Wolfgang Böhme, Editor, 3 vols. Band 1 - Echsen, 1981, 520 pp, 91 figs. Band 2/I - Echsen II (Lacerta), 1984, 416 pp, 47 figs. Band 2/11 (Podarcis), 1986, 434 pp, 64 figs. Price DM 216 for each volume. Available from AULA-Verlag GmbH, Postfach 1366, D-6200 Wiesbaden, Federal Republic of Germany.

The Handbuch der Reptilien und Amphibien Europas is an undertaking of major proportions. The purpose of these volumes is to present detailed accounts of all of the species of amphibians and reptiles known to occur in Europe. The first three volumes deal with lizards; four volumes in preparation will concern the snakes, turtles, salamanders, and anurans, respectively.

These volumes are sturdily bound in buckram; the single column format of clear type is on good white paper trimmed to 15 X 23 cm. The black and white illustrations generally are excellent. Each species account is authored individually; 27 authors contributed the 68 species accounts of lizards. The editor, Wolfgang Böhme, is responsible not only for the high quality and conformity of the accounts but also for the introductory material in Band 1 and keys to the families and genera.

Band 1 contains accounts of five genera and seven species of Gekkonidae, two genera and six species of Agamidae, one genus and one species of Chameleonidae, two genera and two species of Anguidae, four genera and six species of Scincidae, and five genera and ten species of Lacertidae. Some readers will disagree with the inclusion of the Amphisbaenidae (one genus and one species) in the lizards. Band 2/I is devoted to the 18 species of *Lacerta*, and Band 2/II includes the 17 species of *Podarcis*.

The accounts vary from 7 to 54 pages in length. Each contains a detailed diagnosis, a lengthy description (including osteology and karyology in some accounts), geographic distribution, ecology, life history, food, population dynamics, behavior, synonyms, and where appropriate a section on geographic variation. Each account stands alone as an independent review with its own literature cited. Each account contains a detailed spot map indicating the distribution of the species. Some accounts contain drawings of scutellation, skulls, and appropriate graphs. Subspecies are treated simply as a list of subspecific names and geographic distribution of each.

Variation in the thoroughness of the accounts depends mostly on the availability of information. The accounts of well-known and wide-ranging species (e.g., *Lacerta viridis* and *Podarcis muralis*) are lengthy and contain a great deal of information on various aspects of the biology of the species, whereas accounts of other species of limited distribution and not so well known (e.g., *Alsophylax pipiens* and *Cyrtodactylus caspius*) are much shorter. In general, the accounts are of high quality and good organization. Comparable information can be located readily in each account.

North American herpetologists immediately will compare the Handbuch with the accounts that have been published in the "Catalogue of American Amphibians and Reptiles." Whereas the accounts in the American catalogue provide an introduction to the literature on each species, the accounts in the European Handbuch provide a detailed review of each species. Thus, the latter is much more extensive than the American catalogue.

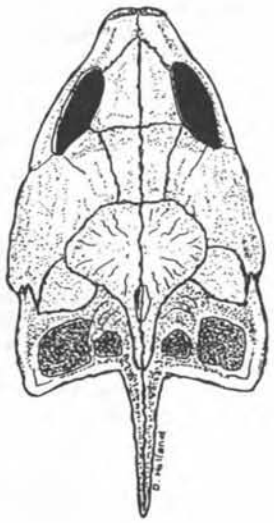
The usefulness of the Handbuch would have been enhanced with the addition of two things: (1) good photographs of living animals and (2) detailed synonymies including type localities and location of type specimens. Granted, good photos of most species are available in any one of several popular books on the European herpetofauna, but a detailed treatise on the lizard fauna should contain adequate photographs. The Handbuch is an obvious place for a worker to seek information on synonymies and type specimens. These data are available for some species in certain checklists, whereas such data on other species are not readily found in the literature. Furthermore, in those accounts dealing with species displaying notable geographic and/or ontogenetic differences in color pattern, it would be helpful to have these illustrated.

The authors, editor, and publisher are to be congratulated on the production of three excellent volumes on European lizards. These books are indispensible for anyone with an interest in European lizards; they are essential for the museum systematist and extremely useful to persons using any of the species in experimental work or maintaining these animals in captivity. I look forward to the publication of the remaining volumes in the series.

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> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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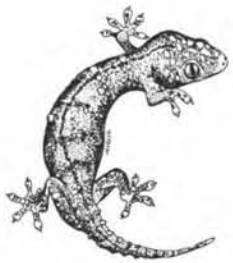
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Herpetological Review

Volume 19 June 1988 Number 2

SSAR BUSINESS

PROPOSAL TO INCLUDE THE RED-EARED TURTLE (*Trachemys scripta elegans*) IN APPENDIX II OF CITES

The Conservation Committee of SSAR supported listing *T. s. elegans* in Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This action was taken on 30 January 1987 in a letter to Dr. Charles W. Dane of the Office of the Scientific Authority of the U.S. Fish and Wildlife Service. I wish to correct a statement in *Herpetological Review* (18(4):62) saying (in a summary of the 30th Annual Meeting of SSAR/HL in Veracruz, Mexico) that the Conservation Committee had not supported this listing.

The proposal to list *T. s. elegans* was spearheaded by the International Wildlife Coalition (1807 H Street N.W., Washington, D.C. 20006) with abundant support by numerous individuals and organizations (including SSAR) in the herpetological community. Supporters cited concern about declining populations of the red-eared turtle and the practice by turtle farms of replacing breeding stock from wild populations to supply several million individuals per year of these turtles in international trade.

Despite much more support for the proposal than against it, the U.S. Scientific Authority decided not to propose the red-eared turtle for inclusion in CITES Appendix II at the 1987 Meeting of the Parties. The proposal, however, will be updated and submitted again prior to the 1989 CITES meeting. Herpetologists desiring a full statement documenting the proposal and who have a concern for this issue should contact the International Wildlife Coalition (address above) for more information.

WILLIAM S. BROWN
Past Chairman, Conservation Committee ●

MAC-WISE? SSAR NEEDS *YOU*!!

As *Herp. Review* moves into the era of desktop publishing, the editorial staff is seeking a computer-wise volunteer to assist with the formatting of each quarterly issue. The volunteer (henceforth known as a Managing Editor) must be familiar with the MacIntosh computer and have access to a MacPlus with either MacWrite or Microsoft Word 3.01. Access to a good quality laser printer would be useful, but not necessary. The volunteer would not be doing the initial inputting—only the final formatting from a disc delivered by mail. Support will be available from SSAR members familiar with these systems.

Interested? Please contact the editor by mail or telephone (216-368-3558). ●

ERRATUM

In the Annual Meeting report which appeared on p. 62 of the December 1987 issue of *Herp. Review*, incorrect/incomplete addresses were printed for the recipients of the 1987 Kennedy Award. Marc P. Hayes (correct address: Department of Biology, University of Miami, Coral Gables, Florida) and Mark R. Jennings (correct address: The University of Arizona, Tucson. Current address: U.S. Fish and Wildlife Service, Los Banos, California) co-authored the winning paper "Decline of ranid frog species in Western North America: Are bullfrogs (*Rana catesbeiana*) responsible?" which appeared in the December 1986 issue of *Journal of Herpetology*. The editor regrets the error. ●

NEWSNOTES

JAMES C. LIST HERPETOLOGICAL COLLECTION

The Museum of Natural History at The University of Kansas, Lawrence, has acquired the herpetological collection of Dr. James C. List, Ball State University, Muncie, Indiana. This collection of 2,500 specimens of amphibians and reptiles is the result of decades of field work by Dr. List and his colleagues and students, and is considered the finest collection of its kind for the Jackson Purchase region of southwestern Kentucky and adjacent states. With the acquisition of this collection, plus private collections donated earlier to KU by Joseph T. Collins, Corson J. Hirschfeld and others, the Museum now houses substantial holdings of Kentucky amphibians and reptiles.

As soon as the specimens in the List collection are sorted and catalogued, they will be available for loan. ●

MEETINGS

ASZ MEETING

The 1988 Annual Meeting of the American Society of Zoologists with the American Microscopical Society, Animal Behavior Society, The Crustacean Society, International Association of Astacology, Society of Systematic Zoology, and the Western Society of Naturalists will be held at the Hilton Hotel and Towers in San Francisco, California, during the traditional post-Christmas period, 27-30 December 1988.

The Call for Contributed Papers has been issued by ASZ, and an *August 8* deadline for receipt of abstracts of papers (oral or poster presentations) has been set.

Symposia presently scheduled which may be of interest to herpetologists include: (1) Recent Developments in the Study of Animal Migration, (2) Parasites and Sexual Selection, (3) Evolving Concepts of Chemical Mediation: A Symposium in Honor of Howard A. Bern, (4) Concepts of Efficiency in Biological Systems, (5) Concepts of Adaptation in Aquatic Animals: Deviations from the Terrestrial Paradigm, (6) Cellular and Molecular Biology of Pattern Formation, (7) History of Regeneration Research, (8) Science As A Way of Knowing—Cell and Molecular Biology, (9) Workshop on Science Comes to California, and (10) Workshop on Research-Education at Small Colleges and Universities: Quality Science on a Frayed Shoestring.

Meeting plans include several socials, special programs, commercial exhibits and a Job Placement Service. Hotel rates are $66 for single, double, triple or quad rooms at the Hilton Hotel and Towers. Housing and Registration deadlines are 20 November. Forms will be available mid-September.

This meeting is hosted by the California Academy of Sciences, with Daphne G. Fautin and Ralph I. Smith co-chairing the Local Arrangements Committee. For more information contact: Mary Adams-Wiley, Executive Officer, American Society of Zoologists, 104 Sirius Circle, Thousand Oaks, California 91360, USA. (805) 492-3585. ●



FEATURES

MORTALITY IN *Ambystoma maculatum* LARVAE DUE TO *Tetrahymena* INFECTION

During the spring of 1984, *Ambystoma maculatum* (spotted salamander) eggs were collected from three ponds in Marquette County, Michigan, for studies on the effects of acid precipitation on larval development (Ling, VanAmberg, and Werner 1986). Within 1-3 days after hatching, swelling of the epidermis was observed on the head and/or chest region of larvae from two of the ponds (Fig. 1). Viewed at 10X, ciliates were seen to completely fill the swollen area under the epidermis. The ciliate (Fig. 1, insert), averaging 47 x 27 μ (N=22), was tentatively identified as *Tetrahymena pyriformis* (Corliss, 1973), based on body size and lack of caudal cilium. A positive species identification requires selective histological staining and/or biochemical tests, and was not done.

One hundred and twenty larvae were hatched from pond 1, of which 31 infected larvae died within 7 days. At pond 2, 10 of 64 larvae had *Tetrahymena* present under the epidermis; all 10 larvae died within three days. No evidence of *Tetrahymena* parasitism was observed in larvae hatching from pond 3. Examination of freshwater from ponds 1, 2 and 3 revealed a similar shaped free-living *Tetrahymena* in ponds 1 and 2, but not pond 3.

In all cases where *Tetrahymena* parasitism was observed, larvae usually died within 24 hours. Swelling of the epidermis spread down the dorsal region of the larvae in the late stages of infection, causing larvae to coil ventrally. Histological examination of preserved *A. maculatum* larvae revealed concentrations of *Tetrahymena* in nervous tissue. No *Tetrahymena* were observed in histological sections of larvae that were not infected at the time of hatching.

Shumway (1940) reported *Glaucoma* sp. in the central nervous system of *A. texanum* in the laboratory. Corliss (1960), however, suggested that the *Glaucoma* sp. Shumway reported was either *T. corlissi* or *T. pyriformis*. Speidel (1953) reported a *Balantidium* sp., later identified as *T. corlissi* (Thompson and Speidel 1955; Thompson 1955) infecting bruised or wounded embryonic and larval stages of the amphibians *Bufo, Rana,* and *Hyla*. The same species was reported from the larvae of *Pseudotriton* (Thompson 1955) and *Pseudacris* (Speidel 1958).

T. pyriformis has been found in egg masses and developing embryos of *A. maculatum,* but its effect is unknown (Corliss 1954). Assuming this parasite is *T. pyriformis,* this is the first reported instance of mortality to *Ambystoma maculatum* larvae, apparently due to effects on the central nervous system.

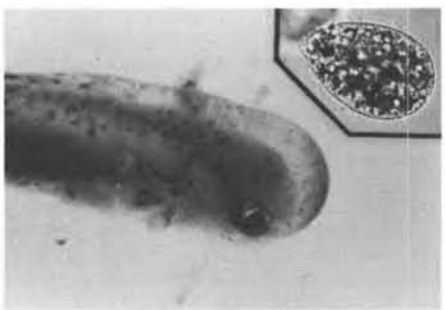


Figure 1. *Ambystoma maculatum* larva showing epidermal swelling surrounding the head and gill region. The swollen area was filled with the ciliate (insert) tentatively identified as *Tetrahymena pyriformis.*

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RECORD LENGTHS FOR SOME AMPHIBIANS AND REPTILES FROM THE WESTERN UNITED STATES

The following list provides unrecorded length records noted in the field, at the Museum of Vertebrate Zoology (MVZ), and at San Jose State University (SJSU). An asterisk denotes uncollected specimens, representing protected species, or those found in a protected area.

AMBYSTOMA GRACILE GRACILE (Brown saamander). SJSU A2458, no collection data. Sexually mature, neotenic male, 132 mm SVL, 256 mm TTL. Exceeds record of 21.9 cm (Behler and King 1979:290).

BATRACHOSEPS PACIFICUS SSP*. (Gabilan slender salamander). Measured 2 Feb 1986 by J. Boundy and A.W. Ford, at the East entrance to Pinnacles Nat. Mon., San Benito Co., CA. SJSU photo 1. Sex unknown, 59 mm SVL, 157 mm TTL. Exceeds record of 14 cm (Behler and King 1979:307).

*BATRACHOSEPS SIMATUS** (Kern Canyon slender salamander). Measured 22 March 1987 by J. Boundy and A.W. Ford, at Stork Cr., Kern River Can., Kern Co., CA. SJSU photo 8. Sex unknown, 54 mm SVL, 130 mm TTL. Exceeds record of 12.5 cm (Behler and King 1979:309).

*BATRACHOSEPS STEBBINSI** (Tehachepi slender salamander). Measured 2 March 1986 by J. Boundy and A.W. Ford, at Caliente Cr., 4.8 km W of Loraine, Kern Co., CA. SJSU photo 2. Female, 60 mm SVL, 127 mm TTL. Exceeds record of 12.2 cm (Behler and King 1979:310).

*ENSATINA ESCHSCHOLTZII KLAUBERI** (Large-blotched ensatina). Measured 30 March 1985 by J. Boundy and A.W. Ford, at Cuyamaca Rancho, San Diego Co., CA. SJSU photo 3. Male, 152 mm TTL. Exceeds record of 150 mm (Bishop 1943:295).

*ENSATINA ESCHSCHOLTZII XANTHOPTICA** (Yellow-eyed ensatina). Measured 27 March 1979 by J. Boundy and W.P. Hutchins, at Sunol Regional Park, Alameda Co., CA. SJSU photos 4 and 5. Male, 75 mm SVL, 159 mm TTL. Female, 83 mm SVL, 154 mm TTL. Both exceed record of 137 mm (Cochran and Goin 1970:40).

BUFO BOREAS HALOPHILUS (California toad). SJSU A1579, Fallen Oak Dr., San Jose, Santa Clara Co., CA. Collected 14 May 1985 by D.L. Martin. Female, 124 mm SVL. Exceeds record of 122 mm (Karlstrom 1962:68).

BUFO RETIFORMIS (Sonoran green toad). SJSU A1312, 86.4 km (by road) E of Why, Pima Co., AZ. Collected 28 July 1981 by T.G. Balgooyen and J. Boundy. Female, 60 mm SVL. Exceeds record of 5.7 cm (Behler and King 1979:396).

PHRYNOSOMA CORONATUM FRONTALE (California horned lizard). SJSU R1192, 1.6 km W of Fat City, near the mouth of Clear Cr., San Benito Co., CA. Collected 25 May 1979 by J. Boundy and W.P.Hutchins. Female, 115 mm SVL, 152 mm TTL. Exceeds record of 89 mm SVL (Smith 1946:297).

PHRYNOSOMA MCCALLI (Flat-tailed horned lizard). SJSU R178, Baja California Norte, MEX. Collected 1957 by R. Hassur. Female, 87 mm SVL, 143 mm TTL. Exceeds record of 81 mm SVL (Smith 1946:308).

SAUROMALUS OBESUS OBESUS (Western chuckwalla). SJSU R215, Randsburg City Dump, near Last Chance Can., Kern Co., CA. Collected 12 April 1960 by E. Harrington.

Male, 222 mm SVL, 457 mm TTL. Exceeds record of 220 mm SVL (Berry 1974:31).

CNEMIDOPHORUS TIGRIS TIGRIS (Great Basin whiptail). SJSU R3060, 11.5 km N of Kelso, San Bernardino Co., CA. Collected 24 May 1986 by J. Boundy and A.W. Ford. Male, 104 mm SVL, 387 mm TTL. Exceeds record of 95 mm SVL (Smith 1946:421).

CNEMIDOPHORUS TIGRIS MUNDUS (California whiptail). SJSU R449, Pinnacles Nat. Mon., San Benito Co., CA. Collected 23 April 1951 by A. Browne. Male, 107 mm SVL, 372 mm TTL. Exceeds record of 105 mm SVL (Smith 1946:427).

ELGARIA COERULEA COERULEA (San Francisco alligator lizard). SJSU R483, Big Basin, Santa Cruz Co., CA. Collected Summer 1939 by R. Pisano. Female, 119 mm SVL. Exceeds record of 108 mm (Fitch 1938:414).

ELGARIA MULTICARINATA MULTICARINATA (California alligator lizard). SJSU R3822, no collection data. Male, 153 mm SVL. Exceeds record of 144 mm (Fitch 1935:21).

*LEPTOTYPHLOPS HUMILIS SEGREGUS** (Trans Pecos blind snake). Measured 3 June 1981 by J. Boundy and W.F. Meyers, at 36.8 km N of Panther Junction, Big Bend Nat. Park, Brewster Co., TX. SJSU photo 6. Female, 333 mm TTL. Exceeds record of 330 mm (Tennant 1984:71).

CHILOMENISCUS CINCTUS (Banded sand snake). SJSU R2116, 184 road km W of Santa Rosalia, Baja California Norte, MEX. Collected 2 May 1985. Male, 229 mm SVL, 261 mm TTL. Exceeds record of 25.4 cm (Behler and King 1979:593).

DIADOPHIS PUNCTATUS AMABILIS (Pacific ringneck snake). SJSU R3042, Skyline summit, 1.6 km NW of Saratoga Gap, Santa Cruz Co., CA. Collected 15 May 1986 by A. Wolf. Female, 449 mm SVL, 532 mm TTL. Exceeds record of 20 inches (Wright and Wright 1957:163).

DIADOPHIS PUNCTATUS REGALIS (Regal ringneck snake). Preserved specimen in the collection of Harry W. Greene, MVZ, obtained by W.F. Meyers on Fort Huachuca, Cochise Co., AZ. Sex unknown, 857 mm TTL. Exceeds record of 76.2 cm (Behler and King 1979:600).

*GYALOPION CANUM** (Chihuahuan hooknosed snake). Measured 1 June 1981 at 1.6 km N of Persimmon Gap, Big Bend Nat. Park, Brewster Co., TX, by J. Boundy and W.F. Meyers. SJSU photo 7. Female, 384 mm TTL. Exceeds record of 36.2 cm (Behler and King 1979:612).

HYPSIGLENA TORQUATA CHLOROPHAEA (Sonoran night snake). SJSU R1216, 4.8 km W of Ortiz, Sonora, MEX. Collected 12 Aug. 1976 by J. Moore. Female, 507 mm SVL, 598 mm TTL. Exceeds Record of 20 inches (Wright and Wright 1957:324).

HYPSIGLENA TORQUATA KLAUBERI (San Diego night snake). SJSU R1404, hwy 79, at the head of Cuyamaca Lk., San Diego Co., CA. Collected 3 Sept. 1983 by J. Boundy and W.P. Hutchins. Female, 368 mm SVL, 433 mm TTL. Exceeds record of 16 inches (Wright and Wright 1957:320).

HYPSIGLENA TORQUATA NUCHALATA (California night snake). MVZ 179786, Corral Hollow, 7.4 km W of the county line, Alameda Co., CA. Collected 24 May 1982. Female, 365 mm SVL, 420 mm TTL. Exceeds record of 14 inches (Wright and Wright 1957:322).

LAMPROPELTIS PYROMELANA PYROMELANA (Arizona mountain kingsnake). SJSU R640, Mt. Lemon Rd., 7.5 km N of Tanque Verde Rd., Pima Co., AZ. Collected 17 Aug. 1977 by T. Rado. Male, 907 mm SVL, 1088 mm TTL. Exceeds record of 104.1 cm (Behler and King 1979:621).

MASTICOPHIS TAENIATUS TAENIATUS (Desert striped whipsnake). SJSU R665, Siskiyou Co., CA. Collected Fall 1955 by P. Gordon. Male, 1150 mm SVL, 1652 mm TTL. Exceeds record of 61 inches (Wright and Wright 1957:453).

PITUOPHIS MELANOLEUCUS CATENIFER (Pacific gopher snake). SJSU R1438, hwy 152 at the NW end of San Luis Res., Merced Co., CA. Collected 29 May 1976 by J. Boundy. Female, 1661 mm SVL, 1905 mm TTL. Exceeds record of 1854 mm (Klauber 1947:16).

TANTILLA NIGRICEPS (Plains black-headed snake). SJSU R2193, 6.4 km S of Apache, Cochise Co., CA. Collected 17 Aug. 1985 by W.P. Hutchins and W.F. Meyers. Male, 320 mm SVL, 384 mm TTL. Exceeds record of 37.5 cm (Behler and King 1979:658).

CROTALUS CERASTES CERASTES (Mojave Desert sidewinder). SJSU R3216, 4.8 km S of Kelso, San Bernardino Co., CA. Collected 24 May 1986 by A.W. Ford. Female, 597 mm SVL, 637 mm TTL. Exceeds record of 587 mm (Klauber 1972:175).

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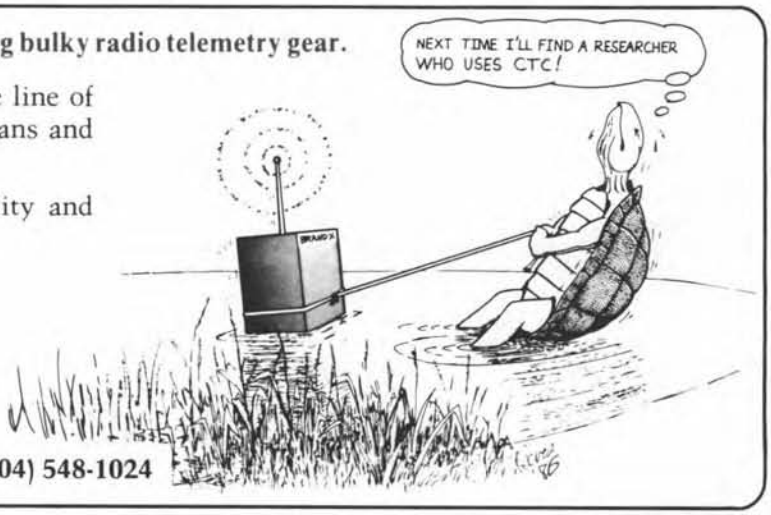
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BREEDING ACTIVITIES OF THE HELLBENDER IN MISSOURI

The last description of hellbender (*Cryptobranchus alleganiensis alleganiensis*) breeding activities based on extensive sampling during the breeding season was by Smith (1907, 1912a). This study involves making such observations for the entire length of the breeding period concurrently with a study of movement and dispersal. Except in the Spring River, Arkansas (unpublished data), hellbenders breed from late summer to early fall, mostly September, throughout their range (cf. Nickerson and Mays 1973). Males can be distinguished by enlarged cloacal glands during that time (Reese 1904). Fertilization is external (Smith 1907).

From 4 September to 7 November 1985, 21 surveys were made in a 100 m section of the Niangua River, Laclede County, Missouri. Hellbenders were caught by hand during daylight by overturning rocks, reaching into crevices, and occasionally breaking bedrock with a crowbar. An attempt was made to reposition rocks. An average ($\pm$ SE) of 9.7 $\pm$ 1.1 males and 16.2 $\pm$ 0.9 females was captured per survey. Newly captured individuals were marked by heat-branding before being released. No juveniles were captured.

On 11 September, a male and female were observed under the same rock for the first time during the study. On 13 September, two males were observed expelling milt upon capture. On 16 September, a clutch of eggs was found in the open near the bank. Neither eggs placed in an aquarium nor those left in the stream from this clutch exhibited any development; the eggs were likely not fertilized. Also, a male and female were found under a single rock, and two females and a male were found in contact with each other in a hole in the bedrock. A rock covered most of the opening of the cavity.

At 1020 h on 18 September, 13 hellbenders were observed nestled together in a narrow strip about 1 m long extending parallel to the stream flow between rocks. A few of these occluded a hole in the bedrock; only their heads were exposed. An egg string trailed from the cavity. Eleven of the 13 were males. Six of them had not previously been captured, so they were placed in a sack for marking. The hole extended farther into the bedrock than I could reach. At 1545 h, after the day's sample had been completed, 8 hellbenders were observed at the same location, including 3 more unmarked individuals. When hellbenders occluding the hole were removed, others took their place, and those gently removed would try to return rather than attempt to escape. Besides these animals, several other hellbenders were caught in the open rather than under shelters. Two hellbenders were observed to inspect holes in a mud-gravel bank, and one was repulsed (snout bitten) by another hellbender occupying a hole. Moreover, while I was branding on the bank, two males at different times walked into the shallows ($<$ 20 cm; I never saw a hellbender there before or after) where the sack containing the unmarked animals was fastened. A female had released some eggs in the nylon mesh sack. Each male appeared to inspect the sack before returning to deeper water. Within the study site, 49 hellbenders were captured that day, 19 more than in any other single day. Fourteen of the 26 new captures were never seen again. This was one of two surveys where males (28) outnumbered females. On the last survey, 11 of 15 were males. Nine of the males plus two females were captured by breaking bedrock on that date.

On 24 and 26 September, an individual was found with a short egg string extending from the cloaca, and a male and female were captured (under the rock covering the hole in the bedrock) where three hellbenders were caught on 16 September. The male had been there on the earlier date but not the female. One of the females of that earlier date was under a rock 24 m downstream on 24 September, sharing the rock with a different male. On 1 October, two hellbenders had egg strings protruding, and a different male and female were found under one rock. This was the last time that more than one hellbender was caught under a single shelter. On 6 October, two females with eggs trailing from their cloacae were observed for the final time.

On 7 October, the snout of a hellbender was observed in the entrance (about 10 cm wide) of a hole in the mud-gravel bank previously mentioned about 15 cm below the surface. The hellbender was not caught, the hole being too extensive, but embryos of two different clutches (based upon stage of development) were found. Developmental stages were approximately 13 and 17 or about 11 and 15 days old (Smith 1912b).

On 2 November, nine hatchlings measuring 25-27 mm total length were removed from this hole. One that was still half within the gelatinous envelope measured 27 mm, thus I inferred that the others were newly hatched. Embryos were also observed on 6 October at the entrance to an extensive cavity under the bedrock and were found with adult males on 15 October and 7 November by breaking bedrock; none represented an entire clutch. Continued flooding after the latter date prevented further sampling.

DISCUSSION

As suggested by Ingersol (1982), the breeding season in the Niangua seemed to extend from the second week of September through the first week of October. Dundee and Dundee (1965), however, found eggs in the Niangua on 3 September 1954, and on 14 November they collected two ripe females. Ingersol (1982) reported that 27.5% of the Niangua females did not spawn and that their ova were atretic. This may explain the collection of ripe females in November.

Smith (1907) reported diurnal congregations of 6-12 hellbenders during the breeding season. Several times he observed them "to pile up in crevices between rocks, two or three lying alongside each other, or two or more trying to force their way into the same crevice." Bishop (1941) stated that these activities were apparently a "kind of nuptial congress" to stimulate mating. He similarly observed a male return to a nest (occupied by three other males) after it was thrown about 6 m upstream. Males are usually found in possession of nests after spawning rather than females (Smith 1912a). The attraction of two males to the capture sack fastened in the shallows in this study suggests that olfactory signals are probably important in these mating activities.

There is only one report in the literature of hellbenders using a cavity in the bank for shelter and spawning (Nickerson and Tohulka 1986), and it was a crevice in bedrock along which there was no noticeable current. In contrast, I found a nest cavity at the base of a 2-m high mud-gravel bank that was slowly being eroded by a moderate current. The defense of a similar cavity as observed on 18 September was not unexpected. Hillis and Bellis (1971) reported that released animals were repulsed when they sought shelter occupied by another hellbender, and both Smith (1907) and Bishop (1941) described the vicious defense of a nest by one male against other hellbenders. Further, fierce defense of shelters has been observed in large river aquaria (Karen McKinnis and Robert Wilkinson, pers. comm.).

Smith (1912a) stated that he found relatively few eggs that were not fertilized. However, besides the Niangua clutch that did not develop, I have found clutches in the Spring River, Arkansas, that also did not seem to be fertile. Unlike the nonfertile clutch, the embryos found under bedrock did not represent an entire complement of about 170-650 eggs (Topping and Ingersol 1981). Whether some had been swept away or were eaten is unknown. Both sexes will consume ova (Smith 1912a).

Bishop (1941) reported that eggs deposited 3-17 September hatched between 7-14 November in northwestern Pennsylvania, and the hatchlings were 27-33 mm long. He also reported that more than one female may lay eggs in the same nest. The hatchlings found in this study are believed to have been no more than 45 days old. Temperature is undoubtedly a major factor in determining the length of the embryonic period and possibly the size at hatching.

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HERPETOLOGY IN HUNGARY

Hungary has never been an important center for herpetological research for several reasons. In the entire country there are only 16 species of amphibians and 15 species of reptiles. Our geographical situation and world political position, such as the absence of possessions, contribute to the general lack of professional interest in herpetology. Lajos Mehely (1862-1953) is probably the best known Hungarian herpetologist.

The official center for herpetological research is the Herpetology Department of the Hungarian Natural History Museum of Budapest. Only a few other scientists conduct herpetological research. Working mostly on their own, without benefit of colleagues in their own institutions, their research follows mostly ecological, faunistic, taxonomic and toxicological themes. Unfortunately, herpetology in Hungary has neither a unifying organization nor its own periodical. The more significant papers are scattered primarily in the following periodicals: Allattani Kozlemenyek, Vertebrata Hungarica, Acta Zoologica, and Acta Biologica Szegediensis. Only rarely are Hungarian authors able to publish in foreign herpetological periodicals.

Officially, all herpetofauna in Hungary are under total protection as a means of conservation. Hungary is also a member of the "Washington Convention" since 1985. Several notable herptiles which are found in our country include: *Ablepharus kitaibelii fitzingeri* (Mertens), *Coluber jugularis caspius* (Gmelin), and *Vipera ursinii rakosiensis* (Mehely).

The once rich herpetofauna of Hungary has suffered reductions in population sizes, as is the case in many parts of the world. The primary reason for this is large scale farming and increased use of chemicals. Also, in the early 1960s, animal collecting campaigns accompanied the land-drainage programs in some of the marshy habitats. Today, all habitats which are home to the meadow viper are under strict protection, and some smaller "Sanctuaries" are completely fenced to protect the species. Nevertheless, there is much to be done to promote conservation techniques which will support population growth of this viper.

In 1985 and 1987, Mr. Keith F. Corbett and several other herpetologists visited Hungary on behalf of the Conservation Committee of the Societas Europea Herpetologica. Their purpose was to advise on the means of habitat protection for *V. ursinii rakosiensis*, as well as to help in determining the current population status of this species.

The First Herpetological Congress of Socialist Countries, in 1981, was the most important herpetological event in Hungary in the last decade. It was organized by Mr. Oliver Gy. Dely and was attended by a number of prominent herpetologists, including several from the Western Hemisphere. This meeting was extremely valuable in promoting interchange among scientists from different countries.

In recent years, the keeping of amphibians and reptiles by amateurs has become more widespread than ever before. Individual pet keepers have not been able to successfully form any major herpetological societies. There are about five or six organized amateur groups in the country, but their membership is small and they function only sporadically. The most reliable of these groups is the "Herpetological Studio" in the town of Érd; this group publishes the periodical *Terrarium*.

The total number of amateur and professional herpetologists in Hungary is estimated to be about one hundred individuals, but only a dozen or so can be considered scientists.

A proposal has recently been made to create a herpetological section within the National Environment and Nature Protection Office, in order to help coordinate the herpetological activities occurring within our country. Possible activities of this office include establishing training camps for youths interested in amphibians and reptiles and preventing the destruction of frogs and toads as they cross roads to reach their breeding site.

Very few books in the area of herpetology are published in the Hungarian language. In order to remain current in the field, amateur and professional herpetologists must read literature in English, German, or Russian. Only ten books relating to herpetology were published in Hungarian in the last twenty-two years, and most of these were popular/educational books.

Current trends indicate that there will be increasing numbers of both amateur and professional herpetologists in the near future in our country and we anticipate significant advances in Hungarian herpetology.

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HERPETOLOGICAL HUSBANDRY

See Herp. Review 19(1) for author's instructions.

CAPTIVE REPRODUCTION OF THE SAN FRANCISCO GARTER SNAKE *Thamnophis sirtalis tetrataenia*

The San Francisco garter snake *Thamnophis sirtalis tetrataenia* is a peninsular race of the common garter snake endemic to the San Francisco Peninsula and known only from San Mateo County, California (Fox 1951; Barry 1978). It is currently listed as endangered by the U.S. Fish and Wildlife Service, the International Union for Conservation of Nature and Natural Resources (I.U.C.N.), and the California Department of Fish and Game. The status of wild populations has been reported by Bury (1971), Medders (1976), and Barry (1978).

On 7 March 1983, the Dallas Zoo (D.Z.) and the Fort Worth Zoo (F.W.Z.) received a group of confiscated *T. s. tetrataenia*. Captive reproduction for this subspecies has not previously been reported. Data on six captive breedings of *T. s. tetrataenia* are presented here.

MATERIALS AND METHODS

Each zoo received three juvenile snakes and one subadult. The snakes represent two broods from two wild-caught, gravid females originally collected in the Pescadero Creek area of San Mateo Co., California (K. McCloud, pers. comm.). The juveniles were believed to be siblings from one wild-caught, gravid female, and the subadults siblings from another wild-caught, gravid female. Therefore, two different broodlines were available for breeding.

Sexing revealed a ratio of one juvenile male, one subadult male, and two juvenile females (F.W.Z.); and three juvenile males and one subadult female (D.Z.). Fecal examination revealed the presence of a coccidea infestation in all of the snakes, which was treated with daily oral administration (injected into the food items) of sulfamethazine at a dosage of 75 mg/kg body mass for seven days.

Initially caging consisted of plastic shoe boxes (29.5 cm x 15.0 cm x 9.0 cm), 1 gallon glass jars, or five gallon aquaria (36.0 cm x 22.0 cm x 26.0 cm). Paper was used as a substrate and plastic hide boxes, pieces of bark, or plastic leaves provided security. This type of caging was also used for rearing neonates. As the snakes grew, they were moved to larger off-exhibit aquaria; or to sweater boxes. Paper substrate and similar props were again used. The Reptile Department staff of each zoo prepared a public display for this species. Exhibit cages were modular fiberglass tanks with gravel substrate and rocks, weathered pieces of wood, and plastic plants as props. Breeding and parturition occurred in off-exhibit aquaria (36.0 cm x 22.0 cm x 26.0 cm) at F.W.Z. and in the display exhibit (36.5 cm x 74.0 cm x 36.5 cm) at D.Z.

Water was available ad libitum. Caging and water bowls were disinfected when necessary with Roccal-D (Winthrop Laboratories) diluted 1:400 in hot water.

Exhibit cage lighting at D.Z. was provided by two 2-foot 20 W "Cool White" fluorescent bulbs (Sylvania). A 75 W incandescent reflector spotlight (Westinghouse) was used to provide a basking spot for gravid females. Off-exhibit lighting was provided by "Cool White" fluorescent bulbs above the work area with skylights providing additional lighting for all cages. Cage lighting at F.W.Z. was provided mainly through skylights. No direct artificial lighting was provided for off-exhibit snakes except for a 50 W spotlight over the breeding cage. Snakes at both zoos were exposed to the natural photoperiod for the Dallas-Fort Worth area via skylights. Artificial lighting photoperiod was varied through the year to correspond to the local natural photoperiod.

Ambient temperatures varied from 27-30° C (D.Z.) and 21-32° C (F.W.Z.) during the warmer months. Incandescent spotlights over cages housing gravid females produced "hot spots" for basking with maximum temperatures of 32° C. Snakes at both zoos were subjected to three-month cooling periods (December-February) to simulate the natural hibernation cycle prior to breeding. At D.Z. temperatures were lowered 2° C/day until a low of 13° C was attained. Beginning in mid-February, temperatures were raised 2° C/day until 27° C was attained. At F.W.Z., snakes were subjected to greater temperature fluctuations ranging from 13-30° C (mean 20.6° C during the cooling cycle). Daily fluctuations ranged from 2-13° C (mean 7.5° C). Water was constantly available during the cooling cycle; no food was offered to the snakes during this time.

Snakes at F.W.Z. were fed a diet consisting of fish (golden shiners *Notemigonus cyrsoleucas*, goldfish *Carassius auratus*, and guppies *Lebistes reticulatus*), frogs (*Acris crepitans* and *Rana pipiens*) and earthworms (*Lubricus* sp.). Frequency of feeding varied from every other day (young snakes) to 2-3 times a week (adults). Depending upon size, specimens were fed either whole or pieces of food items (offered from forceps).

At D.Z. the diet consisted of fish (goldfish *Carassius auratus*, guppies *Legistes reticulatus* and mosquito fish *Gambusia*), frogs *(Hyla regilla)* and newborn mice. All of the snakes were initially fed fish and occasional frogs. Once the snakes were large enough, newborn mice were fed exclusively. In order to get young snakes to accept newborn mice, the mice were scented by rubbing them against a fish or frog. Young snakes were fed every 2-3 days and adults 1-2 times per week.

All frogs were frozen a minimum of three days prior to feeding to avoid possible trematode infestation (Stoskopf and Hudson 1982). Fish were offered live from forceps or in shallow dishes of water.

Snakes were weighed using a triple beam balance and measurements were made using the squeeze box method (Quinn and Jones 1974). Neonates were weighed and measured within two days of birth.

RESULTS

After a cooling period of three months, male garter snakes were introduced to females in off-exhibit aquaria (F.W.Z.) or in an exhibit cage (D.Z.). Usually, the male immediately began courting the female with copulation occurring within eight hours of the introduction. Courtship and copulation corresponded to that described for other subspecies of *Thamnophis sirtalis* (Garstka et al. 1982; List 1950; Pisani 1976).

Copulatory plugs (Devine, 1975) were evident in the females' vents after copulation (Figure 1). The plugs varied in size and were clear initially and turned to a translucent amber color by the following day. The plugs gradually dissolved within three days of copulation.

During gestation, females were observed basking daily, directly under spotlights placed over their cages. Gravid females fed through most of the gestation period with some females refusing food in the last 2-3 weeks.

Parturition occurred after a gestation period ranging from 79 to 98 days. Weight loss after parturition was recorded for two females. F.W.Z. female A had a mass of 167.7 g 14 days prior to parturition (4 June 1984) and was 114.7 g immediately after giving birth, showing a 31.6% (53.0 g) loss of mass. D.Z. female A had a mass of 200.0 g three days prior to parturition (1 June 1986) and was 139.0 g immediately after birth, showing 30.5% (61.0 g) loss of mass.

All neonates shed immediately after birth and exhibited coloration much duller than

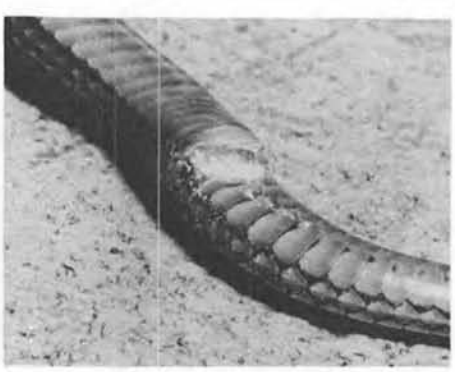
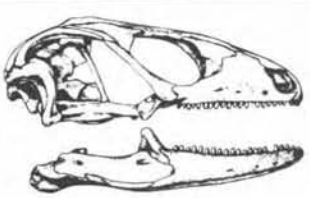


Figure 1. Copulatory plug in female *Thamnophis sirtalis tetrataenia* (F.W.Z. female A) one day after copulation. Photo by John H. Tashjian.

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that of the adult snakes. Neonates began feeding within three days after birth.

Reproductive data for six captive breedings of *T. s. tetrataenia* are summarized in Table 1. F.W.Z. female B was captive raised (from F.W.Z. 4 June 1984 brood) and then bred to her mother's sibling (F.W.Z. male B) on 11 March 1986. Time to sexual maturity for this female was one year 273 days. No deleterious effects from inbreeding were noted in the resulting young.

Some mortality did occur in rearing neonates at both zoos. Two neonates from the F.W.Z. 1984 brood died at 17 and 46 days of age respectively, due to a suspected ameoba infestation. The source of the infestation is unknown. Another neonate from this brood was born with its spine kinked posteriorly and was euthanized. Three neonates of the D.Z. 1985 brood died from a heavy visceral pentostomid *(Sebekia oxycephala)* migration between 3 October 1985 and 23 October 1985. The pentostomids came from the locally seined live mosquito fish *(Gambusia)* used as food (Corkum, pers. comm.). All of the remaining young were given pryanthal pamoate (Strongid-T, Pfizer Inc.) orally at a dosage of 25 mg/kg body mass followed 10-14 days later by subcutaneous injection or oral administration of Ivermectin (M.S.D. Agvet, Inc.) at a dosage of 0.2 mg/kg body mass. Further mortality did not occur and mosquito fish *(Gambusia* sp.) have since been eliminated from the snakes' diet.

Other medical problems encountered were protozoan infestations in the adult snakes. Routine fecal examination prior to the hibernation period revealed flagellated protozoans (F.W.Z.) and ameoba infestation (D.Z.). Treatment consisted of oral administration of metronidazole-di-iodohydroxiquinoline (Flaganase 400, Liomout Labs.) at a dosage of 200 mg/kg body mass repeated in 14 days.

DISCUSSION

Due to the small range and protected status of *T. s. tetrataenia*, published information on reproduction of this subspecies is scant. Barry (1978) mentions a litter of 25 young from a wild-caught female donated to the Steinhart Aquarium.

Because of the endangered status of *T. s. tetrataenia* and our successful captive breeding of the race, supplementation of depleted wild stocks may appear to be a desirable management method. However, Barry (1978) stated the release of captive-born stock at this time appears to be unnecessary and that the risks (e.g., introduction of unfavorable genotypes) outweigh the benefits. He believed that habitat protection, creation of reserves, and enforcement of protective laws would preserve the subspecies and that captive breeding should be a last resort measure.

The original confiscated *T. s. tetrataenia* received by us were not returned to the wild for fear of genetic contamination by *T. s. infernalis* housed with them prior to the confiscation.

While release of progeny from these snakes is not desirable or necessary at this time, the offspring do have educational value. Barry (1978) stated that the lack of public awareness of the plight of the subspecies is a management problem. Progeny of the snakes in our collections have been and will continue to be sent to other zoos and educational institu-

Table 1. Adult size, reproductive data, and neonate size of six captive breedings of *Thamnophis s. tetrataenia.*

Parentage	Snout-vent Length (cm)	Total Length (cm)	Mass (g)	Copulation Date	Parturition Date	Gestation (days)	Number of Young	Total Length (mm) of Young ($\bar{X}$)	Snout-vent Length (mm) of Young ($\bar{X}$)	Mass (g) of Young ($\bar{X}$)	Sex Ratio (male, female, unknown)
F.W.Z. Male A	46.5	65.0	43.1	6 March 84	4 June 84	90	9	218-243 (233)	———	2.3 - 4.0 (3.2)	3.4.2
X											
F.W.Z. Female A	58.1	78.4	82.3								
F.W.Z. Male A	49.0	68.5	47.7	26 Feb 85	1 June 85	96	12	210-242 (230)	150-173 (167)	2.7 - 3.6 (3.1)	4.8
X											
F.W.Z. Female A	68.7	92.0	170.0								
D.Z. Male A	50.4	68.8	57.0	3 Mar 85	9 June 85	98	16	———	147-185 (169)	1.7 - 3.1 (2.6)	6.10
X											
D.Z. Female A	59.8	80.5	131.5								
F.W.Z. Male B	55.2	76.5	104.8	11 Mar 86	28 May 86	79	17	214-235 (224)	158-174 (167)	2.6 - 3.7 (3.2)	5.12
X											
F.W.Z. Female B	65.8	88.0	171.1								
F.W.Z. Male A	50.8	71.1	78.7	27 Feb 86	29 May 86	92	35	205-238 (227)	153-177 (168)	2.2 - 3.9 (3.2)	19.16
X											
F.W.Z. Female A	75.5	101.0	279.5								
D.Z. Male (unknown)*	———	———	———	———	1 June 86	———	13	211-235 (226)	154-174 (166)	1.8 - 2.2 (2.0)	7.6
X											
D.Z. Female A	67.0	90.5	156.0								

*The identification of the breeding male is unknown. Male A was housed with female from 3 March to 9 March 1986, Male B from 10 March to 16 March 1986. Copulation was not observed.

tions. Through the use of zoo graphics, publications, etc., captive *T. s. tetrataenia* will contribute towards the goal of public awareness of the need to protect the remaining wild populations and their habitat.

ACKNOWLEDGMENTS

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ANURA

RANA AREOLATA AESOPUS (Florida Gopher Frog). **MOVEMENT.** An adult female *Rana areolata aesopus* (84 mm SVL), marked at the Breezeway Pond on the Katharine Ordway Preserve/Swisher Memorial Sanctuary, 4 km E of Melrose, Putnam County, Florida, on 30 March 1987, was caught in a Sherman live trap set at the mouth of an active gopher tortoise burrow on 26 July 1987. The recapture occurred 2.0 km WSW of the Breezeway breeding pond on a disturbed longleaf pine-turkey oak site dominated by planted slash pine. We believe this to be the first documented observation of a long-distance movement for this frog. Carr (1940, Herpetology of Florida, p. 64) states these frogs ". . . travel some distance to congregate at widely separated ponds, since I have found them a mile (1.6 km) from water."

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RANA LIVIDA (Green Cascade Frog). **DENSITY.** In South China this brilliantly colored species is "most often seen clinging to rocks or in crevices and is adept at this due to its enlarged toe disks" (Karsen, Lau, and Bogadek 1986. Hong Kong Amphibians and Reptiles, Urban Council, Hong Kong: 136 pp). We located an accessible and seemingly dense population at Fei Shue Tang (Waterfall Pool), *ca.* 70 m within the Man-and-Biosphere Reserve, Dinghushan, Guangdong Province, China (Lazell and Liao 1986. Acta Herp. Sinica 5(1): 70-71). We conducted repeated mark-recapture censuses between 27 April and 26 May in 1986 and 1987. The frogs were actively breeding at this time; all individuals appeared sexually mature. Twenty-four males measured 44-52 mm SVL ($\bar{X}$ = 49). Nine females measured 85-95 mm SVL ($\bar{X}$ = 89). One female, 92 mm SVL, was caught in both years. Travel distance between recaptures was 2.75-37.0 m ($\bar{X}$ = 12.3). There was no significant difference between average male and female travel distances: 14.3 and 10.25 m respectively. We used average travel distance to calculate the size of the area sampled as 0.259 ha. We estimate the population to be 32 individuals with 95% confidence limits 20-101. Our point estimators were not significantly different in 1986 and 1987: 34 and 29 respectively. Density is approximately 124 *Rana lividia* per hectare. Our work was supported by the Conservation Agency and Earthwatch.

Submitted by **JAMES D. LAZELL,** The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835, USA, **NUMI C. GOODYEAR,** Department of Zoology, University of Rhode Island, Kingston, Rhode Island 02881, USA, and **LIAO WEI-PING,** Guangdong Institute of Entomology, Guangzhou, Guangdong, People's Republic of China. ●

CAUDATA

AMBYSTOMA TIGRINUM (Tiger Salamander). **MIGRATION.** A migration of recently metamorphosed tiger salamanders was observed beginning 21 July 1986. Movements were witnessed on the three following mornings, but the intensity of migration appeared to decrease steadily after the initial peak on the 21st. The animals were found moving primarily southward across US Hwy 86 in Dickinson Co., Iowa (R37W/T99N s.36) and a few (<10) were found moving southeasterly across the N-S blacktop connecting Hwy 86 with the Terrace Park road. In 1987, a southward migration of newly metamorphosed individuals from the same population again

began on the morning of July 21. No evidence of movement to the north was seen in either year. The salamanders apparently emerged from a small farm pond located 600 m directly north of the highway. During both years the pond was surrounded by cultivated agricultural land. Roads in the area of the observed migration were traveled regularly on mornings before and after the migration, but no movement was seen prior to July 21 during either season.

In 1986, ca. 25 salamanders were observed crossing a 400 m length of Hwy 86 between 0830 and 0900 h on the first morning. Numerous road-killed individuals suggested that more extensive movements probably occurred early in the morning. There were only two road kills and one live salamander observed on the N-S road. Fewer live salamanders and road kills were seen before 1000 h on the following three mornings. Heavy rains preceded the initial observed migration and substrates were found to be cool and damp on the following mornings.

The migrating population appeared to be smaller in 1987 as reflected by fewer road kills (12) along the same 400 m stretch of Hwy 86. As in the previous year, heavy rain fell during the early morning hours on the day of migration in 1987.

Although experimental evidence is lacking to distinguish the causal relationship of either time of year or rainfall on the migratory movements, it is nevertheless interesting to note that the same population consistently initiated movement on July 21 during the two years of monitoring and that the movements occurred following heavy rainfall.

Submitted by **BLAINE P. BIEDERMANN**, Department of Zoology, University of Tennessee, Knoxville, Tennessee 37996-0810, USA. ●

GYRINOPHILUS PORPHYRITICUS (Spring Salamander). **MAXIMUM SIZE.** On 17 May 1986 an exceptionally large *Gyrinophilus porphyriticus* was collected by Edgar L. Breland just inside the entrance to Bryant's Corkscrew Cave in Blount Co., Alabama (T13S, R3W, Sec. 22). SVL = 137 mm; TL = 232 mm. This specimen, verified by William A. Cox, exceeds the record TL of 219 mm listed for the species by Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston). Subspecific designation was not assigned, as Mount (1975. The Reptiles and Amphibians of Alabama, Auburn Univ. Agricultural Experiment Station, Auburn) noted that all Alabama populations are considered intergradient between subspecies *porphyriticus* and *dunni*. The new record specimen is deposited in the University of Alabama at Birmingham Vertebrate Museum (VM-UAB 0385).

Submitted by **KEN R. MARION,** Biology Department, University of Alabama at Birmingham, Birmingham, Alabama 35294, and **JAMES LAMB,** Red Mountain Museum, Birmingham, Alabama 35205, USA ●

PLETHODON VEHICULUM (Western Redbacked Salamander). **PREDATION.** Though *P. vehiculum* is believed to be preyed upon by garter snakes (genus *Thamnophis*), apparently no documentation of such predation exists (Nussbaum, Brodie and Storm 1983. Amphibians and Reptiles of the Pacific Northwest. University Press of Idaho. Moscow. 322 pp.). On 4 June 1984, a foraging adult *Thamnophis sirtalis* (SVL 414 mm) was collected in dense coniferous forest on Cape Alava Trail, ca. 3.2 km W of Ozette Ranger Station, just W of Ahlstrom's Prairie (T31N, R16W, Sec. 26), Olympic National Park, Clallam Co., WA. The stomach of this specimen contained the partially digested remains of two adult *P. vehiculum* (orange phase) and the partial vertebral column of an unidentified salamander. Vouchers, including the snake, are deposited in the University of Washington Burke Museum (UWBM 104, 109, 110).

Submitted by **BRADFORD R. NORMAN,** University of Washington, Burke Museum, Department of Herpetology, Seattle, Washington 98195, USA ●

SAURIA

SCELOPORUS UNDULATUS CONSOBRINUS (Southern Prairie Lizard). **COLORATION.** An undescribed color pattern is typical of males in a population occupying the sand sheet region in Kenedy County, Texas, where lizards were collected on oaks along U.S. 77 between Sarita and Armstrong and on U.S. 281 between Falfurrias and Encino. In adult males, the side of the head is bright yellow, as is all of the ventral neck surface anterior to the blue throat patches. Females appear to lack this yellow coloration. Otherwise, the color pattern is typical for *S. u. consobrinus*. The yellow head coloration is a potential chromatic social stimulus.

Submitted by **WILLIAM E. COOPER, JR.** and **ALLEN J. BILLY.** Department of Biology, Auburn University at Montgomery, Alabama 36193, and Institute of Reproductive Biology, Department of Zoology, University of Texas at Austin, Austin, Texas 78712, USA ●

SCELOPORUS UNDULATUS ELONGATUS (Eastern Fence Lizard, North Plateau Lizard). **BEHAVIOR.** We recently observed an extraordinarily glutted individual of this species. The lizard was captured on 5 June 1987 in Jones Canyon in Dinosaur National Monument. Although the temperature was warm (ca. 29° C) with sunny weather, this male, in apparently good condition, was not as mobile nor agile as is typical of the species, being unusually easy to capture by hand. The width of this individual's abdomen was about one-third of its SVL and was bulging and slightly lumpy due to engorged food. These food items could be felt while holding the lizard. We could not find a similar instance in the literature where an individual of this species had engorged itself to such an extent that its ability to escape predation was significantly affected. The diet of this species is known to include a variety of insects, including Orthopterans (Hammerson, G.A. 1982. Amphibians and Reptiles in Colorado. Colo. Div. Wildlife, DOW-M-1-27-82. 131 pp.). This individual probably had been feeding on Mormon crickets (*Anabrus simplex*), which are currently experiencing a population explosion in the area. The population of Mormon crickets at the site where the lizard was caught was extremely dense, essentially forming a moving dark mass on the ground and low lying rocks such as the one on which the lizard was captured. That these large crickets formed a readily available, easy-to-capture prey base only conservatively describes the situation.

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Because we were in a national monument, we could not legally verify this by examining stomach contents and the lizard was released.

Submitted by **RICHARD M. ENGEMAN,** Denver Wildlife Research Center, USDA/APHIS/ADC, Building 16, P.O. Box 25266, Denver Federal Center, Denver, Colorado 80225-0266, and **ANGELIKA HANNES,** DER Travel Service, 8000 E. Girard, Suite 518 S., Denver, Colorado 80231, USA

SERPENTES

CROTALUS ATROX, (Western Diamondback Rattlesnake). **HUNTING BEHAVIOR.** Several field observations of one specimen of *Crotalus atrox* have shown repetitive behavior and close association with a single dwelling place. The described behavior took place at the fringe of the Aden Lava Flow in southern New Mexico. The individual studied has been observed inhabiting a crevice in a lava cliff ca. 3 m high. On 17 June and on several other dates during summer 1987 at ca. one and two week intervals, the rattlesnake emerged from the crevice, paused at the mouth for ca. 10 min and then crawled from the shelter approximately 2 m along the base of the ledge to a circular area on the ground 35 cm in diameter which has been denuded of grass and detritus through constant use. The bare patch is tangential to a well-used track used by pack rats and kangaroo rats which abound in the flow.

The snake approached the bare patch, drew the head slightly past it and then brought the tail to the center of the bare patch, carefully covering the rattle with the next layer, then forming an outer coil with the thickest portion of the body and then leaving the anterior part of body and head resting at the top. Once this coil was formed, the snake extended head and neck ca. 15 cm further along the ledge as though preparing to proceed further but then the head was pulled back after sensing the ground and the behavior was repeated at 90° counterclockwise from the first sensing extension. My observation point was 3 m distant from the snake. It should be noted that the rattlesnake did not attempt to explore the ledge behind its coil or to re-examine the path it had assayed to get to the hunting spot. Once the other approaches to its coil were explored it settled and did not rouse itself to rattle even when approached carefully within 50 cm for a closeup photograph. Several encounters with *C. atrox* indicate that when hunting the snake may consistently lie on its own rattle, presumably to avoid giving its position away when prey approaches.

Submitted by **FRANK D. THAYER, JR.,** Department of Journalism and Mass Communication, Box 3J, New Mexico State University, Las Cruces, New Mexico 88003, USA

ELAPHE GUTTATA (Corn Snake). **REPRODUCTION.** Fitch (1970. Univ. Kansas Mus. Nat. Hist. Misc. Publ. 52:1-247) indicated the largest reported corn snake clutch to be 21 eggs. A large female (137.5 cm SVL, 157.0 cm TL) was collected 25 Feb. 1987, 2.5 km NE of Carrabelle, Franklin Co., Fla. It was maintained in captivity and observed by one of us (DWJ) in copulation with a smaller male collected from the same locality. Oviposition began on 2 June 1987, when 29 eggs were deposited. Egg laying continued through 5 June 1987, and 11 additional eggs were deposited, bringing the total clutch to 40 eggs. The reason(s) for the extended period of egg deposition is unknown, but may have been a result of the unusually large number of eggs. The eggs were weighed and measured within 24 h of oviposition; $\bar{X} = 3.11 \pm 0.20$ cm length, 2.10 ± 0.10 cm width, and 8.35 ± 0.81 g mass. The eggs were incubated in damp vermiculite. The last six eggs laid were fully yolked but infertile. This is in contrast to only one infertile egg from the 29 eggs deposited the initial day of oviposition.

Submitted by **DAVID W. JUSTICE** and **ROBERT E. HERRINGTON,** Department of History and Political Science and the Department of Biology, Georgia Southwestern College, Americus, Georgia 31709, USA
Present address DWJ: 1065 NE 107th St., Miami, Florida 33161, USA

ERPETON TENTACULATUM (Tentacled Snake). **REPRODUCTION.** Little information is available on tentacled snake reproduction. Seven *E. tentaculatum* litters have been born at the New York Zoological Park since 1970. Births were noted from early July to early October and litter size ranged from 5-12 young (X = 7.9). Parturition dates, litter size, SVL, TL and mass data are indicated in Table 1. SVL, TL, and mass were not recorded for litters A and B.

First ecdysis occurred 1-3 days postpartum. The young *Erpeton* began accepting 20-25mm long goldfish one day after birth.

Litters B - G were born to a group of six females (ranging from 36.0-48.0 cm SVL/48.5-66.0 cm TL with a mass variationof 69.2-148.0 g) maintained with a single adult male 34.5 cm SVL/49.0 cm TL; mass 57.7 g). All were wild caught and imported form Thailand in 1983 and 1984. On 17 February 1984, 1.5 animals were introduced into a 730 l aquarium half-filled with water. A sixth female was added to the group 27 September 1984. Numerous branches, which extended from the gravel substrate to above the water surface, were provided for basking and subsurface perching. A 150-watt incandescent spot bulb, directed toward the center of the basking area, was positioned 50 cm above the water surface. Water temperature was maintained at a relatively constant year-round temperature of 26-27° C. Water was circulated through a subgravel filter at 6.0 gpm (22.7 lpm) via a March MDX-3, 1/25 HP, magnetic drive pump. The snakes were fed ad libitum, fifty 20-35 mm long goldfish/week.

Courtship behavior was observed only on 24 February 1985. The male died 12 March 1986. It is interesting to note that all 1986 broods were born well after the male's death; the last occurred 29 weeks after that event.

Submitted by **JOE MARTINEZ** and **JOHN L. BEHLER,** Department of Herpetology, New York Zoological Society, Bronx, New York 10460, USA.

***GEOPHIS* SP. PREDATION.** There are numerous records of predation on small snakes by large invertebrates, however this account may add both a new predator and new prey species. The vinegaroon or whip scorpion (*Mastigoproctus giganteus*) is a common and easily recognized inhabitant of the southern United States and Mexico. It is known to take a wide variety of arthropod prey and occasionally small frogs (Cloudsley-Thompson. Spiders, Scorpions, Centipedes and Mites, Pergamon Press, Oxford, p. 147). On 7 August 1987 we found a vinegaroon 35 mm body length under a stone on a hillside 12 km NE Xicotepec de Juarez, Puebla, Mexico. It was in the act of eating a very small tricolor snake about 90 mm in length. The snake was dead and about a quarter of its midbody portion reduced to pulp (Fig. 1). On the basis of color, pattern, and geographic locality, it is tentatively identified as *Geophis semidoliatus* (Dumeril, Bibron & Dumeril).

Submitted by **SHERMAN A. MINTON,** Department of Microbiology & Immunology, Indiana University School of Medicine, Indianapolis, Indiana 46223, USA and **SARBELIO MORENO,** Universidad Autonomia de Queretaro, Queretaro, QRO, Mexico



Figure 1. Snake that was being eaten by *Mastigoproctus.* TL about 90 mm. The light head band and anterior two body bands were cream, the remaining bands orange.

Table 1. Parturition dates and litter size for litters A - G; and minimum/maximum and average SVL, minimum/maximum and average TL, minimum/maximum and average mass for litters C - F.

Litter	Birth Date	Litter Size	SVL (mm)	$\bar{X}$ SVL	TL (mm)	$\bar{X}$ TL	Mass (gm)	$\bar{X}$ mass
A	20 Aug 80	8						
B	25 Jul 85	6						
C	3 Jul 86	8	143-150	146	197-212	203	2.4-3.0	2.8
D	10 Jul 86	10	145-157	152	200-223	214	3.0-3.9	3.5
E	21 Aug 86	6	152-160	156	218-226	221	3.5-5.0	4.3
F	19 Sep 86	5	160-168	163	226-244	231	3.5-4.2	3.8
G	1 Oct 86	12						

HETERODON NASICUS KENNERLYI (Mexican Hognose Snake). **COLORATION.** An amelanistic *Heterodon platyrhinos* was described by Dyrkacz (1981. SSAR Herp. Circ. No. 11). On 8 May 85 an amelanistic female *Heterodon nasicus* was collected by Alfredo Gonzalez on the high school grounds of the Universidad Autonoma de Nuevo Leon (located at NE of Ejido Esmeralda; ca. 26 km from Gomez Palacio, Durango, Mexico). On 15 May the specimen was brought to the Museo de Historia Natural by Prof. Fernando Jimenez G. (MHN-0136). On arrival the snake's mass = 12.45 g, SVL = 112 mm, and TL = 139 mm. Dorsal blotches of the snake were creamy white with white interstices. The venter was yellow and the eyes were reddish.

The specimen was maintained in captivity and began feeding on tadpoles of *Gastrophryne olivacea* on 17 May after initially refusing to eat. It continued feeding on two tadpoles ($\bar{X}$ mass = 0.94 g) twice weekly. The snake eventually began feeding on juvenile mice (2-3 each week, $\bar{X}$ mass = 10.45 g). Upon its death it will be deposited in the Museum's herpetological collection. I wish to thank Director Luis Galan Wong for providing materials to maintain the snake in captivity and support for future studies.

Submitted by **DAVID LAZCANO, JR.,** Museo de Historia Natural, Universidad Autonoma de Nuevo Leon, Apartado Postal-513, San Nicolas de los Garza, Nuevo Leon, Mexico ●

LIASIS PAPUANUS (Papuan Olive Python). **FEEDING.** The Southern Trans-Fly region of the Western Province of Papua New Guinea is a large low-lying area dominated by extensive *Eucalyptus alba* savannas, tree and palm swamp woodlands and monsoon forest. The vegetation of the coastal and estuarine fringes consists largely of *Nipa* palm and dense mangrove swamps. The entire region receives between 40 and 100 inches of rainfall annually, a relatively low precipitation level for Papua New Guinea. Numerous rivers flow into the Fly estuary and delta to the east and the Torres Strait to the south. The area boasts an impressive herpetofauna comprising New Guinea endemics, northern Australian invaders and introductions and representatives of Oriental and Pacific taxa, including six of New Guinea's eight pythons.

The Trans-Fly region contains numerous riverine villages and many of the people survive entirely by hunting and fishing and by harvesting sago, potatoes and various fruits. The method of fishing largely consists of the setting of gill nets on a series of imbedded stakes along the slow stretches of the river, parallel to the flow. On occasion large pythons become entangled in these nets as they swim across the rivers. The author was called upon to free an eight foot D'Albert's python, *Liasis albertisi*, from such a net on the Binaturi River, near the village of Kunini, and the next day a second python, a drowned Papuan python, *Liasis papuanus*, was brought into camp following its discovery in another gill net on the same river.

The alternating bulges of this python's last meal aroused suspicion and further examination revealed a partially digested Amethystine python, *Morelia amethistinus*. The Papuan python measured 1932 mm and the more slenderly built amethystine python approximately the same, as near as could be established due to *rigor mortis*. Since the second python had been swallowed headfirst and no other prey item was present in the stomach of the *Liasis* it would appear that this episode represents a case of python ophiophagy. The gut of the Papuan python also contained a large population of nematode worms.

Pythons are not normally known to eat snakes with the exception of the Northern Australian black-headed python, *Aspidites melanocephalus*. The inclusion of a large snake in the diet of the Papuan python, a species thought to prey largely upon mammals ranging in size from marsupial mice, (pers. obs.), to wallabies, (McDowell S.B. 1975. A catalogue of the Snakes of New Guinea and the Solomons, with Special Reference to Those in the Bernice P. Bishop Museum. Part II. Anilioidea and Pythoninae. *J. Herp.*, *9*(1):1-79. Parker F. 1982. *The Snakes of Western Province.* Wildlife in Papua New Guinea No. 82/1. Div. Wildlife, Dept. Lands & Environment.) and birds, (McDowell op. cit), and possibly lizards, constitutes an interesting observation. This may be a potential problem associated with their maintenance in captivity. The author has been unable to locate any further records of instances of python ophiophagy in New Guinea.

The collection of these two specimens took place on 20 June 1986 during a 3½ month herpetological project which the author was conducting as part of the scientific work on the Papua New Guinea phase of Operation Raleigh. Both specimens were preserved and have been deposited in the collection of the British Museum (Natural History): *Liasis papuanus* (BM 1986, 1175); *Morelia amethistinus* (BM 1986, 1176).

For invaluable assistance in the field during the 3½ months duration of the project, thanks to the Venturers of Operation Raleigh; also the University of Papua New Guinea, (John Pernetta, Peter Lambley, John Hillary); National Museum of Papua New Guinea, (Jim Menzies); Fred Parker and Division of Environment and Conservation, (Karol Kisokau).

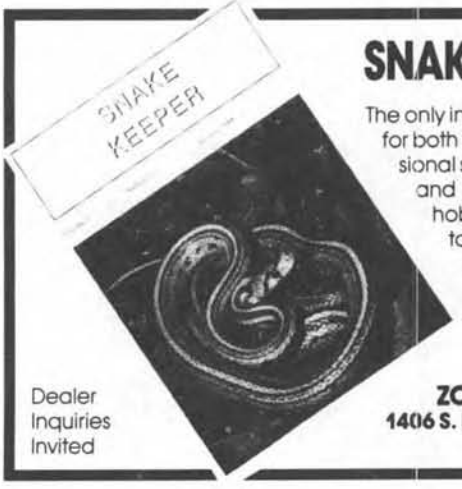
Submitted by **MARK T. O'SHEA,** 46 Buckingham Road, Penn, Wolverhampton WV4 5TJ ENGLAND ●

MASTICOPHIS FLAGELLUM FULIGINOSUS (Whipsnake). **PREDATION.** Many snakes are known to include birds and their eggs as part of their diet (Porter 1972. Herpetology. W.B. Saunders Co.), but usually there is little direct evidence of predation (G.T. Austin et al. 1972. Condor 74:492). We report an instance of coachwhip snake (*Masticophis flagellum fuliginosus*) predation on an adult black-throated sparrow (*Amphispiza bilineata*).

One of us (DW) observed the incident on 6 July 1981 in the Catavina region of Baja California, Mexico. The site is 9 km NW Rancho Santa Ines, latitude 29° 46'N, longitude 114° 46'W, elevation 550 m. The area is characterized by granite boulder fields, sandy soil, and scattered perennial vegetation including creosote bush (*Larrea tridentata*), ocotillo (*Fouquieria splendens*), boojum (*Idria columnaris*), elephant tree (*Pachycormus discolor*), mesquite (*Prosopis juliflora*), *Ambrosia dumosa, A. chenopodifolia* and a variety of cacti.

At ca. 1430 h (air temperature 34.5° C, relative humidity 14%), a coachwhip snake was observed entering a small pile of leaves, twigs, and rocks at the base of an elephant tree at about seven m distant from DW. At ca. 1500 h (air temperature 35° C, relative humidity 15%), three adult male black-throated sparrows alighted on branches of the elephant tree. All remained on branches about 1.5 m from the ground for several minutes at which point one flew down to a branch about 0.4 m from the ground surface. He was struck immediately by the whipsnake and pulled to the ground in the snake's jaws. The snake had apparently been lying in wait among the dead leaves and branches on the ground. As DW and two fellow expeditioners approached to investigate, the snake released the bird which escaped, seemingly unharmed. The black-throated sparrow and coachwhip are both common at this site. We do not know the impact of coachwhip predation on the black-throated sparrow or other bird species, but it may be an important factor in the survival of adults and nestlings alike.

Stebbins (1954. Amphibians and reptiles of Western North America, McGraw-Hill) notes



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that the food of the common whipsnake includes birds. Austin et al. (1972. Condor 74:492) reported whipsnake predation on cactus wrens in Arizona. Finch (1981. Condor 83:389) reported *M. flagellum* as a predator of nestling Abert's towhees (*Pipilo aberti*) and a nestling brown-headed cowbird (*Molothrus ater*). The black-throated sparrow has apparently not been previously noted as a prey item of the whipsnake.

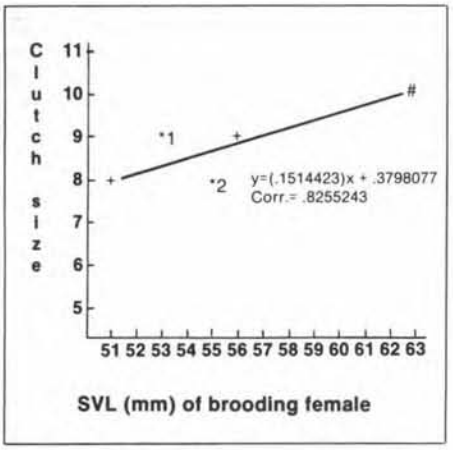
This research was funded in part by grants from EARTHWATCH and The Center for Field Research of Belmont, Massachusetts to WHC. We thank Paul E. Blom, Eric Yensen, and other members of the expedition for assistance in the field.

The coachwhip was collected and the specimen has been deposited in the Museum of Natural History, College of Idaho (CIDA 66).

Submitted by **DAVID M. WARD, JR.** and **WILLIAM H. CLARK,** Museum of Natural History, College of Idaho, Caldwell, Idaho 83605, USA ●

ERRATUM

The graph points on Figure 1 of Life History Note *Ensatina escholtzii oregonensis* (Oregon ensatina) Reproduction (*Herp. Review* 17(4):89. 1986), by Bradford R. Norman, were unfortunately placed in the wrong positions during typesetting. The corrected graph appears below. The editor regrets the error.



MORELIA SPILOTES VARIEGATA (Carpet Python). **MALE COMBAT.** On 15 February 1987 I observed vigorous combat behavior between two adult male *M. s. variegata* in my laboratory. The contest occurred when both males were removed from their respective enclosures and placed together on the floor during manipulation of the breeding colony. Both males were equal in size (1.9 m). They had been separated from one another for several months previous to the encounter on the floor. One of the males involved, identified as LV1, had been housed with another male, identified as TGR2, without incident. The involved males had been very active, constantly prowling their enclosures for several weeks and both were off feed. LV1 had copulated with one of the females in the breeding colony on 30 November 1986 and 10 February 1987, the latter breeding occurring when the female was apparently gravid. The other male involved, identified as CR3, had not yet copulated with any females in the colony.

The combat ritual consisted of the pythons rearing their heads and foreparts of their bodies to a height of up to 46 cm and vigorously intertwining their bodies and tails in a corkscrew fashion while each attempted to press the other's head to the ground. Several times they violently slammed one another to the ground from the reared position. During the contest, which lasted 29 minutes, both males were breathing heavily to the point that their throats were puffing out considerably upon exhaling. At no time during the combat ritual did either male bite, or attempt to bite, the other. The contest ended when LV1 very rapidly crawled away from the area. The other male, CR3, started to give chase then abruptly turned and returned to the contest site. With head reared up to 50 cm above the ground he circled the contest site for seven minutes before crawling away. Another male identified as TGR2 was placed near CR3 but neither showed interest in the other. CR3 was then placed with three different females which were housed separately. He did not initiate courtship with any of them but remained in a very active state, constantly on the prowl. Eight hours later LV1 was again placed on the floor with CR3. CR3 reared his head and approached LV1 but LV1 did not rear his head and, as if in a panic, rapidly crawled away. CR3 remained in the reared position, which was apparently a dominance display, after LV1's retreat.

Submitted by **STEVE HAMMOND,** 12319 Steedland, Louisville, Kentucky 40229 USA ●

TECHNIQUES

A PHOTOGRAPHIC METHOD FOR QUANTIFYING COLORS

One of the principle difficulties in assessing color morphs, clinal variation in color, and color changes in amphibians and reptiles lies with imprecise means of describing and remembering colors. Nassau (1983) reports several definitions of color from different sources. In all, color is defined in terms of human perception. Verbal descriptions of color leave a great deal to be desired, partly because individuals perceive color differently, and partly because their attempts to assign meaningful words to their perception of the color is futile.

Most attempts to describe color in quantitative terms involve either chemical extraction or visual comparison to standardized color chips. Using extraction methods, pigments are dissolved and the solution analysed with a colorimeter. If the pigments are soluble and if the color is produced by soluble pigment alone, this procedure can provide repeatable, quantitative data. However the color of an amphibian or reptile may be influenced more by nonpigmentary structural colors and the distribution of pigment than by amount, and this method necessitates sacrificing the animal.

The use of color chips is preferred in most cases because it is quick and simple, provides standardized colors and notation for communication with other workers, and permits the researcher to record the combined effect of pigmental and structural colors. The Munsell System is the most widely used in the United States although there are others such as the CIE (Commission Internationale de l'Eclairage) system, or variations on such systems as presented by Palmer (1962).

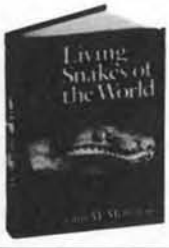
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"standard observer" (Mitchell 1984). The assessment of lightness and darkness (value) and color intensity (chroma) are also defined by normal observers. Mitchell correctly recognizes the strengths of the Munsell system as follows: "This system of color representation is psychological in nature, because the eye of a human observer is the measuring instrument. This is as it should be since the intent is to catalogue and describe what people see." Because of the nature of the Munsell system the value of statistical analysis has some limitations.

In this paper, I describe a procedure that provides for non-invasive color quantification applicable to colors that result from pigment alone, structural factors, or both. It is inexpensive, provides reasonably permanent records and is therefore particularly suited to recording and measuring color changes of individual specimens. It can be calibrated with the color chips of the Munsell system or any other. The only equipment required in addition to a camera is an enlarger equipped with a voltage regulator, and a photographic color analyser (CA). CAs are in common use throughout the photographic industry and may be purchased for as little as $200.

THEORY

It is essential to recognize the components of color to understand how this procedure works. A full range of colors can be produced by mixing only three hues called primary colors. These primaries may be additive or subtractive. Mixing light that is red (R), green (G) and blue (B) (the additive primaries) results in a hue which we perceive as white, or more correctly neutral, since gray, black and white all result from the same mixture of primaries. The subtractive primaries, cyan (C), magenta (M) and yellow (Y) are the complements of the additive primaries. Cyan, composed of equal parts of green and blue, complements red. Magenta results from a combination of red and blue, and complements green. Yellow, a combination of red and green, complements blue. Optical filters of these primaries remove the hue of their complement from light passing through them (e.g. a cyan filter placed in a beam of light removes red from the light in proportion to the strength of the filter). The other subtractive primaries act in equivalent manner to remove their complements.

It is also essential to discriminate among the three properties of color: hue, value and chroma. Hue is determined by the combination of wavelengths of light reflected by an amphibian or reptile, usually reported as its color. Value varies with the proportion of light reflected (whether it is a light or dark animal), and chroma is the intensity of a color, sometimes described as its "saturation" or "brightness." This paper deals only with the assessment of hue. Mitchell (1984) provides a more complete discussion of these properties.

Color film records images using three layers of dye so that three separate images are formed in register. At the time of exposure, each dye layer of the film records the intensity of light reflected from the subject in terms of the subtractive primary colors (i.e. cyan, magenta and yellow). Subsequent projection yields an image with a full range of colors resulting from sequential removal of precise amounts of the primaries from the light beam passing through these layers. It is the function of the CA to measure the density of each layer independently, using a neutral such as gray or white as a reference point. Gray is preferable to white because a standard gray, determined by a central authority (Kodak), is available as a Neutral Gray Card.

EXAMPLE

A specific example from work in progress will help to clarify these relationships. All data from the following discussion are summarized in Table 1. The Cricket Frog (*Acris crepitans*) is a polymorphic species reported by many authors, notably Pyburn (1961) and Gray (1971), to be capable of color changes. The vertebral stripe of a newly captured green-striped morph was described as bright green with a slightly yellow cast. Using the Munsell color chips, a more precise description was possible. It most closely approximates color chip 7.5 GY 5/8 in the Munsell system, a designation which includes evaluation of hue (7.5GY), value (5) and chroma (8). The same specimen was photographed in the field using a Neutral Gray Card background. Subsequent analysis with a CA identified the hue of the vertebral stripe relative to that of the Neutral Gray Card as: OC + 46M - 13Y. These values describe the differences in light transmitted through the gray background image in comparison to the light through the vertebral stripe image. The procedures necessary to arrive at these data will be described below.

Positive values are more easily manipulated than mixed values. It can be assured that one of the primaries is equal to zero and the remaining two positive, by adding gray (equal parts of C, M and Y). This addition does not alter the hue. In this case, adding 13 units of gray (+13C +13M +13Y) converts the reading to positive values. The result is: 13C + 59M + 0Y. The numbers in these formulas, as read directly from the CA, are 100 times the density of each subtractive primary. Density is defined as the log of (1/proportion of light transmitted). It is now established that light passing through the vertebral stripe image differs from that passing through the Neutral Gray Card image by the removal of 0.13 density units of C and 0.59 density units of M.

The values 13C + 59M do not seem reasonable descriptors of a green hue, because they are subtractive primaries. We commonly think in terms of additives (which hues might be added to white to change it in a particular way). Therefore, it may be desireable to convert the expression of this hue to its additive components. Subtracting 13C (0.13 density units of cyan) from white light is the equivalent of adding 13R (0.13 density units of red). Thus, with cyan and magenta converted to their additive components, the above reading becomes: 13R + 59G + 0B. Red and green light in equal parts produce yellow, so this hue may be described as green with a yellow cast.

Hues, independent of value and chroma, are precisely described by the ratio of any two primaries. In this case, the hue of the vertebral stripe can be accurately described by a single number, the R/G ratio which is equal to 0.22.

Table 1. Summary of Hue Descriptions from a Cricket Frog.

Visual description	green with yellow cast
Munsell color system	7.5 GY 5/8
Color Analyser	
Subtractive primaries	
- inital reading	0C + 46M - 13Y
- elimination of negatives	13C + 59M + 0Y
Additive primaries	
- equivalent reading	13R + 59G
- Red/Green ratio	.220 R/G

PROCEDURAL DETAILS

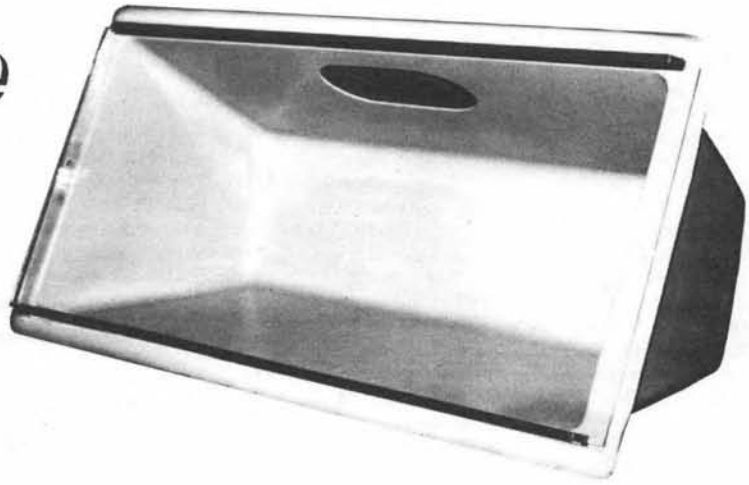
The amphibian or reptile under study is photographed on a background of neutral gray. Any neutral gray can be used but the benefits of a standardized gray favor the Kodak Neutral Gray Card. A painted surface may be used so that the necessary wetting associated with handling amphibians will leave the reference gray card unsoiled. If a painted surface is used, the difference in hue between the Neutral Gray Card and the painted card can be recorded by photographing both painted and reference cards on the same slide and measuring the difference with the CA as described below. All sample values can subsequently be adjusted to the standard gray by adding or subtracting the measured amounts. If the Neutral Gray Card is protected with glass, it may be necessary to adjust its hue to the standard gray because the color added by the glass (usually green) will probably be identified by the CA.

Film. A film that produces transparencies, such as Kodachrome or Ektachrome, is most useful. The type of film is not important, though it must be used according to the manufacturer's specifications. Some films are designed for use with daylight or electronic flash, while others are balanced for tungsten illumination. Because of the heat associated with tungsten lights, daylight film used with electronic flash is the recommended combination.

The common observation of faded color images raises the question of permanence. Currently available Kodachrome has the greatest permanence (100 years) without fading, assuming storage in a cool, dark and dry location. This time span is reduced to 30 minutes by projection with conventional 2 x 2 projectors, while the projection life of Ektachrome is 90 minutes (Hammond 1984). Other brands of film are roughly equivalent to Ektachrome, so the researcher need not be concerned about the permanence of the image, unless it is projected for extended periods or subjected to unusual levels of heat or humidity in storage. The use of an enlarger for color analysis, described below, is not equivalent to projection, relative to deterioration of the image.

Exposure. Exposure is not critical. For initial testing, a Kodak Neutral Gray Card can be used according to the enclosed instructions to approximate the correct exposure, but tests should be employed to determine the optimum exposure for the specimens under study. Once established the lighting arrangement should be held constant. In testing with Kodak's Ektachrome 100, overexpo-

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sure or underexposure by a full f-stop did not detectably alter the hue on the transparency. Of the two, overexposure is preferable because the film shifts toward green in parts of the image where exposure of the film is barely above threshold levels, such as in dark regions of the subject or in deep shadows. Therefore, if the hues to be studied are of low value, (e.g. the ground color of *Ambystoma maculatum*) the transparency as a whole may be overexposed so that those hues appear nearer to a middle tone on the transparency. The value will be changed but not the hue. This procedure will eliminate the shift toward green of low exposure areas and provide a broader acceptable range of exposure. Analysis of a series of exposures taken at different f-stops will provide a basis for determining if any correction is necessary.

Equipment for Color Analysis. The transparency is placed in the enlarger and an image of desired size projected onto the baseboard. Any enlarger of reasonable quality will do, but it must be equipped with a voltage regulator, so that fluctuations in line voltage do not alter the color of the light source. There are several color analysers on the market; Omega and Beseler are the most popular brands. They come with a variety of capabilities, of which only the digital read-out is recommended, because it is quicker and probably more accurate than reading the scale of a meter behind a needle. Most CAs are equipped with a probe that rests on the easel and permits analysis of a small portion of the enlarged image, usually a 3 mm to 5 mm disk. This corresponds to an area on the specimen which is highly variable depending on the magnification of the image on the film and in the enlarger. Assessment of subjects 100 micrometers in diameter or less is easily accomplished.

Using the CA. Operation of the CA requires that a reference gray be defined. This is the function of the gray card in the background. It is essential that the image of the subject and of the gray card be subject to the same sources of variation (film type, emulsion number, processing variation, etc.) so that these variables are cancelled. To accomplish this, CA is zeroed with the probe on the image of the gray card. When the probe is moved to the part of the image under investigation, the CA will display the difference between gray and that hue in terms of densities of cyan, magenta, and yellow, one of which will eventually be eliminated.

Recording changes that occur in a single individual requires evaluating the same surface area each time. This can be assured by tracing the projected image on paper or by marking registration points (such as the eyes, lip line and posterior width of the torso). Either will provide permanent records to be filed with the transparencies. It may be desireable to neutralize the impact of small irregularities in pigmentation (scars, freckles, warts, scale boundaries, etc.) if they are not resolved without magnification and hence are not part of the image presented to an observer. To neutralize these irregularities, the image may be thrown slightly out of focus so that they contribute their hue to the general appearance in proportion to their surface area, but do not dominate a particular reading. Alternatively, one could run transects through the image and take readings at any number of points along the line.

Consult Mitchell (1984) for additional information on colors and color sensitometry at a general level. The Kodak Data Books (Anonymous 1974) are also very informative.

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A METHOD OF LIVE-TRAPPING WARY CROCODILES

Fifteen of the 21 presently recognized species of crocodilians are endangered (U.S. F.W.S., 1984). This status is a result of both extensive habitat destruction and intensive hunting practices. Managers of populations of endangered species have the difficult task of studying small numbers of wary individuals in large, remote and often inaccessible areas. For example, our experience is that the few remaining adult American crocodiles (*Crocodylus acutus*) in southern Florida are often difficult, and frequently impossible, to approach closely.

Several papers have described methods for direct capture of crocodilians (Chabreck 1963; Jones 1965; Joanen and Perry 1971; Webb and Messel 1977). Murphy and Fendley (1975; trap boards) and Webb and Messel (1977; rope nets) developed live-trapping methods for crocodilians that proved particularly successful with wary, difficult-to-approach individuals. We found two disadvantages to using these techniques: (1) The equipment is bulky, thus limiting the number of traps that can be carried to remote areas; and (2) they require bait. The habits and low numbers of American crocodiles in southern Florida generally mean that their occurrence at any trap site is infrequent. In addition, the bait may attract other predators. Blue crabs (*Callinectes* spp.) and black and turkey vultures (*Coragyps atratus* and *Cathartes aura*) are common and have consumed bait within 48 h of a trap being set. Another disadvantage of trap boards set on trails is that crocodiles easily avoid them. Here we describe a simple, baitless trap for capturing crocodilians.

The trap configuration consists of a #3 Klef-

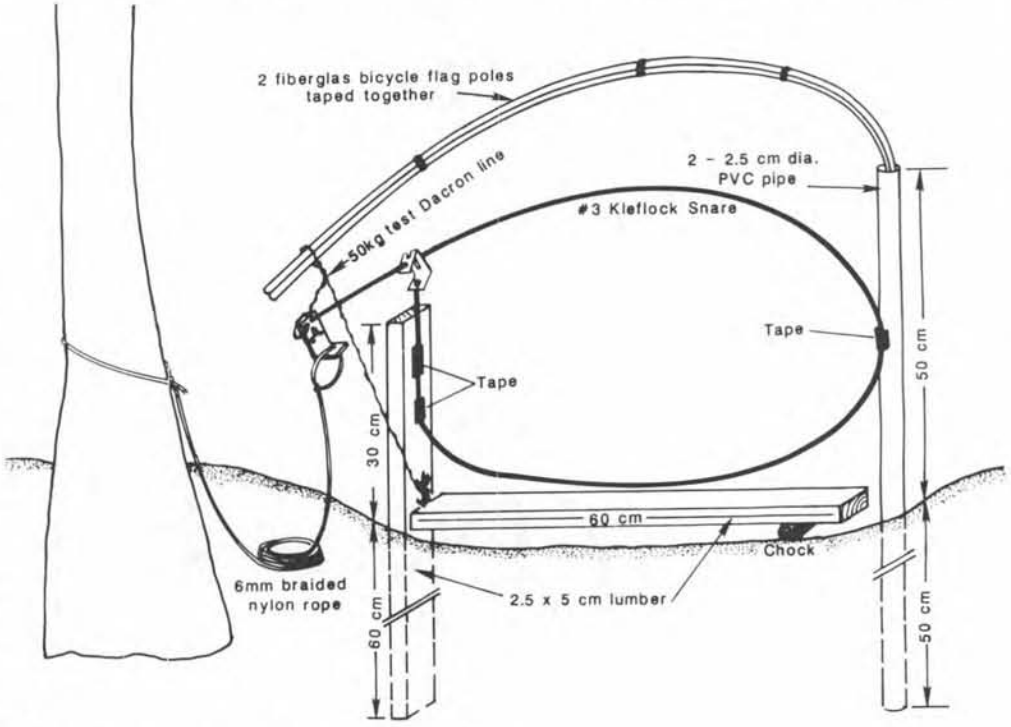


Figure 1. Configuration of crocodilian trail trap.

lock wire noose (Woodstream Corp., Lititz, PA), trigger and spring pole (Fig. 1). The noose is set in a natural narrowing of an active trail between vegetation or where a crawl emerges from the water. The noose is held in place by forked sticks or is lightly taped to the trigger arm and spring-pole support. The snare is anchored to either a stout tree or an iron reinforcing bar driven into the ground, or is attached to a float with 6 mm diameter braided nylon rope of sufficient length to allow the crocodile access to water. We found that two flexible fiberglass bicycle flag poles taped firmly together were the most effective for springing the noose. The spring pole, supported in PVC pipe (2 to 2.5 cm diam., 1 m length) driven into the substrate to approximately half its length, is attached simultaneously to the noose and trigger using 50 kg test dacron trolling line (Fig. 2). The dacron trigger attachment is placed on the flathead nail between the two horseshoe nails and the tension adjusted so that only a slight pressure on the treadle is needed to release the spring-pole. The treadle is depressed by the crocodile's chest, after the head passes through the noose. The noose is usually set partly, or fully, between the fore and hind legs. Traps should be checked at least once a day, preferably by mid-morning to avoid exposing the animal to extreme temperatures.

Seven of 15 adult crocodiles captured in Everglades National Park (ENP) and all (four) of the adult crocodiles captured at Florida Power and Light Company's Turkey Point power plant site (TP) were trapped using this method. Of the 11, 10 were females (seven from ENP associated with particular nests) ranging in size from 2.27 m, 47.6 kg to 3.08 m, 95.4 kg. The one male captured (at TP) was 3.5 m, 215 kg. Five of the 11 adult crocodiles trapped were recaptured using the same method.

One trap was set on each active trail in an area where we wished to capture crocodiles. For example, at nest sites in Everglades National Park we would set one or two traps on the trails that approached the nest from the water. To allow the crocodile access to water, and to keep her from destroying the nest, traps were placed as close to the water as possible. At Turkey Point, traps were set in locations where crocodiles were known to cross roads from one body of water to another (Gaby et al. 1985). Large limestone rocks (0.3-1.0 m diam.) were strategically placed in the areas where the trails emerged from the water, directing crocodiles through the traps.

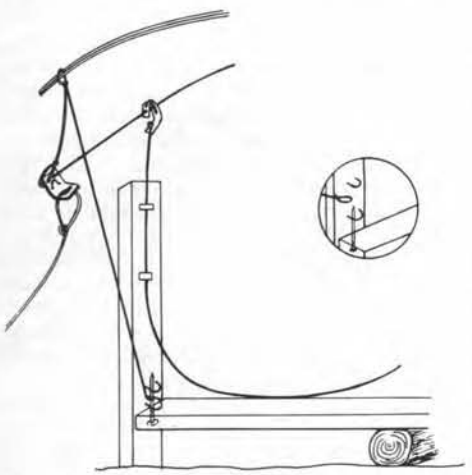


Figure 2. Closeup of trigger mechanism.

The seven female crocodiles caught in Everglades National Park in 1979 were captured in 36 trap nights during two trapping periods, for a trapping success of 19.4%. During the first trapping period five traps were set early in the incubation period on active trails at five nest sites on 30-31 May 1979. Two females were captured. One, captured 30 May, continued to visit her nest after capture and opened the nest at the end of incubation. The other animal, captured 1 June, was found dead on 10 July. Based on size (3.08 m) and tooth and scute wear, this animal was judged to be the oldest crocodile captured in South Florida, and it was not possible to determine if she died as a result of capture trauma (a blood sample was taken via caudal puncture and a radio collar was attached).

During the second trapping period, seven traps were set at five nests from 26 June - 1 July 1979. Five animals were captured. Two failed to return to the nest sites after capture. One of these nests was destroyed by raccoons, the other opened by investigators. Two animals continued to visit their nests; one nest was successfully opened by the crocodile, the other was destroyed by raccoons. No active nest was located for the fifth animal. To prevent desertion of nests, we recommend that trapping of females at particular nests be limited to early in the incubation period.

Using these methods we have been able to capture adult crocodiles that we were otherwise unable to approach. We were able to capture females known to be associated with particular nests and, by attaching radio transmitters, to obtain detailed information on their movements and habitat use. The major disadvantage of snare traps is that they must be set on an active trail. However, this technique is very effective for capturing animals known to use specific areas and has the important advantage of ease in transporting materials. Also, because it is baitless, the daily maintenance is low, and it can be used when animals may not be feeding, i.e. during the cooler months of the year.

This method has been effective in capturing *Crocodylus acutus* in Florida and *Alligator mississippiensis* in north Florida (Phil Hall, pers. com.) and with modification it should work successfully for capturing other crocodilians, particularly those that are wary and in remote areas.

ACKNOWLEDGMENTS

Support came from Florida Power and Light Co. (FPL) and the National Park Service (NPS). We thank J. Kushlan (NPS) and J.R. Wilcox (FPL) for their assistance, advice and encouragement. S. Carney and D. Phillips designed the snare trap with assistance of C.R. Stone. J. Coleman illustrated the trap. J.W. Gibbons, J.L. Knight, S.S. Novak, and R.A. Seigel offered suggestions on the manuscript. Preparation of the manuscript was supported by contract DE-AC09-76SR00-819 between the U.S. Department of Energy and The Savannah River Ecology Laboratory, University of Georgia.

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BOOK REVIEWS

FACSIMILE REPRINTS IN HERPETOLOGY IN CELEBRATION OF A SILVER ANNIVERSARY

Biologia Centrali-Americana. Reptilia and Batrachia, by Albert Carl Ludwig Gotthilf Günther. 1987 (Facsimile Reprint of 1885-1902 original). (i-lxix) xx + 326 pp., 76 pls. (12 in full color). Society for the Study of Amphibians and Reptiles, Athens, Ohio, USA. Hardbound $50.

Some twenty-seven years ago one of the founders of the nascent Society for the Study of Amphibians and Reptiles (SSAR) conceived the brilliant idea of reprinting exact facsimiles of rare and significant herpetological works for its members. The society was then a tadpole at about stage 21 (Gosner 1960) in the early Ohio Herpetological Society period of development and the first facsimile reprint (E.V. Wilcox's 1891 *Notes on Ohio Batrachians*, 3 pp.) was a modest and parochial beginning. Nevertheless this unique activity (reprints of papers by Kirtland and Rafinesque-Schmaltz followed in rapid order) attracted the attention, if not the approval, of professional herpetologists to what up to then was regarded as mostly a local, amateur organization. Subsequent reprintings (from 1962 on) were to carry the bold title, Facsimile Reprints in Herpetology, and they completely changed the destiny of the fledgling society.

Following the facsimile reprinting of the herpetological portions of the 12th edition (1766) of Linne's *Systema Natura* in 1963 membership in the society nearly doubled to 291. By 1965 the formidable task of making available all of George Albert Boulenger's papers (1877-1920) on American herpetology in a uniform set was initiated to culminate some 18 parts and 900 pages later in the final section that appeared in 1977. During this period many other facsimile editions were issued, most importantly the first book-length (hardbound) reprint, Johann Jakob von Tschudi's *Classification der Batrachier* in 1967. The appearance of this work was concordant with the passage of the society through Gosner stage 46 to become the SSAR and was the visible symbol of the stability (422 members) and confidence that led to the establishment of the *Journal of Herpetology* the following year.

During the earlier period the reprints were distributed to all members without additional cost (a practice continued for the pamphlet-length series until 1979) but the Tschudi and all subsequent book-length facsimiles were available for an extra charge, albeit a substantially discounted one for members, and for sale to non-members and institutions. Reinvestment of income from these sales has allowed for the publication of a continuing series of well produced and exceptionally useful works, that otherwise could be unavailable to most members of the herpetological community because of the limited availability, rarity and cost of the originals. To date 61 separate items and more than 7500 pages have appeared as the result of the dedication of a single individual, one of the founders of what has become SSAR, the originator of the idea of the reprint series, the driving force in the development of this activity and editor of every facsimile to date, Kraig Adler.

From the point of view of SSAR the extremely successful Facsimile Reprint Series (FRS) has had several major benefits. First the uniqueness of this activity (not duplicated by any other society) gave SSAR a special identifying quality that legitimized the group as a serious scientific association. Second, it provided an unusual and valuable prerogative that aided in the recruitment of new members. Finally, income from sales of numbers in the series provided additional revenue that subsidized (and still subsidizes) the publication of the *Journal of Herpetology* and *Herpetological Review*. Under these circumstances one must attribute much of the growth and success of SSAR to this innovative publishing venture that contributes so much to the reputation and vitality of the society.

Needless to say both the SSAR and all herpetologists are greatly indebted to Kraig for his commitment to and organization of this grand project. The selection of major key works for re-publication, the overall design (especially for the book-length series), the physical reproduction and the inclusion of additional explicatory material within each work reflect his artistic, scholarly and bibliophilic talents in a most admirable combination. Adler's financial legerdemain to insure publication of the series also reveals rare skills. Few realize that he has often provided the necessary "up front" support for the printing of a particular volume, gambling that his investment would be recouped by subsequent sales. Of course his abilities as a fund raiser cannot be better illustrated than with the present reprint. After receiving an initial commitment of support from Ernie Liner, Kraig then raised sufficient matching funds to make possible the reproduction of the 12 color plates. Ernie thus deserves special recognition for his contribution to this project from all herpetologists as well.

As a user I particularly appreciate the content and format designed by the editor for the introductory materials to each major reprinted work. His philosophy has been to take advantage of the opportunity provided by the reprinting to research the topic and its author in-depth. The introductory material (Editor's Note and Introductory Essay) aims to provide all the available historical information the modern user may need. Often the Editor's Note contains important original discoveries made during preparation of the facsimile reprint, revealing, for example, the existence of many J.E. Holbrook specimens in the Paris Museum and the previously unreported expanded versions of volumes 1-2 of the first edition of his *North American Herpetology* (1836-1840) containing several new taxa, and rediscovering most of Spix's types (thought to have been lost during World War II) in Munich and Leiden.

The Introductory Essay is by a leading herpetologist intellectually connected to the subject matter of that work. These presentations invariably contain illuminating material on the life and career of the original author and the relationship of that career and the particular work at hand to the development of herpetology. Frequently they also present original ideas relating to the current state of knowledge on the subjects addressed in the reprinted volume. There is also a short biography, a bibliography of published herpetological material and a photograph or other likeness of the author of the reprinted opus. In most cases, as appropriate, a listing of mentioned taxa and their current identifications, detailed itineraries, maps of expedition routes and associated illustrations are also included. All of these materials enhance the utility of the volumes and provide intriguing insights into the particular author's life and approach to science that enhances understanding and enjoyment of the reprinted work.

All of the previous opera in the FRS and especially the books appearing in the last decade (Espada, Gloyd and Spix) are exemplars of the very best of the qualities discussed above. It is perhaps no surprise that we now have Günther's seminal work on Mexican and Central American herpetology in an edition that overshadows them all. Dear editor of the series you have outdone even yourself! What a superb production! The book itself is well-made and beautifully designed. It has an attractive art-deco lavender cover and the deep-red, leather-simulated, Tara cloth spine is embossed in gold with a Mesoamerican motif of a pair of entwined *coatls* (rattlesnakes) and the SSAR's symbol (a tree-frog) below the similarly embossed title and author information. The frontispiece is from a watercolor done of Günther in 1900 and the title-page and introductory materials are elegantly and tastefully prepared so as to blend with the original text. The plates are beautifully done, the slight reduction in size from the originals seems to have improved their sharpness without loss of intensity or color quality when compared to my copy of the original book (purchased in 1951 for $25). Overall this is a visually stunning edition! Serendipitously it also was published to coincide with the occasion of the SSAR's first annual meeting outside of the USA in Veracruz, Mexico (Adler thinks of everything!).

In terms of content this is also the best in the series thus far. Hobart M. Smith has provided a marvellously cogent, understated and succinct review of the *Biologia Centrali-Americana* (67 volumes containing 1677 plates of

which over 900 are colored), its organizers and patrons (O. Salvin and F.D. Godman) to set Günther's contribution in proper context. Both he and the FRS editor were aided in this regard by Sybil Salvin Calverley Rampen of Oakville, Ontario, Canada, who is O. Salvin's great-granddaughter. Doubtless the discovery of her existence and her ownership of many unpublished Salvin materials is another example of Adler's researching. I note a minor error in Smith's account: Carl (known as Don Carlos in Costa Rica) H. Lankester is listed as H. Lankester. He was the nephew of the eminent zoologist Ray Lankester, whose two volume (1906) history of the British Museum was so unsatisfactory to Günther, that the latter wrote a separate history of the Zoology Department (1912). Smith also has provided a listing using modern nomenclature (about 1080 species-group names) for nearly every specimen cited in Günther. The extreme value of this enumeration to the working taxonomist cannot be overestimated. For some, it alone will be worth the purchase price of this reprint. A careful review of this list shows only one erroneous identification. *Hylodes euryglossus* is based on *Eleutherodactylus fleischmanni* not *E. punctariolus.*

A.E. Günther, A.C.L.G. Günther's grandson, contributed a fascinating and personalized biography of his grandfather. The story of how the elder Günther began his career at the British Museum as a "walk-on" from the street, who was then hired for piecework identification of specimens by J.E. Gray is especially intriguing. From that position Günther, who had a medical degree and a "doctorate" in philosophy and arts, progressed to being contracted to prepare specific works, then was added to the museum's staff and finally became Keeper of Zoology. Can one imagine such a thing happening today? It's difficult enough landing a museum position under the best of circumstances without the handicap of being an immigrant with a thick accent and relatively little advanced training. One must give tremendous credit to Gray's ability to recognize potential, or perhaps it was Günther's personality and obvious talent that came through. Finally, the editor has included a bibliography of herpetological publications by Günther, who is better known as an ichthyologist than a herpetologist. On the other hand it was Günther who brought G.A. Boulenger to the British Museum to work on amphibians, reptiles and fishes and Boulenger became one of the two or three most important herpetologists of all time.

The value of having this book available again to those working on the Neotropical herpetofauna, especially in this informative and usefully supplemented edition, cannot be over-estimated. It is a "must" purchase for anyone carrying out studies on the amphibians and reptiles of Mesoamerica. All other herpetologists with an appreciation for the history of our science and the intrinsic beauty of our study organisms will find much of value here. At $50 it is a best buy!

Kraig, I hope you continue to serve as the Facsimile Reprints Editor for another quarter of a century. I don't know how you can top this production which is as near to perfect an effort as could be imagined. But don't rest too long on your laurels. I've been wondering. . . would you consider doing a facsimile reprint edition of *Beiträge zur Naturgeschichte von Brasilien, Batrachia* Vol. 1 (1825) by Prince Maximilian Wied-Neuwied?

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A Directory of Crocodilian Farming Operations compiled by R.A. Luxmoore, J.G. Barzdo, S.R. Broad and D.A.Jones. 1985. Jointly published by the International Union for the Conservation of Nature and Natural Resources (IUCN), Gland, Switzerland and Cambridge, U.K., and the Secretariat of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Lausanne, Switzerland. 204 pp. Printed in Great Britain by University Press, Cambridge, England. ISBN 2-88032-809-8. £ 8 (about $12.00).

This work is a start towards providing a comprehensive listing of crocodilian farming operations which have been established throughout the world. Included are commercial operations, government and scientific research farms, and a few zoological captive breeding facilities.

To say the least, this was a most ambitious undertaking on the part of the authors. The proliferation of crocodilian farming operations in recent years has been spurred by elevated skin prices, some promising market projections, investment interest, and fashion promotions that promise to continue to bolster consumer interest in crocodilian products into the long-term future. Investors, eager to capitalize on seemingly guaranteed high returns, are often quick to back the building of such farms. They find, however, that a lack of management expertise, husbandry technology, fluctuating markets, lack of consumer interest in exorbitantly high priced products, and a nearly ten year wait before any considerable return is feasible, make crocodile farming anything but a lucrative fast turnover business. As fast as new operations appear, many disappear. Attempting to set forth such a rapidly changing listing is an accomplishment of no little merit. This work has succeeded in presenting this information.

Some of the information in the book, provided in many cases by the farming or ranching operations themselves, should be viewed with skepticism. It is interesting to note that on page 97, one farm is shown to have been established in Italy, a major tanner of caiman skins, for the broad snouted caiman *Caiman latirostris,* with breeding stock having been acquired from Colombia in 1980. However, that species is not endemic to Colombia, nor any regions in northwestern South America.

The authors point out that listings of farms do not imply credibility. The reader must decide if the operation listed is a legitimate one or not. Bogus farms may be established for the purpose of "laundering" illegal or controlled hides, and provide documentation for products made from skins of undocumented origins. A rating system for each listing, based on CITES criteria, would be of great interpretive value to the reader.

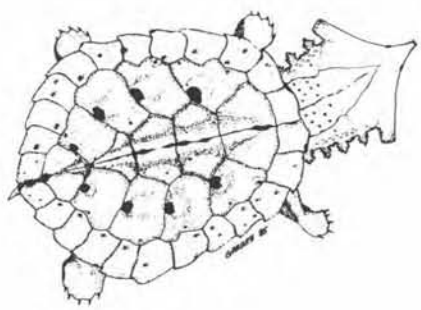
There is a lengthy introduction, written in English, French, and Spanish, which presents short overview discussions on the scope of the work and the methods employed in compiling the information, CITES controls on trade and CITES criteria for farms and ranches, captive breeding, farming and ranching finances, the impact of farming on crocodilian conservation, the effects on wild populations, habitat and species preservation, cultural preservation, and the outlook for the future. Tables include a species list with CITES status, harvest quotas for African countries, species maintained in different countries, numbers of individuals of each species, and stock and production figures.

Listings for operations are given alphabetically by country, prefaced by a short history and summary of that country's programs, protocols, and production. Each listing contains as much information about the operation as possible, including ownership, stock levels, production and financing. Wherever an operation reported activities that were not consistent with known information, every effort was made to include these questions or other comments.

Sources of information are referenced wherever possible. Two-hundred-and-twelve references are given, largely personal communications and a number of anonymous citations. The list of acknowledgments, which should include the many people who helped comment on or reviewed the text, is conspicuously brief. The methods section does not indicate what standards were used to determine scientific or common names used in the text. While the bound work cannot be easily updated, the modest purchase price of about U.S. $12.00 will bring future revisions within the range of most interests.

This work will be of greatest interest to commercial enterprises. However, it will serve as a source list for researchers and zoological institutions, and will be a valuable tool for wildlife law enforcement authorities who must scrutinize shipments of crocodilians, hides and products.

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La Nomenclature Supragénérique des Amphibiens Anoures, by Alain Dubois. 1984. Mémoires du Muséum National d'Histoire Naturelle (n. s.), Serie A, Zoologie, 131:1-64, 1 Figure.

Few herpetologists approach taxonomy with as much dedication as Alain Dubois. This paper is a comprehensive treatment of the suprageneric taxonomy of anurans. Dubois has rendered a genuine nomenclatorial service by unearthing older names and forgotten literature, reflecting a brand of scholarship not likely to be appreciated by nontaxonomists. Although Dubois writes with apparent authority, alternative views exist; Savage (1986) expressed several objections, all of which were dismissed by Dubois (1987).

Dubois provides (1) six conventions to govern taxa above the family-group rank, thus extending the type-concept to those categories, (2) a list of anuran type-genera, with type-species and citations, (3) and most significantly, a family-group classification of Recent anurans. Unfortunately, the third edition of International Code (Anonymous 1985) rendered some of the nomenclature out-of-date, and Dubois later (e.g., 1985) amended his classification. Indeed, this review, first prepared in late 1985, has suffered three revisions to accommodate Dubois' modifications to the original paper.

The classification above the family level is disturbingly arbitrary. Batrachia is preferred to Lissamphibia on the grounds that it is older and used more; Dubois points out that Lissamphibia appeared only twice in titles of citations in the Zoological Record from the years 1969-1978. Batrachia is in fact the older name, but that it is more commonly used is questionable: Lissamphibia was utilized by Porter (1972); Goin, Goin, and Zug (1978); Duellman (1975); and Dowling and Duellman (1978). Also, Dubois proposes a new name (Pipoidei) for the Mesobatrachia of Laurent, (1980); the latter is abandoned because of supposed lack of use. However, given that Mesobatrachia was only proposed in 1980, this rejection is somewhat self-serving.

The most significant feature of the paper is the annotated classification of family-group taxa of frogs, previously published (Dubois 1983) without definition or diagnosis of the included taxa—interesting, considering that he (1987) chastised Savage for naming Allophrynidae and Platymantinae without definition or diagnosis. Some particulars of the family-level classification are noteworthy. Dubois regards the Discoglossidae as problematic. On the basis of biochemical data, Lanza et al. (1975) suggested that *Discoglossus* be placed in one family, and *Alytes* and *Bombina* in another. Dubois, however, feels that the degree of morphological divergence is only sufficient to warrant subfamilies: Discoglossinae and Bombinatorinae.

Dubois places some megophryine pelobatids in the subfamily Leptograchiinae. Although he (1980) previously suggested recognition of this group and the Megophryinae as tribes on the basis of tadpole morphology, he deferred action because larvae of *Leptobrachella* were unknown. Following Inger's (1983) description of those larvae, Dubois (1983) elevated the two "tribes" (previously not recognized) to subfamilies—an interesting taxonomic legerdemain.

The traditional Pelobatinae (*Pelobates* and *Scaphiopus*) are divided by Dubois into Pelobatinae and Scaphiopodinae, following Rocek (1981), who placed *Pelobates* as the sister-group to all other Salientia. If Dubois accepts Rocek's hypothesis, then the Pelobatidae of Dubois is clearly polyphyletic. Otherwise, there is no justification for subfamilies. Also, Dubois follows Laurent (1980) in elevating the Rheobatrachinae (Myobatrachidae) to a family, but later (1985) placed it and all Myobatrachidae into the Leptodactylidae without any explanation.

The treatment of the Bufonidae is particularly annoying. Following Laurent (1986), Dubois divides bufonids into the genus *Bufo*, and the Neotropical, African, and Asian clusters of non-*Bufo* genera. However, Laurent did not accord these taxonomic status; the latter three are simply geographic assemblages. Dubois, however, recognizes four subfamilies (Bufoninae, Atelopodinae, Tornierobatinae, and Adenominae, respectively). It is distressing that this arrangement is based only on geography. Worse, the content and diagnosis of the subfamilies is not given, and use of Adenominae violates the Code, because the monotypic *Adenomus badioflavus* is a synonym of *Bufo kelaartii*.

Allophryninae is recognized as a fifth subfamily of Bufonidae, following Laurent's (1980) suggestion that *Allophryne* is a bufonid. Laurent's statement was somewhat casual, and one wonders why Dubois chose to formalize this opinion. Lynch and Freeman (1966) tentatively placed *Allophryne* in the Hylidae; it is evident from their data that *Allophryne* is not related to bufonids.

Dubois' classification of firmisternal frogs recognizes Microhyloidea and Ranoidea. However, Dubois (1985) raised the Scaphiophryninae (Microhylidae) to family rank and placed the Microhyloidea in the Ranoidea, based on Wassersug's (1984) analysis, although Wassersug did not propose such an arrangement. Dubois (1986) later included Hyperoliidae as a subfamily of Arthroleptidae, and Rhacophoridae as a subfamily of Ranidae. One wonders when such juggling will stop.

Although I have severe doubts about the usefulness of the classification presented, it would have been tolerable as one more classification of anurans. Unfortunately, there were more to come (Dubois 1985, 1986, 1987). These revised classifications result largely from new opinions rather than new data. One wonders whether his first effort should be taken seriously; *La Nomenclature Supragénérique des Amphibiens Anoures* appears to be simply a point of departure for a series of somewhat capricious taxonomies. Ironically, Dubois (1986:8) wrote "Une cause particulière d'instabilité de la classification est l'existence à l'heure actuelle de plusieurs théories distinctes de la classification zoologique, dont les trois principales sont les conceptions phénétique, cladiste et synthétiste (ou évolutionniste) de celle-ci. . ."

Systematic theory has progressed beyond the point where taxonomic changes are made simply on the basis of similarity, morphological gaps, or authority. Although my perspective is admittedly phylogenetic, my criticism is not directed at the admission of paraphyletic groups, but at groups for which there is no hypothesis of relationship. Distressingly, Dubois has bestowed a patina of validity on several groups (e.g., subfamilies of Bufonidae) that are nothing more than assemblages. In this sense, Dubois' classification is a curious atavism. He does not seem to be as concerned with communicating evolutionary relationships as with providing an all-subsuming *Systema Ranarum*.

Taxonomies should reflect the extent to which phylogeny is understood; in this respect, the absence of a superfamilial classification in Duellman and Trueb (1986) is real progress. Meanwhile, the herpetological community awaits a higher taxonomy of anurans based on evolutionary relationships rather than authoritarianism.

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Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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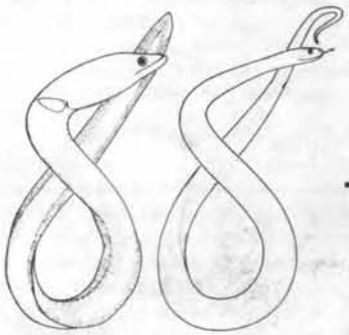
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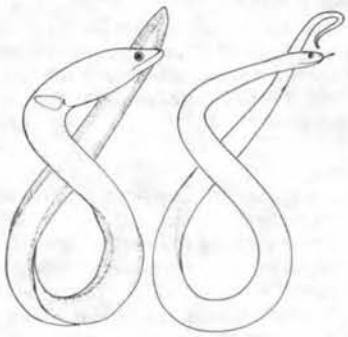
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GENERAL INFORMATION

Meeting Site

All sessions and symposia of the combined meetings of the SSAR, HL, ELHS, AES, and ASIH will be held on the campus of the University of Michigan in meeting rooms of the Rackham School of Graduate Studies, the Michigan League, and the Modern Languages Building. These buildings are adjacent to each other and two blocks from the Museum of Zoology, which will host the workshops and the live exhibit.

Dormitories for participants are 1 block east of the Museum. Hotels, diverse restaurants, bookstores, art museums, and entertainment are all within 1-3 blocks of the meeting site. Food service will also be available in the dormitories and the Michigan League. Two large University parking lots are within a block of the Museum. Airport shuttle service ($11) leaves Detroit Metro Airport for Ann Arbor every half-hour, and will stop at the Michigan League or the dormitory area when requested. Camping facilities are available 16 miles NW of Ann Arbor (see below). Weather will be warm with possible showers.

Board and Business Meetings

SSAR Board Meeting—24 June, 1000 h
HL Board Meeting— 24 June, 1600 h
ASIH Board Meeting—24 June, 1300 h
SSAR Business Meeting—26 June, 1900 h
HL Business Meeting— 27 June, 1900 h
ASIH Business Meeting— 27 June, 1900 h

Call For Papers

Titles and abstracts for papers and posters must be submitted by 1 April on a form to be mailed to each member, or which can be obtained by writing to G.R. Smith, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109, USA. Only one paper may be read by each speaker. Additional papers may be read by co-authors or presented as posters. Late abstracts will be accepted as standby papers or (if the author consents) as posters, but not as regular presented papers. Presented papers are limited to 12 min, with three additional minutes for discussion. Speaker ready rooms will be provided for checking slides and loading Carousel trays.

Posters are encouraged especially for authors (including paper presenters) who wish to present and discuss detailed data, methods, or ideas. Large and attractive poster space (and time) will be provided. Posters will be left up one additional day.

Student Awards

Student poster presenters in the Herpetologists' League and ASIH will be eligible for Best Poster Prizes. ASIH Stoye Awards for best papers will be given in four categories: (1) general ichthyology, (2) general herpetology, (3) genetics-development-morphology, (4) ecology-ethology-environmental physiology. To be eligible a student should be a member of the awarding society and be the sole author and presenter of the paper or poster, and must indicate his or her entry category on the abstract form. (SSAR and HL students are eligible for the HL Best Poster Award.)

Registration

Registration fees are $50 regular and $25 student, with a late fee of $20 after 1 June, so please register early. The registration fee includes the Welcoming Reception on the 24th, the barbeque picnic on the 25th, refreshments at breaks and at the Auction, an abstract book, and admittance to all conference activities. There is an additional charge for the banquet on June 28th.

Registration received by 10 June will be acknowledged by mail. Non-members should write for forms and maps to U-M Extension Service, Conferences and Institutes, 200 Hill Street, Ann Arbor, Michigan 48104-3297. Members will receive forms and maps in a mailed Announcement. The fee is due in advance by check or money order, in U.S. dollars and drawn on a U.S. Bank, payable to the University of Michigan, or you may use your VISA, MasterCard, or American Express charge card for payment.

The registration desks will be open on Friday, 24 June from 0900 to 2200 h in the Lobby of the Stockwell Residence Hall. The desks will reopen at 0700 h in the lobby of the Rackham Building.

Lodging

To arrange for campus residence hall lodging, indicate your wishes when writing for

registration forms. Mosher-Jordan and Stockwell Residence Halls will house participants for the nights of 24-27 June, with breakfasts 25-28 June. Mosher-Jordan rates are: Single $118.56, Double 87.36 per person. Extra nights lodging may be reserved. Mosher-Jordan rooms are air-conditioned and have bunk sized beds. Stockwell Hall has similar rooms, but without air conditioning; rates are Single $101.92, Double $70.72 per person.

To arrange for hotel accommodations, contact the Ann Arbor Conference & Visitors Bureau, 211 East Huron, Suite 6, Ann Arbor, MI 48104. Rooms have been reserved at several hotels for meeting participants.

Recreational Facilities
An outdoor track (free) and indoor athletic building are next to the Residence Halls. Facilities include courts for racquetball, squash, volleyball, and basketball, and a swimming pool, indoor track, weight rooms, saunas and other features. Day or week passes ($3 or $9) are available.

Parking
Limited parking is available at $3.50 per day in University parking structures and lots within a block of the residence halls and the meeting buildings. Parking stickers available at the residence halls.

Camping
There is a State Park Campground (rustic) 16 miles northwest of Ann Arbor, near Silver Lake in the Pinckney Recreation Area. Directions: seven miles north of Ann Arbor on US-23 to North Territorial Road; 11 miles west on North Territorial Road to Dexter Town Hall Road; one mile North on Dexter Town Hall Road to State Park on the left.

Nearby, more civilized (RV) camping facilities with showers and swimming can be rented at Timberland Campground, 12780 North Territorial Road. Phone (313) 475-8679 or watch for signs nine miles west of US-23 on North Territorial Road.

Transportation to Ann Arbor
Ann Arbor is located on US-23 and I-94, approximately 25 miles west of Detroit Metro Airport. There is a regularly scheduled limousine ($11) between Ann Arbor and the Airport. Major car rental services are available at the airport. Ann Arbor is also served by Greyhound Bus and Amtrack.

Cultural Events
For family members, the Ann Arbor Summer Festival is a month-long potpourri of major artistic events, free movies, good food, and entertainment. The festival will be taking place during the meetings on the University of Michigan campus. Though the 1988 schedule is incomplete, the past season included such performers as Dave Brubeck, the Brecht Company, Marcel Marceau, the Harbinger Dance Company, New York's Circle Repertory Company, and many other fine performers.

SYMPOSIA AND SPECIAL SESSIONS

SSAR Regional Societies Workshop: "Exotic Places, Exotic Herps, Vol. II" (organized by Stephen Hammack)

"State of the Art—75th Anniversary of Copeia" (eight speakers, organized by Clark Hubbs)

Sessions on the ecology, evolution, natural history, and physiological ecology of amphibians and reptiles, to be arranged

Nomenclatural treatment of hybrid-derived taxa (organized by Andrew Price)

Distinguished Members from Outside the USA (organized by Clark Hubbs, Including Plenary Speakers, Distinguished Herpetologist Ilya Darevsky, and Distinguished Ichthyologist Colin Patterson)

Amphibian Reproduction and Husbandry (organized by Zoo Liaison Committee, Donal Boyer, Ch.)

Ontogeny and Systematics (organized by J. Richard Dunn)

mtDNA in Ichthyology and Herpetology (organized by Tom Dowling and Irv Kornfield)

Twelfth Annual Larval Fish Conference (organized by Neal Foster; Konrad Dabrowski, Keynote speaker)

The Biology of Chaetodontid fishes (24 speakers, organized by Phil Motta)

Catfishes of the World (organized by Carl Feraris)

Biology of Early Life-history Stages, Great Lakes Fishes (organized by Dave Jude and Nancy Auer)

Functional Development of Sensory Systems and Acquisition of Behavior in Larval Fish (organized by Howard Browman)

Special Elasmobranch Paper Sessions (organized by William Raschi)

SPECIAL ACTIVITIES

SSAR AUCTION. The SSAR Auction, Joseph T. Collins, Auctioneer, will be held on the evening of 25 June. Please bring or mail contributed items for this event to: Greg Schneider, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109. (313) 763-4525.

SLIDE SHOWS by DAVID DENNIS—Including "Herpetology of the West"

LIVE EXHIBIT OF AMPHIBIANS AND REPTILES. To be held in the Museum of Zoology, U. of M. For arrangements, write to James Gillingham, Department of Biology, Central Michigan University, Mt. Pleasant, Michigan 48859. (517) 774-3291.

DOPEIA PAPER SESSION. Send abstracts to Joe Luczkovich, Harbor Branch Oceanographic Institute, 5600 Old Dixie Hwy, Ft. Pierce, FL 33450, before April 1, 1987. (305) 465-2400.

WEDNESDAY JUNE 29, WORKSHOPS AND FIELD TRIPS

1) Computerization of Ichthyological and Herpetological Museum Collections—Organized by Stu Poss
2) Mitochondrial DNA methods in Ichthyology and Herpetology—Organized by Tom Dowling and Wes Brown
3) Detroit Zoo (Steve Conners)
4) Belle Island Aquarium (Doug Sweet)
5) Toledo Zoo (Pete Tolson)
6) E.S. George Reserve (Justin Congdon)
7) Local Seining (R.M. Bailey, R.R. Miller, W.A. Gosline)
8) Local herpetology collecting
9) Detroit River and Western Lake St Clair fish collecting (David Jude)

Collecting Permits
For Michigan collecting permits, write to Fisheries Division, Michigan Department of Natural Resources, PO Box 30028, Lansing, Michigan 48909; Attn. Barb Walker.

Scientific Study of Museum Collections
For arrangements to study specimens deposited in the Division of Amphibians and Reptiles of the Museum of Zoology, contact Greg Schneider, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109 (312) 763-4525.

Arrangements
For further information about registration, lodging, transportation, facilities, exhibits and arrangements, contact the University of Michigan Extension Service, Department of Conferences & Institutes, 200 Hill Street, Ann Arbor, Michigan 48104-3297, USA.

Program
For a copy of the announcement and call for papers (with abstract form) or for information about the paper sessions, symposia, abstracts, live exhibits, workshops, program, or other interests, contact the local chairman:

Gerald Smith
Museum of Zoology
University of Michigan
Ann Arbor, Michigan 48109, USA ●



SSAR BUSINESS

SSAR ELECTION RESULTS

The results of the 1987 SSAR Election are as follows:

President-elect: Henri C. Seibert
Secretary: James S. Jacob
Treasurer: Douglas H. Taylor
Board - Regular: J. Eric Juterbock
Board - Regional Societies: Martin J. Rosenberg

A total of 351 members voted in this election.

The Society extends its gratitude to the Nominating Committee (Kraig Adler, Chair) and to the SSAR Elector (George R. Pisani) for their hard work, and to the outgoing President and Board Members for their service during their terms. ●

SSAR CONTRIBUTORS

SSAR wishes to recognize the following members who have contributed to the financial resources of the Society for the year 1987. These contributions make it possible for the Society to provide benefits to the membership that otherwise would be impossible. Many thanks. H.C. Seibert, Treasurer.

Contributing
Mary L. Anderson
Allen F. Greer
Richard Reifsnyder

Sustaining
Clarence L. Abercrombie
Ralph W. Axtell
Joseph R. Bailey
H. Bernard Bechtel
Thomas L. Belden
John Byrne III
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Martha L. Crump
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Margalee M. Patton
Martin J. Rosenberg
Rodolfo Ruibal
Joseph T. Schall
Robert G. Webb
Ruth Zantzinger
Robert Zappalorti

Grants-in-Herpetology
Paul Andreadis
A. Dale Belcher
Greg Brock
R. Bruce Bury
C.C. Carpenter
Brad Carry
Joseph T. Collins
Robert P. Cook
Joseph F. Copp
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David L. Stephan
Samuel S. Sweet
Joseph A. Tihen
Richard Wassersug
Kenneth L. Williams
Naida Zucker

●

HR GOES HT*

Readers will notice the slightly different format and typeface of some sections in this issue, compared to the remaining sections. This reflects our first effort at desk-top publishing, a process which bypasses the typesetting tasks usually performed by the printer. Over the next few issues we will be experimenting with different styles; eventually the entire issue will be done on desk-top, resulting in savings which will allow publication of more pages in each issue of *HR*. Please bear with us (and the intra-issue style changes) as we experiment with this technique.

**High Tech* ●

SSAR COMMITTEES FOR 1987-1988

Following the Veracruz meeting, President Norman Scott appointed the following committees and coordinators for the current year to report to the Board at the Ann Arbor meeting in June 1988. Individuals with important matters pertaining to the activities of Society committees should contact the relevant committee chair. Addresses for committee chairs are included on the inside rear cover of each issue of *Herpetological Review*.

Conservation: Nat Frazer (Ch.).
Grants-in-Herpetology: Thomas H. Fritts (Ch.), Steven D. Aird, Robert N. Bader, Dale Belcher, Arthur C. Echternacht, Darrel Frost, and Michael V. Plummer.
Kennedy Student Award: J. Eric Juterbock (Ch.).
Long-range Planning: James L. Christiansen (Ch.), Sherman A. Minton, George R. Pisani, and Norman J. Scott, Jr.
Meetings: Henry R. Mushinsky (Ch.), James S. Jacob, Joseph Mitchell.
Nominating: George R. Pisani (Ch.), James L. Christiansen, John Iverson, James S. Jacob, Douglas H. Taylor, and Robert Wilkinson, Jr.
Regional Society Liaison: Stephen H. Hammack (Ch.), Fred Antonio, Mike Bumgardner, and Brint Spencer.
Resolutions: Robert A. Thomas (Ch.).
Zoo Liaison: Donal Boyer (Ch.), Dennis W. Herman, James A. Hitchiner, Brint Spencer, Ruth Zantzinger.
Common and Scientific Names Coordinator: Joseph T. Collins.
Translations Coordinator: Robert D. Aldridge.

NEWSNOTES

NEW USDI PUBLICATIONS

The United States Department of the Interior, Fish and Wildlife Service, has recently produced two publications that may be of interest to herpetologists. These are *Checklist of Vertebrates of the United States, the U.S. Territories, and Canada*, Resource Publication 166 (Richard C. Banks, Roy W. McDiarmid and Alfred L. Gardner, eds.) and *Marking and Tagging of Aquatic Animals: An Indexed Bibliography*, Resource Publication 165 (Lee Emery and Richard Wydoski, eds.). Copies may be obtained by writing to either: Publications Unit, U.S. Fish and Wildlife service, Room 148, Matomic Building, Washington, DC 20240, USA *or* National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161, USA.

Individuals who wish to receive product announcements of the Service's scientific publications should send their request to: Publications Coordinator, Office of Information Transfer, U.S. Fish and Wildlife Service, 1025 Pennock Place, Suite 212, Fort Collins, Colorado 80524, USA. ●

W. FRANK BLAIR AWARD

The Chihuahuan Desert Research Institute (CDRI) announces the 1988 W. Frank Blair Award competition for excellence in written data presentation. The Institute will make the $350.00 cash award to a student for the best paper, published or unpublished, pertaining to the natural sciences (including archaeology and anthropology) in the Chihuahuan Desert Region. Undergraduate and graduate students are eligible. All papers must be 7,500 words or less and must be based on original research performed by the author or authors. Entries are to be made prior to October 1, 1988. For the rules of entry write: CDRI, Blair Award Competition, Box 1334, Alpine, Texas 79831, USA. ●

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NIXON GRIFFIS FUND FOR ZOOLOGICAL RESEARCH AWARDS EIGHT GRANTS

The Nixon Griffis Fund for Zoological Research, established in 1984 by New York Zoological Society Trustee Nixon Griffis, awarded eight research grants in October 1987. Three of these grants were given in the area of herpetology. The recipients were: James C. Gillingham, Central Michigan University, "An Ethological Analysis of the Mating System of Tuatara, *Sphenodon punctatus*"; John A. Phillips and Nancy Czekala, San Diego Zoo, "Inducing Ovulation in Monitor Lizards via GnRH Therapy"; and Kent A. Vliet and Louis J. Guillette, University of Florida, "The Effect of Stocking Density on Plsama Steroid Hormone and Gonadotropin Levels in Captive-reared Alligators."

Nixon Griffis Fund for Zoological Research grants are available to members of the zoo and aquarium community. Fund recipients may be keepers, curators, veterinarians, or research and consulting biologists. Grants, not to exceed $3000, are awarded semiannually. Closing periods are 1 January and 1 July. For information about the Fund and grant application procedures, contact John Behler, Coordinator, Nixon Griffis Fund for Zoological Research, c/o New York Zoological Society, Bronx Zoo, Bronx, New York 10460, USA. ●

WORKSHOP PROPOSALS SOLICITED

The Time, Place and Program Committee (TPPC) of the American Society of Ichthyologists and Herpetologists (ASIH) has been charged with soliciting workshop proposals. Proposals for the 1989 meetings are invited at this time.

Workshops, as defined here, are distinct from symposia in that they involve hands-on experience. A workshop should provide a more thorough and complete treatment of a method or topic than one would expect from a platform presentation. Participants in an ASIH workshop should be able to leave the workshop with the ability to carry out procedures learned there or to teach what they learned to others. Workshops may involve field and laboratory exercises in ichthyology and herpetology. They could be of a systematic nature and constitute a review— with specimens available for examination—of a major taxonomic group. The TPPC is open to proposals in all areas of ichthyology and herpetology.

Each workshop should include a handout or syllabus. A typical workshop might run from 2-3 hours and have 20-24 participants, although the TPPC will consider applications for longer and larger workshops.

ASIH Board of Governors has approved cash advances of up to $300 to cover expenses (e.g. syllabus preparation, shipping workshop materials to the meeting site, etc.) in setting up each workshop approved by the TPPC. It is hoped that these funds can be recovered, in full or in part, from registration fees for each workshop.

Those interested in organizing workshops for the 1989 (*and future*) meetings should submit their proposals to: Workshop Program, ASIH-TPPC, c/o Richard Wassersug, Department of Anatomy, Dalhousie University, Halifax, Nova Scotia, B3H 4H7, CANADA.

Workshop proposals should be no longer than three typed pages and must include brief statements on the qualifications of the organizer(s), the size and length of the workshop, and the budget, if any set-up funds are requested. Proposals will be considered on a first come first serve basis. Students as well as senior members of the community are invited to submit proposals.

In order to assure a time slot in the program and funding, prospective workshop organizers should have their proposals submitted at least three weeks before the annual meeting of the year preceding the proposed workshops. All those interested in organizing workshops for 1989 should get their proposals to the Workshop Program, ASIH-TPPC, as soon as possible, preferably before 1 June 1988. ●

SOCIETIES

VHS REPRINTS TOBEY BOOK

The Virginia Herpetological Society is pleased to announce a second printing of F.A. Tobey's *Virginia's Amphibians and Reptiles*, first published in 1985. The reprinted version is identical in content to the original; a new method of binding should make the maps easier to use, however. Copies of the book may be purchased for $6.00 each, postage paid. Make checks payable to "Virginia Herpetological Society" and send to: Charles M. Neal, Department of Biology, Radford University, Radford, Virginia 24142, USA. ●

HERPETOLOGICAL SECTION OF POLISH ZOOLOGICAL SOCIETY

The Herpetological Section (Sekcja Herpetologiczna) of the Polish Zoological Society (Polskie Towarzystwo Zoologiczne) was founded twenty years ago. After a rather long inactive period, the Herpetological Section has resumed its activities. A new board elected in April, 1987, includes the following persons: M. Mlynarski (President), L. Berger (Vice-president), Z. Szyndlar (Secretary), R. Bielawski, H. Dobrowolska, J. Rafinski, and W. Zamachowski (Members). The address of the Herpetological Section is given below.

The current tasks of the Herpetological Section are: mapping of the distribution of Polish herps (as a part of the program of the Societas Europaea Herpetologica), collecting Polish herpetological literature, protection of Polish herpetofauna, and others.

The official publication of the Herpetological Section is the column "Herpetologia" in "Przeglad Zoologiczny" (Zoological Review), a quarterly of the Polish Zoological Society. Recently we have started to edit (simply as photocopies) "Biuletyn Sekcji Herpetologicznej" (Bulletin of the Herpetological Section), including current information about the activities of the Section.

The Herpetological Section is very interested in any form of contacts with other herpetological societies in other countries.

Z. SZYNDLAR, Secretary
Polish Academy of Sciences
Institute of Systematic and
Experimental Zoology
Slawkowska 17, 31-016 Krakow, Poland ●



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GREATER CINCINNATI HERPETOLOGICAL SOCIETY

The Greater Cincinnati Herpetological Society, founded in 1977, provides a vehicle for information and resources exchange between its members. Through education, responsible research, and example the society zealously promotes the welfare of reptiles and amphibians.

The GCHS provides information to its members regarding herpetologically-related legislation and threatened and/or endangered species. Society members are available to community groups or educational facilities for lectures. Members are active in "white bag runs" on a year round basis, rescuing reptiles from the homes and yards of frightened or concerned citizens. These animals are released into more appropriate locations. The society sponsors periodic trips to observe the animals in the field and also behind the scenes at various zoos.

The highlight of the year is the annual GCHS sponsored "Herp Show" at the Cincinnati Museum of Natural History. Live animal displays, demonstrations and lectures draw large crowds to the museum for this exciting event.

The GCHS newsletter, published monthly and distributed to 160 members, has grown from a one page "flyer" to a professional 10-12 page bulletin which includes an illustrated cover, pertinent articles, news items, a question and answer column and classified ads. Articles and papers submitted for publication are welcome.

Membership is open to anyone with an interest in herpetology. Dues for 1988 are:

Family	$15.00
Individual	10.00
Student	8.00
Corresponding	8.00

For futher information please write to:

The Greater Cincinnati Herpetological Society
c/o The Cincinnati Museum of Natural History
1720 Gilbert Avenue
Cincinnati, Ohio 45202 ●

IN MEMORIAM

JOSEPH LASZLO

"One man's *Crotalus willardi* is another man's *Lampropeltis alterna*. No man can be truly rich or free until he reproduces both in captivity!"

Joseph Laszlo
1986

It is not every herpetologist who has endured or enjoyed as varied a background as Joseph Laszlo; Superintendent of the Reptile Department at the San Antonio, Texas Zoo, he died on 14 November 1987 as a result of an aneurysm. He was born in Budapest, Hungary on 13 September 1935. His interest in natural history began to develop as a youngster and at age six, he found a water snake while collecting fish for his aquarium. This experience led to a lifetime interest in herpetology.

Times were difficult for the Laszlo family during World War II and he often told stories of great hardships. Food was rarely available and on one occasion, he was forced to eat the carcass of a dead horse. Joe developed a strong distaste for conquerers and invaders of any kind.

Joe attended Petofi Sandoa Public High School and St. Antal College in Budapest between 1945 and 1953 where he completed academic courses in literature, natural and physical sciences, mathematics, languages and art.

When he was twenty, he was drafted into the Hungarian Red Army but was forced to escape later when he turned over the keys to an ammunition depot that he was guarding to the Hungarian rebels when the Russians invaded Budapest. Several escape attempts went awry before he was able to make it to Austria. In the first attempt, he was captured by Russian soldiers at a checkpoint as he journeyed toward the Austrian border. He carried a detailed military map to assist in the escape but its discovery would have led to instant death; he swallowed it as he sat between two machine gun-laden Russian soldiers. The Russians turned Laszlo over to the Hungarian Army after a three day detention. The second escape attempt was no more successful. A sympathetic Hungarian soldier allowed him to hide under a pile of hay but Joe had hay fever. The journey was arduous as he tried to control his sneezing. Unfortunately, as he slipped off the hay truck to continue his escape, he discovered in horror that the driver had disembarked at the same Russian control post where he had been detained earlier. Finally, after a few more false starts, he arrived at the Austrian border aboard a train where he walked across the Andau Bridge to freedom. He stayed in a Red Cross camp in Vienna until he was able to arrange passage to the United States.

Immediately upon arrival, Joe began a pilgrimage through the US to locate herpetologists by searching for their addresses in the herpetological literature. Since he was not conversant in English, he communicated with gestures, drawings and by using scientific names, and was able to get his points across to his colleagues. He was awarded a scholarship, through the efforts of Wilfred Neill, to the University of Florida in 1957 but unfortunately lost it due to the language barrier.

In 1963, he became a US citizen and worked for the Humane Society of Greater Miami, Florida. His first job at a zoo was in 1963-1964 at the Crandon Park Zoo in Miami, Florida.

I initially met Joe in the Fall of 1965 while employed as a reptile keeper at the Atlanta Zoo. His boundless enthusiasm and absolute dedication to herpetology were awe-inspiring. Joe was a raconteur par excellence and often he would regale any assembled throng of herpetologists with anecdotes of his early days in Europe, his theories on captive reptile management and, finally describe his Weltanschauung in elaborate detail. Many pleasant hours were spent listening to him as he



Joseph Laszlo holds two newly hatched water monitors at the San Antonio Zoo during February 1981. Photograph by John Tashjian.

punctuated his stories with wonderful facial expressions and charming imagery.

Joe was hired as a keeper at the Columbus Zoo by the late Louis Pistoia but alas, the association was tumultuous. Pistoia directed him to clean the king cobra enclosure but no shift box was in evidence. Understandably Joe was reluctant to enter the cobra's domain and he expressed his reservations vociferously. To demonstrate, Lou proceeded to enter the cage, stimulated the snake to rear its magnificent body and then tied a handkerchief around its eyes so that it could not see. In response to this, Joe quickly sought employment elsewhere.

Joe and I arrived in Texas in tandem in 1966, Joe to the Ft. Worth Zoo as assistant supervisor at the Herpetarium and I to the Dallas Zoo. Joe's ideas on proper captive reptile care were beginning to solidify and he investigated thermoregulation, medical treatment, feeding techniques and so on in meticulous detail. In fact, as a measure of his commitment, his house had virtually no furniture but rather was filled with an impressive array of terraria, herpetological literature and diagrams of heating elements, enclosures, cooling devices, myriad paraphernalia and lists of medications for reptiles.

In an effort to expand his horizons, Joe secured a position at the Houston Zoo in 1966. He admired John Werler, herpetologist and Director of the Zoo, who had a Mexican natricine snake *(Nerodia rhombifera werleri)* named in his honor. During one of my visits to the Zoo, Joe, in a state of abject despair, lamented how he had accidentally fed some of John's namesakes to the king cobra. . .in fact, the snakes which were fed were some donated *Nerodia r. rhombifera* from Texas, and his coworkers, with John's complicity, had foisted an elaborate practical joke upon Joe by insisting that the snakes were *werleri*. Days passed before the practical joke was exposed as Joe ruminated about his future in the zoo profession.

In response to Joe's interest in cooling and hibernating reptiles to elicit reproduction, the staff at the Houston Zoo began experimenting with techniques and soon the service area was filled with reptile enclosures, festooned with dials and gadgets, of every size and description. One evening in Houston, as a group of us were sitting around talking about reptilian husbandry as related to cooling our charges, an atrocious foreign movie about an attack of dinosaurs on a heavily populated Japanese city flashed on the television. We began speculating how these creatures, if they now existed, should be maintained in zoological gardens. Joe, after deliberate thought, rolled his eyes skyward and said "You've got to keep them cool, mon" with absolute certitude. With that statement, he deftly solved the controversy surrounding dinosaur thermoregulation.

Joe's final position was Superintendent of Reptiles at the San Antonio Zoo in 1970 where his creative energy flourished. He embarked on a series of projects related to lighting, heating, cooling, and exhibitry of reptiles and amphibians. A visit to view his charges was always exciting. Joe, with stupefying energy, opened virtually every enclosure, gave a detailed history of the inhabitant, recaptured those few creatures which had exited their cages as he was speaking, and presented detailed taxonomic information and literature citations for each.

Joe's particular passion was directed toward reproduction in the Old World vipers *(Vipera);* he often said that he wanted to reproduce vipers in such numbers that. . ."The snakes would cover the world like Sherwin Williams paint, mon."

It is likely that there have been herpetologists who have had more impressive credentials or higher visibility in the herpetological community. But it is unlikely that any will be as sorely missed as Joe. Ever the devoted father, he was generous, kind, helpful, creative and maintained a remarkable enthusiasm for herpetology, mostly self-taught, for over forty years. We will all miss his unique and colorful view of life. No doubt, Joe has already convinced St. Peter to remodel the Heavenly Gates into an entrance for his new reptile building.

JAMES B. MURPHY, Curator
Department of Reptiles and Amphibians
Dallas Zoo
621 East Clarendon Drive
Dallas, Texas 75203-2996, USA

MEETINGS

ALL FLORIDA HERP CONFERENCE

The eleventh annual All Florida Herpetological Conference will be held April 23 at the University of Florida. The conference is cosponsored by the Florida State Museum and the Gainesville Herpetological Society. Program themes will be "Conservation of Herps and Habitats," "Outdoor Enclosures for Exhibiting and Breeding Amphibians and Reptiles," and "Public Education and Herpetology." Workshops in "Still Photography of Amphibians and Reptiles" and "An Introduction to Herpetology for Children" will also be offered. Registration and program information is available from Rhoda Bryant, Florida State Museum, Museum Road, Gainesville, Florida 32611, USA. (904) 392-1721. ●

SIXTH SYMPOSIUM ON AFRICAN AMPHIBIANS (organized by the African Amphibian Working Group)

The Sixth Symposium was held 13-17 April 1987 under the sponsorship of the University of Miami, at the Archbold Biological Station near Lake Placid, Florida. A summary of the program appears below.

Tuesday, 14 April
Morning Session
Introduction to the Archbold Biological Station - James L. Wolfe, Executive-Director, Archbold Biological Station
Review of Project on Locally Endemic African Amphibians - David Stubbs, Ecological Consultant to IUCN Conservation Monitoring Centre, Cambridge, Great Britain
Tour of facilities and 4,300 acre Biological Station - Fred S. Lohrer, Scientific Assistant, Archbold Biological Station.

Afternoon Session - Alan Channing, chairperson
Evolutionary Morphology and Relationships of the Pipid Genera *Hymenochirus* and *Pseudhymenochirus* - David Cannatella, University of California, Berkeley, USA
Discussion of Pipid Relationships and the Resurfacing of *Silurana* (the catfish frog) - Linda Trueb, University of Kansas, USA
The Genus *Hyperolius* or the *Hyperolius viridiflavus* Group Revisited - Alan Channing, University of the Western Cape, Vellville, R. South Africa
Comparative Lingual Morphology and the Relationships of African Ranids - Jean-Luc Perret, Museum historie naturelle, Geneve, Suisse
A Review of Ranoid Relationships - Raymond F. Laurent, Fundacion Miguel Lillo, Universidad de Tucuman, Argentina

Evening
Field trip to collect local amphibians - David M. Hillis, guide

Wednesday, 15 April
Morning Session - Rose Bloomers-Schlosser, Chairperson
Some Ecological Interactions of new *Xenopus* Species Endemic in Montane Regions - Richard C. Tinsley, Queens Mary College, University of London, Great Britain
Aftican Bufonids and Their Habitats - Mills Tandy, Austin Community College, Texas, USA
Reproductive Modes in Malagasy Anura - Rose Bloomer-Schlosser, Institute For Taxonomic Zoology, University of Amsterdam, Netherlands
Status of the African Amphibian Bibliography - D.E. van Dijk, University of Natal, South Africa (presented by Alan Channing)
Discussion: Ecomorphological Guilds of Anuran Tadpoles - Ronald Altig*, Mississippi State University, USA and Gail F. Johnston, Southern Illinois University, USA

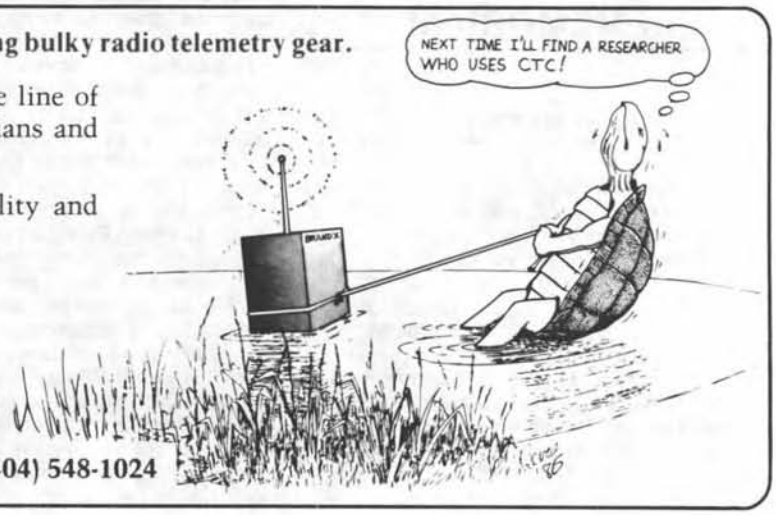
Afternoon Session - Rose Bloomers-Schlosser, chairperson
Fertility conditions in F_2 hybrids between *Xenopus l. laevis* and *X. gilli* - Hans Rudolf Kobel, University of Geneve, Suisse
The Inheritance of Color Pattern and Sex in *Hyperolius v. viridiflavus* - Christina M. Richards, Wayne State University, Michigan, USA
The Structure of the Carpus in Some Primitive Ranoid Frogs - Raymond F. Laurent* and Marisa Fabrezi, Fundacion Miguel Lillo, Tucuman, Argentina

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Rainforest Conservation in Costa Rica: a model - Mills Tandy, Austin Community College, Texas, USA

Evening
Field trip to collect local amphibians - David M. Hillis, guide.
Post-field trip evening Social: Darrel Frost, guide

Thursday, 16 April
Morning Session - Richard C. Tinsley, chairperson
Biosystematics of Selected Genera of African Amphibians - James P. Bogart*, University of Guelph, Canada and Mills Tandy, Austin Community College, Texas, USA
Crosses Among Various Groups of *Hyperolius* - Christina M. Richards, Wayne State University, Michigan, USA
Establishment of African Parasites in the USA with Feral *Xenopus* populations - Richard C. Tinsley, Queen Mary College, University of London, Great Britain
Polymorphism versus Polyploidy, the Example of *Xenopus l. laevis* - J. Wolff and Hans Rudolph Kobel*, University of Geneva, Suisse
Discussion: Endemic African Amphibians and Conservation Areas - David Stubbs, IUCN Conservation Monitoring Centre, Cambridge, Great Britain

Friday, 17 April
Field trip to Everglades - David M. Hillis

* = Speaker

The African Amphibian Working Group will hold an open meeting at the time of the first World Congress of Herpetology (WCH) at Canterbury (U.K.), 11-19 September 1989. The purpose of the meeting will be to update the working group membership and select a site and date (in 1991 or 1992) for the 7th Symposium on African Amphibians. All individuals interested in African amphibians are invited to attend. Professor Alan Channing, Biochemistry Department, University of the Western Cape, Private Bag X17, Belleville, 7530, Republic of South Africa, will coordinate the WCH session and may be contacted regarding that meeting and/or the 7th Symposium.

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FEATURES

SEXUAL BEHAVIOR OF THE CASPIAN TERRAPIN, *Mauremys caspica rivulata*

The Caspian terrapin *Mauremys caspica* occurs in the Near East from the Caspian Sea and the Persian Gulf in the east to the Balkan in the west. The subspecies *M.c. rivulata* is known from the Mediterranean region and *M.c. caspica* is known in the eastern parts of the species range (Busack and Ernst 1980). In Israel, where *M.c. rivulata* reaches its southern limit of distribution, it occurs in a wide range of fresh and brackish water habitats, of standing or slow flowing water, including highly polluted waters (Gasith and Sidis 1983, 1984). The period of sexual activity (courtship and copulation) of *M.c. rivulata* in Israel extends from September until May, peaking in mid winter. Sexual activity may take place at temperatures as low as 8°C (Gasith and Sidis 1985). Males of *M.c. rivulata* are slightly smaller (80-220 mm CL) than the females (140-240 mm CL) and are usually more intensely colored.

Scant information is available on the sexual behavior of *M. caspica* or its closely related species *M. leprosa* (formerly *M. c. leprosa*, Busack and Ernst 1980). According to Lortet (1887) *M. leprosa* mates on land or in water. When in water, it is usually on the surface though sometimes a mated pair may be seen descending to the bottom where they remain immobile for several hours. Gadow (1920) reported that in mating, the male of *M. leprosa* tries to fasten onto its mate by biting into the collar-like fold of the neck, into which her head is withdrawn. This repeated irritation may inflict serious injury to the female. Glass and Meusel (1964) reported that *M. caspica* mates in water and that copulation is preceded by courtship. In reviewing the evolution of stereotyped behavior in reptiles, Carpenter and Ferguson (1977) summarize the behavioral patterns and act systems observed in turtles relating primarily to intraspecific aggression, courtship and mating. For *M. caspica* these are (based on Gadow 1920; Loveridge and Williams 1957; Eglis 1962): sinking to the bottom, withdrawing head into shell, pulsation of gular region, biting. Berry and Shine (1980) classified *M. caspica* among the truly aquatic species in which males are usually smaller than females, and male combat and forcible insemination are rare. Instead, males utilize elaborate precoital display and female choice is highly important.

During 1979-1982, we observed the sexual behavior of this species in its habitat in Israel and in captivity (53 and 58 observations respectively). The study sites in Israel are described elsewhere (Sidis and Gasith 1985; Gasith and Sidis 1985). The following is a composite description of the courtship display and mounting behavior of *M. c. rivulata*.

Courtship and mounting usually take place in shallow water (< 30 cm depth). On two occasions courtship was initiated in water but continued on land near the water's edge. In courtship, a male or a group of up to six males pursue an adult female. In the latter case the largest male usually leads the chase. In most cases the males are either equal to or smaller than the courted female. The smallest courting male recorded in this study was about 80 mm in carapace length (CL) (1-2 years) and the smallest courted female was about 150 mm in CL (4-6 years, age determination based on growth rings). The male crawls on the bottom or swims behind the female, his neck fully extended and head behind the female's hindquarters, his snout almost touching her vent. During this interaction the male intermittently pulsates his gular region (several pulses per second) and may occasionally

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bite her hindleg or carapacial margin. Then the male circles or partially circles the female, occasionally biting her legs and the edge of her carapace. The longest duration of this portion of the courtship display recorded in this study was about 15 min and the maximum distance covered was about 30 m.

When the female stops moving the male moves in front of her, faces her from a distance of about 30 cm and then approaches her while swaying his head and intermittently pulsating the gular region. Eventually he reaches with his head to one or the other side of the female's head and retreats backward. This behavior is usually repeated several times, lasting overall about two min. Following this face to face interaction the male moves behind the female and mounts.

During the period of peak sexual activity (December-January) mounting sometimes occurs without courtship display. This was observed when males and females were temporarily placed in a small container in which the turtles' movements were limited. This observation is consistent with the view that courtship serves to immobilize the female and facilitates mounting attempts by the male (Eglis 1962; Jackson and Davis 1972).

Two extreme postures could be distinguished in the mounting phase. (a) Horizontal (riding) position in which the male is astride the female's carapace, gripping the edges with all four legs. In this position the male is able to maintain his hold if the female resumes swimming. The male's neck is fully extended and the head is lowered over the female's head, occasionally biting her neck. The male sways his head with intermittent pulsation of his gular region. Unlike Gadow's (1920) report of severe biting by male *M. leprosa*, we recorded only gentle bites in *M. c. rivulata*. The female usually responds by partially or completely withdrawing her head into the shell. At any time during this phase the male may lower his tail towards the female's vent. (b) An oblique mounting position which differs from the horizontal posture in that the male holds onto the female's carapace with forelegs only, supporting his body in an oblique position to that of the female's body. Varying degrees of horizontal to oblique postures were recorded and it is possible that the above positions reflect different phases of the mounting behavior. However, we have no evidence for position changing by the mounting male, as for example the backward sliding reported in *Emydoidea blandingi* (Baker and Gillingham 1983). Mahmoud (1967) observed variations in the mounting postures within species of kinosternid turtles which he could relate to size difference between the mates. We have found no evidence for such correlation in *M. c. rivulata*.

In nature we followed mounted pairs for up to 30 min. On three different occasions, in captivity, we observed pairs that remained mounted from early morning until after dark and these same pairs were still mounted also on the following morning. Homosexual interaction was observed once in captivity: A male mounted another male, performing the normal head swaying and neck biting. In nature, *M. c. rivulata* proved to be extremely alert to approaching humans, quickly submerging into the water and fleeing. However, courting and especially mounted individuals were quite oblivious to such interruptions and were easily taken by hand.

Various elements of sexual behavior of turtles (reviewed in Carpenter and Ferguson 1977) are found also in *M. c. rivulata*. These include trailing and pursuit of female, moving around the female, face to face interaction, biting, head swaying, pulsation of gular region, holding onto female with hind and forelegs or forelegs only. Unlike some other turtles *(Chrysemys, Pseudemys, Graptemys)* the face to face interaction of *M. c. rivulata* involves no titillation but is composed of a series of approaches and retreats of the male accompanied with head swaying and pulsation of the gular region.

ACKNOWLEDGMENTS

We wish to thank H. Mendelssohn, W.L. Werner, A.S. Perry and J. Hoofien for their valuable remarks on the early version of this manuscript.

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YOUNG OF THE YEAR RED-SIDED GARTER SNAKES *(Thamnophis sirtalis parietalis)* AT COMMUNAL DENS IN MANITOBA'S INTERLAKE REGION

Fall aggregations of red-sided garter snakes *(Thamnophis sirtalis parietalis)* at hibernacula in Manitoba's Interlake region are usually composed entirely of adults (Aleksiuk and Gregory 1974; Gregory 1974; Gregory and Stewart 1975). There are no records of young of the year occurring at den sites in fall. However, while conducting a mark and recapture program near Broad Valley, Manitoba (approximately 100 km north of Winnipeg), two young of the year snakes were captured on 21 September 1985.

Previous literature has suggested that it would be advantageous for young snakes to remain afield in fall rather than undertake long migrations to the dens. In this way, they may continue to feed until immediately before hibernation and thus attain an earlier sexual maturity (Gregory and Stewart 1975). During winter, young snakes would be obliged to find alternative denning areas, such as animal burrows or post holes. However, pregnant females may not give birth in summer feeding habitat (usually marshland some distance from the den site) but may bear their young during migration back to dens. If this occurs, young might travel to dens with adults to assure themselves a suitable hibernaculum, as they have lost the opportunity to remain in the summer feeding habitat. Such a scenario may occur if embryo development is delayed by a cool summer, such as that of 1985 in the Interlake region of Manitoba. The relatively large number of gravid females found at dens in fall 1985 further supports this interpretation, as few gravid females are normally encountered during fall migration (Aleksiuk and Stewart 1971). It is hypothesized, therefore, that young of the year normally spend their first winter afield on summer range. They may be found at communal dens in fall if the preceding summer had been cool enough to prolong the gestation period of part of the female component of the population.

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CANADA

REDISCOVERY OF THE HOLOTYPE OF *Ophisaurus ventralis sulcatus* (COPE)

Opheosaurus [sic] *ventralis attenuatus* var. *sulcatus* (Cope 1880. Bull. U.S. Natl. Mus. (17):1-51) [*Ophisaurus v. sulcatus* (Cope 1900. Ann. Rep. U.S. Natl. Mus. for 1898: 153-1249)] was described on the basis of one specimen from Dallas, Texas. *O. v. sulcatus* has been placed correctly in the synonomy of *O. a. attenuatus* (McConkey 1954. Am. Midl. Nat. 51: 133-171), the only glass lizard known to occur in Texas, but the holotype apparently has not been examined since the original description (Holman 1971. Cat. Amer. Amphib. Rept.: 111.1-111.3).

The type, collected by J. Boll, and originally in Cope's personal collection, has been found in the Philadelphia Academy of Natural Sciences (Malnate 1971. Proc. Acad. Nat. Sci. Philadelphia 123: 345-375) and examined by me. It is a juvenile (ANSP 12755), about 87 mm SVL, with a single frontonasal, 105 scales along the lateral fold, and color patterns typical of those in young *O. attenuatus*. The eighth supralabial on the left side is separated from the orbit by two small scales, although one of several early drawings (Cope 1900, fig. 89) shows this labial contacting the orbit. The remaining suborbital supralabials are separated by prominent lorilabials, and other scale configurations in the specimen agree with those depicted in the Cope drawings. All characters in ANSP 12755 are well within the range of variation reported by McConkey (1954) in *O. a. attenuatus*.

I thank E. V. Malnate for allowing me to borrow this specimen and for confirming the presence of certain characters after it had been returned.

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A PLEA FOR STANDARDIZATION OF BODY SIZE MEASUREMENTS IN STUDIES OF SNAKE ECOLOGY

Body size[1] has been found to exert an important influence on the ecological characteristics of snakes, especially in the areas of life-history evolution (Dunham and Miles 1985) and foraging ecology (Mushinsky et al. 1982). Data that can be used to correlate ecological traits with body size are crucial to a complete understanding of the evolutionary ecology of ophidians. However, while conducting several recent reviews of the literature on snake reproductive biology, we noted a lack of standardization among herpetologists concerning which body size measurements are recorded and reported, and suggest that this lack of standardization hampers efforts to advance our knowledge of snake biology. The purpose of the paper is to demonstrate the lack of consistency in body size measurements, and to establish some basic criteria for reporting measurements. Although our comments are addressed primarily to researchers working with snakes, it is likely that investigators working with other taxa face similar problems.

The three most commonly-reported measures of body size are snout-vent length (SVL, the distance from the tip of the snout to the posterior edge of the vent), total length (TL, the distance from the tip of the snout to the posterior tip of the tail), and body mass (BM, total mass in g). Convincing biological arguments can be made for recording all three measures. The two length components show significant correlations with reproductive traits such as clutch size, clutch frequency, and offspring size (Shine 1977; Ford and Killebrew 1983; Seigel and Ford 1987) and SVL exerts a strong influence on other life-history characteristics (Dunham and Miles 1985). Body mass is also important in life-history correlations (Hedges 1985), in calculating relative clutch mass (Seigel and Fitch 1984), and in calculating metabolic rates (Bennett 1982). Of the two measures of length, we suggest that SVL is more important, primarily because it obviates the problems of tail breakage (Fitch 1987). In addition, because the length of the tail is often sexually dimorphic (Fitch 1981), it should be reported either as a discrete entity or by subtraction of SVL from TL, permitting calculation of relative tail length (tail length/SVL). Fitch (1987) and Vitt (1987) provide further details on these and other morphological measurements that are relevant to snake ecology.

Although it seems apparent that complete reporting of body size measurements (SVL,TL, and BM) is important to ecological studies on snakes, complete records in the literature are the exception rather than the rule. While examining the literature on relative clutch mass (RCM) in snakes, we found that less than 50% of the studies reviewed reported data on the mass of both the female and the offspring (Seigel and Fitch 1984). Later reviews of the relationship between RCM and body size (Seigel et al. 1986) reinforced the view that complete data on body size were reported rarely. In order to determine quantitatively the extent of this problem, we examined back issues of *Herpetological Review* from 1984-1986 for studies on snake foraging and reproductive ecology, then scored each study as to the measurements reported (e.g., SVL alone, TL alone, complete data, etc.). Where data for parents and offspring were reported differently, we scored the paper as two studies. Of the 36 studies examined, complete data (SVL, TL, and BM) were reported in only eight (22.2%). Data on SVL alone were reported in 19.4% of the studies, and TL alone in 13.9%. Information on mass (alone or in combination with either SVL, TL, or both) was reported in less than half of the studies (47.2%). In 13.9% of the studies, the measure length was either not specified as to SVL or TL, or no body size measure was reported. (A complete breakdown of all categories is available from the senior author.) Although we recognize that we examined only a limited number of papers from one journal, this matches our subjective impressions from a wider literature review covering 30 years and more than a dozen journals.

We suggest that this lack of uniformity in body size measurements seriously hinders the advancement of our knowledge of snake ecology. Many of the life-history and ecological reviews cited previously were dependent primarily on empirical data drawn from the literature. It is extremely frustrating to search for a reference on a poorly-known species, finally find it, then be unable to utilize otherwise high-quality data because the author failed to include the necessary measurements. Far too little is known about the ecology of snakes to have to disregard 50% or more of the literature.

We strongly encourage investigators to include the three basic measures of size, or at least, SVL and BM. Recording both SVL and TL takes only a few more seconds per specimen than recording just one measure, but may significantly enhance the usefulness of the data.

Although recording BM may have been difficult in the past, the advent of inexpensive, portable, and accurate spring scales means that BM can be recorded in the field in just a few moments.

Editors and reviewers too must accept some responsibility for this lack of uniformity. Although reporting all three measures takes only a little more space than reporting just one, it is likely that editors and reviewers have not sufficiently encouraged authors to include these measures in their papers. In some cases, editors have apparently discouraged the practice. One researcher we spoke with said that he would have included BM more frequently in his papers, but had been told by editors that "no one cares about weight." We suggest that editors and reviewers have an obligation to encourage authors to report complete data on body size, even to the point of rejecting papers that fail to include the necessary information.

It is not our intention to criticize the research of any individual. Clearly, studies are conducted for a variety of reasons, and the measurements suggested here may not be of immediate interest to the investigator. Nonetheless, reporting standardized body measurements may greatly increase the potential value of the research. In a similar manner, it is not our goal to denigrate the quality of the papers published by *Herpetological Review*. Indeed, we deliberately selected *Herpetological Review*, both for our database and as a publication outlet, because it publishes papers from a wider variety of sources then is true for other herpetological journals, with contributors ranging from professional herpetologists to amateur naturalists. It is to this diverse audience that we address our "take-home message" to record and report SVL, TL, and BM of snakes whenever possible. Although the data may not seem important at the time, some future herpetologist may be grateful for your extra effort.

[1]S. Moody (per. comm.) has correctly pointed out that the term "body size" formally refers only to that part of the body exclusive of the head and tail, so our use of "body size" should be considered in the broader sense of the term.

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A NOTE ON THE DISTRIBUTION OF *Eleutherodactylus eileenae*

Eleutherodactylus eileenae Dunn is one of six species comprising the *auriculatus* group of Cuba. Schwartz and Thomas (1975) reported the species' distribution as from Pinar del Río to Camaguey Province, but noted a questionable record isolated from Oriente Province, eastern Cuba.

My purpose is to clarify the identity of this specimen, and the distribution of *E. eileenae*. The specimen is an immature female (SVL 22.2 mm) collected by Philip Darlington in Cueva de la Ma, Pico Turquino, and deposited in the University of Michigan (UMMZ 80910). Although a member of the *auriculatus* group, it is not *E. eileenae*, from which it can be distinguished by: dorsum uniform, with flanks somewhat darker in the anterior third (a double scapular chevron characterizes *eileenae*); a faded papilionaceous interorbital figure (not present in *eileenae*); supratympanic stripe faintly expressed, (*eileenae* shows a well-defined stripe); supralabials lacking the alternate pattern of dark and light spots of *eileenae*. *Eleutherodactylus eileenae* has a moderately dark throat, whereas in this specimen the throat is lighter. The head appears to be wider than in individuals of *eileenae* of the same size.

These characteristics, as well as other body measurements, suggest that the specimen is *Eleutherodactylus varians ionthus* Schwartz, a form distributed in Oriente Province. Hence the distribution of *E. eileenae* is the rest of the island.

I thank Dr. Richard G. Zweifel, American Museum of Natural History, who kindly borrowed the specimen for me, and provided the material for comparison.

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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Knoxville Zoological Park, Box 6040, Knoxville, Tennessee 37914, U.S.A.

REPRODUCTION AND GROWTH OF THE CHELID TURTLE *PHRYNOPS (MESOCLEMMYS) GIBBUS* AT THE COLUMBUS ZOO

Aspects of reproduction in *Phrynops gibbus* have been reported by several authors and summarized by Pritchad and Trebbau (1984). Available information on egg laying consists of five clutches reported by Niceforo (1952), Medem (1973) and Dixon and Soini (1977). Information regarding growth, beyond the nine month growth data presented by Medem (1973), and maturation is not presently available.

Specimens housed at the Columbus Zoo have produced 14 clutches of eggs from 1978 through 1985. In addition to clutches laid by wild collected but long term captive animals, these include clutches laid by specimens hatched in the collection and reared to maturity. One additional clutch, laid by a recently collected female, is also reported.

The original breeding pair consisted of a 15.7 cm carapace length (CL) male, donated 28 June 1968, and a 21.8 cm CL female obtained on breeding loan from the Detroit, Michigan, Zoo 30 June 1977. This pair produced seven clutches of eggs from 28 February 1978 through 27 August 1982. The last of these, non-viable during incubation, was produced following reintroduction of the male after a 19 month isolation for treatment of trauma and prolapse of the penis. A large amount of tissue was sloughed from the penis due to necrosis. No eggs were produced by the female during the isolation of the male, but the 27 August 1982 clutch was produced ca. two months after reintroduction of the male. Progeny from 1978 and 1980 began producing eggs in 1985, and have produced five clutches to date. An additional female, 17.8 cm CL, was donated 25 January 1984 after being held by a private collector for ca. 18 months. This animal produced two clutches in 1985.

HUSBANDRY METHODS

Adults have been housed in an irregularly shaped display tank, ca. 140 cm square, with a water depth of 50 cm. A basking site and sand pit are provided ca. 12 cm above water level. Cage lighting, provided by two 30 watt fluorescent tubes (G.E. Chroma 50 series), is controlled by a timer set to approximate the photoperiodic variation of 15° N. latitude. Water temperature is maintained between 20 and 24° C, with air temperature varying from 24 to 32° C during the year. A variety of other forms of turtles have been housed with the *P. gibbus* over the years. Diets for units such as these are not formulated for specific forms, but are designed for the mixed species groups occupying the tank. Thus, until 1979, the *P. gibbus* were offered one feeding per week of cut horsemeat or cut freshwater smelt, and two feedings per week of serially fed produce. In 1979, a fourth feeding per week was added to these, consisting of pelleted commercial diet (Purina Trout Chow). Earthworms, chicken livers and hearts, mealworms, and since 1984 crayfish and mystery snails have been offered as occasional supplementary feedings. Diet of hatchlings and juveniles has approximated this, with the substitution of pelleted trout chow for one weekly produce feeding, and four to five feedings per week. Observations of all age classes support the statement of Mittermeir et al. (1978) that diet is primarily carnivorous, but that plant matter is occasionally taken. While greens and fibrous vegetables (e.g. kale, lettuce, spinach, celery, carrot and sweet potato) are seldom ingested, fruits (e.g. apple, grape and particularly banana) are eaten regularly.

Most eggs have been buried in the sand pit to depths of 2 to 12 cm. In periods when more than one female was housed in the tank, identification of the egg laying female has been made by observation of oviposition, or vation of pre-nesting digging coupled with palpation of eggs through the inguinal area of the female. Eggs are removed soon after oviposition, and incubated in a 1:1 mixture (by weight) in sealed gallon jars or equivalent containers. Jars are vented every 4 to 6 weeks, and some have been repotted with a fresh mixture of vermiculite at 100 day intervals. Some clutches were heavily misted with tap water when hatching seemed imminent due to the appearance of scratches on the inner aspect of the outer shell. Incubation temperatures have varied from 26 to 31° C.

RESULTS AND DISCUSSION

Dates of egg laying, clutch sizes, egg sizes and weights, and incubation periods for the 14 clutches produced in this collection are summarized in Table I.

Nesting dates for recently collected specimens have been reported for only two specimens. Medem (1973) reported the laying of a clutch on 23 November by a specimen from Rio Vaupes, Colombia, and Dixon and Soini (1977) reported the laying of a clutch on 3 August by a specimen from Iquitos, Peru. An additional specimen, recently imported and referable to specimens noted by Pritchard and Trebbau (1984) to have been collected in southern Surinam for export in the live animal trade, was acquired by the Columbus Zoo 27 August 1985, and laid single eggs on 27 August, and 4 and 28 September 1985. The first of these, 46 x 51 mm, 26 g, hatched 7 February 1986 after 164 days incubation. The second, 45 x 30 mm, 23.7 g, hatched 4 February 1986 after 154 days incubation. The third, 41 x 24 mm, 25.5 g, failed to develop during incubation.

While laying dates for these three wild bred specimens fall within a 112 day period (3 August - 23 November), annual aspects of egg laying have not been clearly defined for the series laid in this collection. Clutches have been laid in all months except June and September, with single clutches in all months except December (2 clutches) and February (3 clutches). On five occasions, females have laid two clutches with internesting intervals of less than 150 days, including the period 13 November 1979 - 26 April 1980 during which the Detroit Zoo female laid 3 clutches with internesting intervals of 96 and 70 days.

Mean clutch size for the 14 clutches here reported has been 3.92 eggs per clutch, ranging from 2 to 7 eggs per clutch. Clutch size of only the 10 clutches in which hatching subsequently occurred has shown the extremes of this range, with a mean of 4.10 eggs per clutch. These figures include eggs broken during laying which are excluded from further data.

Eggs of the 14 clutches have ranged from 34 to 50 mm along the long axis (n=50, $\bar{X}$ = 42.09 mm), and from 24 to 32 mm along the short axis ($\bar{X}$ = 27.05 mm). Clutches which have included the extremes of both ranges have subsequently produced hatchlings. The 7 March 1985 clutch is noteworthy not only as the largest clutch (7 eggs), but also due to the small size of the eggs ($\bar{X}$ = 35.1 x 24.4 mm) and long incubation times of the two hatchlings (222 and 248 days). While one hatchling survived only 66 days posthatching, the remaining individual has appeared to be normal in growth and behavior since hatching (290 days).

Incubation periods have ranged from 140 to 248 days, with a mean (n=20) of 178.05 days. However, incubation periods within clutches have not varied more than 30 days (29 December 1985 clutch).

Hatchlings have ranged from 43 to 49 mm CL shortly after hatching and assumption of normal shell contour. Extended growth of specimens hatched in 1978 and 1980 is presented in Table II. Due to disparate hatching dates and dates of measure, ages are reduced

to years and days. Records are presented for 5 siblings, from 4 clutches. Other specimens from these clutches were removed from the collection shortly after hatching.

Of the two female progeny, the older (P.M. 1) consistently grew more slowly than a sibling hatched approximately 19 months later (P.M. 3), and laid her first clutch only 6 months before the first clutch laid by the younger animal. The earliest ages at egg laying for these were 6 years 116 days (187 mm CL) for P.M. 1, and 5 years 85 days (184 mm CL) for P.M. 3. Males (P.M. 4 and 5) were observed to be courting and attempting to copulate in the fall of 1984, in the early part of their fourth year. Clutches laid by sibling females (P.M. 1 and 3) were sired by one or the other of these males in their fourth year and subsequently. Presumably, clutches laid by the female obtained 25 January 1985 were also sired by one of these males.

Sexual dimorphism in tail length, preanal tail length, and preanal tail thickness is not so clearly defined in *P. gibbus* as in related forms. The most obviously dimorphic male of adults seen by the author (including but not limited to those here reported) has been the 1968 male in this collection. After 17 years in captivity, this specimen had a plastral length of 132 mm, a preanal tail length of 25 mm and tail length of 42 mm. The most obviously dimorphic female has had a plastral length of 170 mm, preanal tail length of 24 mm, and tail length of 42 mm. While the preanal tail of the male was greatly thickened, that of the female was only slightly so. No plastral concavities have been observed, and no dimorphism in the depth of the anal notch has been noted. Due to difficulties of obtaining accurate measurements of tail and preanal tail length in small living turtles no attempt has been made to quantify the onset of observable change in these external characters. However, observations on this series indicate that identification of sex based upon preanal tail length and

Table I. Reproductive Data for *Phrynops gibbus*

Laying Date	No. Eggs	Egg Size (mm) Range	Egg Size (mm) Mean	Egg Size (mm) X Range	Egg Size (mm) Mean	Egg Mass (g) Range	Egg Mass (g) Mean	Days Incubation	Notes
30 June 1977 Female									
28 Feb. 1978	4*	42.5-48	44.8	28-28.5	28.2	-	-	205	P.M. 1 in text
2 Oct. 1978	3	37-43	39.7	25-28	27.0	-	-	198	
13 Apr. 1979	3	42-43	42.7	28-29	28.3	-	-	-	
13 Nov. 1979	4	46-50	48.0	28-30	29.3	-	-	167	P.M. 2 in text
								168	
								168	P.M. 3 in text
16 Feb. 1980	4	44-47	45.3	29-30	29.3	-	-	140	
								143	P.M. 4 in text
26 April 1980	6*	39-43	40.6	27-30	28.6	-	-	169	P.M. 5 in text
								170	
								170	
27 Aug. 1982	4	45-49	47.3	27-29	28.0	-	-	-	
25 January 1984 Female									
7 March 1985	7	34-36	35.1	23-25	24.4	12-15.5	13.5	222	died 13 Dec. 1985
								248	
29 Dec. 1985	4	42-44	43.0	28-29	28.8	-	-	163	
								190	
								193	
20 September 1978 Female (P.M. 1)									
14 Jan. 1985	3	39-40	41.0	13.5-14	13.8	13.5-14	13.8	-	
19 May 1985	4	36-40	39.0	20-20.5	20.3	11.5-12.5	12.0	-	
27 Feb. 1986	2	42-45	43.5	25-26	25.5	16.8-16.9	16.9	161	
								161	
30 April 1980 Female (P.M. 3)									
24 July 1985	3	43-46	44.7	28	28	21.3-22.4	22.0	167	
								187	
19 Dec. 1985	4	41-43	42.3	30-32	30.5	-	-	171	

* egg broken in laying, included in number of eggs; excluded from further data

Table II. Growth in *Phrynops gibbus*

FEMALES					MALES				
No.	Age	CL(mm)	CW(mm)	PL(mm)	No.	Age	CL(mm)	CW(mm)	PL(mm)
3	2 years 271 days	146	111	-	5	2 years 106 days	123	90	-
3	3 years 116 days	171	124	-	4	2 years 202 days	132	100	-
1	4 years 128 days	170	129	-	2	2 years 271 days	139	111	-
3	4 years 245 days	189	139	160	5	2 years 316 days	140	100	-
3	5 years 85 days	194	147	171	4	3 years 52 days	154	116	-
1	6 years 102 days	187	136	167	5	4 years 80 days	154	113	138
1	7 years 147 days	190	141	167	4	4 years 178 days	170	118	142
1	7 years 325 days	191	142	167	5	5 years 124 days	158	113	138
					4	5 years 202 days	185	130	151
					5	5 years 302 days	158	114	138
					4	6 years 35 days	187	131	152

thickness is only fully applicable to specimens more than 3 years old, and of greater than 145 mm CL.

An incidental observation concerning *P. gibbus* concerns marking technique. As with other turtles in the Columbus Zoo collection, individuals are marked by scarring the plastral scutes with a rotary burr of appropriate size. In the period 1977 through 1985, in excess of 450 specimens of 48 forms have been marked with this technique, with resultant complications occurring in 6 animals. Five of these were *P. gibbus* which developed extensive necrosis, leading to death in 2 specimens. No explanation has yet become available for the dramatic difference in effect of this marking technique on *P. gibbus* as opposed to other forms.

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TECHNIQUE

A METHOD FOR RAPID AND PRECISE DOCUMENTATION OF LIZARD COLORATION

Color patches of many iguanid lizard species are known to provide important signals during social interactions. The messages they convey have been and continue to be the focus of considerable work (Crews and Williams 1977; Ferguson 1976; Greenberg and Noble 1944; Hover 1985; Losos 1985; Sigmund 1983; Vinegar 1972; Williams and Rand 1977). In order to understand the social significance of color variation within and between populations or species it is necessary to accurately document the coloration under study.

Until recently, the tree lizard, *Urosaurus ornatus*, one of the most abundant lizards in the western U.S., had received little attention from ethologists. In both sexes, considerable color variation is known between and, sometimes, within populations (Murray 1953; Roueche 1971; Smith 1946). Males exhibit belly patches of varying intensities of blue or blue-green and throat patches that may be yellow, orange, green or blue, or some combination of these (Gates 1963; Hover 1985; Roueche 1971; Smith 1946; Thompson, pers. comm.; Zucker, pers. obs.). Females lack the blue belly patches but have variably-colored throats (Roueche 1971; Zucker, pers. obs.). Current studies are exploring the significance of throat color variation and involve classifying throat colors of individual animals (Hover 1985; Thompson, pers. comm.; Zucker, in prep.).

This communication explores several methods that have been used to document lizard coloration and proposes a procedure for quantifying coloration in species whose colors are not stable over time. I demonstrate the method by comparing two populations of tree lizards and show that throat patch coloration of males may change rather rapidly and significantly upon capture.

METHODS

During July, 1986, male *Urosaurus ornatus* were captured by noose, six from the Aguirre Spring Recreation Site on the east slope of the Organ Mountains, 25 air km E of Las Cruces, Doña Ana Co., NM, and six from the Doña Ana Mts., 25 air km NE of Las Cruces. Males at Aguirre Spring generally have blue-green throats. Those in the Doña Ana Mts. exhibit more variable coloration. Their throats may be solid yellow, rust, orange or green, but most commonly have a varying amount of green as a central spot surrounded by a rust or orange rim. For this study, only males with a rust or orange rim and green central spot were used.

Within 15 sec of capture I compared the throat of each male with a series of Munsell color chips (see below), and the notation which most closely matched was recorded. The lizard was held in my hands until one min after capture when a second comparison was recorded. It was then placed singly in a one gallon translucent plastic jar and withdrawn at five and at sixty min after capture for additional readings. Each lizard was transported to the laboratory in an individual jar. At 24 hours after capture the throat color was again compared to the color chips. The lizards were then placed individually in 76 liter aquaria containing a layer of sand and a rock and could not see other lizards. The tanks were lit with two 40 watt Vita-Lite® bulbs (Duro-Test Corp.; North Bergen, NJ); each rock was heated with a 60 watt incandescent bulb. After two hours in the tank with a heat lamp, a final reading was made. Since the lab room was located close to a building exit, all readings were made outdoors in direct sunlight within 15 sec of removal from the jar or aquarium. The ventral part of the male was held facing directly into the sun during all readings. Hue comparisons between the lizard coloration and Munsell chips should not, however, be affected by light level.

The Munsell System of Color Notation (Munsell Color; Baltimore, MD) is a standardized set of color chips which identifies three attributes of color: hue (portion of the spectrum), value (degree of lightness) and chroma (degree of saturation or grayness). There are ten major hues, each divided into ten hue steps and symbolized as a number (1-10) and initial(s) for the major hue. Values are placed on a scale of 0 (for black) to 10 (for white); chroma ranges from 0 for neutral gray to about 14 or 16 for the most vivid (strong or saturated) colors. For simplicity, I am only reporting here on hues, although value and chroma were also recorded.

Photography has also been used to document throat color. I determined the accuracy of this method by photographing the Munsell color chips in both sun and light shade with a 35 mm SLR camera using Kodacolor VRG ISO 100 print film, Kodachrome 64 slide film and Ektachrome 64 slide film. The prints were locally processed (PDQ One Hour Photo Finishing); the slides were processed by Kodak. The prints were compared directly with the color chips. The slides were compared with the Munsell chips outdoors in direct sun against a white background with the aid of a hand lens, and also on a projector using a Sylvania DDK 60 watt bulb. The same nine hues, which included oranges, yellows, green-yellow, green, blue-green and blues, were compared for all three film types under all conditions.

RESULTS AND DISCUSSION

The green to blue-green throat color of two of the six males from Aguirre Spring (males 3 and 4) changed 2 1/2 hue steps within one min of capture and three males (a, 2, 4) changed 5 hue steps within five min (Fig. 1). Changes in major hue occurred in five males after 60 min and in all

after 24 hours in captivity (Fig. 1). The addition of a heat lamp brought the throat colors closer to those at the time of capture, but four males (1, 2, 3, 5) were still 2 1/2 or more hue steps different (Fig. 1). The orange rim on the Doña Ana males was much more stable, never changing more than 5 hue steps (Fig. 2A). However, the green or green-yellow central spot changed within one minute of capture for five males (1, 2, 4, 5, 6), and in males 1, 2 and 6 totally disappeared after 24 hours, revealing orange underneath (Fig. 2B). Thus, the green is relatively unstable and appears to be superimposed upon an orange background, normally seen only as a rim. Four Doña Ana males (2, 4, 5, 6) had green patches that did not return to their original color after two hours under the heat lamp (Fig. 2B). I do not know whether longer exposure to the heat lamps would have returned the color of these lizards to field conditions. For both populations, values and chromas also varied somewhat from their original notation.

Photography proved to be a poor method for documenting coloration. The best overall match between photographs and color chips occurred with the Kodachrome 64 slide film shot in light shade and displayed on a projector. Six of the nine color chips were 2 1/2 hue steps off; the remainder matched well. Value and chroma were not evaluated. If photography is used, the accuracy of the color should be documented by comparison with a Munsell chart. Different film batches and processing laboratories may also be sources of variation.

The biological significance of the degree of color change reported here is still unknown. However, Ferguson (1976) found that a change of as little as 5 hue steps in the orange spotting on female collared lizards represents a significant change in reproductive condition (pre- versus post-ovulation) and probably functions as a social signal. Thus, I recommend that workers interested in the social significance of color pattern in tree lizards document color immediately upon capture, at least until the relative stability of the colors for the study population is determined. For laboratory studies which use heat lamps to bring out the colors, I would recommend that initially, immediate documentation of coloration be made in the field for later comparison under the lamps. Once it is determined how long it takes for color to return to normal under the lamps, further field recordings should not be necessary. These recommendations, I believe, should also be followed for studies of coloration in other species of lizards, at least until it is apparent that color changes over time do not take place.

The Munsell color chip method is quick and can be precisely interpreted by other researchers who have access to the charts; it has been used successfully by other lizard ethologists (Benes 1969;

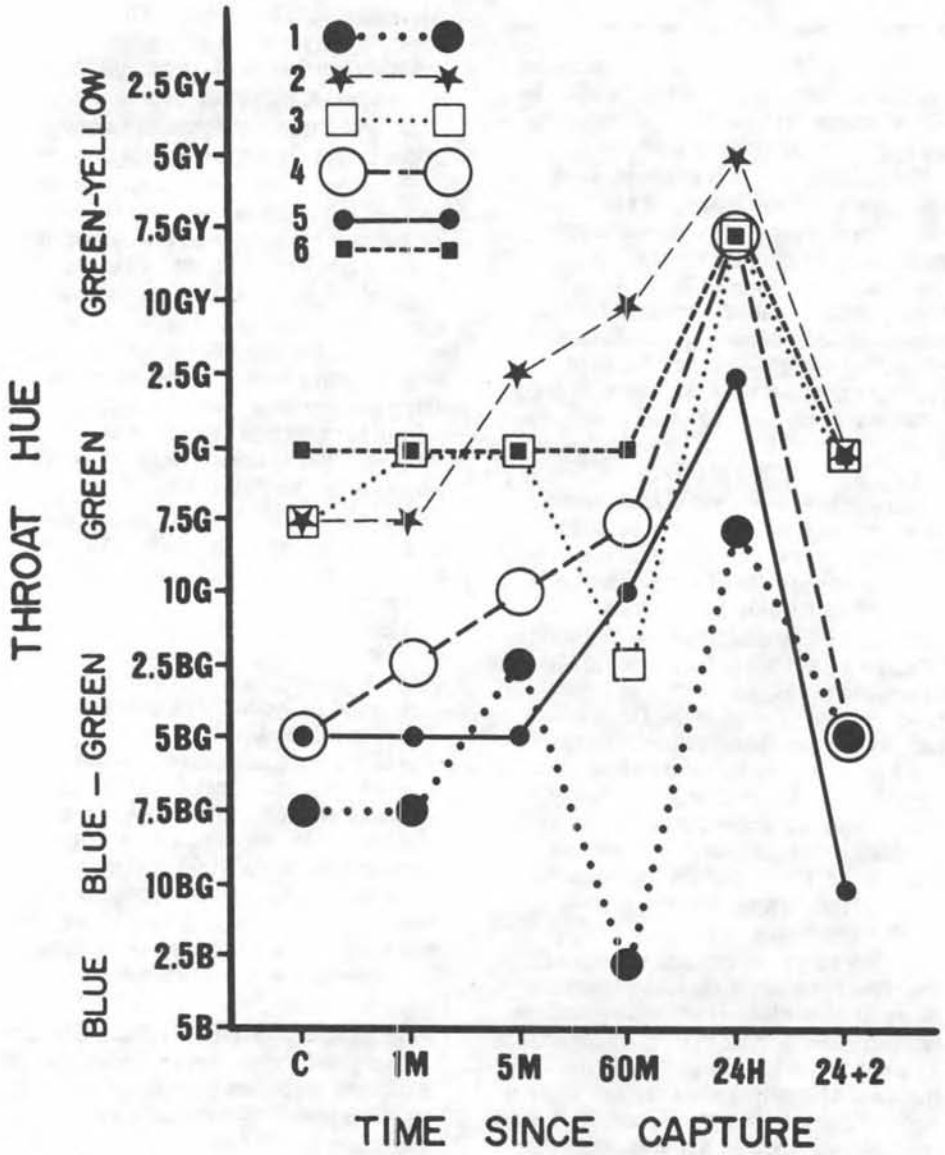


Figure 1. The throat color (Munsell hue) of six males from Aguirre Spring at the time of capture (C), and one min (1 M), five min (5 M), 60 min (60 M), 24 h (24 H) and 24 + 2 h under a heat lamp (24 + 2) after capture.

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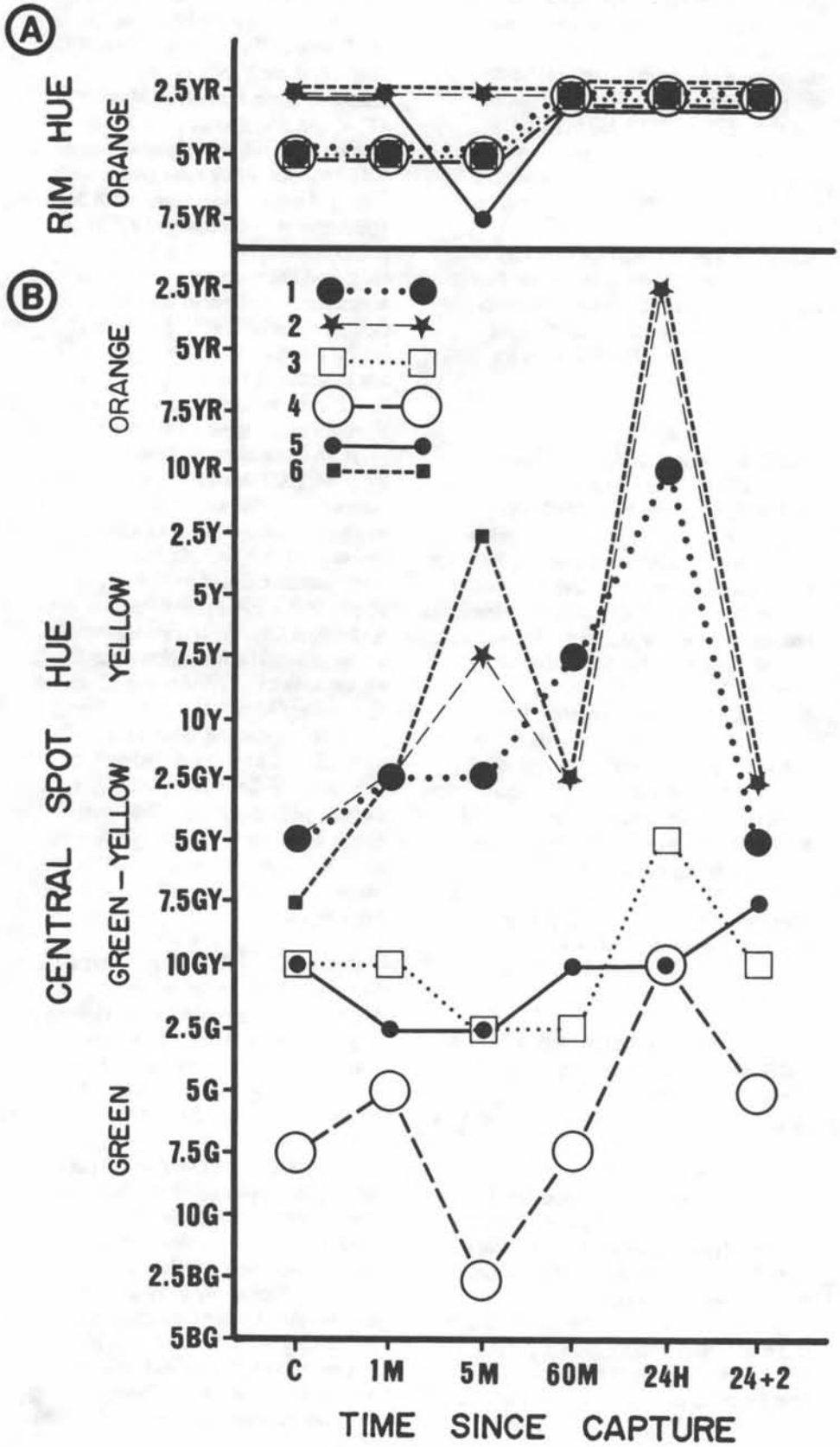


Figure 2. The color (Munsell hue) of the rim (A) and central spot (B) of the throats of six males from the Doña Ana Mts. at the time of capture (C), and one min (1 M), five min (5 M), 60 min (60 M), 24 h (24 H) and 24 + 2 h under a heat lamp (24 + 2) after capture.

Cooper and Ferguson 1972; Ferguson 1976; Sigmund 1983). A standardized method of color documentation would greatly facilitate communication among researchers and may reveal subtle, but biologically significant, changes in coloration otherwise likely to be overlooked.

ACKNOWLEDGMENTS

I wish to thank Steven Bailey for his help in the field, as well as Ed Hover and two anony-mous reviewers for their useful comments.

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GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of a species' range, and thereby permit a more significant interpretation of its biology. These geographic distribution records have a **standard format**, and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

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Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10 (1):1.

ANURA

BUFO BOREAS BOREAS (Boreal Toad). USA: ALASKA: Alexander Archipelago, Etolin Island (56°06'N, 132° 21'W), Burnett Inlet, sea level. 31 July 1984. B.R. Norman. Verified by K.B. Aubry. University of Washington Burke Museum (UWBM #2131). First record for Etolin Island; establishes presence of *B. b. boreas* between latitudes 55 (Revillagigedo Island at 55°35'N, 131° 20'W; Ammette Island at 55° 09'N, 131°28'W; and Mary Island at 55° 05'N, 131°12'W) and 57 (Chichagof Island at 57° 30'N, 135° 30'W) in the Alexander Archipelago of SE Alaska (Hoege 1976. Amphibians and Reptiles of Alaska, the Yukon and Northwest Territories. (Anchorage; Alaska Northwest Publ. Co.). The specimen was collected within the intertidal zone at the mouth of a small river.

Submitted by **BRADFORD R. NORMAN**, Burke Museum, Department of Herpetology, University of Washington, Seattle, WA 98195, USA

HYLA CRUCIFER (Spring Peeper). USA: WISCONSIN: Florence Co: Norbertine property along Morgan Lake (T38N, R16E, Sec.18). 11 June 1987. P.A. Cochran. Verified by P.A. Cochran. University of Wisconsin-Green Bay Richter Collection (0310-R). Calling male. New county record (Vogt. 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Pub. Mus. 205 pp.).

Submitted by **PHILIP A. COCHRAN,** Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA

HYLA GRATIOSA (Barking Treefrog). USA: DELAWARE: New Castle Co: E side State Rt. 476, 6.7 km SW Townsend, on Vandyke Tract of Blackbird State Forest. 22 May 1987. J.F. White. Verified by R.G. Arndt. Carnegie Museum of Natural History (CM 115460). Adult male taken while calling. Another male taken on 6 June 1987 now in possession of J.F.W. A photograph by J.F.W. of first specimen, and short accompanying text by Anonymous, appear in the Delaware Conservationist 30(3):28, Fall 1987 , but no details on capture or biology are included. Choruses of one to ca. 30 individuals heard in a vernal pond surrounded by lowland shrubs and trees on several dates from 12 May to 20 June 1987. New state record. Population is ca. 232 km NNE of the northernmost portion of its known range in SE Virginia (Caldwell. 1982. *Hyla gratiosa*. Cat. Amer. Amphib. Rept.: 298.1-298.2), and 29.8 km N of a Caroline County, Maryland, locality where a single adult female was found on 18 June 1982 (Anderson, K. and H. G. Dowling 1982. Geographic Distribution: *Hyla gratiosa*. SSAR Herp. Review 13(4):130). These findings suggest that the Cape May County, New Jersey, population reported on by Black and Gosner (1958. Herpetologica 13(4):254-255) may be a natural population, and not introduced as they suggested.

Submitted by **RUDOLF G. ARNDT**, Faculty of Natural Sciences and Mathematics, Stockton State College, Pomona, New Jersey 08240, and **JAMES F. WHITE**, Delaware Nature Education Society, P.O. Box 700, Hockessin, DE 19707, USA

HYLA VERSICOLOR (Gray Treefrog). USA: WISCONSIN: Florence Co: Norbertine property along Morgan Lake (T38N, R16E, Sec 18). 11 June 1987. P.A. Cochran. Verified by P.A. Cochran. University of Wisconsin-Green Bay Richter Collection (0311-R). Calling male; SVL 54mm. New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Pub. Mus. 205 pp.)

Submitted by **PHILIP A. COCHRAN**, Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA

PACHYMEDUSA DACNICOLOR (Mexican Leaf-frog). Mexico: Sonora: Centro Acuicola de Esperanza: 10 km NE Ciudad Obregon. 11 October 1986. Adrian Quijada. Verified by Adrian Quijada. Herpetology Collection of Ecological Center of Sonora (0585). New record in riparian community of Foothills, Sonoran Desert subregion (Duellman, W. E. 1970.). Monogr. Mus. Nat. Hist. Univ. Kans. 1, Lawrence). Mexican Leaf frog found in association with *Bufo mazatlanensis* and *B. cognatus*.

Submitted by **ADRIAN QUIJADA**, Centro de Estudios Superiores del Estado de Sonora (CESUES). Escuela Superior de Ecología. Ley Federal del Trabajo, prolongación Col. Apolo, E.P. 83200, Hermosillo, Sonora, México

PTERNOHYLA FODIENS (Lowland Burrowing Treefrog). MEXICO: JALISCO La Huerta: Estación de Biología Chamela, 59 km NW Barra de Navidad. 1 October 1986. A. García and E. Pérez. Verified by G. Casas. Colección Herpetológica de la Estación de Biología, UNAM (EBCH 0302). Extends range to coastal Jalisco (Duellman 1970. Monogr. Mus. Nat. Hist. Univ. Kans. 1, Lawrence).

Submitted by **ANDRES GARCIA**, Estación de Biología Chamela, Instituto de Biología, UNAM. Ap. 21 San Patricio, Jalisco 48980 México and **EDMUNDO PEREZ**, Laboratorio de Herpetología, Departamento de Zoología, Instituto de Biología, UNAM. Ap. 70-153, México, D.F. 04510, México.

RANA PALUSTRIS (Pickerel Frog). USA: ARKANSAS; Marion Co.: 5.1 km S Oakland (T20N, R15W, S10). 25 April 1980. S.E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 8852). Clark Co.: 1.6 km W Arkadelphia T7S, R20W, S15). 24 September 1974. S.E. Trauth. (ASUMZ 8826). Hot Spring Co.: 1.8 km W Donaldson (T6S, R18W, S4). 4 April 1986. S.E. Trauth and P. Chaffin. All verified by S.E. Trauth. (ASUMZ 5676, 5699). New county records (Schaaf and Smith. 1971. Cat. Amer. Amph. Rept. 117.1-117.3).

Submitted by **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander) USA: PENNSYLVANIA: Jefferson Co.: Sportsburg. 7 May 1987. W.D. Fisher. Verified by J.E. Lovich. George Mason University (GMU 3457). Specimen was excavated during construction activities along the flood plain of Big Mahoning Creek. New County Record (McCoy 1982. Amphibians and Reptiles in Pennsylvania. Spec. Publ. Carnegie Mus. Nat. Hist. No. 6, p. 56).

Submitted by **JEFFREY E. LOVICH**, Savannah River Ecology Laboratory, Drawer E, Aiken, SC 29801 and **WILLIS D. FISHER**, R.D. 6, Box 114, Punxsutawney, PA 15767, USA

AMBYSTOMA TALPOIDEUM (Mole Salamander) USA: ARKANSAS: Poinsett Co.: Clay Pool (T12N R3E S34). 10 October 1987. W.E Meshaka Jr. Verified by S.E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 9168). This new county record marks the third find of this species in Arkansas in 40 years: Clay County (Parker 1947. Proc. Arkansas Acad. Sci. 2:15-30) and Cross County (Sutton and Paige 1980. SSAR Herp Review 11(1) :13.

Submitted by **W. E. MESHAKA, JR.** Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467 and **P. MCLARTY**, Off Hwy 49, Brookland, AR 72417, USA

EURYCEA BISLINEATA BISLINEATA (Northern Two-lined Salamander) USA: ILLINOIS: Saline Co.: 4.9 km NE Rudement (T10S, R7E, Sec. 17). 25 March 1987 and 5 May l987. T.D. Boatright, W.T. McDowell, and S.L. Turner. Verified by R.A. Brandon. Southern Illinois University at Carbondale (SIUC H-3341-3347). New county record. Extends range 9.6 km N of nearest locality (Smith 1961. The Amphibians and Reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1-298).

Submitted by **WILLIAM T. MCDOWELL**, Town and Country Trlr. #103, Carbondale, IL 62901, USA

SAURIA

ANOLIS CAROLINENSIS (Green Anole). USA: ALABAMA: Walker Co: 4 km E Manchester, Blackwater Creek below AL Hwy 257. 23 May and 30 July 1985. J.N. Stuart. Verified by J.N. Stuart. Museum of Southwestern Biology, University of New Mexico (MSB 45213 and 45239). New county record (Mount 1975. The Reptiles and Amphibians of Alabama, Auburn Univ. Agric. Exper. Station, Auburn, AL). Collected under Alabama Dept. of Conservation permit.

Submitted by **JAMES N. STUART**, 516-#3 Columbia SE, Albuquerque, NM 87106, USA

CNEMIDOPHORUS SEXLINEATUS SEXLINEATUS (Six-lined Racerunner) USA: ALABAMA: Walker Co: ca. 5 km E Carbon Hill, Lost Creek, near inactive strip mine. 24 April 1985. J.N. Stuart. Verified by J.N. Stuart. Museum of Southwestern Biology, University of New Mexico (MSB 45273). New county record (Mount 1975. The Reptiles and Amphibians of Alabama, Auburn Univ. Agric. Exper. Station, Auburn, AL). Collected under Alabama Dept. of Conservation permit.

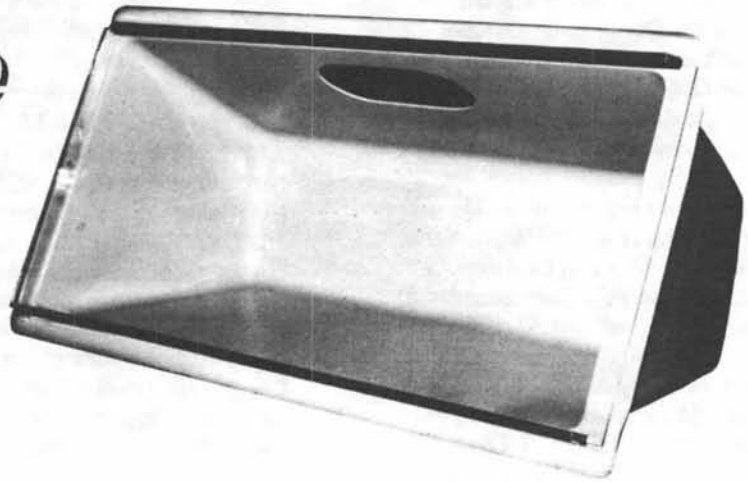
Submitted by **JAMES N. STUART**, 516-#3 Columbia SE, Albuquerque, NM 87106, USA

EUMECES ANTHRACINUS (Coal Skink) USA: Arkansas: Garland Co: Camp Couchdale (T35, R18W, S31). 24 May 1987. M.D. Fletcher. Verified by S.E. Trauth. Arkansas State Museum of Zoology (ASUMZ 8066). New county record (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

Submitted by **MARION D. FLETCHER**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA

HEMIDACTYLUS TURCICUS TURCICUS (Mediterranean Gecko). USA: TEXAS: Dallas Co.: collected from an apartment complex. 1 August 1984. Aletha Jesttis. Verified by Thomas Vance. Deposited in the Navarro College Herpetological Collection (NC

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1984.8. 1.1L). New county record of this introduced species (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M Univ. Press. College Station, Texas).

Submitted by **MIKE CHEATHAM**, Rt. 1, Box 108, Milford, TX 76670, USA

HEMIDACTYLUS TURCICUS TURCICUS (Mediterranean Gecko). USA: TEXAS: Burnet Co: 9.7 km S and 6.4 km W Burnet, Longhorn Cavern State Park. 18 August 1987. M.S. Calaway. Verified by J.E. Cordes and J.M. Walker. University of Arkansas, Department of Zoology (UADZ 2574). The subsequent collection of an additional specimen, and the sighting of another Mediterranean gecko, suggest that a population has been established in the State Park. New county record (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M Univ. Press, College Station xii + 434 pp.) extending margin of range northwestward from Travis county. Specimen collected under authority of Texas Parks and Wildlife permit No. 61 and State Park permit No. 20-87.

Submitted by **MICHAEL S. CALAWAY**, Longhorn Cavern State Park, Park Road 4, Burnet, Texas 78611, **JAMES E. CORDES** and **JAMES M. WALKER**, Department of Zoology, University of Arkansas, Fayetteville, AR 72701, USA

OPHISAURUS ATTENUATUS ATTENUATUS (Western Slender Glass Lizard). USA: ARKANSAS: Sharp Co: 12.6 km E Cave City (T15N, R4W, S16). 15 May 1987; 14.1 km E Cave City (T15N, R4W, S15). 20 May 1987. S.E. Trauth. Verified by S.E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 8010, 8060). New county record (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51; Holman 1971. Cat. Amer. Amph. Rept. 111.1-111.3).

Submitted by **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA

PODARCIS MURALIS (European Wall Lizard). USA: OHIO: Hamilton Co: Cincinnati Zoo and Botanical Garden. 2 May 1987. S.E. Hedeen. Verified by G.F. Petri. Xavier University (photo nos. 46Y1-46Y3). This second Cincinnati population was established in1985 by Children's Zoo escapees, originating from the population 4 km SW (Vigle 1977. SSAR Herp. Review 8(3) Supplement:19).

Submitted by **STANLEY F. HEDEEN**, Department of Biology, Xavier University, Cincinnati, OH 45207, USA

SCELOPORUS OCCIDENTALIS OCCIDENTALIS (Northwestern Fence Lizard). USA: WASHINGTON: Snohomish Co.: 5.3 km N, 4.7 km W of Tulalip (T30N, R4E, Sec 6 SW 1/4) elev. 915 m. 7 September 1986. T.C. Mathies. Verified by K.B. Aubry. University of Washington Burke Museum, Seattle (UWBM 2123). Northernmost record for eastern Puget Sound region, and first record for Snohomish Co. (Nussbaum et al. 1983. Amphibians and Reptiles of the Pacific Northwest. Univ. Press Idaho, 332 pp.).

Submitted by **THOMAS C. MATHIES**, Burke Museum, University of Washington, Seattle, WA 98195 and **KEITH B. AUBRY**, USDA Forest Service, Pacific Northwest Research Station, Olympia, WA 98502, USA

SERPENTES

AGKISTRODON PISCIVOROUS LEUCOSTOMA (Western Cottonmouth). USA: TEXAS: Navarro Co: 1 km W Kerens on Richland Creek. 9 October 1986. Chad Marion. Verified by Thomas Vance. Deposited in the Navarro College Herpetological Collection (NC 1986. 10.9.1S). New county record fills hiatus between Ellis, Henderson, Freestone, and Limestone Counties (Dixon, J. 1987. Amphibians and Reptiles of Texas. Texas A&M Univ. Press. College Station, Texas; Vermersch, T. and R. Kuntz. I986. Snakes of South Central Texas. Eakin Press. Austin, Texas). USA.

Submitted by **MIKE CHEATHAM**, Rt. 1, Box 108, Milford, TX 76670, USA

CARPHOPHIS AMOENUS (Worm Snake). USA: OHIO: Hamilton Co: 4.8 km N, 3.2 km W Miamitown. 10 July 1985. D. Shaw. Verified by Robert S.

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Kennedy. Cincinnati Museum of Natural History (CMNH H2882). New county record. No adjacent county records in Ohio, but *C. a. helenae* recorded from adjacent Franklin Co, Indiana (Minton et al. 1983. Proc. Ind. Acad. Sci. 92, p. 489). Specimen agrees with *C. a. amoenus* based on head scalation (internasals and prefrontals unfused).

Submitted by **AL WINSTEL**,Hamilton County Park District, 10245 Winton Road, Cincinnati, OH 45231, USA

CEMOPHORA COCCINEA COPEI (Northern Scarlet Snake). USA: ARKANSAS: Grant Co: 1.0 km N Sheridan (T4S, R13W, S34). 6 October 1974. S.E. Trauth. Verified by S.E. Trauth. Milwaukee Public Museum (MPM 20310). New county record (Williams 1985. Cat. Amer. Amph. Rept. 374.1-374.4).

Submitted by **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA

ELAPHE VULPINA (Fox Snake). USA: WISCONSIN: Marinette Co: US Hwy 141, 10.6 km S of US Hwy 8 out of Pembine. 8 June 1987. P.A. Cochran. Verified by P.A. Cochran. University of Wisconsin-Green Bay Richter Collection (0314-R). Road killed adult. Outagamie County: County Road S, just E of County Road M (T22N, R15 E, Sec 13). 19 July 1987. P.A. Cochran. Verified by P.A. Cochran. University of Wisconsin-Green Bay Richter Collection (0315-R). Road killed adult. New county records (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Pub. Mus. 205 pp.).

Submitted by **PHILIP A. COCHRAN**, Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA

FARANCIA ABACURA REINWARDTII (Western Mud Snake). USA: ARKANSAS: Clark Co: 9.6 km S Arkadelphia (T8S, R19W, S1). 11 May 1975. S.E. Trauth. Milwaukee Public Museum (MPM 20345). Hot Spring Co: 9.6 km E. Donaldson (T6S, R17W, S15). 12 May 1975. S.E. Trauth. Verified by S.E. Trauth. (MPM 20327). New county records (McDaniel and Karges 1983. Cat. Amer. Amph. Rept. 314.1-314.2).

Submitted by **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, AR 72367, USA

HETERODON PLATYRHINOS (Eastern Hognose Snake). USA: WISCONSIN: Waupaca Co: Bestul Road, ca. 1 km N of State HWY 161, near Iola. (T24N, R12E, S34). 2 May 1987, G. Messinger. Verified by R.M. Korb. University of Wisconsin-Green Bay Richter Collection (0317-R). New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Mus. 205 pp.).

Submitted by **RANDY M. KORB**, 1121 Emilie Street, Green Bay, WI 54301, USA

NERODIA FASCIATA FASCIATA (Banded Water Snake) USA: NORTH CAROLINA: Camden Co: 3.1 km E Elizabeth City [Pasquotank Co.]. 18 June 1976. R. G. Arndt et al. N. C. State Museum of Natural History (NCSM 18787); Hertford Co: near Harrellsville. 20 May 1977. O. Boody. (NCSM 17922); Pasquotank Co: 3.2 km from Perquimans Co. line, between Belvidere and Elizabeth City [= ca. 9 km WSW Elizabeth City]. 2 September 1962. N. Rothman. American Museum of Natural History (AMNH 89144); Perquimans Co: 5.6 km SW Belvidere. 10 May 1980 (NCSM 20896) and 18 May 1980 (NCSM 20902). J. P. Perry; Suttons Cr., 6.8 km ESE Hertford. 18 June 1979, J. P. Perry and A. L. Braswell. (NCSM 20163). All verified by R. Conant. Extends range north of Albemarle Sound (Conant 1963. Amer. Mus. Novitates, No. 2122:1-38).

Submitted by **WILLIAM M. PALMER** and **ALVIN L. BRASWELL**, North Carolina State Museum of Natural History, P.O. Box 27647, Raleigh, NC, USA

NERODIA RHOMBIFERA RHOMBIFERA (Diamondback Water Snake). USA: ARKANSAS: Marion Co: 5.4 km S. Oakland (T20N, R15W, S14). 24 July 1975. S. E. Trauth. Verified by Max A. Nickerson. Milwaukee Public Museum (MPM 20332). New county record that fills a distributional gap in the Ozark Mountains (McAllister 1985. Cat. Amer. Amph. Rept. 376.1-376.4).

Submitted by **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA

REGINA SEPTEMVITTATA (Queen Snake). USA: ARKANSAS: Johnson Co: 2.1 km W Oark (T12N, R25W, S24). 23 July 1987. S.E. Trauth. Veried by S.E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 8747). New county record (Dellinger and Black 1983. Occ. Pap. Univ. Arkansas Mus. 1:1-47; Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51; Schwardt 1938. Univ. Arkansas Agric. Exp. Sta. Bull. No. 357. 47p).

Submitted by **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA

RHADINAEA FLAVILATA (Pine Woods Snake). USA: SOUTH CAROLINA: Aiken Co: 8.9 km SE of Jackson at Hwy 125, ca. 33°15'N, 81°44.5'W. 9 May 1987. David P. Young, Jr. and David J. Davis. Verified by J. Whitfield Gibbons and Trip Lamb. National Museum of Natural History (USNM 278317). New county record and first record for Savannah River Plant. Extends range of 112 km from coast to ca. 150 km (Myers 1974. Bull. Am. Mus. Nat. Hist. 153:49-54.). Also extends range ca. 145 km NW of closest previous records [South Carolina: Berkeley Co.: 8 mi W Moncks Corner (Carnegie Museum 28892-28893)]. Collected during studies under Contract DE-AC09-76SR00819 between the U.S. Department of Energy and the University of Georgia.

Submitted by **DAVID P. YOUNG, JR.**, Zoology Department, University of Georgia, Athens, GA 30602, USA

SISTRURUS MILIARIUS STRECKERI (Western Pigmy Rattlesnake). USA: TEXAS: Montague Co.: within Sunset city limits. 9 October 1987. D. Balentine. Verified by M.A. Nelson. University of Texas-Arlington Collection of Vertebrates (UTA R-19315).

New county record, extends range at least 16 km westward of Wise and Cooke County localities (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M Univ. Press. College Station. i-xii + 434 pp.). *S. m. streckeri* appears to be restricted to more mesic habitats within the surrounding grasslands.

Submitted by **MARK A. NELSON**, Department of Biology, The University of Texas at Arlington, Arlington, TX 76019, USA

SISTRURUS MILIARIUS STRECKERI (Western Pigmy Rattlesnake). USA: ARKANSAS: Dallas Co: 4.8 km E Manning (T8S, R16W, S29). 28 September 1974; 12.8 km NW Fordyce (T10S, R14W, S5). 28 September 1974. S.E. Trauth. Arkansas State University Museum of Zoology (ASUM Z 8848-8849); Ouachita Co: 8.5 km N Amy (T11S, R17W, S11). 28 September 1974. S.E. Trauth. (ASUMZ 8846). All verified by S.E. Trauth. New county records (Palmer 1978. Cat. Amer. Amph. Rept. 220.1-220.2).

Submitted by **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA

STORERIA DEKAYI TEXANA (Texas Brown Snake). USA: TEXAS: Llano Co: 20.8 km W Burnet on State Hwy 29. 28 April 1977. F.E. Cordes. Verified by J.E. Cordes and J.M. Walker. University of Arkansas, Department of Zoology (UADZ 2602). New county record (Dixon 1987. Amphibians and Reptiles of Texas. Texas A&M Univ. Press. College Station xii + 434 pp.) filling hiatus between Burnet, San Saba, Mason and Gillespie counties.

Submitted by **JAMES E. CORDES**, Department of Zoology, University of Arkansas, Fayetteville, AR 72701, USA

STORERIA DEKAYI WRIGHTORUM (Midland Brown Snake) USA: ARKANSAS: Randolph Co: Jane's Creek (T19N, R1W, S17). 21 March 1987. Arkansas State Museum of Zoology (ASUMZ 6965). Independence Co: Salado Creek (T11N, 6W, 52). 24 March 1987. (ASUMZ 7604). Both collected by W.E. Meshaka Jr. Both verified by S.E. Trauth. New county records (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

Submitted by **WALTER E. MESHAKA, JR.**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA

TESTUDINES

CHELYDRA SERPENTINA SERPENTINA (Common Snapping Turtle). USA: NEW MEXICO: Socorro Co: La Joya State Game Refuge, (T1N, R1E). 24 May 1978. C.W. Painter. Verified by C.W. Painter and J.N. Stuart. Museum of Southwestern Biology, University of New Mexico (MSB 33590); Bernalillo Co: US Hwy 85 at Valencia Co. line, "Isleta Marsh," (T8N, R2E, Sec 34). 5 April 1987. J.N. Stuart. Verified by R.D. Jennings and J.N. Stuart. (MSB 48733). First specimens from Rio Grande drainage of New Mexico (Degenhardt and Christiansen 1974. Southwest. Nat. 19(1):21-46). More extensive distribution in drainage (Stebbins 1985. Field Guide to Western Reptiles and Amphibians, 2nd ed. Houghton Mifflin Co.) is unsubstantiated by specimens (R.C. Stebbins, pers. comm.).

Submitted by **JAMES N. STUART**, 516-#3 Columbia SE, Albuquerque, NM 87106, and **CHARLES W. PAINTER**, Endangered Species Program, New Mexico Department of Game and Fish, Villagra Building, Santa Fe, NM 87503, USA

CHRYSEMYS PICTA (Painted Turtle). USA: WISCONSIN: Florence Co.: on road from Fence to Morgan Lake (T38N, R16E, Sec 23). 8 Jume 1987. P.A. Cochran. Verified by P.A. Cochran. University of Wisconsin-Green Bay Richter Collection (0309-R). Shell fragments of road killed adult. New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Pub. Mus. 205 pp.).

Submitted by **PHILIP A. COCHRAN**, Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA

CLEMMYS INSCULPTA (Wood Turtle). USA: WISCONSIN: Florence Co: State Highway 101 at Pine River (T39 N, R17E, Sec 15). 10 June 1987. P.A. Cochran with M.D. Cochran. Verified by P.A. Cochran. University of Wisconsin-Green Bay Richter Collection (0316-R). Road killed adult. New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Pub. Mus. 205 pp.).

Submitted by **PHILIP A. COCHRAN**, Division of Natural Sciences, St. Norbert College, De Pere, WI 54115, USA

EMYDOIDEA BLANDINGII (Blanding's Turtle). USA: WISCONSIN: Shawano County: Shioc River, ca. 1 km W of Lesser Navarino Road, Navarino State Wildlife Area. (T25N, R16E, S24). 28 March 1981. K.A. Korb. Verified by R.M. Korb. University of Wisconsin-Green Bay Richter Collection (0307-R). New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Pub. Mus. 205 pp.).

Submitted by **RANDY M. KORB**, 1121 Emile Street, Green Bay, WI 54301, USA

HEOSEMYS LEYTENSIS (Leyte Pond Turtle): PHILIPPINES: PALAWAN PROVINCE: Palawan Island: Taytay Municipality: ca. 30 km SW city of Taytay (119°18'E, 10°33'N). 27 March, 1987. W. Timmerman (WWT 87-13), purchased from local resident. Caught in a pool of a creek of an interior drainage. Verified by D.L. Auth. Florida State Museum (UF/FSM 67515). Previously known only from the type-locality: Philippines: southern Leyte: city of Cabalian, ca. 580 km E of present site (E.H. Taylor 1920. Philippine J. Sci. 16(2):111-144).

Submitted by **WALTER W. TIMMERMAN** and **DAVID L. AUTH**, Department of Natural Sciences, Florida State Museum, Museum Road, University of Florida, Gainesville, FL 32611, USA

KINOSTERNON SUBRUBRUM HIPPOCREPIS (Mississippi Mud Turtle). USA: ARKANSAS: Craighead Co: Burlington Northern Railway at Cara-

way Rd. Crossing (T14N, R4E, S6). 8 April 1987. W.E. Meshaka Jr. Verified by S.E. Trauth. Arkansas State Museum of Zoology (ASUMZ 7079). New county record (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

Submitted by **WALTER E. MESHAKA, JR.**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA

STERNOTHERUS CARINATUS (Razorback Musk Turtle). USA: ARKANSAS: Garland Co: Camp Couchdale (T3S, R18W, S31). 24 May 1987. W.E. Meshaka Jr. and J.D. Wilhide. Verified by S.E. Trauth. Arkansas State Museum of Zoology (ASUMZ 8063). Clark Co: 3.6 km N Jct. of Hwy 8 and Ouachita River at Arkadelphia (T7S, R19W, S8). 23 January 1975. Mike Dewey and Tom Mullins. Verified by S.E. Trauth. (ASUMZ 8068). New county records (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

Submitted by **WALTER E. MESHAKA, JR., J. D. WILHIDE** and **STANLEY A. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, AR 72467, USA

TRIONYX SPINIFERUS EMORYI (Texas Spiny Softshell): USA: NEW MEXICO: San Miguel Co: Gallinas River, 5.6 km N Guadalupe Co. line, Culbertson Ranch (1.6 km N headquarters), ca. 1550 m. 7 August 1981. R. Gutierrez. Museum of Southwestern Biology, University of New Mexico (MSB 37558); Guadalupe Co: 12.4 km N and 4.8 km W Santa Rosa, Pecos River at River Ranch, 1450 m. 25 May 1986. S. Stocking and J. N. Stuart. (MSB 48736, skeleton). Both verified by J.N. Stuart. Record extends range upstream in Pecos River drainage from Sumner (Alamogordo) Lake, 1220 m (Degenhardt and Christiansen 1974. Southwestern Nat. 19(1):21-46). Gallinas River record is near the upper elevation limit of 1580 m reported for the species (Stebbins 1985. Field Guide to Western Reptiles and Amphibians, 2nd ed., Houghton Mifflin Co.).

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DISTRIBUTIONAL RECORDS FOR REPTILES AND AMPHIBIANS FROM THE PUERTO RICAN BANK

Field and museum studies of the biogeography of the Puerto Rican Bank, especially the Virgin Islands, have led to the discovery of several new island records for reptiles and amphibians. All specimens representing new island records are in the Museum of Comparative Zoology, Cambridge (MCZ) or the National Museum of Natural History, Washington (USNM). We also present new locality (not island) and morphological data for *Epicrates monensis granti*, a species rare in collections, and discuss the locality data of specimens in the American Museum of Natural History, New York (AMNH).

Although numerous herpetologists have visited the Virgin Islands (for previous records see Schwartz and Thomas 1975; Schwartz et al. 1978; Philibosian and Yntema 1976, 1978; MacLean et al. 1977; and Lazell 1983), we suspect that a number of islands harbor more species than are currently known. The species-by-island occurrence matrix for these islands is quite "nested" (Diamond and Gilpin 1982); i.e., the species list of each island tends to be a subset of that of the next larger island, and the island list of each species tends to be a subset of that of the next more widely distributed species. This regular pattern of distribution can be clearly seen in Lazell's (1983) Table 1. If the matrix were perfectly nested, each species would occur on all islands above a threshold size for that species; and, each island would be inhabited by all species occurring on islands smaller than it in size, plus additional species found only on islands of that size and larger. Assuming that future collecting will conform to this pattern, making the matrix more nearly perfectly nested, allows prediction of what species will be found on which islands. Distributional gaps may be most easily seen by looking at Table 1 of Lazell (1983), and noting the lacunae in the otherwise densely occupied upper and left hand portions of the matrix. That these predictions can be useful is borne out by the fact that as we compiled literature records for the Puerto Rican Bank, the initial nested pattern became more perfect as further sources were examined (a form of "retrodiction"), and that collecting efforts guided by these predictions have turned up expected species.

Particularly noteworthy in this regard is Jost van Dyke, which, for an island of its size (840 ha), is lacking a number of species. Most surprising is the absence of *Ameiva exsul*, a species otherwise found on every one of the British Virgins greater than 24 ha (except Great Thatch, 187 ha), and known from the much smaller and closely adjacent island of Little Jost van Dyke. During a day-long visit to Jost van Dyke we recorded two expected species there for the first time, but failed to find *Ameiva*, or another expected species, *Liophis (= Alsophis) portoricensis*. The reason for the absence of these two species was explained to us by a number of residents. Some seven to ten years previously, a resident of the island released mongooses *(Herpestes auropunctatus)* in hopes of wiping out snakes, which, he feared, might discomfort tourists. The mongoose, a number of which were seen during our brief visit, has apparently been effective. Our informants agreed that it was responsible for the disappearance of the ground lizard *(Ameiva)* and the common snake *(Liophis)*, both of which they were familiar with. They had not seen snakes for a few years, but ground lizards were seen occasionally. One person, familiar with the extant fauna, said he had seen a lizard about 2½ months prior to our visit.

NEW RECORDS

Eleutherodactylus lentus: U.S.V.I.: HASSEL ISLAND. 12 April 1932. C. M. Grant. (MCZ 18776). This island was part of the mainland of St. Thomas until 1865, when a channel was dug connecting St. Thomas Harbor and Gregerie Channel (Gjessing, 1980-1981).

Eleutherodactylus antillensis: B.V.I.: FRENCHMAN'S CAY. 3 April 1982. C. Stoner (MCZ 107344). B.V.I.: GUANA ISLAND. 8 November 1984. T. Giovannone. (MCZ 107528). These are the two smallest (24 and 297 ha, respectively) islands in the British Virgins inhabited by *Eleutherodactylus*.

Hemidactylus mabouia: B.V.I.: JOST VAN DYKE: Great Harbour. 24 July 1984. G. C. Mayer and J. D. Lazell. (MCZ 170885-86). This species was listed from Jost van Dyke by Heatwole et al. (1981) as an unverified literature record. We have not found the prior literature reference, but confirm the species' presence on the island with two juveniles collected from under boards during daylight. Island residents are familiar with the species. B.V.I.: FRENCHMAN'S CAY. 3 April 1984. J. D. Lazell. (MCZ 166967). B.V.I.: BELLAMY CAY. 24 July 1985. G. C. Mayer and E. M. Azevedo. (MCZ 170887).

Sphaerodactylus macrolepis: B.V.I.: CARROT ROCK: Sloane Ghut. 13 July 1985. J. D. Lazell. (MCZ 170890).

Sphaerodactylus parthenopion: B.V.I.: TORTOLA: Zion Hill, ca. 150 m N of jct. with south coast road. 13 June 1980. R. Crombie and G. Pregill. Verified by W. P. MacLean. (USNM 221593).

Anolis cristatellus: PUERTO RICO: ISLA DE CABRAS (= LEPER ISLAND), near San Juan. 7 December 1931. C. Grant. (MCZ 35753). PUERTO RICO: PUNTA SALINAS ISLAND, west of San Juan. January 1932. C. Grant. (MCZ 35929-30). PUERTO RICO: CAYO RATONES, near Jobos. February 1932. C. Grant. (MCZ 35776-85). B.V.I.: SKIPPER CAY, an otherwise nameless cay south of Key Point, Peter Island; cay #1 of Lazell 1983. 13 July 1985. G. C. Mayer and J. D. Lazell. (MCZ 170894-7).

Anolis pulchellus: PUERTO RICO: ISLA DE CABRAS (= LEPER ISLAND), near San Juan. 7 December 1931. C. Grant. (MCZ 36089). B.V.I.: FRENCHMAN'S CAY: Meown, the Dupont-Dean estate at far west end of island. 8 July 1985. G. C. Mayer and N. Stokes. (MCZ 170891).

Anolis stratulus: B.V.I.: FRENCHMAN'S CAY: Meown, the Dupont-Dean estate at far west end of island. 8 July 1985. G. C. Mayer and N. Stokes. (MCZ 170893).

Ameiva wetmorei: PUERTO RICO: ISLA MORRILLITO (= PLATILLO). May 1932. C. M. Grant. (MCZ 36429). The locality is recorded in the MCZ catalogue as "Islet S. of Caja de Muertos Id." This could only refer to Isla Morrillito (see USGS map N1752.5-W6630/7.5, Playa de Ponce quadrangle), also known as Platillo (Schwartz and Thomas, 1975). A second specimen from Isla Morrillito (MCZ 36430) was exchanged to the Museu de Zoologia de Universidade de Sao Paulo. Both specimens are paratypes of *Ameiva wetmorei eleanorae* Grant and Roosevelt, 1932.

Mabuya mabouya sloanii: B.V.I.: GUANA ISLAND. 13 July 1984. G. C. Mayer and J. D. Lazell. (MCZ 166975); 21 October 1984. P. Shelby. (MCZ 170883). B.V.I.: CARROT ROCK: Sloane Ghut. 13 July 1985. J. D. Lazell. (MCZ 170884).

Amphisbaena fenestrata: B.V.I.: GUANA ISLAND. 9 March 1984. J. D. Lazell. (MCZ 166995); 7 November 1984. T. Giovannone.

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Typhlops richardi: B.V.I.: JOST VAN DYKE: Great Harbour. 24 July 1984. G. C. Mayer and M. Gibbons. (MCZ 170892). B.V.I.: GUANA ISLAND. Various dates from March 1982 to November 1984. G. Durrell, J. D. Lazell, L. Jarecki, D. Ford and M. Gibbons. (MCZ 166937-38, 166954, 166980-85).
Epicrates monensis granti: U.S.V.I.: ST. THOMAS: 2V7 Estate Nazareth. January 1984. R. Olive. (MCZ 166976). B.V.I.: TORTOLA: Pockwood Pond. November 1983. N. Grigg. (MCZ 166977). The St. Thomas specimen comes from the eastern end of the island, as do all previous specimens from this island (Nellis et al. 1984). The Tortola specimen is the second recorded from that island, and the first with specific locality data. Mr. Richard Starkey reported seeing boas in his rafters three times in two years at Havers, near Pockwood Pond on Tortola. All specimens and reports of this species with precise locality from Tortola thus seem to come from the more arid parts of the island, west of Road Town. This agrees with Nellis et al.'s finding that the species occurs in the more arid eastern part of St. Thomas.

Since only five specimens were available to Sheplan and Schwartz (1974) in the most recent treatment of this form, we provide in Table 1 morphological data for these two specimens. Sheplan and Schwartz found that the previously known Tortola specimen (the holotype) had the highest number of ventrals and dorsals. The present specimen extends the upper limits for ventrals, subcaudals and midbody dorsals, supporting their suggestion that the Tortola population may prove differentiable from that of St. Thomas. The St. Thomas specimen extends the upper limit of number of tail blotches.

There are some discrepancies between Nellis et al. (1984) and Lazell (1983) regarding the islands on which this species occurs. The following is the basis for records of this species. Museum specimens exist for Tortola and St. Thomas. The record for Guana Island is based on Grant (1932), and supported by descriptions of the morphology and behavior of a snake killed by residents a few years ago. Necker Island and Virgin Gorda are sight records by Dr. John G.H. Smith of Road Town, Tortola, a botanist. Cayo Diablo is a sight record by Richard Thomas (Nellis et al. 1984). For Great Camanoe, a specimen exists and is in the possession of a local resident. A snake very much like the boa has been described to us by Mr. F. Collwood from Jost van Dyke, who kept the specimen for a while in formaldehyde, but it has now apparently been lost.
Liophis (= Alsophis) portoricensis anegadae: B.V.I: GREAT CAMANOE. 11 March 1984. L. Jarecki and J. D. Lazell. (MCZ 166965-66). This is by far the most common snake in the British Virgins; in contrast, *Liophis (= Arrhyton) exiguus* is the common species in the U.S. Virgin Islands (MacLean 1982).

Table 1. Morphological data for *Epicrates monensis granti.* In the first column, the first two rows give MCZ numbers, and the third and fourth rows give lower and upper limits, respectively, from Sheplan and Schwartz (1974). Lengths in millimeters.

	Sex	SVL	Tail Length	Ventrals	Sub-caudals	Dorsals	Body Blotches	Tail Blotches
166976	♀	602	142	263	84	38/43/24	67	23
166977	♂	479	120	271	90	36/48/26	65	22
low				261	80	34/41/23	61	20
high		770		269	84	38/47/31	73	22

ERRONEOUS RECORDS

Anolis pulchellus: U.S.V.I.: ST. CROIX: Christiansted. 5 March 1919. A. Emerson. (AMNH 14051). This species is otherwise unknown from St. Croix, which, though politically part of the Virgin Islands, is on its own island bank separated by deep water from the Puerto Rican Bank, on which all the other Virgins lie. The expedition which collected the specimen had been in St. Thomas the day before, and the specimen's field number is shared with specimens from that island. Although the possibility of human introduction, or even an ill fated natural colonization cannot be ruled out, it is most likely that the locality data became confused.
Anolis sagrei: "PORTO RICO". 1906. W. M. Wheeler. (AMNH 1614). This species is native to Cuba, the Bahamas and several other islands and mainlands in the northwestern Caribbean; it is almost certainly erroneously recorded from Puerto Rico.

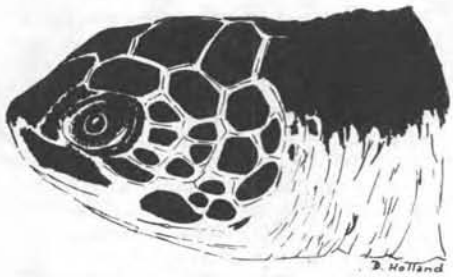
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We are grateful to Ellen Censky of the Section of Amphibians and Reptiles, Carnegie Museum of Natural History, for her excellent work as section editor during the past several years. ●

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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (four issues per year), **Herpetological Review** (four issues per year), and occasional issues of **Facsimile Reprints in Herpetology.** Members may purchase other Society publications at reduced rates.

ANNUAL DUES 1987

Student member	$20.00*	Sustaining member	$50.00*
Regular member	$27.00*	Contributing member	$75.00*
Institutional	$50.00*		

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*All memberships and subscriptions *outside of the U.S.* require either a $5 surcharge to defray additional surface mailing costs or $25 for air mail delivery.

Subscriptions to **Herpetological Review** only are available for $10 per year. Subscriptions *outside of the U.S.* require a surcharge of $2.50 (surface) or $12.50 (air mail). Subscribers to **HR** only are not members of the Society.

Individuals are encouraged to join at the higher membership categories. Money from such support substantially helps promote the publications and services of the SSAR. For information about SSAR membership, write to:

Henri C. Seibert
SSAR Treasurer
Department of Zoological and Biomedical Sciences
Ohio University
Athens, Ohio 45701, USA

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Herpetological Review

Volume 18 December 1987 Number 4

30th ANNUAL MEETING HELD AT HOTEL MOCAMBO, VERACRUZ, VER., MEXICO

The 1987 Annual Meeting of the Society for the Study of Amphibians and Reptiles was held jointly with the Herpetologists' League in Veracruz, Ver. Mexico, 9-14 August. Local Committee Co-Chairmen Richard C. Vogt, Gustavo Casas-Andreu, and Zeferino Uribe hosted a very relaxed, diversified, and informative gathering of herpetologists from around the world at the Hotel Mocambo.

Board of Directors' Meeting

The annual meeting of the SSAR Board of Directors was held on Sunday, 9 August, under the chairmanship of SSAR President Norman J. Scott, Jr. Most Board members were present plus other officers, editors, committee chairs, and guests. The Board met for 8 hours and discussed annual reports submitted by each Society officer, editor, committee chair, and coordinator. The financial status of the Society was felt to be decidedly more secure than last year, and we have significantly reduced our deficit without any need or plans to increase dues. More remains to be done to eliminate the deficit, and Society editors are totally committed to carefully remaining within their budget allocations. Decisions of the Board were announced at the annual Business Meeting of the Society and are described in the following paragraphs.

Business Meeting

A. Call to Order

President Norman J. Scott Jr. called the 1987 business meeting of the Society for the Study of Amphibians and Reptiles to order at 1800 hr on Wednesday, 12 August, in room B of the Hotel Mocambo.

B. President's Report

President Scott announced the Society's deficit reduction plan, and stated that there was no necessity to increase dues. He also stated the commitment of officers and editors to total deficit elimination, and the eventual full restoration of programs curtailed when the Society altered its fiscal year in 1986. He then introduced other officers and editors, or their substitutes, to present reports.

C. Secretary's Report

Acting Secretary George Pisani summarized the report, indicating that the Board had, via mail ballot in the past year, approved the Society's Financial Exigency Guidelines, and also several measures aimed at restricting budget over-runs by the Society's various editors and others with fiscal responsibilities.

D. Treasurer's Report

Treasurer Henri Siebert reaffirmed that there would be no dues increase, and said that the Society is in considerably better shape than this time last year. He said that the Regional Society Affiliate Membership Program had added 42 new members to our ranks, and that 21 persons had taken Life Memberships; he hoped that these trends would continue. He said that the funding level of major Society programs had been somewhat restored, and that this should continue to catch up.

E. Publications Secretary's Report

Kraig Adler, representing Publications Secretary Douglas Taylor, reported that sales from Taylor's office were good, and that this revenue was a major factor in our deficit reduction. There were 102 prepublication orders for *Biologia Centrali-Americana, Reptilia & Batrachia*. The Board was considering reprinting various back issues of society publications, when necessary, at a shop which promised greatly reduced costs. The trade-off was that much scheduling flexibility was needed for printing, but this should not be a problem with back issues.

F. Editors' Reports

1. *Contributions to Herpetology*

Editor Kraig Adler announced that prepublication orders for Number 3 in the *Contributions to Herpetology* series, Jay Savage and Jaime Villa's *Introduction to the Herpetofauna of Costa Rica*, had accounted for about half the press order. Number 4 in the *Contributions to Herpetology* series, *Salamanders of China* by Zhao Ermi and Hu Qxiong, will be published early in 1988. Donations had been received to cover the cost of four color plates. Number 5, Gloyd and Conant's *Snakes of the* Agkistrodon *Complex*, was progressing well, with publication expected in 1989.

2. *Facsimile Reprints in Herpetology*

Editor Kraig Adler announced that *Biologia Centrali-Americana, Reptilia & Batrachia*, will appear in September 1987. Thanks to the generous donations of Ernie Liner, many other individuals, and regional societies, there will be 12 full color plates in the volume. In 1988, the series plans to publish a reprint of Bogert and Del Campo's book *Gila Monster and its Allies* (1956).

3. *Catalogue of American Amphibians and Reptiles*

Editor Jaime Villa announced that the *Catalogue* is on schedule for 1988, and in fact had a three year backlog of accounts. This means that subscribers will receive at least 20 accounts per installment. The comprehensive index is in preparation, with the Caudata and Salientia sections currently in review. Villa presented an informative introduction to desk-top publishing techniques, and indicated how this has been a great asset to SSAR in production of the *Catalogue* for considerably reduced costs. Villa closed by honoring C. J. McCoy with a plaque commemorating his 20-year editorship of the Lacertilia section of the *Catalogue*. McCoy is resigning this position at the close of 1987.

4. *Journal of Herpetology*

Editor Rodolfo Ruibal indicated that the Board had given the *Journal of Herpetology* a budget increase for 1988, and that this would allow the *Journal* to increase slightly the pagination in Volume 22. Louis Guillette, Jr. has replaced Paul Hertz as Associate Editor; David Chiszar and David Crews have been appointed to the Editorial Board.

5. *Herpetological Review*

George Pisani, reporting for Editor Martin Rosenberg, stated that advertising income has risen 31%, and *Herpetological Review* editors are investigating using desktop publishing techniques as a way to increase pagination in the 1988 volume at no increase in cost. This change should allow rapid reduction of the three-year backlog of feature articles, and also should allow resumption of all sections in each issue instead of in alternate issues as now is done. The addition of color to *HR* had been funded by increasing advertising rates. Plans to publish the Cumulative Index have been put on "hold" until manuscript publication has caught up with supply.

6. *Herpetological Circulars*

Number 16 (*Herpetological Collecting and Collections Management*) will be advertised this Fall. The next title in the series is *An Annotated Field List and Guide to the Amphibians and Reptiles of Monteverde, Costa Rica.*

G. Committee Reports

1. Conservation Committee

President Scott called Committee Chair Bill Brown to the lectern. Brown summarized the Committee's work during the year by reporting that *Pseudemys alabamensis* had been federally listed as Threatened, as had the western populations of *Gopherus polyphemus*. The Committee had not supported listing *Trachemys scripta elegans* in CITES Appendix II, and this had not been done. The Committee's recommendation that the proposed Stacy Dam project (Texas) be halted because of its severe impact on habitat of the Threatened Concho Watersnake (*Nerodia harteri paucimaculata*) had been disregarded by the Corps of Engineers and the US Fish and Wildlife Service. A subcommittee chaired by Tom R. Johnson had compiled a list of monetary values for amphibians killed in environmental accidents. The document is comparable to one which has already been prepared for fishes. Two resolutions would be presented as joint SSAR and HL resolutions at the closing banquet. They support acquisition and conservation of sea turtle nesting beaches by the State of Florida, and a call for the Georgia legislature to prohibit gassing of gopher tortoise burrows as a means of removing venomous snakes.

2. Meeting Sites Committee

President Scott announced that SSAR has accepted an invitation from the University of Michigan to participate in a three-way meeting of SSAR, the Herpetologists' League, and the American Society of Ichthyologists and Herpetologists in Ann Arbor in 1988. Dates for the meeting are 23-28 June, with field trips scheduled for the 29th. The Society's 1989 annual meeting will be held in conjunction with the World Congress of Herpetology.

3. Grants-in-Herpetology

Dale Belcher announced the Grants-in-Herpetology awards for 1987. **Graduate Student Herpetological Research:** John W. Beck, Jr. (University of Miami) "An investigation of the apparent competitive exclusion or reduction of the native Green Anole *Anolis carolinensis* by the introduced Brown Anole *Anolis sagrei* in nonwetlands habitat in southern Florida;" and Diana K. Hews (University of Texas at Austin) "Experimental analysis of resource defense, sexual selection and the potential evolution of phenotypic traits in a terrestrial lizard." Because of budget restrictions for 1987, this was the only category in which awards were made. The amount budgeted for 1988 awards has been increased, and the Chairman encouraged donations to this Society program.

4. Kennedy Award

Chairman J. Eric Juterbock announced that Mark P. Hayes (US Fish and Wildlife Service) and Mark R. Jennings (University of Arizona, Tucson) had been chosen as the winners of the 1987 Kennedy Award. Their article on decline of ranid frog species was chosen as the best student authored paper or note published in the *Journal of Herpetology*. Three papers and four notes were considered by the Committee.

5. Nominating Committee

Nominating Committee Chair Kraig Adler presented the following candidates for Society office in 1988; the slate had been approved by the Board of Directors. **President-Elect:** Richard R. Montanucci and Henri Siebert. **Secretary:** James S. Jacob (unopposed). **Treasurer:** Douglas H. Taylor (unopposed). **Director (Regular, USA):** J. Eric Juterbock and Ernest A. Liner. **Director (Regional Society Representative):** Harold DeLisle and Martin J. Rosenberg. President Scott called for nominations from the floor. No further nominations were made and George Pisani moved that nominations cease. The motion was seconded by Dale Belcher and approved by a voice vote. A ballot will be sent to all active members by first-class mail.

6. Resolutions

Whereas Georgia Game and Fish Law 27-1-30 makes it unlawful to use chemicals, devices or smokers of any kind in order to drive wildlife from dens, holes, or their other homes, "... provided that this Code section shall not apply to poisonous snakes"; and,

Whereas research on the effects of "gassing" gopher tortoise burrows has shown the practice to be harmful to protected species such as the gopher tortoise, eastern indigo snake and other regular inhabitants of tortoise burrows, and is nonselective for poisonous snakes; and,

Whereas most persons who "gas" and excavate tortoise burrows to drive out poisonous snakes do not have the expertise or means to determine whether poisonous snakes are the sole inhabitants or whether they cohabit the tortoise burrow with protected species; and,

Whereas federal and other state fish and wildlife agencies with jurisdiction over gopher tortoises and their habitats have recognized these facts by banning the practice of "gassing" and excavating tortoise burrows to remove poisonous snakes; therefore,

Be it resolved that the Society for the Study of Amphibians and Reptiles and the Herpetologists' League at their joint annual meeting for 1987 in Veracruz, Mexico respectfully urge the Georgia Department of Natural Resources to remove the exemption allowing the use of chemicals to remove poisonous snakes from burrows.

Be it further resolved that copies of this resolution be sent to the Commissioner of the Georgia Department of Natural Resources, the Executive Director of the Georgia Conservancy, Inc., and the President of the Georgia Wildlife Federation.

Whereas the loggerhead sea turtle (*Caretta caretta*) is a federally protected "Threatened" species in the USA, and the Florida population of the green turtle (*Chelonia mydas*) is federally classed as "Endangered," and,

Whereas some of the most important nesting habitat for these species in the Western Hemisphere, collectively known as "Brevard Turtle Beaches" and "Wabasso Beach," additionally provide critical habitat for the gopher tortoise (*Gopherus Polyphemus*), the eastern indigo snake (*Drymarchon corais couperi*) and the leatherback turtle (*Dermochelys coriacea*); and,



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Whereas these beaches and adjacent habitats have been proposed for acquisition by Florida's Conservation and Recreation Lands Program to preserve them from the threats of development or agriculture, which have extensively destroyed similar habitats worldwide; therefore,

Be it resolved that the Society for the Study of Amphibians and Reptiles and the Herpetologists' League give their highest endorsement of the conservation of these lands, and encourage the CARLS Program to give highest priority to the preservation of these lands and the fauna and flora dependent upon them.

Whereas the Society for the Study of Amphibians and Reptiles and the Herpetologists' League were most distressed at the serious medical condition which has struck Local Committee member Ruebén Castro Franco; therefore,

Be it resolved that said societies sincerely wish Sr. Franco a speedy and complete recovery.

Be it further resolved that said societies similarly wish Ms. Dawn Wilson speedy recovery from her operation.

Whereas the Society for the Study of Amphibians and Reptiles and the Herpetologists' League have held their first non-USA annual meeting in Veracruz, Mexico; and,

Whereas several hundred intrepid herpetologists and their guests elected to brave the rigors of microbial succession and overexposure to excellent cuisine, archaeological adventures and other field trips, sun, sand, and cool breezes—and, oh yes, also paper sessions; and,

Whereas these assembled persons have had a splendid and productive time in Mexico; therefore,

Be it resolved that the Society for the Study of Amphibians and Reptiles and the Herpetologists' League jointly express their most sincere thanks and appreciation to Richard C. Vogt, Gustavo Casas-Andreu and Zeferino Uribe, our hosts; to the Instituto de Biologia de la UNAM and the Comité Nacional de Herpetologia, institutional sponsors of this meeting; to all members of subcommittees who have worked so hard, especially Claudia López C. and Elisabeth Arevalo, who have taken extra time to assist those of us illiterate in Spanish; and to the fine staff of Hotel Mocambo for their excellent service throughout this event.

Whereas several persons have generously given their time and effort to advance the goals of the Society for the Study of Amphibians and Reptiles during 1986; and,

Whereas the Society hopes that by lauding them here it may encourage them to do so again at some future time; therefore,

Be it resolved that the Society for the Study of Amphibians and Reptiles expresses its most sincere thanks to the following individuals:
Sherman A. Minton, President
George R. Pisani, Immediate Past President
Timothy R. Halliday, Director
Alan H. Savitzky, Director
Stephen G. Tilley, Editor, *Catalogue of American Amphibians and Reptiles*
Hugh R. Quinn, Chair, Nominating Committee
Richard A. Sajdak, Chair, Zoo Liaison Committee
Ray E. Ashton, Jr., Chair, Regional Society Liaison Committee

H. Transfer of Gavel and Adjournment: President Scott asked if there was any further business. There being none, Scott asked President-Elect Quinn to come forward and accept the SSAR gavel as a symbol of the transfer of the Presidency which will officially take place on 1 January 1988. Quinn thanked Scott, and moved (George Pisani seconded) that the meeting be adjourned. The motion passed by voice vote, and President-Elect Quinn declared the meeting closed at 1845 hr.

Respectfully submitted,
George R. Pisani
Assistant Secretary ●

Announcing a New Book . . .

The long awaited book on the amphibians and reptiles of Missouri is now available. *The Amphibians and Reptiles of Missouri* contains up-to-date information on the identification, distribution, natural history and status of the 107 species of amphibians and reptiles native to Missouri. The book contains 368 pages, 258 color photos, 109 maps, keys to adult amphibians and reptiles, a guide to selected tadpoles and an extensive bibliography. This will be a welcome addition to anyone's library.

The Amphibians and Reptiles of Missouri is authored by Tom R. Johnson, herpetologist for the state of Missouri and published by the Missouri Department of Conservation (1987).

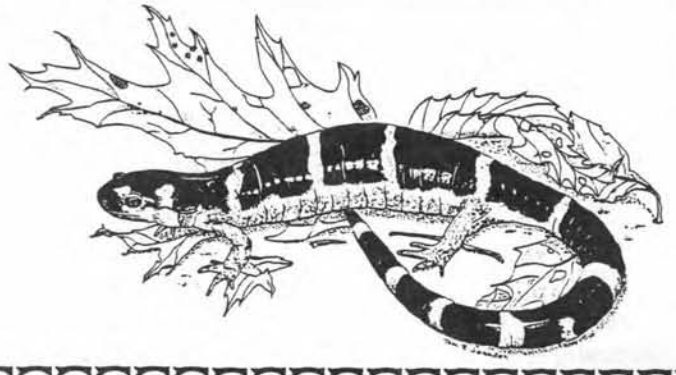
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Missouri Department of Conservation
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Jefferson City, Missouri USA
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Payment for all foreign orders must be in U.S. currency. Make check or money order payable to: Missouri Department of Conservation. Prices include postage for orders within the U.S.; Canadian and Mexican orders add $3.92. All other foreign orders add $12.00.



SSAR COMMITTEES FOR 1987-1988

Following the Veracruz meeting, President Norman Scott, Jr. appointed the following committee chairs and coordinators for the current year to report to the Board at the Ann Arbor meeting in 1988. Individuals with important matters pertaining to the activities of the Society committees should contact the relevant committee chair. Addresses for the committee chairs are included in the inside rear cover of each issue of *Herpetological Review*. A listing of committee members will appear in the March issue.

Conservation: Nat B. Fraser
Grants-in-Herpetology: Thomas H. Fritts
Kennedy Student Award: Eric Juterbock
Long-range Planning: James L. Christiansen
Meetings: Henry R. Mushinsky
Nominating: George Pisani
Regional Society Liaison: Stephen H. Hammack
Zoo Liaison: Donal Boyer
Common and Scientific Names Coordinator: Joseph T. Collins
Translations Coordinator: Robert D. Aldridge

●

SSAR ELECTIONS

Ballots were mailed without the return envelopes mentioned on the ballot. George Pisani, SSAR Elector, wishes it to be known that all original ballots sent in any sort of envelope were counted. ●

CAAR ACCOUNTS AVAILABLE

The **Catalogue of American Amphibians and Reptiles** is celebrating its 25th year of service to the herpetological community. The catalogue committee seeks to assign remaining open accounts for species native to the United States. The following lizard accounts are still available:

Callisaurus draconoides
Cnemidophorus burti
Cnemidophorus exsanguis
Cnemidophorus flagellicaudus
Cnemidophorus gularis
Cnemidophorus hyperythrus
Cnemidophorus inornatus
Cnemidophorus laredoensis
Cnemidophorus marmoratus
Cnemidophorus sexlineatus
Cnemidophorus sonorae
Cnemidophorus tigris
Crotaphytus collaris
Crotaphytus insularis
Eumeces fasciatus
Gerrhonotus liocephalus
Gerrhonotus panamintinus
Holbrookia maculata
Phrynosoma platyrhinos
Sceloporus clarki
Sceloporus cyanogenys
Sceloporus jarrovi
Sceloporus poinsetti
Sceloporus scalaris
Uta stansburiana
Xantusia riversiana

The **Catalogue** is also actively seeking persons interested in preparing accounts for species native to the remainder of the Western Hemisphere, as well as accounts for genera and families. Most such lizard accounts remain open. Persons interested in preparing any of the above-listed accounts, or seeking additional information, should contact the Sauria Editor, Dr. Andrew H. Price, Texas Natural Heritage Program, Texas Parks & Wildlife Department, 4200 Smith School Road, Austin, Texas 78744, USA ●

THANKS TO REVIEWERS

The editor would like to acknowledge the following individuals who reviewed manuscripts for *HR* during the past year. Their service to the Society is greatly appreciated.

R. Adams
K. Adler
S. Aird
R. Aldridge
R. Axtell
G. Balasz
K. Berry
W. Brown
S. Busack
J. Caldwell
D.R. Clark
J.T. Collins
R. Conant
W. Cooper
C.K. Dodd
W. Dunson
Z. Ermi
J. Ferner
H. Fitch
R. Franz
P. Freed
N. Ford
R. Funk
J.W. Gibbons
R. Gibson
J. Gillingham
S. Gorzula
T. Graham
P. Gregory
J. Groves
R. J. Hall
G. Hearns
J. Huheey
R. Inger
J. Kushlan
R.L. Lardie
J. Losos
R.A. Luckenbach
W. Magnusson
C. J. McCoy
H.S. McDonald
R. Mount
C. Myer
H. Mushinsky
S. Nyman
M. Paulissen
D. Pettus
B. Pierce
F.H. Pough
H.K. Reinert
R. Ross
M. Seidel
M.A. Shields
M. Stark
S. Stoneburner
S. Sweet
I. Swingland
A. Taub
S. Tilley
S. Trauth
L. Vitt
R. Ward
P. Weatherhead
G.J.W. Webb
R. Zweifel
N. Zucker

●

EXHIBITORS WANTED FOR 1988 JOINT HERPETOLOGY/ICHTHYOLOGY MEETING

The 1988 SSAR meeting will be held jointly, at the University of Michigan, with the Herpetologists' League, the Early Life History Section of the American Fisheries Society, the Elasmobranch Society, and the American Society of Ichthyologists and Herpetologists, on the occasion of the 75th anniversary of the founding of *Copeia*, the journal of the ASIH. The local committee for this meeting is in the process of contacting possible exhibitors. Any individual or organization is welcome to display herpetologically-oriented material (except live animals). The following information may be useful to potential exhibitors.

Registrants: Biologists, college professors, zoo and museum personnel, state and federal wildlife officials, graduate students in biology and serious lay persons with interests in amphibians and reptiles.

Previous exhibitors: Publishers, used-book companies, biological supply companies, manufacturers of animal collecting and housing equipment, artists (with animal themes), tee-shirt sellers, and travel services.

Cost: $100 for each table (ca. 4x6 feet). Artists who sell materials created by themselves will be charged $100 or $50 in donated arts or crafts; such persons are expected to be actively engaged in their work at the exhibit area. Other exhibitors may also donate $50 worth of goods in lieu of the table rental fee.

Exhibitors (or commercial organizations which will not have exhibits at the meeting) are also invited to place advertisements in the meeting program booklet. Full page, copy ready ads will cost $125; smaller ads will cost proportionately less.

For exhibit applications or further information, contact G. R. Smith, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109, USA. (313) 764-0491. ●

DOCTORAL FELLOWSHIPS AT THE UNIVERSITY OF SOUTHWESTERN LOUISIANA

The Department of Biology at U.S.L. will offer three doctoral fellowships for students entering the doctoral program in August, 1988. One or more of these fellowships can be used to support students in the field of *herpetology*. Each fellowship has a life-span of three years (for students entering with a master's degree) or four years (for students with a bachelor's degree), and each carries a minimum stipend of $12,000 per year with waiver of tuition and fees. Also, each fellow will receive $500 per year for travel to scientific meetings and $2,000 per year for research expenses; supplemental research funds may be supplied by the Department of Biology, the Graduate Student Organization, and faculty grants. Because fellowships are duty-free, fellows can devote full time to course work and research. Current research in herpetology in this department emphasizes (but is not confined to) evolutionary morphology (Dr. James Jackson) and amphibian behavioral ecology (Dr. Robert Jaeger). For further information and application forms, write to Dr. Jackson or Dr. Jaeger at:

Department of Biology
The University of Southwestern Louisiana
Lafayette, LA 70504
or phone (318) 231-6748

NEWSNOTES

VOLUNTEER PROGRAM AT AMNH SOUTHWESTERN RESEARCH STATION

Approximately 20 volunteer positions are open in 1988 at the Southwestern Research Station of the American Museum of Natural History in Portal, Arizona. The volunteer program is run annually and offers students in the biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging at the Station are provided to volunteers in exchange for four hours per day of routine work chores, with the remaining time available for research activities.

Volunteers are needed between 10 March and 1 December and are appointed for part of this period, with a minimum appointment of six weeks. Faculty knowing of promising students should alert them to this opportunity for professional experience toward, development of, and evaluation of their career goals.

Applicants for positions from March through May should submit forms by 15 February, summer volunteers, June through September, by 1 April. The program is open to both undergraduate and graduate students, who may pursue their own research projects.

For application forms, write: Resident Director, Southwestern Research Station of The American Museum of Natural History. Portal, Arizona 85632, USA. (602) 558-2396. ●

SUMMER COURSE ON AMPHIBIAN LARVAL BIOLOGY

An intensive, two-week summer course on "Amphibian Larval Biology" will be offered at the Highlands Biological Station in the Blue Ridge Mountains of southwestern North Carolina during the period 6-17 June 1988. Instructors will be Richard Wassersug (Dalhousie University), H. Bradley Shaffer (University of California, Davis), and James Hanken (University of Colorado). The course will include lectures, laboratories, field studies, and individual student projects. Among topics to be covered are study and identification of local larvae, morphology, ecology of amphibian larvae, evolution of complex life cycles and metamorphosis, and feeding behavior.

Credit for the course (three semester hours) will be available through either Western Carolina University or the University of North Carolina at Chapel Hill. The course may be taken without credit. For further information and application forms write: Highlands Biological Station, P.O. Box 580, Highlands, North Carolina 28741, USA. ●

THE FROGS OF BORACEIA, BRAZIL

Recordings of 34 of the 64 described species known from the Boracéia field station in the Atlantic Forests of southeastern Brazil are now available on cassette tape. The tape was made in conjunction with preparation of the forthcoming publication, *Frogs of Boracéia*. The recording will not be distributed with the publication and must be purchased separately.

The cost per cassette is $5 US, including postage and handling. Make check or money order out to: Smithsonian Institution and send order to:

Frogs of Boracéia Recording
Amphibians and Reptiles
NHB Stop 162
Smithsonian Institution
Washington, D.C. 20560 USA ●

BOOKS AND JOURNALS SOUGHT FOR WILDLIFE MANAGEMENT PROGRAM IN COSTA RICA

The Environmental Sciences School of the National University of Costa Rica is setting up the first graduate wildlife management program in Latin America with assistance from World Wildlife Fund-US (WWF-US), United States Fish and Wildlife Service, International Affairs Office (USFWS) and the Organization of American States (OAS), among other organizations. The program, which is structured similar to a North American graduate program and leads to a Master's Degree in Wildlife Management, was initiated in February 1987 with 12 students from Central and South America.

Emphasis is broad based and focuses on endangered, non-game, cynegetic, and pest species, management of genetic resources and systems in tropical environments. Students work closely with human communities and government organizations during their three year training period.

A Wildlife Resource Documentation Center is planned to complement the Master's Degree Program. This is to serve not only the graduate students and staff at the University as a reference library but will also offer a much needed extension service to those biologists and administrators responsible for the research, management and conservation of wildlife resources in Latin America, especially in the region of Central America and the Caribbean.

Over the past two years the program has been able to accumulate a respectable collection of wildlife related materials that presently includes nearly 300 book titles, over 5,300 reprints, approximately 700 non-periodical documents, and incomplete collections of 17 scientific journals. In spite of these efforts, the center remains weak in the herpetological field. The coordinators of the program ask members of the Society for the Study of Amphibians and Reptiles for donations of books or back issues of journals to help correct this unfortunate situation. Donations should be sent in boxes weighing less than 40 pounds to Herb Raffaele, Office of International Affairs, U.S. Fish and Wildlife Service, Washington, D.C. 20240, USA. All donations will be formally acknowledged by the wildlife program.

CHRISTOPHER VAUGHAN
University Coordinator
and
STEPHEN E. CORNELIUS
Regional Coordinator
Escuela de Ciencius Ambientales
Universidad Nacional
Heredia, Costa Rica ●

CLEMMYS GUTTATA RESEARCH

Our local unit of government in Northern Illinois is involved with research/management with the only known extant Illinois population of *Clemmys guttata*. We are seeking to communicate with individuals, groups, organizations or societies involved with research, management or conservation biology of this species.



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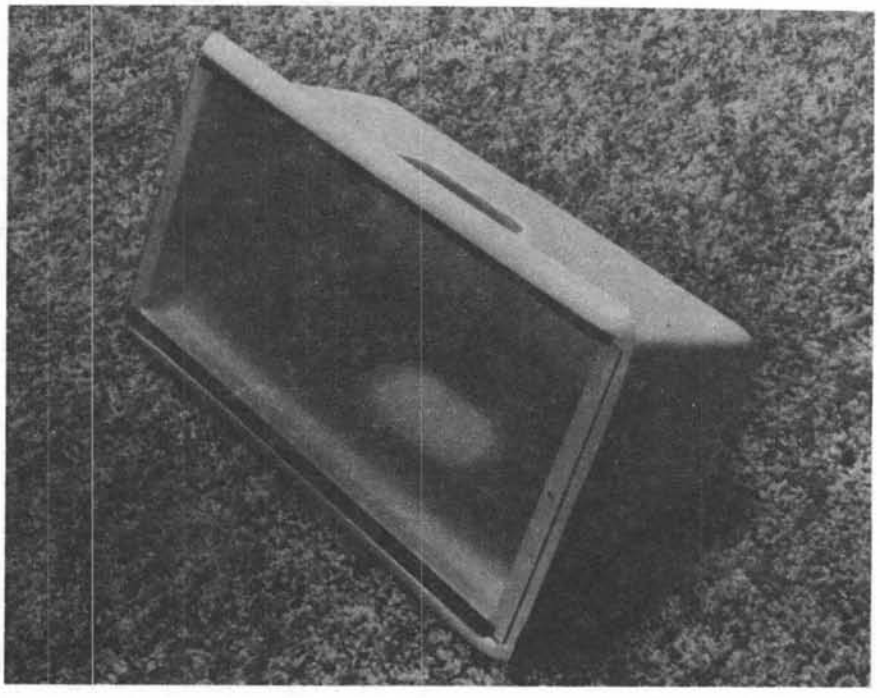
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MEETINGS

BRITISH HERPETOLOGICAL SOCIETY LONDON MEETINGS 1988

Meetings are held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1, and start at 7:00 pm, ending at 9:00 pm, unless indicated otherwise. For further details and membership, please write to BHS, c/o Zoological Society of London, Regent's Park, London NW1 4RY, U.K. As always, SSAR members and other North American-based herpetologists visiting or passing through London are most welcome.

March 3 - Jonathan Wright: Population Ecology of Two Mediterranean Tortoises in Northern Greece - Account of a Joint Universities Expedition, 1985.

March 29 - A.G.M. (see separate Agenda), followed by Peter Curry: A Case for Captivity.

April 27 - Dr David J. Bullock: Herpetofauna of The Northern Mauritian Islands (Indian Ocean).

May 26 - David Risley: Captive Breeding of Reptiles in The London Zoo.

July 6 - *Amphibia and Reptilia Worldwide: Their Care and Breeding.* A discussion organized by the Captive Breeding Committee (Chairman: Mike Linley). Members are encouraged to bring live animals, preserved specimens, amphibian voice recordings and 35 mm colour slides for display and to illustrate discussions.

September - *Care and Breeding of Amphibians and Reptiles: An Open Meeting.* Contributions from members - live animals, slides, etc. There will be facilities for the sale and exchange of members' private home-bred stock. Saturday date and venue to be arranged.

October 13 - Talk to be arranged, hopefully Paul Edgar, on the herpetofauna of Indonesia.

November 30 - Mike Linley will show some herpetological films not previously screened by Anglia TV. Date to be confirmed.

Please note that *the Herpetological Journal*, the Society's newly-named scientific publication, now publishes mini-reviews, short notes with a single data set, and from December 1987 short articles on contentious or generally controversial matters in herpetology. Mini-reviews are normally solicited by the Editor (Dr T.J.C. Beebee, School of Biology, University of Sussex, Falmer, Brighton BN1 9QG, U.K.). ●

SYRACUSE CONFERENCE TO ADDRESS ECOSYSTEM MANAGEMENT

The State University of New York College of Environmental Science and Forestry (ESF) will host a conference on ecosystem management titled "Rare Species and Significant Habitats" on 6-9 June 1988.

The conference will be held in conjunction with the 15th Annual Natural Areas Conference and the 10th Annual Meeting of the Natural Areas Association. Co-sponsors of the conference include the Natural Areas Association, the New York State Museum, the New York State Department of Environmental Conservation Divisions of Fish and Wildlife and Lands and Forests, the New York State Office of Parks, Recreation and Historic Preservation, and The Nature Conservancy of New York.

The conference aims to promote sensitive management of rare species and significant habitats through a forum allowing botanists, zoologists, ecologists and natural resource managers to share their research findings, experiences and viewpoints. The conference will provide a unique opportunity for interaction between scientists and managers through papers, poster sessions, field trips and workshops.

For more information on the conference, contact Dr. Donald J. Leopold, 333 Illick Hall, State University of New York College of Environmental Science and Forestry, Syracuse, New York 13210, USA. ●

CALL FOR PAPERS

The 12th Annual International Herpetological Symposium on Captive Propagation and Husbandry will take place on 15-18 June 1988 in the New York-New Jersey Metropolitan

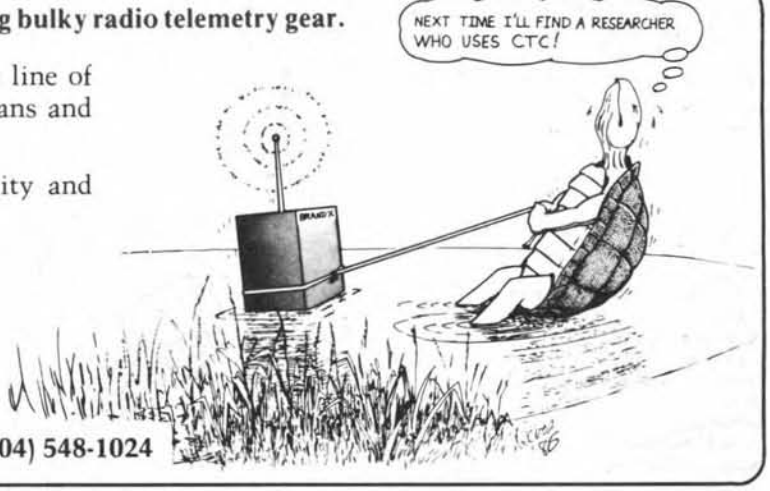
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area. The exact location will be announced shortly.

Abstracts and titles for papers to be presented at this meeting must be submitted by 28 February 1988. A copy of *Guidelines for Abstracts and Papers* may be obtained from: Brian P. Backner, 17 Margaret Road, Sharon, Massachusetts 02067, USA (617-784-7264) or Brett C. Stearns, 2442 Sharon Oaks Drive, Menlo Park, California 94025, USA (415-854-2099). For general information contact Michael J. Uricheck, Department of Chemistry, Western Connecticut State University, Danbury, Connecticut 06810, USA (203-797-4232 or 203-754-6839). ●

AUSTRALIAN SOCIETY OF HERPETOLOGISTS ANNUAL MEETING 1987

The Australian Society of Herpetologists held its 17th annual meeting on February 13 to 15, 1987, at Edrom Lodge near Eden, New South Wales. The venue was idyllic - an old mansion set in delightful gardens and bushland, 100 metres from a superb beach on Twofold Bay. The warm weather encouraged aquatic activities by the conference participants between formal sessions, and there were probably as many herpetological conversations in the blue Pacific as in the seminar rooms.

Twenty-four papers were presented at the meeting, and about 50 people attended. There was a far greater concentration on ecology (rather than taxonomy, morphology or physiology) and on reptiles (rather than frogs) than has been evident at most previous meetings. David Slip (University of Sydney) won the major student prize for his presentation on ecology of diamond pythons; other student awards went to America Cuff (Macquarie University) for work on environmental sex determination in crocodiles, and to Darryl Houston (University of Sydney) for ecological studies on acrochordid snakes.

The business meeting considered several issues. The society's policy statement on conservation was formally ratified, and new office-bearers elected (President - Dick Barwick; Vice-president - John Coventry; Secretary-treasurer - John Wombey; Public Officer - Ric Longmore; Councilor - Rick Shine). The next A.S.H. meeting has been tentatively scheduled for the third week of August 1988, at the Queensland Museum in Brisbane. Overseas herpetologists are welcome to attend.

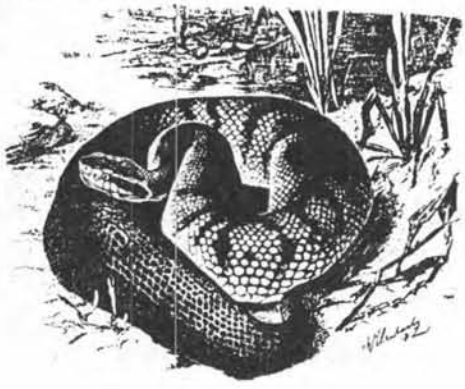
A full list of authors and titles at the 1987 meeting is given below:

Stephen Morton and *Craig James:* "Diversity of Australia's arid zone lizards: A reappraisal."
Richard Shine: "Ecological causes for sexual dimorphism in snakes."
David Slip: "Ecology of diamond pythons: a brief overview."
Rodney Kennett and Arthur Georges: "Growth and reproduction of *Chelodina longicollis.*"
Darryl Houston: "Where have all my filesnakes gone?"
David Slip, Richard Shine and Richard Braithwaite: "A radiotelemetric and population ecology study of water pythons, *Liasis fuscus.*"
David Carter: "Ecology of the Lace Monitor: Pre-PhD ideas."
Murray Littlejohn and G. Watson: "*Litoria ewingi* in New Zealand: A preliminary analysis of the structure of advertisement calls."
David Choquenot and Allen Greer: "Intrapopulational and interspecific variation in limb and presacral vertebrae configuration in the genus *Hemiergis.*"
Glen Shea: "Ontogenetic changes and species differences in the dentition of Bluetongue lizards (*Tiliqua*)."
Richard Shine and *Robert Lambeck:* "Why does the frillneck lizard have a frill?"
Terry Annable: "Sloughing behaviour of *Underwoodisaurus milii* in captivity."
Harry Ehmann: "Post-oviposition egg care by skinks."
Gregory Mengden: "Phylogeny of pythons."
Elizabeth Yeatman: "Ecology of *Tiliqua.*"
John Gee: "Subsurface buoyancy control by the sea snake *Pelamis platurus.*"
Harold Heatwole and William Dunson: "Blood and plasma volumes and hematocrits of some marine snakes."
Arthur Georges: "Nesting ecology of the pig-nosed turtle *Carettochelys insculpta.*"
Michael Thompson. "Nesting ecology and egg physiology of Tuatara, *Sphenodon punctatus,* on Stephens Island, New Zealand."
Linda Schwarzkopf and R. Brooks: "Nest site selection and offspring sex ratio in painted turtles (*Chrysemys picta*)."
America Cuff: "Environmental sex determination of the saltwater crocodile *(Crocodylus porosus).*"
Richard Longmore: "Atlas of Elapid snakes of Australia. A concept - a product."
Garry Webb: "The impact of various logging treatments on lizards of a montane eucalypt forest."
Daniel Lunney, Peggy Eby and Michael O'Connell: "Changes in reptile populations in Mumbulla State Forest, near Bega, NSW, following logging, fire and drought."

RICHARD SHINE
University of Sydney ●

ANNUAL ASC MEETING

The Association of Systematics Collections (ASC) will hold its Annual Meeting at the Field Museum, Chicago, Illinois, 11-13 May 1988. An all-day workshop on *Living Collections,* on 13 May, will include representatives from museums, zoos, aquaria, gardens, culture collections, NSF, and NIH. On 12 May there will be a workshop on *Endangered Collections.* For further information contact: The Association of Systematics Collections, 730 11th Street NW, 2nd Floor, Washington, D.C. 20001. (202) 347-2850. ●



FEATURES

THE SIN OF ANECDOTAL WRITING

An anecdote is defined as a short account of an interesting or humorous incident. The word is derived from Greek, *anekdota,* "things unpublished." Nevertheless, published writings about animals have often consisted of anecdotes. Increasing pressures on modern-day authors, reviewers and editors to avoid unnecessarily lengthy, rambling or unfocused accounts, and to achieve maximum economy in publishing results of research have caused anecdotal writing to fall into ill repute. A statement by a reviewer that a manuscript offered for publication is anecdotal has become a severe condemnation. It makes no difference (to some reviewers, at least) whether the "anecdote" is a humorous account relating how the author missed sleep on his last field trip, or instead describes previously unobserved aspects of a species' life history. Any sort of narrative is equated with an anecdote, and a single sentence mentioning time and place of a specific incident can be cause for the entire paper to be branded as anecdotal, with the implication that it is, therefore, unsuited for publication.

Admittedly, there are anecdotes that add nothing to the scientific merit of a paper; some may inject a touch of humor, and some may only amount to "padding." Nevertheless, I contend that narrative accounts of rarely observed events in species' life histories sometimes have much merit and value. On the University of Kansas Natural History Reservation where 37 species of amphibians and reptiles are known to occur, I have spent 37 consecutive years of field work, yet I have observed the complete sequence of courtship and copulation in only 14% of the resident species. Likewise, I have observed the sequence of stalking, capture and eating of prey in just 14% of the species, not all the same as those of the first group. I cite these figures to make the point that even routine occurrences in the lives of amphibians and reptiles easily escape attention because of secretive habits. When an observer is fortunate enough to see and record behavior significant in the natural history of a species, his observations should be published. The advocates of biometrical methods need to recognize that some types of behavior are not readily quantified because they are so rarely observed. Even a single observation may constitute a valuable contribution, and may be a break-through in understanding the species' ecology. There are many kinds of anecdotes, and the fact that some are trivial is a poor excuse for condemning all narrative statements or accounts in scientific writing.

HENRY S. FITCH
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HERPETOLOGICAL HUSBANDRY

See Herp. Review 18(1) for author's instructions.

FEEDING BEHAVIOR OF A FALSE CORAL SNAKE, *Pseudoboa neuwiedii*

An adult female *Pseudoboa neuwiedii* was collected near Cartagene, Colombia on 28 December 1985. The snake has been maintained in a 30 l aquarium in about 15 cm of soil in the museum facilities in Madrid, Spain since 6 January 1986. Room temperature ranged from 16-30° C; water and refuge have always been available.

During the first three weeks of captivity the snake refused a variety of prey such as frogs, lizards, eggs, earthworms and insects. It was finally force-fed with fresh beef.

The snake began feeding voluntarily on live *Blanus cinereus* on 8 March 1986. The next ingestions of *Blanus cinereus* occurred on 12 and 24 April, 4 and 18 May, 9 and 20 June, and 3 July.

The behavior of the snake was always the same: As soon as it recognized the *Blanus* it quickly struck it in the middle of the body and did not release its hold despite the vigorous efforts of the victim to escape. In some instances the snake was firmly held by the jaws of the *Blanus*. After ca. 15 min. the *Blanus* would cease to struggle. Swallowing was completed in an additional five min, with the head being ingested first.

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TECHNIQUES

PHOTOGRAPHS AND DENTAL CASTS AS PERMANENT RECORDS FOR AGE ESTIMATES AND GROWTH STUDIES OF TURTLES

Permanent physical records of the surface details of turtle scutes can provide a variety of information unavailable through either field observations or by killing individuals to obtain long bones or the carapace. Several forms of permanent records of the topography of carapacial or plastral scutes, including photographs (Moll and Legler 1971, Dobie 1971), photocopies (J. W. Gibbons, pers. comm.), and graphite rubbings (Moll and Legler 1971), have been used for age estimation or individual identification.

Physical records have a distinct advantage over field measurements, as repeated measurements are easily made in the laboratory, and new measurements are possible any time after the records have been made. In addition, direct comparison of scute surface details from the same individual in different years is possible with detailed records. Two types of physical records facilitate estimates of age and growth in turtles. Black and white photographs may be taken of the surface of the fourth vertebral scutes of adult and juvenile turtles and dental casts of the fourth vertebral scutes can be made. Below we describe both techniques, and evaluate the records in terms of detail, distortion, and cost.

PHOTOGRAPHIC TECHNIQUE

The objective of photographing surface details on carapacial scutes was to provide permanent records of the growth lines of individuals. A scale was included in each photograph, so that measurements could be made from finished prints. Fine-grain film (Ilford FP11 or Kodak Plus-X-Pan black and white print film) allowed enlargement for measurement and counting. The distance (45 cm) and angle (90°) from lens to turtle were standardized. Prior to field photography, several test exposures were made and developed immediately. A 35 mm SLR camera with macro-lens was positioned to fill the viewfinder with the fourth vertebral scute, and an adjacent ruler. The flash was positioned to throw highlights off otherwise dark relief features. A slight overexposure (for neutral gray) was required to capture details of surface relief on the dark carapace. The exposures were bracketed a full stop either side of the exposure that gave good results in the laboratory.

Turtles were restrained (Galbraith and Brooks 1983), and the region of the turtle's carapace to be photographed was cleaned of algae and dirt by gentle scrubbing with mild detergents using a plastic sponge or brush.

DENTAL CAST TECHNIQUE

The objective in making casts was to provide fine-resolution permanent records of details on portions of the turtles' carapaces, independent of the photographs. The prime requisites were speed, inexpensive materials, safety for the animals, and lack of distortion.

Casts required making a negative mold directly from the object being modelled (Fig. 1), and then casting the finished positive from the mold (Fig. 2). Very finely resolved molds have been made for paleontological purposes using latex rubber, but these are expensive and require many hours for the mold to set and cure (Baird 1955). The most common material for dental casts is alginate, an inexpensive, non-toxic powder that gels quickly after being wetted (Coe Alginate, Coe Laboratories, Inc. 3737 West 127th Street, Chicago, Illinois 60658 USA).

To make a cast, the turtle was restrained and the fourth vertebral scute was cleaned as for the photographs. All detergent was thoroughly rinsed away to avoid contaminating the alginate. The soft, gelatinous alginate required support during setting and after gelation to avoid distortion. 'Mother molds,' perforated plastic plates or as rough molds made previously out of dental stone (Vel Mix Stone, Sybron/Kerr Products, 28200 Wick Road, Romulus, Michigan 48174 USA) effectively supported the alginate (Fig. 1). The surface of the carapace to be modeled was wetted before molding. Setting time of the mold generally required less than five minutes.

Once the alginate mold had set, it was removed from the carapace and rinsed with clean water. The finished positive was then made using the liquid dental stone (Fig. 2).

EVALUATION OF THE TECHNIQUES

To assess agreement between measurements made in the field and on photographs and casts, the length of the fourth vertebral scute was measured by hand-held caliper in the field on 46 adult and juvenile snapping turtles in 1984. The same measurement was repeated blindly from photographs and from casts from the same individuals later in the laboratory. On average, the difference between field measurements and photographs

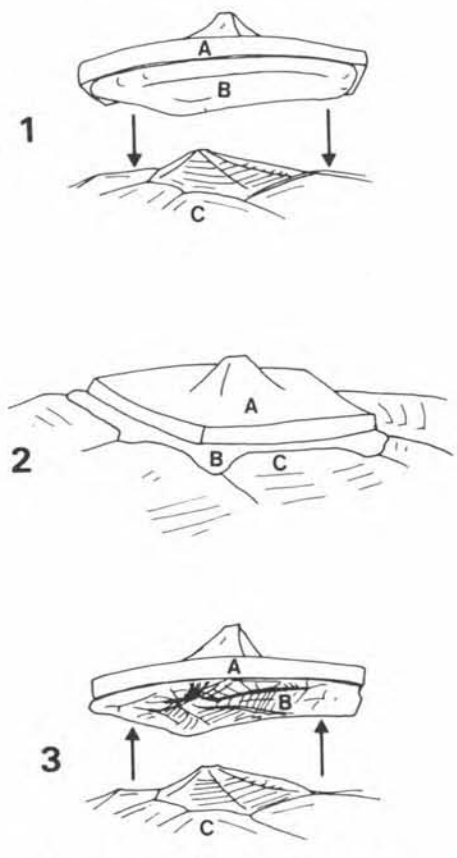


Figure 1. Steps in making the negative mold for casts of scutes. 1. The mother-mold (A), supporting the alginate paste (B) is lowered onto the carapace (C), quickly, with a rolling motion. 2. The mother-mold is pressed down until alginate is forced out from underneath. 3. After setting (3-5 min.), the completed mold is lifted from the carapace with a quick twist.

Amphibians and Reptiles in West Virginia

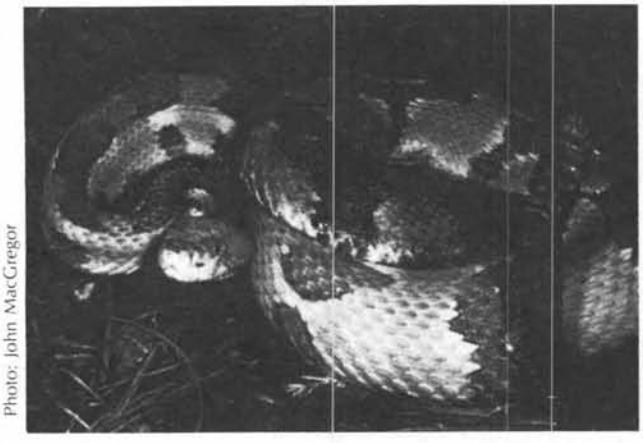


Photo: John MacGregor

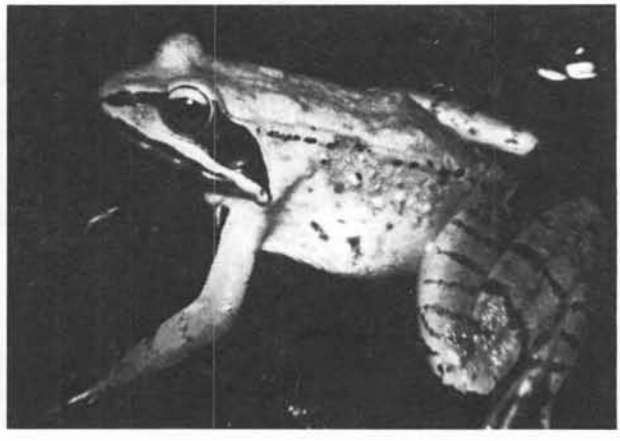


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N. Bayard Green and Thomas K. Pauley

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N. Bayard Green, Professor Emeritus of Zoology at Marshall University, was until 1971 Curator of the Herpetological Collections of the West Virginia Biological Survey. Thomas K. Pauley is Associate Professor of Biology at Marshall University.

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was 0.70±0.50 % (mean±1 SE). The difference between field measurements and measurements made on casts was 0.30±0.30 %.

Distortion within individual photographs was assessed by comparison of two scales incorporated in the photographs, at right angles to each other. The scale parallel to the vertebral column of the turtle was on average shortened relative to the scale at right angles to it (Mean distortion = -1.04±0.16%, n = 86, t = -6.37, $P < 0.01$.). This distortion may have been the result of a consistent error in the angle at which the camera was held relative to the turtle.

The cast-making process was assessed separately in a laboratory trial. Ten casts were made from the same object, a smooth plastic disk approximately 6.5 cm in diameter and 1 cm thick. Cemented to the surface of the large plastic disk were three smaller metal disks, ranging in diameter from ca. 1.8 cm to 2.1 cm, each less than 2 mm in thickness. The casts were made over a period of two months and each was allowed to dry thoroughly (at least a week) prior to measurement.

Eight measurements were made on each cast: two diameters at right angles were measured for the plastic disk and each of the metal disks. A paired t-test was used to test

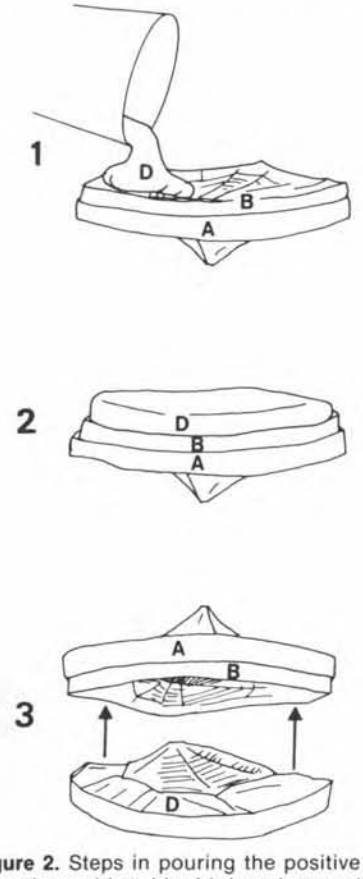


Figure 2. Steps in pouring the positive cast from the mold. 1. Liquid dental stone (D) is poured into the alginate mold from the side, to lessen air-bubble entrapment. The mold is tapped against the tabletop to encourage air bubbles to rise. 2. The poured casting is set aside for at least four hours. 3. The finished cast (D) is removed from the mold with a quick pull. The alginate mold is discarded, and the mother-mold is cleaned for re-use.

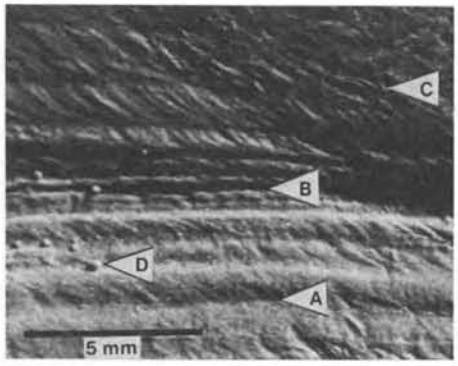


Figure 3. Surface of a dental cast of the edge of the fourth vertebral scute of a snapping turtle. A) Annual growth line. B) Sulcus or suture between scutes. C) Algal filaments. D) Air bubble trapped in alginate during mold-making.

for differences between the diameters as measured on the casts and on the original. The casts were, on average, significantly larger than the original (n = 80 measurements; average difference = 0.42 ± 0.05 %; t = 8.589).

The two techniques were comparable in cost for materials, but photography required a large initial outlay for camera and flash. In 1984, materials for each finished photographic record cost ca. 80 cents US, as opposed to approximately 60 cents US for a finished cast. When the total costs of a field season are tallied, the additional expense per turtle for either photographs or casts is small.

In general, each type of record presented advantages and disadvantages both for making and for using the records. Photography was more portable, and required less time in the field, and finished prints were easier to use than were casts. The casts, however, provided three-dimensional detail with better resolution than the photographs (Fig. 3). In addition, the photographs were developed weeks later, with no possibility of returning to re-photograph. The cast molds were ready to be cast immediately, and if required, could be repeated. Growth lines that could not be seen on photographs were visible on casts when illuminated from a low angle, to throw shadows. In addition, the casts themselves can be rephotographed as needed.

Both photographs and casts have proven useful in field studies (Galbraith 1986). Photographs were adequate for enumeration of growth lines, and for making measurements to estimate missing growth lines on turtles with worn scutes. The fine resolution of the casts enabled comparisons under magnification of specific recent growth lines between years on adult turtles. In general, permanent records of growth lines provided by photographic or casting procedures will allow direct inter-year comparisons and repeated observations under laboratory conditions for the construction of confidence limits around age estimates, and will provide ample reward for the small investment of time and funds required.

ACKNOWLEDGEMENTS

The authors thank Drs. D. E. Snider, D.D.S, and A. R. Vano, D.D.S., for their assistance during development of the casting technique. We thank E. G. Nancekivell and three anonymous reviewers for criticisms of earlier drafts of this paper. This study was funded by Natural Sciences and Engineering Research Council, Canada, Grant A5990 to R. J. Brooks.

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LIFE HISTORY NOTES

See Herp. Review 18(1) for author's instructions.

ANURA

***PLECTROHYLA GUATEMALENSIS*. REPRODUCTION.** Adult males of *Plectrohyla guatemalensis* lack vocal slits and a vocal sac and thus have been presumed to be mute (Duellman 1970. Monogr. Mus. Nat. Hist., Univ. Kansas No. 1, vol. 1 and 2). However, we have collected calling adult males of this species at several localities in Honduras. The call consists of a single low pitched note best described as a grunt which is repeated at intervals of about two min. Males call from concealed positions and have been collected while calling from within a vertical crack in a boulder (LDW 6376, Depto. Copán; Quebrada Grande, 1370 m), inside an arboreal bromeliad ca. 5 m above the ground (LDW 6183. Depto. Ocotepeque; El Chagüitón, 1870 m), and from a hollow portion of a slender tree ca. 6 m above the ground (LDW 8370. Depto. Francisco Morazán; Cerro Cantagallo, 1900 m). At the latter locality, at 1840 m, several males were heard calling from the underground root systems of trees and shrubs growing along the banks of and within a small stream. While trying to locate one of these calling males, we discovered a single clutch of eggs, presumably of this species, within one of these root systems. The eggs were in contact with the bottom of the shallow stream and were adhered to the roots of a shrub. There were 240 eggs in the clutch (LDW 6671) each with a diameter of about 3.4 mm. Two other stream-breeding frogs (*Hyla spinipollex* and *H. salvadorensis*) also occur at this locality. However, our eggs were considerably larger than those reported for the smaller *H. spinipollex* and related species (Duellman 1963. Univ. Kansas Publ. Mus. Nat. Hist. 15:297-349) and likewise were larger than those to be expected from the even smaller *H. salvadorensis*.

All of the above localities were alongside small, slow moving, and quiet montane streams in relatively level areas. The call was readily audible from distances of up to 5 m even though the sound was muffled by the nature of the calling position. The other Honduran localities where *P. guatemalensis* have been collected were along larger, fast moving, and "roaring" streams in areas of considerable relief. We have never heard this frog calling under such conditions and it is doubtful that the call, if present, could be heard by us above the noise created by these streams.

Submitted by **JAMES R. McCRANIE,** 10770 SW 164th Street, Miami, Florida 33157, **LARRY DAVID WILSON,** Department of Biology, Miami-Dade Community College, South Campus, Miami, Florida 33176, and **KENNETH L. WILLIAMS,** Department of Biology, Northwestern State University of Louisiana, Natchitoches, Louisiana 71497, USA ●

RANA SEPTENTRIONALIS (Mink Frog). **TERRESTRIAL ACTIVITY.** Hedeen (1986. Copeia 1986(1):239-244) notes that there are few published reports of terrestrial activity by *Rana septentrionalis*. He observed such activity in Minnesota at night, and concluded that "Mink frogs usually restrict their overland movements to periods of nocturnal precipitation." I report here a summary of terrestrial (including diurnal) activity of this species.

From 1979 to 1986. I collected on gravel roads through broad-leaved swamp forest, brushy marsh and cultivated fields in Limerick Forest, 4 km E Bishops Mills, Grenville Co., Ontario. During rainy fall nights I never found *R. septentrionalis* on the road before 13 October, but it was collected frequently after 13 October, representing 20% of the total ranids (66 of 328 specimens; five species) found on the road. Most of the frogs had empty digestive tracts, suggesting the overland movement was toward hibernating sites in flowing water.

At 0400 h of 13 June 1983, at a lake 3 km SE Postelnic Lake, Kenora Dist., Ontario, R.M. Rankin and I found a male *R. septentrionalis* (57 mm SVL (NMC 24466-3)) on a gravel roadway. We found others in a ditch-like channel in a peaty lakeshore marsh, but only the one on the road was active. The air was 24° C at 0100 h, lake water temperature 18° C at 1500 h, and there had been no rain for several days. At 1320 h, 18 September 1986, just E of the road to Holtyre, 16 km E of Matheson along Hwy 101, Cochrane Dist., Ontario, I found a thin, 49 mm SVL, 8.06 gm, male *R. septentrionalis* (NMC 28813) in the middle of the highway, 400 m from any water deeper than 10 cm roadside ditches in muskeg. A light rain was falling, and the air temperature was ca 12° C.

The National Museums of Canada catalogue files list nine additional collections of *R. septentrionalis* that were made on land at night or in puddles in roadways: Nova Scotia (15, 20, 21 Aug 1971); Gaspé, Quebec, (5 June 1971); eastern Ontario (11 Sept 1982, 6 Nov 1984); and Cochrane area, Ontario (12, 16 Aug 1972, 17 Sept 1986).

Submitted by **FREDERICK W. SCHUELER,** Herpetology Section, National Museum of Natural Sciences, National Museums of Canada, Ottawa, Ontario, CANADA, K1A 0MB ●

CAUDATA

NOTOPHTHALMUS VIRIDESCENS DORSALIS (Broken-striped newt). **BEHAVIOR.** Antipredator posturing has been documented in a variety of salamanders. Perhaps the most striking displays are the "unken" postures exhibited by salamandrids (Brodie 1977. Copeia 1977:523-535). Neill (Copeia 1955:61) observed antipredator posturing of adult *Notophthalmus viridescens louisianensis* in the dried beds of bottomland pools in Georgia when air temperatures were slightly above freezing. Because he had collected numerous adults and efts on other occasions that never assumed the unken posture, he postulated that the behavior only occurred when newts were chilled and unable to move quickly.

On 11 January 1987 I observed antiposturing behavior in *N. v. dorsalis*, 2.7 miles N of Wagram in Scotland County, North Carolina. Five pairs of amplexed aquatic adults were collected from a flooded burrow pit, and three terrestrial adults were found beneath cardboard boxes within 30 m of the pond margin. When initially uncovered, all three terrestrial adults assumed an unken posture. Fig. 1 shows two adults photographed at the site of capture immediately after the boxes were lifted. The posturing was similar to that described by Neill, except that the limbs of *N. v. dorsalis* were drawn inward rather than being flexed, the front toes were overlapped or crossed, and the animals rested on their tails and hindlimbs rather than their chests and forelimbs. Individuals maintained the unken

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posture for 2-3 minutes before unfolding and assuming a normal posture. Air and water temperatures at the time were 7° C.

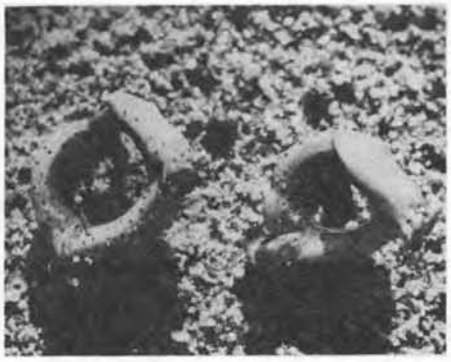


Figure 1. Antipredator posturing of two *Notophthalmus viridescens dorsalis from North Carolina.*

I prodded and pinched ten aquatic adults collected from the pond, but was unable to induce any antipredator posturing. Three terrestrial adults and five aquatic adults were taken to the laboratory, placed on wet sand collected from the borrow pit, and maintained at room temperature. After two hours, I attempted to induce posturing. All three terrestrial adults again assumed the posture seen in Fig. 1, while four of the five adults removed from the pond assumed a modified posture with the head flexed laterally, rather than mid-dorsally. This modified posture was similar to that of *Triturus alpestris* pictured by Brodie (op. cit. : p. 526), except that the limbs were drawn inward and the front toes were crossed. The following day when prodded, all but one of the terrestrial adults and all five aquatic adults assumed this modified posture rather than the posture in Fig. 1. Subsequent prodding every few days thereafter induced similar behavior.

My observations as well as Neill's suggest that antipredator posturing is commonplace in terrestrial adults that have left water and moved to land. Chilling obviously is not a requisite for posturing since terrestrial adults postured at room temperature. The rapid response of aquatic adults after being removed from water suggests that the switch to strong antipredator posturing upon leaving water is not hormonally-mediated. I have occasionally collected terrestrial adult *N. v. viridescens,* but have never observed antipredator posturing in this subspecies.

Submitted by **JAMES W. PETRANKA,** Department of Biology, 010A Coker Hall, University of North Carolina, Chapel Hill, North Carolina 27514, USA ●

CHELONIA

CHELYDRA SERPENTINA SERPENTINA (Common Snapping Turtle). **SIZE.** An exceptionally large male *Chelydra serpentina serpentina* was caught in northern Minnesota on 25 May 1986 by a fisherman in the Popple River at the north end of Squaw Lake, Itasca County. (NW¼ SE¼ Section 28 T149N R27W) The CL = 49.4 cm and was 40.7 cm in width. Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston 429 pp.) lists the record CL as 47.0 cm. No record of a larger specimen could be located. Mass of the turtle = 29.6 kg at the time of capture.

The turtle was purchased by the Minnesota Department of Natural Resources. It was displayed at the Itasca County Fair and the Minnesota State Fair. It was then tagged on the back of the carapace (B-7001) and double-notched on marginal 14. On 17 September 1986 it was released at the capture site.



Figure 1. Snapping turtle captured in northern Minnesota. Ruler on carapace measures 12 inches.

Submitted by **JAMES E. GERHOLDT,** P.O. Box 86, Webster, Minnesota 55088, USA and **BARNEY OLDFIELD,** P.O. Box 273, Goodhue, Minnesota 55027 USA ●

PSEUDEMYS TEXANA (Texas River Cooter). **SIZE MAXIMA.** Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, 2nd Ed., Houghton-Mifflin Co., Boston. 429 pp.) lists 27.3 cm carapace length (CL) as the maximum known size for *Chrysemys concinna texana (=Pseudemys texana).* Here we report record sizes for this taxon in northcentral texas.

A large female *P. texana* (CL= 30.5 cm) was collected by G. Owen on 13 October 1985 in Throckmorton Co., 24.1 km E Throckmorton on TX 222. Another large female *P. texana* (CL= 29.7 cm) was collected by one of us (CTM) on 13 June 1987 in Johnson Co., 17.0 km NE Glen Rose Off US 67 on county rd. 1234. The former specimen increases the upper range of CL by 3.2 cm.

Voucher specimens are deposited in the University of Texas at Arlington Collection (UTA R-18692) and the Texas Cooperative Wildlife Collection (TCWC 65308). We thank J. T. Collins for providing helpful information and D. Barker, J. A. Campbell and M. E. Retzer for technical assistance.

Submitted by **CHRIS T. McALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, and **WILLIAM W. LAMAR,** School of Sciences and Mathematics, University of Texas at Tyler, 3900 University Boulevard, Tyler, Texas 75701, USA ●



CNEMIDOPHORUS TIGRIS (Western Whiptail Lizard). **PREDATION.** On 20 June 1987, 1856 h, under a Creosote bush *(Larrea tridentata)* east of Wonder Valley, San Bernardino County, California, at an elevation of ca. 345 m we observed a *C. tigris* holding a subadult side-blotched lizard (*Uta stansburiana*) weighing ca. 2-3 g. The *C. tigris* held the right side of the *Uta* slightly anterior to the hind leg, in its mouth, and was vigorously shaking its head from side to side in an apparent attempt to hit the *Uta* against the rocks and the branches. The *Uta* was curved sharply to the right, and was trying to chew on the right side of the *C. tigris'* neck.

After about three minutes the *C. tigris* disappeared into a burrow under the bush, with the *Uta* still in its mouth. Less than 30 sec later, the *Uta* emerged from the opening, ran toward the nearest bush, and disappeared.

After an additional 10 sec or so, the *C. tigris* also emerged and spent the next seven minutes in what seemed to be searching behavior. It walked around the bush, digging in the leaf litter, and kept going into the multi-opening burrow wherein the *Uta* escaped. The lizard went into the burrow no less than ten times through different openings, spent a few seconds inside, and emerged from another opening. The behavior was different than regular foraging behavior of *C. tigris* in that so much time was spent under the same bush with no pauses for basking. Most importantly, the animal was not observed eating anything during this activity.

At 1907 h we decided to noose the *C. tigris.* The animal vigorously attacked the noose repeatedly. Usually a *C. tigris* which makes an exploratory attack upon a noose will not pursue the issue after a first or second attempt. This animal tried to bite it at least five or six times.

The animal was measured, and found to be an adult non-gravid female, mass = 15 g, SVL = 89 mm and tail base = 65 mm with a regenerated portion of 90 mm. As the animal was part of a marked study population, it was released after measurement.

Submitted by **RON LICHTENSTEIN,** Department of Biology, University of California, Los Angeles, California 90024 and **VARDIT LICHTENSTEIN,** School of Education, California State University, Los Angeles, California 90032, USA ●

ELGARIA KINGI (Arizona Alligator Lizard). **ANTIPREDATOR BEHAVIOR.** On 19 June 1987, at 1045 h, in central Arizona ca. 18 km N of Payson along the East Webber Creek a striped whipsnake (*Masticophis taeniatus*) was observed beneath a thicket of grape vines and poison ivy near the base of a 6-10 m tall ponderosa pine tree. The apparent 'sit and wait' foraging mode of the snake (SVL ca. 80-100 cm) and an adult male *E. kingi* (SVL = 108 mm), already in my possession, provided the ingredients to study gerrhonotine antipredator behavior. After setting up my camera gear, the lizard was slowly placed about one meter in front of the snake's head. I touched the lizard's tail and he fled in front of the snake, eliciting an immediate movement to-

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wards the fleeing lizard and attempted bite by the snake. Both animals paused, the lizard fled again, and this time the snake successfully bit and held the lizard and a struggle ensued. The snake then responded to my movements by retreating, but it always remained within the thicket. At distances greater than one meter, the snake did not attempt to escape and I could freely photograph the animals.



Figure 1. Striped whipsnake attempting to subdue an Arizona alligator lizard. The lizard is in a "loop" position, biting its tail.

During the first successful bite or ensuing struggle, the snake bit the lizard's neck, the lizard coiled and bit his own tail (ca. 1 cm from the vent) and maintained this 'loop' position (Fig. 1) during the 15 min observation period. Since my presence clearly disturbed the snake and sacrificing my marked lizard would eliminate a lizard from my study population, I terminated the interaction. After releasing the lizard, both animals remained motionless within 50 cm of each other. A few seconds later, the snake tongue-flicked and moved away. The lizard did not move until disturbed again.

This introduction demonstrated two behaviors: 1) striped whipsnakes will attack and attempt to eat Arizona alligator lizards; and 2) *E. kingi* use a 'loop' posture when attacked by a snake. Carpenter (1977. *In.:* C. Gans and D. W. Tinkle (eds.), Biology of the Reptilia, Vol 7, Ecology and Behavior A. pp 335-554. Academic Press, New York) has used literature references to identify the 'loop' posture in four lizard families: Gekkonidae *(Tarentola delalandi);* Cordylidae, *(Cordylus cataphractus* and *C. cordylus);* Varanidae, (*Varanus* sp.); and Anguidae, (*Ophisaurus* sp.). Compton (1933. Copeia 1933:225) also identified this behavior in the anguid *E. multicarinata.*

Submitted by **ROBERT W. BOWKER,** Department of Biology, Glendale Community College, Glendale, Arizona 85302 USA ●

EUMECES SEPTENTRIONALIS OBTUSIROSTRIS (Southern Prairie Skink). **REPRODUCTION.** Breckenridge (1943. Amer. Midl. Nat. 29:591-606), Clarke (1955. Herpetologica 11:161-164) and Gehlbach and Collette (1959. Herpetologica 15:141-143) provided information on aspects of the reproductive biology of the northern prairie skink (*E. s. septentrionalis*) from Texas. Here I report data on a clutch and hatchlings of this taxon from the state.

On 16 May 1987 an adult female (SVL = 61 mm) was excavated while guarding a clutch of 10 eggs from a shallow burrow under a decomposing pile of *Juniperus ashei* in Hood County, 18.5 km SE Granbury off FM 2174 (Hinton-Parker Ranch). At necropsy, she was found to contain an additional egg in the oviduct which suggests recent clutch deposition. While transferring eggs, two were damaged and the remainder (N=8) were measured (L x W; range 10.1-10.2 x 7.4-8.1, $\overline{X} \pm$ SEM = $10.12 \pm 0.02 \times 7.72 \pm 0.06$ mm) and placed in a small container of damp vermiculite and incubated at room temperature (ca. 23° C). Hatchlings emerged following an incubation period lasting 37-38 days on 21 and 22 June 1987 and measured 24-26 (25.6 ± 1.8) mm SVL. In addition, there was evidence of post-natal molting. Tail coloration was similar to other species of *Eumeces* in being bright violet-blue. The dorsum was uniformly dark brown to black with a light middorsal and two dorsolateral stripes. Head pattern consisted of light lines and orange-red coloration bordering the labial scales. The gular region was light cream and the venter was light grayish brown.

Sabath and Worthington (1959, op. cit.) collected a female skink (SVL = 60 mm) in Harris County that deposited a clutch of nine eggs in late May with average measurements of 11.1 x 6.4 mm. I collected another female *E. s. obtusirostris* (SVL = 69 mm) on 6 June 1987 from the same locale reported herein which did not contain eggs and evidently had previously deposited a clutch.

In conclusion, depending upon geographic locality, *E. septentrionalis* may deposit clutches from mid-May through mid-July with number of eggs/clutch varying from six (usually 10) to rarely as high as 18 (Fitch 1970. Univ. Kansas Mus. Nat. Hist. Misc. Publ. 52:1-247). Incubation period is variable with temperature and can last from 37 to 52 ($\overline{X}$ = 44.3) days in captivity (Breckenridge 1943, op. cit.; McAllister, this report).

Voucher specimens are deposited in the Arkansas State University Museum of Zoology (ASUMZ 8181-adult, 8182-8189-hatchlings).

I thank C. Russell, E. W. Lewis, W. Parker and J. Hinton for allowing me to collect on their properties and the Texas Parks and Wildlife Department for Scientific Collecting Permit SP044-1.

Submitted by **CHRIS T. McALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, and Department of Biological Sciences, North Texas State University, Denton, Texas 76203 USA ●

SERPENTES

DRYMOBIUS MARGARITIFERUS (Speckled Racer). **REPRODUCTION.** This species is distributed from the United States to South America (Peters and Orejas-Miranda 1970. Catalogue of Neotropical Squamata. Part I: Snakes. Bull. U.S. Natl. Mus. 297:(1)397). It is one of the most abundant snakes in Costa Rica, and is usually found in regions below 1200 m.

Two clutches of eggs from two *D. margaritiferus* were collected by the authors at San José Province, Dulce Nombre de Coronado (Female No. 1) and San José Province, Salitrales de Puriscal (Female No. 2). Female No. 1 was taken on 27 March 1983 and female No. 2 on 10 February 1985. The specimens had TLs of 639 mm and 738 mm and SVLs of 447.3 mm and 516.6 mm, respectively. Both have been deposited in the collection of the Instituto Clodomiro Picado, Universidad de Costa Rica and have museum numbers MICP-772 and MICP-773.

The snakes were kept in plastic boxes and provided with water. A clutch of 5 nonadherent eggs from Female No. 1 was found on 29 March 1983 and a clutch of 4 nonadherent eggs from female No. 2 was found on 19 February 1985. Measurements and masses of the two clutches are shown in Table 1. Eggs were incubated on moist cotton in a 500 ml beaker. Ambient humidity was 70%. Incubation temperatures for clutch No. 1 ranged from 23.5-28.0° C daytime to 19.0-22.5° C nighttime. Incubation temperatures for clutch No. 2 ranged from 22.0° C daytime to 20.5-24.0° C nighttime.

Clutch No. 1 hatching began on 31 May 1983 and ended on 2 June 1983 for an incubation period of 64-66 days. Clutch No. 2 hatched on 28 April 1985 after incubating 68 days. Neonate sex ratio for clutch No. 1 was 4.1. Sex ratio for clutch No. 2 was 2.2. Lengths and masses for all neonates are listed in Table 1. All neonates had similar diffuse color pat-

Table 1. Reproductive Data of *Drymobius margaritiferus**

Oviposition	Clutch #1 (5 eggs) (29 March 1983)	Clutch #2 (4 eggs) (19 February 1985)
Incubation Period	64 - 66 days	68 days
Hatching Date	1 - 3 June 1983	28 April 1985
Egg Lengths (mm)	36.2 ± 2.1 (34.1-38.2)	35 ± 2.5 (32.0-37.8)
Egg Diameters (mm)	54.4 ± 0.2 (51-56)	52.2 ± 0.9 (51-53)
Egg Masses (g)	5.08 ± 1.7 (3.4-7.2)	6.1 ± 0.2 (5.8-6.3)
Neonates SVL (mm)	171.2 ± 1.3 (150-183)	161.5 ± 1.7 (140-180)
Neonate TL (mm)	258.8 ± 1.7 (230-273)	248 ± 2.4 (225-275)
Neonate masses (g)	4.98 ± 0.3 (4.5-5.4)	4.85 ± 0.4 (4.3-5.1)

* Results are presented as mean $\pm$ 1 S.D.; range.

terns characterized by irregular yellow bands on a dark background in the anterior dorsal region and a vertebral line and bands, posteriorly. There was no evidence of sexual dichromatism.

Fitch (1970. Reproductive cycles of lizards and snakes. Univ. Kansas Mus. Nat. Hist. Misc. Publ. 52:1-247.) noted gravid females in April, July and August whereas we have observed them in February-May. The largest clutch observed by us was 8. We have also observed neonates in March-July and September. These data indicate that reproductive activity in this species may be aseasonal.

We thank José María Gutiérrez for this assistance in the writing of this article.

Submitted by **ALEJANDRO SOLÓRZANO** and **LUIS CERDAS,** Facultad de Microbiología, Instituto Clodomiro Picado, Universidad de Costa Rica, San José, COSTA RICA ●



TYPHLOPS MONENSIS (Mona Island Blind Snake). **PREDATION.** An adult *Typhlops monensis* (ca. 2.4 g; ca. 175 mm SVL) was recovered from the bill of a snowy egret, *Egretta thula,* at Sardinera Beach, an altered portion of southern Mona Island, Puerto Rico. The snake was recovered after I pursued the bird for two minutes; the bird then dropped the specimen to the grass. This beach has more mesic and introduced vegetation than the rest of the island. The bird was discovered on 21 July 1986 at 1544 h at a shady location covered sparsely with grass, elevation ca. 5 m, on a partially cloudy day. The snake showed evidence of being bitten at both ends. The head was crushed, and portions of the body had lacerations probably caused by bites. The specimen has been deposited in the Museum of Biology of the University of Puerto Rico at Rio Piedras, receiving the catalog number UPR-5739.

Submitted by **ENRIQUE HERNANDEZ-PRIETO,** Department of Environmental, Population, and Organismic Biology, Campus Box B-334, University of Colorado, Boulder, Colorado 80309-0334, USA ●

BOOK REVIEWS

Introduction to the Herpetofauna of Costa Rica/Introduccion a la Herpetofauna de Costa Rica, by Jay M. Savage and Jaime Villa R. 1986. Society for the Study of Amphibians and Reptiles, Contributions to Herpetology, Number 3, viii + 207 pp., 15 figs. color frontispiece, dedicatee photograph; clothbound. $30.00, including shipping charges.

This document is the latest incarnation in a series of preliminary treatments of the herpetofauna of Costa Rica. This, the fourth edition, is the first to be published in both English and Spanish and to be coauthored (the first three editions are in English and authored solely by Jay Savage). The current edition is intended to be another step leading to an eventual full-scale treatment of the Costa Rican herpetofauna by Savage.

The book consists of six major portions, viz.: (1) the introductions to the current editions and the 1980 edition; (2) a distributional checklist; (3) a bibliographic index; (4) the keys for identification; (5) an annotated bibliography; and (6) a scientific name index. These sections are preceded by an attractive photograph of the spectacular anuran *Agalychnis calcarifer* and a dedication of the book to *el sabio* ("the sage"), Rafael Rodriguez C., longtime director of the Department of Biology of the University of Costa Rica.

Some of the book's sections require comment. The distributional checklist utilizes a set of nine geographic areas to compartmentalize the distributions of the Costa Rican amphibians and reptiles. Any arrangement of this nature is bound to have its limitations, as the authors freely acknowledge, but it does serve to compress a mass of distributional data into a small space (15 pp.).

The bibliographic index consists of a series of recent references (since 1950) to the Costa Rican herpetofauna keyed to taxa at various levels and provides "an entry into the extensive literature" on the subject. Systematic papers are emphasized, especially those that will assist with identification.

The keys for identification, which comprise the bulk of this work (155 pp.), are written for taxa at all levels from the class to the species. Happily, the authors avoid the embranglement represented by the subspecies category. The keys are written using features not likely to be affected by injury or preservation. In most cases, where colors are diagnostic and affected by preservation, appearance both in life and in preservative are indicated. Where only color in life is given, other unaffected characteristics are accorded preference. Clear, generally effective illustrations of diagnostic features precede the groups of keys to which they apply.

The annotated bibliography consists of 238 references, including those cited in this work and other key publications. Many of the citations are annotated bilingually, especially when the title is not entirely self-explanatory of content.

This work is a welcome addition to the literature on the Central American herpetofauna for a number of reasons. First, it provides a summarization, preliminary and limited in scope though it may be, of the Costa Rican herpetofauna, as the authors note, "the richest and most diverse in Central America." Savage and Villa list 150 species of amphibians and 212 of reptiles for Costa Rica. The total figure of 362 is up 14 species from that indicated in the first (1973) edition. Summarizations such as this one provide base-line data of interest not only to professional systematic herpetologists but also to wildlife agencies and conservation organizations which are involved in developing programs of management and protection.



The bilingual text signifies the recognition that Spanish is the mother tongue of Costa Rica and that the utility and appeal of the work is considerably heightened by its presentation in two of the three most widespread languages in our hemisphere. I can only hope that the appearance of the current work will help to initiate a trend in bilingual publishing in our field, a trend which will only help to promote cooperative efforts between North- and Latin Americans and underscore our commonality of interest and purpose. The fact that Savage is from the U.S. and Villa from Nicaragua lends further felicity to the project.

An important aspect of such work which remains hidden in the published account is the immense amount of back-breaking and exhausting labor that goes on during the field work that provides the data base for such an effort. Systematic field biology has a much less glamorous reputation than does high-tech laboratory-based research. But those who meet the creatures on their own ground need to be accorded the respect due to people who, in the pursuit of knowledge, will submit themselves for weeks and months on end to the encumbrances and hazards of field work in the tropics. As one of my colleagues who works in a troubled area in Latin America recently told me, "When I'm in the field, I am often running scared."

In attempting to work with some of the keys in this work (especially the generic key to the snakes), I experienced some difficulty and confusion in running through them occasioned by the use of multiple pathways in the key to reach the same taxon. This device (as opposed to keying difficult genera out at different points) necessitates the writing of confusing couplets. For example, with couplet 15 of the snake generic key (single vs. paired prefrontals), both sides will eventually send the user to couplet 63 where once again a decision has to be made about the prefontal condition. It would have been helpful to have notified the user in the introduction to the keys that such a device is utilized or to dispense with it altogether in favor of the more traditional device of keying out the same genus at different points.

To increase the utility and appeal of the work, especially to non-herpetologists, it would have been helpful to include a glossary of technical terminology to supplement the diagrams preceding the keys.

Beyond those minor criticisms, I am pleased to see this effort made to provide information about the Costa Rican herpetofauna to the *costarricenses* and other Spanish-speaking Latin Americans. Attempts such as this one to build bridges of understanding between our two cultures represent a vital step as we struggle to salvage something of the incomparable diversity of life in the American tropics.

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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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MJR

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Herpetological Review

Volume 18 September 1987 Number 3

SSAR BUSINESS

SSAR GRANTS-IN-HERPETOLOGY-1988

The Society for the Study of Amphibians and Reptiles announces that proposals are now being accepted for the 1988 Grants-in-Herpetology Program. This program is designed to provide financial support to deserving individuals or organizations engaged in research on or conservation of amphibians and reptiles. In keeping with the Society's goal of encouraging the participation of the broadest possible community of people in herpetological research, preference may be given to students, recent graduates, and others who might not have access to other funding sources. All applicants must be members of the SSAR except those applying for Regional Herpetological Society Programs, who must be members of the sponsoring regional society. Applicants are limited to the submission of one proposal in only one category per year. Normally one award is made in each category. This year, however, one award will be given in *either* the Regional Herpetological Society category *or* the Zoo Research category. Further, if proposals in categories 2, 3 and 4 are not judged to be of sufficiently high quality by the GIH Committee, the funds for those categories will be used to create additional awards for Graduate Student Research.

Grant proposals will be considered in the following categories.

1. GRADUATE STUDENT RESEARCH IN HERPETOLOGY. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only. Applications must be accompanied by a letter of support from the student's major advisor or committee chairperson.

2.HERPETOLOGICALLY ORIENTED CONSERVATION. Proposals should address research on species endangered or threatened at the state, national, or international levels, or address research on potentially threatened habitats or species. Proposals may be received from individual members only and must be accompanied by a letter of support from another member of the SSAR.

3. REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS. Proposals may address any herpetological research endeavor or project, provided said endeavor or project concerns herpetology within the implied geographic limits of the regional society. Proposals may be submitted by regional herpetological societies or by individual members of the society and must be accompanied by a letter of support from the current president of the appropriate regional society. Membership in SSAR Is not necessary for applicants in this category.

4. HERPETOLOGICAL RESEARCH IN ZOOS. Proposals may address any herpetological research endeavor which is conducted at a zoo or that has evident importance to zoo programs. A letter from the director or herpetological curator of the sponsoring zoo must accompany the proposal.

Each proposal must include the following elements: A) ABSTRACT; B) BACKGROUND AND OBJECTIVES of the proposed project, in terms of its relevance to herpetology; C) METHODS of carrying out the research or conducting the project; D) ITEMIZED BUDGET for the project, which should not exceed $430. Travel funds may be included in the budget; E) CURRICULUM VITAE for the applicant or project coordinator (if Regional Society application); and F) LETTER OF SUPPORT. The proposal must be typed, double spaced, and must not exceed five pages excluding cover page, abstract, bibliography, budget, and curriculum vitae.

Applicants must designate to which one of the four categories their proposal is being submitted. All proposals must be submitted in duplicate and postmarked no later than 31 JANUARY 1988. Failure to meet the deadline or to follow the guidelines may result in elimination of the proposal from consideration. The awards will be announced by 15 March 1988. Submit proposals to:

Thomas H. Fritts, Chair
SSAR Grants-in-Herpetology Committee
U.S. Fish and Wildlife Service
Department of Biology
University of New Mexico
Albuquerque, New Mexico 87131, USA

Successful applicants will be expected to submit to the SSAR a written report of their research or project results within a reasonable time after the project year is completed. They are also encouraged to submit the results of their work for publication in the Journal of Herpetology or Herpetological Review.

Financial contributions by SSAR members, institutions, and other interested benefactors can increase the number of awards in this program. Your tax-deductible contribution to this program will be appreciated by the Society and will directly benefit meritorious research. Contact the President of SSAR for additional information on contributing to the Grants-in-Herpetology Program. If you are employed by an organization which will match donations made to nonprofit educational organizations, please notify your employer that you have made a donation to the Grants-in-Herpetology Program. ●

GIH RECIPIENTS, 1987

The Society for the Study of Amphibians and Reptiles is pleased to announce the recipients of Grants-In-Herpetology awards for 1987. Due to budgetary constraints, awards were limited to the category of Graduate Student Research.

John W. Beck, Jr., Department of Biology, University of Miami, Coral Gables, Florida, "An Investigation of the Apparent Competitive Exclusion or Reduction of the Native Green Anole *Anolis carolinensis* by the Introduced Brown Anole *Anolis sagrei* in Nonwetlands Habitats in Southern Florida.

Diana K. Hews, Department of Zoology, Austin, Texas. "Experimental Analysis of Resource Defense, Sexual Selection and the Potential Evolution of Phenotypic Traits in a Territorial Lizard." ●

JOINT MEETING OF HERPETOLOGICAL AND ICHTHYOLOGICAL SOCIETIES JUNE 24-28, 1988

The Society for the Study of Amphibians and Reptiles, The Herpetologists' League, The Early Life History Section of The American Fisheries Society, and The Elasmobranch Society, will meet with the American Society of Ichthyologists and Herpetologists on the occasion of the 75th anniversary of the founding of Copeia, the journal of the ASIH. The joint meetings, including diverse paper sessions and symposia, will be held 24-28 June 1988, on the campus of the University of Michigan. Address inquiries to G.R. Smith, Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109, USA ●

FIRST WORLD CONGRESS OF HERPETOLOGY

Canterbury, United Kingdom • 11-19 September 1989

THE CONGRESS will be held at University of Kent and in Canterbury. H.R.H. Prince Philip, President of the World Wildlife Fund, will serve as Patron of our Congress and Professor Angus d'A. Bellairs as Honorary President. The Congress will also serve as the official 1989 meetings of Societas Europaea Herpetologica, Herpetologists' League, and Society for the Study of Amphibians and Reptiles. It will be co-hosted by the Zoological Society of London, Fauna and Flora Preservation Society, Societas Europaea Herpetologica, and The British Herpetological Society.

The Scientific Program, subject to modification, is listed below. Plenary speakers and Convenors are now being invited. *Persons who wish to participate in events should contact the Convenors,* whose names and addresses may be obtained from the Secretariat (see below). There will be poster sessions open to all persons but no oral contributed papers. All presentations will be in English, but discussions can be in other languages.

PLENARY LECTURES

THE STATE OF HERPETOLOGY • EVOLUTION AND ECOLOGY OF PARTHENOGENESIS • BIOGEOGRAPHY OF SOUTH AMERICA • INTERNATIONAL CONSERVATION • SEXUAL SELECTION • SYSTEMATICS AND PHYLOGENY • PALEOHERPETOLOGY • ECOLOGICAL PHYSIOLOGY • COMMUNITY ECOLOGY • BIOLOGY OF SALAMANDERS

SYMPOSIA (S), WORKSHOPS (W) and ROUNDTABLES (R)

Conservation

S.1. CONSERVATION AND MANAGEMENT OF SPECIES
S.2. EFFECTS OF POLLUTION ON HERPETOFAUNA
S.3. CAPTIVE MANAGEMENT
S.4. HEALTH AND DISEASE
R.1. IUCN HERPETOLOGY SPECIALIST GROUPS
R.2. CONSERVATION PROBLEMS

Behavior

S.5. SEXUAL SELECTION AND COMMUNICATION
S.6. ENVIRONMENTAL SEX DETERMINATION
S.7. ORIENTATION, NERVOUS SYSTEM AND SENSES
R.3. OPTIMAL SIZES OF EGGS AND CLUTCHES
R.4. MIMICRY AND PREDATOR-PREY BEHAVIOR

Ecology

S.8. LONG-TERM STUDIES
S.9. SNAKE ECOLOGY AND BEHAVIOR
S.10. ADAPTATIONS TO EXTREME ENVIRONMENTS
S.11. AMPHIBIAN COMMUNITY ECOLOGY
S.12. HERPETOFAUNAS: EXPLORATIONS AND STUDIES
R.5. THE ECOLOGY OF THE TUATARA
W.1. SKELETOCHRONOLOGY
W.2. FIELD METHODS AND BIOTELEMETRY

Evolution

S.13. EVOLUTION AND PHYLOGENY OF FROGS
S.14. ORIGIN OF AMPHIBIA AND REPTILIA
S.15. PALEOHERPETOLOGY
S.16. ISLAND HERPETOFAUNAS
S.17. LIFE HISTORY EVOLUTION OF TURTLES
R.6. BIOGEOGRAPHIC REVIEW OF THE CONTINENTS
R.7. CAECILIAN BIOLOGY AND EVOLUTION

Systematics and Genetics

S.18. MOLECULAR SYSTEMATICS
S.19. CYTOGENETICS
S.20. PARTHENOGENESIS AND HYBRIDOGENESIS
S.21. SYSTEMATICS AND PHYLOGENY
S.22. BIOLOGY AND GENETICS OF PIPIDAE
R.8. PHYLOGENY AND CLASSIFICATION OF LIZARDS
W.3. MOLECULAR TECHNIQUES
W.4. AMPHIBIAN LARVAE
W.5. PHYLOGENETIC ANALYSIS

Physiology and Development

S.23. ENERGETICS
S.24. ECOLOGICAL PHYSIOLOGY
S.25. FUNCTIONAL MORPHOLOGY
S.26. REPRODUCTIVE PHYSIOLOGY
S.27. DEVELOPMENTAL PROCESSES

General Topics

R.9. FIELD RESEARCH AND NATIONAL REGULATIONS
R.10. AMATEUR CONTRIBUTIONS TO HERPETOLOGY
R.11. MEDICAL AND RESEARCH ASPECTS OF VENOMS
W.6. PHOTOGRAPHIC TECHNIQUES

EXCURSIONS: Pre- and post-Congress trips are planned to Europe, Russia, the Mediterranean, Belize, Honduras, the Amazon, Ecuador, various sites in Africa, Indian Ocean, Pakistan, Malaysia, China and Australia, each led by professional herpetologists. Day or half-day trips to Darwin's home, London, Cambridge, Oxford and Paris are also planned.

FIRST CIRCULAR: The complete program and full details of excursions, including prices, are given in the First Circular, available from the Secretariat. This includes a Provisional Registration Form. Registration begins January 1988; £90 fee covers abstract book and program, refreshments, and costs of hiring meeting rooms and equipment. *Advance registration is strongly encouraged* for planning purposes and to insure that you receive all other announcements promptly.

SECRETARIAT: Address all inquiries to: First World Congress of Herpetology, Ecology Research Group, Rutherford College, University of Kent, Canterbury, Kent CT2 7NY, UK. *Telephone: (0227) 764000, ext. 3501. Telex: 965449.*

NEWSNOTES

HERPETOLOGISTS' LEAGUE ARCHIVES

The Herpetologists' League established an archives with the Smithsonian Institution Archives Program in 1986. We are soliciting correspondence, committee notes, copies of programs, membership files, photographs, and other materials of interest and value to the HL. We would appreciate the donation of any of these materials from members who have participated in HL activities and corresponded with HL officers. We are particularly lacking materials from the early years. Inquiries can be sent to Joseph C. Mitchell, Secretary, Department of Biology, University of Richmond, Richmond, Virginia 23173, USA. Materials can be sent directly to Roy W. McDiarmid, U.S. Fish and Wildlife Service, National Museum of Natural History, Washington, D.C. 20560, USA. Your cooperation with this important HL project is crucial to its success. ●

"TURTLES OF COSTA RICA" PROPOSED

A Spanish/English monograph entitled *The Turtles of Costa Rica* is being prepared. It will review the literature on Costa Rican turtles as well as provide recent and previously unpublished data. The book is intended for professional herpetologists and wildlife biologists as well as for non-professionals with an interest in turtles of the region. We are soliciting notes, photographs or any other material which relate to turtles in Costa Rica; all contributions will be acknowledged in the book. Please contact: Julián Monge-Nájera, Biología, Universidad de Costa Rica, Central America. ●



NIXON GRIFFIS FUND FOR ZOOLOGICAL RESEARCH AWARDS SEVEN GRANTS

The Nixon Griffis Fund for Zoological Research (NGFZR), established in 1984 by New York Zoological Society Trustee Nixon Griffis, awarded seven research grants in June 1987. One of these grants was given in the area of herpetology. The recipients were Adam Asquith and Howard Snell, Ph.D., University of New Mexico, for their study of "Ontogenetic Changes in Nutrients Procurement and Assimilation in the Galapagos Giant Tortoise, *Geochelone elephantopus.*"

Nixon Griffis Fund for Zoological Research grants are available to members of the zoo and aquarium community. Fund recipients may be keepers, curators, veterinarians, or research and consulting biologists. Grants, not to exceed $3000, are awarded semi-annually. Closing periods are January 1st and July 1st. For information about the Fund and grant application procedures, contact John Behler, Coordinator, Nixon Griffis Fund for Zoological Research, c/o New York Zoological Society, Bronx Zoo, Bronx, New York 10460, USA. ●

POISON DART FROG SOCIETY

An effort is underway to establish a formal "society" for those individuals with an interest in poison dart frogs of the genera *Dendrobates, Phyllobates, and Colostethus.* It is hoped that the new society will be international in scope. All members of the herpetological community, both professional and amateur, who share a common interest in these frogs are encouraged to respond to this announcement by writing to the steering committee for more information.

At this point in time there are no funds to support this work. Each respondent is asked to include with his/her initial letter three 22¢ U.S. postage stamps for the mailing of the information packet (those outside the U.S. are requested to include $1.32). Responses should be sent to Dale Bertram, M.D., Chairperson-Steering Committee, Poison Dart Frog Society, One Virginia Terrace, Madison, Wisconsin 53705, USA ●

UPDATED DISTRIBUTION MAPS FOR MINNESOTA AMPHIBIANS AND REPTILES

The 1985 distribution maps have been updated to include all new records as of April 1987. Maps are available from the Minnesota Herpetological Society, Bell Museum of Natural History, 10 Church Street, S.E., Minneapolis, Minnesota 55455, USA. Cost is $4.50 including postage. Those with 1985 maps can send a stamped self-addressed envelope for a listing of new records. ●

PARASITIC NEMATODE SYNOPSIS

Memorial University of Newfoundland has published Synopsis of the Nematoda Parasitic in Amphibians and Reptiles, by M.R. Baker, 1987. This 325 page publication is listed as Occasional Papers in Biology, No. 11, and is available for $8.00 Canadian from: Occasional Papers in Biology, Department of Biology, Memorial University of Newfoundland, St. John's Newfoundland, Canada A1B 3X9. ●

GRANTS FOR WILDLIFE REHABILITATION

The National Wildlife Rehabilitators Association announces a small-grants program and the establishment of two awards. Two $1000 grants are available for research projects in the field of wildlife rehabilitation or for several smaller research projects each totalling less than $1000. Applicants must demonstrate financial need and submit a typewritten proposal that includes name(s) and resume of personnel involved, objectives of the project, a brief description of how the project will be carried out, a brief statement of the literature reviewed and an itemized budget. An annual report on progress is required.

The awards include the Lifetime Achievement Award given to an individual whose primary identification is with rehabilitation of wildlife and who has contributed to this field in a major way for many years. The Signifi-

No species of study should be burdened with carrying bulky radio telemetry gear.

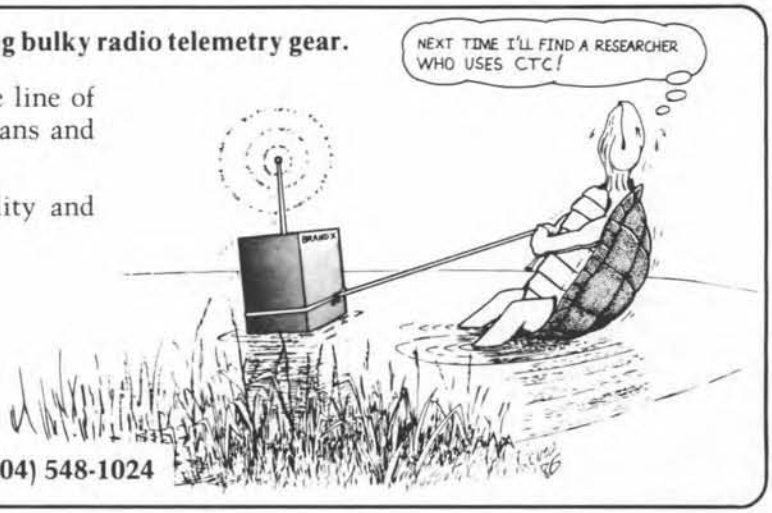
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GRADUATE AND POST-GRADUATE RESEARCH GRANTS

The Edmund Niles Huyck Preserve and Biological Research Station announces the 1988-89 competition for research grants (max = $3,500) for biological research for investigations that utilize the resources of the Preserve. The 2000 acre Preserve is located on the Helderberg Plateau, in the towns of Rensselaerville and Berne, 30 miles southwest of Albany, New York. Habitats include northeast hardwood-hemlock forests, conifer plantations, old fields, permanent and intermittent streams, 10- and 100-acre lakes and a 150-ft waterfall. Facilities include a wet and dry lab, small library, and six houses/cabins for researchers.

Deadline for proposals is 1 February 1988. Application material may be obtained from Dr. Richard L. Wyman, Director and Resident Biologist, E. N. Huyck Preserve and Biological Research Station, P.O. Box 188, Rensselaerville, New York 12147, USA ●

BRAILLE FACILITY FOR THE BLIND AT POONA SNAKE PARK, INDIA

Poona Snake Park has, for the first time in this country, introduced Braille Script for the Blind, thus enabling blind persons to learn about snakes. This facility was inaugurated on 26th January 1987, the Republic Day of India. It consists of information charts about each species, prepared in Braille Script. No entrance fee is being charged for the blind and disabled. The blind will also be allowed to touch and feel non-poisonous snakes. Additional information about snakes is recorded on audio cassettes and may be played.

Mr. Neelimkumar Khaire, Director of Poona Snake Park, has also been preparing detailed information, which will be transfered into Braille books. These books will be presented to schools and institutions for the blind.

Anil Khaire
Assistant Director
Katraj, Poona-Satara Road
POONA - 411 046 INDIA ●

IN MEMORIAM

PHILIP W. SMITH



On October 11, 1986 as the colors of autumn began to spread over the hills and prairies he knew so well, Philip Wayne Smith died of cancer at Urbana, Illinois. He was born December 2, 1921 near Neoga, Illinois and grew up in a series of small southern Illinois towns where he developed an interest in natural history that was to last all his life. In May 1942, he married Dorothy M. Dearnbarger who was to be his lifelong companion and source of strength and inspiration. Their daughter, April, was born in 1943 and now lives with her husband and two children in Madison, Wisconsin. Also surviving are Philip's mother, Pauline Stewart, two brothers and a sister.

Phil Smith obtained his undergraduate education at Eastern Illinois University from 1940-42 and 1946-47. The interruption coincided with a 37-month period of service in the U.S. Army. He did graduate work at the University of Illinois under the guidance of Hobart M. Smith and received his doctorate in 1953. His association with the Illinois Natural History Survey began while he was still an undergraduate and continued until his retirement in 1979. For more than ten years, he was head of the Section of Faunistic Surveys and Insect Identification. He had a joint appointment as Professor of Zoology in the University of Illinois Graduate School for 14 years. In 1986 he was awarded an honorary D. Sc. degree by Eastern Illinois University.

Phil's contributions to herpetology include his authoritative and popular *Amphibians and Reptiles of Illinois*, his analysis of post-Wisconsin distribution patterns of terrestrial vertebrates in the Midwest, descriptions of the Illinois chorus frog and Illinois mud turtle, systematics of *Pseudacris triseriata* (with Dorothy as co-author), and numerous other papers. However, his contributions to ichthyology were fully as significant and culminated with his monumental and beautifully illustrated *Fishes of Illinois*. He was active in numerous scientific societies serving on the Board of Directors of The Society for the Study of Amphibians and Reptiles and on the Board of Governors of the American Society of Ichthyologists and Herpetologists. He was Editor-in-Chief of *Copeia* from 1959 to 1961.

Phil was a superb field naturalist. Although most of his publications dealt with the midwestern fauna, he was equally at home in the southwestern deserts and austroriparian swamplands. He had an uncanny ability to scan an area and predict what amphibians and reptiles were living there and usually just where they were to be found. This made him a formidable collector, but one who always showed great respect for animal populations and habitats. As a taxonomist, he tended to be conservative, but his insights were almost always sound. His ability as a teacher is reflected in such fine students as Mike Morris and D. S. Liem. Great personal and professional integrity went hand-in-hand with an open, friendly manner and well-developed, sometimes ribald, sense of humor.

After Phil's retirement, he and Dorothy made trips to Africa and Australia where Phil particularly enjoyed observing mammals, a group that really interested him more than cold-blooded vertebrates. The Smiths also had time for other interests including collecting antique dolls, a field where Phil said taxonomic judgment also helped, and amassing a store of Bing Crosby memorabilia. Phil faced his final illness with characteristic courage and grace. During this time he completed his autobiographical book, *A Naturalist in the Environmental Crisis*, and continued to referee manuscripts and review grant requests. At one of our last meetings, I was returning from one of the national herpetology meetings and remarked to Phil that there were a lot of people who remembered him and his work. He replied, "They damn well better!"

They will, Philip, they will.

Sherman A. Minton
Department of Microbiology and Immunology
Indiana University School of Medicine
Indianapolis, Indiana 46223, USA ●

DICK HILLENIUS

On 4 May 1987, quite unexpectedly, Dr. D. Hillenius died at age 60. Our Institute lost one of its most remarkable members. As a scientific worker and curator of the Department of Herpetology, Dr. Hillenius made important contributions to our knowledge of natural history and was a specialist on African chameleons. The Netherlands will remember him also as a beloved popular writer and poet. Our Institute will not forget his charming personality.

W. LOS, Director
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MEETINGS

FIRST CALL FOR PAPERS

"The Management of Amphibians, Reptiles, and Small Mammals in North America" is the subject of a symposium to be held 18-22 July 1988, in Flagstaff, Arizona. The symposium is being co-sponsored by Northern Arizona University (School of Forestry), the USDA Forest Service (Region 3 and the Rocky Mountain Forest and Range Experiment Station), and the Wildlife Society. The intent of the symposium is to bring together scientists and managers to exchange knowledge and ideas on habitat requirements, management needs, and other information on these often overlooked components of North American fauna. Another purpose will be to summarize the state-of-the-science of habitats and habitat requirements of species within these groups. Of particular interest are papers emphasizing habitat models, habitat requirements, sampling techniques and problems, community dynamics, and management recommendations. Single-page abstracts, due two weeks after receipt of this issue of HR, are solicited that emphasize one or more of the above topics. Authors will be notified of acceptance in November 1987. First draft manuscripts will be due 15 February 1988, and will be subjected to a review process and returned to the author. Final drafts will be due 15 June 1988. Proceedings will be published by the USDA Forest Service. For instructions on abstracts and other information, contact Robert C. Szaro or Kieth E. Severson, Rocky Mountain Forest and Range Experiment Station, Arizona State University, Tempe, Arizona 85287, USA (602) 261-4365 or (FTS) 261-4365. For local arrangements contact David R. Patton, NAU School of Forestry, P.O. Box 4098, Flagstaff, Arizona 86011, USA (602) 523-7528. ●

CALL FOR PAPERS

The 1987 Annual Meeting of the Gopher Tortoise Council will be held November 13-14 at Auburn University, Alabama. Council members and interested persons are invited to submit titles and abstracts of papers to be presented. The deadline for receipt of titles and abstracts is 1 October 1987.

For those persons unfamiliar with GTC meetings, they generally consist of a Friday evening social, presentations, state reports, and a panel discussion on Saturday, and an optional field trip on Sunday.

Please submit titles and abstracts to Ed Wester, Co-Chairman GTC, General Biology, 101 Cary Hall, Auburn University, Alabama 36849, USA ●

CONFERENCE ANNOUNCEMENT

The California Energy Commission and the California State College at Bakersfield are co-sponsoring "Endangered and Sensitive Species of the San Joaquin Valley: A Conference on Their Biology, Management and Conservation." The conference will be held 10 and 11 December 1987 at California State College, Bakersfield. Papers will address problems relating to both plants and animals. For further information, registration materials, or paper guidelines, contact Daniel F. Williams, Department of Biological Sciences, California State University, Stanislaus, Turlock, California 95380, USA ●

FEATURES

NOTES ON A LARGE *Melanosuchus niger* SKULL FROM BOLIVIA

The maximum lengths of the larger crocodilians have always been a topic of great interest and conjecture among herpetologists. Many literature accounts refer to large measured specimens or skulls of *Crocodylus porosus*, generally recognized to be the largest of the living crocodilians (Barbour 1924; Greer 1974; Montague 1983). Nevertheless, other than for *C. porosus*, little has been reported on the maximum lengths of other crocodilians. As preserved material of larger specimens is quite rare, discussions have often been centered on anecdotal accounts. Such is the case with the black caiman, *Melanosuchus niger*, a large alligatorid found principally in the Amazon River drainage of South America.

The maximum length of *Melanosuchus* has remained problematical for quite some time. However, it has generally been acknowledged that *Melanosuchus* is the largest of the South American alligatorids. Neill (1971) stated that the largest specimen he had seen was approximately 13 ft (3.96 m) long and that there was no reason to assume that *Melanosuchus* exceeded the length of the American alligator, considered by Neill to be 18 ft. (5.48 m). Guggisberg (1972) noted that in exceptional cases *Melanosuchus* could reach "4.5 m, and even 6 meters." Brazaitis (1973) in his review on the identification of crocodilians stated that males may reach 5 m in length. Medem (1981, 1983) in his definitive work on South American crocodilians considered the maximum length of *Melanosuchus* to be more than 6 meters. This is apparently based on a reported 6.4 m individual killed in Limoncocha, Ecuador in 1957. Unfortunately, no material was saved from this specimen. Medem (1983) also reported that La Condamine (1778) considered the maximum size of *Melanosuchus* to be 20 ft (6.09 m).

In 1981 a large *Melanosuchus* skull was seized by the U.S. Fish and Wildlife Service in Miami, Florida (Seizure tag No. 81-059A, 4 June 1981). The owner reported that he had obtained the skull from a Bolivian hunter in Trinidad, Departamento del Beni, Bolivia. The animal was reported to have been killed within five or six miles of the town, in the Rio Mamore drainage, within the year prior to its seizure in Miami. Upon confiscation, the skull was deposited in the collection of the Florida State Museum, Gainesville (UF 53600). Skull dimensions are presented in Table 1.

Based on data for skull lengths and total lengths of eight *Melanosuchus* reported in Medem (1963), the ratio of total length to skull length (TL/SL) varies from 7.62 to 8.51. The largest specimen in Medem's sample (TL 3.45 m) had a mutilated tail, and based on the average snout-vent/total length ratio (0.48) of the other *Melanosuchus*, this animal should have measured 3.96 m TL. Although the total length and skull length increase with age, the rates of increase vary among specimens and in this small sample there is no consistent ontogenetic increase or decrease in the TL/SL ratio. Nevertheless, the mean TL/SL ratio for the two largest individuals (TL 3.32 m, 3.96 m) was 8.23. Based on this value, and the skull length of the UF Bolivian specimen (58.8 cm), the estimated total length of this *Melanosuchus* was 4.84 m.

As it is reasonable to assume that this skull does not fully represent the maximum attainable size of *Melanosuchus*, it is not unlikely that lengths of over 5 meters are possible for this species. It then appears that the maximum lengths of *Melanosuchus* and *Alligator mississippiensis* are very similar and represent the largest of the living Alligatoridae.

Table 1. Dimensions (cm) and mass of the *Melanosuchus niger* skull (UF 53600) from Trinidad, Bolivia.

Skull length:	
snout-occipitals	58.8
snout-quadrate	65.7
snout-articulars	76.6
Snout length:	
from ant. edge orbits	35.7
Snout width:	
4th mandibular tooth	20.8
5th maxillary tooth	26.1
ant. edge orbits	30.0
Width cranial table:	
ant. edge	15.4
center	15.3
post. edge	18.2
Skull width (at quadrates)	36.8
Interorbital distance	4.5
Skull mass	14.95 kg

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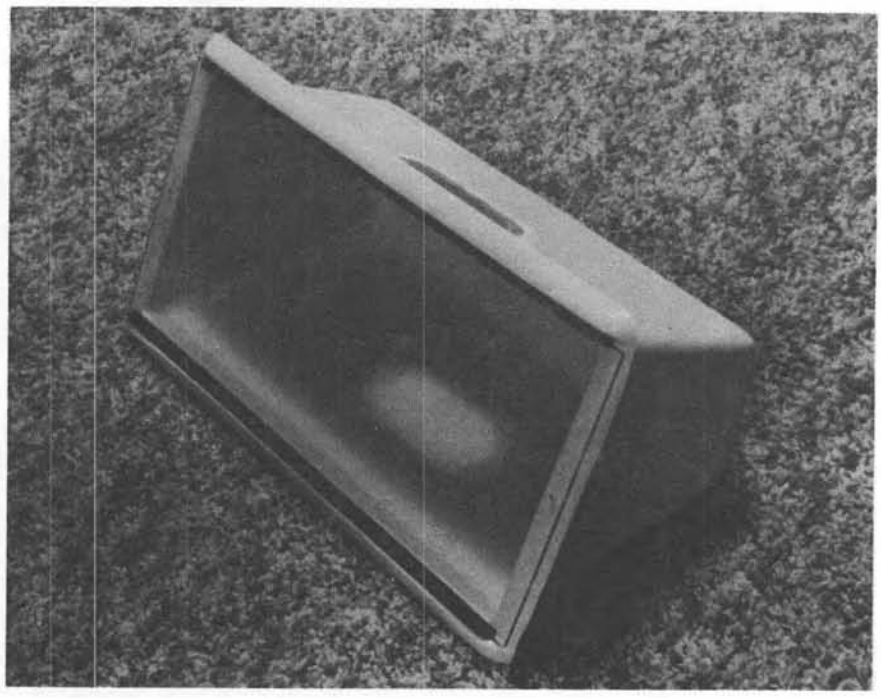
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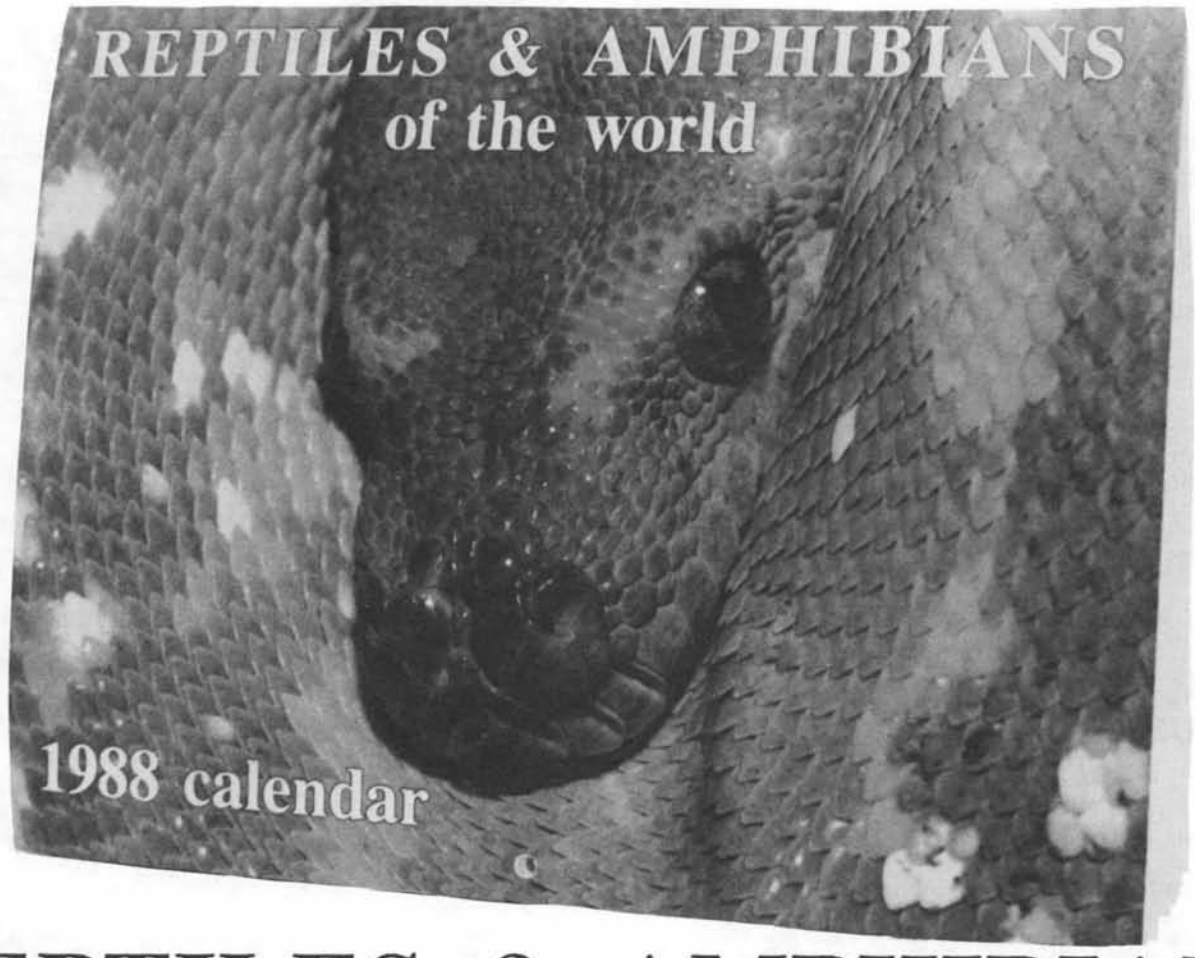
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NOTES ON THE NATURAL HISTORY OF THE UNUSUAL CUBAN LIZARD, *Anolis lucius*

The ecology of *Anolis lucius* is unusual in many respects. The species is one of the most vocal in the genus (Ruibal 1964), lays eggs communally (Hardy 1957) and occupies regions of low light intensity such as the mouths of caves and large complicated tree trunks (Ruibal 1961, 1964), perhaps its most unique feature. These habitat associations represent a structural niche specialization that is not found in anoles outside of Cuba (Williams 1969) but is shared by two other Cuban species, *A. bartschi* and *A. argenteolus* (Ruibal 1964).

No work on *A. lucius* has been published since the early 1960s and these studies did not include quantitative data on the unique structural niche. A recent cooperative venture between the Smithsonian Institution and the Cuban Academy of Sciences has allowed North American herpetologists to visit Cuba and work with Cuban colleagues. In the summer of 1983, an opportunity arose to gather data on some aspects of the ecology of *A. lucius*.

MATERIALS AND METHODS

A. lucius occurs from central La Habana province east to western Oriente. The species was reported erroneously by Ruibal (1964) to extend into the province of Pinar del Rio (personal observation). The present study was conducted in the province of Cienfuegos at the Soledad Botanical Gardens. The gardens are composed of plantings of exotic and native trees and bamboos separated by mowed grassy areas. A heavily wooded ridge of limestone rock occupies one part of the garden and is not maintained. The field work was concentrated on the rocky limestone ridge and in an area of large introduced figs (*Ficus* spp.)

Three days were spent at the gardens (29 June to 1 July), and data were collected from 0800 to 1700 h. Habitat variables were recorded using a procedure similar to the censusing method developed by Rand (1964). The study areas were systematically searched, without backtracking; sex, perch type, perch height, perch diameter and insolation (shade, filtered sun, full sun) were recorded for each new lizard. Sex determination at a distance was based on external features (see results) and proved to be accurate, as only two of 57 animals were sexed incorrectly prior to capture. Sexing at a distance was simplified as no hatchlings or subadults were seen or captured. Five perch types were established: ground, rock, small bush ($\leq$ 2 m high), large bush ($>$ 2 m), small tree ($\leq$ 5 m high), and large tree ($>$ 5 m). Perch height was estimated to the nearest 50 cm and perch diameter to the nearest centimeter. No perch diameters were estimated for individuals on rocks. Study areas were censused once or twice each day.

A sample of lizards was captured by hand and by noosing. Cloacal and air temperatures were recorded with a Schultheis thermometer to the nearest degree immediately after capture. Air temperatures were taken at a

Table 1. Mass and length comparison of adult male and female *Anolis lucius*

	Male (N=27)	Female (N=30)	t	Significance Level
Snout-vent length (mm) $\bar{X} \pm$ SE (Range)	65.0 ± .51 (61-69)	56.0 ± .50 (52-63)	12.17	$p<0.001$
Mass (g) $\bar{X} \pm$ SE (Range)	7.0 ± .23 (5.0-9.0)	4.5 ± .12 (3.0-5.5)	10.79	$p<0.001$

Table 2. Perch height and perch diameter statistics for male and female *Anolis lucius*

	Perch Height (m) $\bar{X} \pm$ SE (Range) N	Perch Diameter (m) $\bar{X} \pm$ SE (Range) N
Male	2.44 ± .20 (0-15) 77	.57 ± .15 (0.1-8.0) 66
Female	1.70 ± .20 (0-15) 118	.60 ± .11 (.01-8.0) 108

Table 3. Number (N) and percent of males and females as recorded in three insolation categories.

	Shade		Filtered		Sun	
	N	%	N	%	N	%
Male	53	68	22	28	3	4
Female	61	57	43	40	3	3
Combined	114	62	65	35	6	3

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height of approximately one and one-half meters in the shade as near the site of capture as possible. Animals were sexed after capture to confirm the prior visual sexing. Weights to the nearest 0.5 g (Pesola 5 and 10 g spring scales) and snout-vent lengths to the nearest millimeter were taken in the field, after which the animals were immediately released at or near their capture sites.

RESULTS

Females differ from males in being smaller in length and mass, having no dewlap, and in the occasional presence of three or four faint reddish middorsal blotches. The length & mass dimorphism is significant with ranges for males and females barely overlapping (Table 1).

Anolis lucius in the gardens was found exclusively on the rocky ridge and its associated vegetation and on an adjacent group of irregularly spaced large figs with complicated trunks. The ridge and the adjacent figs provided a somewhat continuous habitat. The canopy of the closest fig overlapped the edge of the ridge, and in some cases the canopy of adjoining figs touched. The maximum distance betwen the crowns of any two figs was approximately 50 m. Groundcover between and under the trees was mostly grass and leaf litter. Other parts of the garden were searched for *A. lucius*, including areas with large complex figs, but no *A. lucius* were found. The nearest unoccupied fig that appeared suitable habitat for *A. lucius* was over 200 m from the occupied habitat, and much of this distance was open meadow.

The perch types noted were almost exclusively large trees (figs with complicated trunks) and rocks (164 observations), with only 17 other perch types recorded. Two animals were seen on the ground within 10 cm of a fig, and the remainder were on the vegetation of the rocky ridge. In this area, 13 animals were observed on large trees with simple trunks and two on large bushes.

The fig and limestone rock perch sites were characterized by an abundance of vertical surfaces. Both habitats offered numerous crevices and hollows that the animals used for shelter. The few animals recorded on simple trunked trees had only to move a very short distance to be back on the complicated vertical rock surfaces.

Perch heights for *A. lucius* ranged from 0 to 15 m, with only two lizards out of 195 on the ground. Males perched significantly higher ($t=3.66$; $p<0.001$) than females (Table 2). Perch diameters ranged widely (.01-8.0 m) due to the nature of the figs with large main trunks and many small adventitious trunks. Mean perch diameters were similar for males and females (Table 2).

Animals were infrequently seen in direct sunlight (3% of observations) and most were in filtered sun (35%) or in full shade (62%) (Table 3). Females appeared to occupy filtered sun (40%) more commonly than males (28%); however, the frequencies were not significantly different ($X=2.71$; $p<0.10$).

Mean cloacal temperature for 58 recordings was 29.97 ± 1.71 and there was no significant difference in temperature between the sexes (male 29.64 ± 1.71; female 30.3 ± 1.71). Air temperatures were nearly identical to cloacal temperatures with a mean of 30.03 ± 1.57. The calculated slope of the linear regression of body temperature on air temperature was 0.89 with a y-intercept of 3.36. These data qualify this lizard as a thermoconformer (Huey 1982).

The sex ratio for *A. lucius* is strongly biased in favor of females. In 194 observations there were significantly more females (117) than males (77) recorded, ($\chi^2=8.24$; $p<.005$). This difference in numbers of males and females was corroborated by individual tree censuses. In 25 censuses of 10 trees over a three-day period, more males were counted on a tree three times, more females 18 times and the same number of males and females four times. An attempt was made to collect all the animals on one large fig tree over a two day period. When the tree produced no more animals, six adult males and 12 adult females had been collected.

Casual observations of the distribution of animals in the trees indicated that males defended portions of the figs and that females moved rather freely over the trees and did not defend areas against other females. The free movement of females is also implied by the reports of communal egg laying (Hardy 1957). Males were observed to display towards conspecifics, but no displacements or fights were seen.

Although hourly censuses were not taken in a systematic manner, the activity of *A. lucius* appeared to be spaced evenly throughout the day. The average number of animals seen per hour was similar before (19) and after (14) noon. Prior to a thunderstorm and immediately after a heavy rain, individuals were found inactive, secluded in cracks and crevices.

Vocalizations were frequently heard when animals were grasped during capture. The louder squeaks were clearly audible from over 20 m distant. No unmolested animals were heard vocalizing.

DISCUSSION

In spite of its unusual structural niche, *Anolis lucius* is a typical anole in many aspects of its ecology. It is diurnal, arboreal, and sexually dimorphic. Its shade-loving habits and thermoconformity are also shared with other *Anolis* (Gonzalez and Rodriguez 1982; Ruibal and Philibosian 1974; Rand 1967). However, this species has a few unusual aspects to its ecology.

The sex ratio of adult *A. lucius* strongly favors females. Most studies of anoline lizards have confirmed a 50:50 adult sex ratio (Ruibal and Philibosian 1974; Jenssen 1970; Rand 1967). An adult sex ratio in favor of females has been reported in *A. garmani* (Trivers 1976) and *A. valencienni* (Hicks and Trivers 1983). Our minimal observations on the social organization of *A. lucius* indicate that mating may be polygynous, which would be predicted by the biased sex ratio.

The preference of *A. lucius* for large complex tree trunks and rock surfaces reported by Ruibal (1961, 1964) is generally consistent with results in this study.

This paper demonstrates the need for a more detailed examination of social structure and social behavior in this species. Such studies may elucidate how the biased sex ratio is achieved and maintained as well as determine how the unusual structural niche might be implicated in social structure and behavior.

ACKNOWLEDGMENTS

We thank Noel González, Julio Novo, Stanley Rand and Ernest Williams for their assistance with the field work. Fernando González, the Director of the Institute of Zoology of the Cuban Academy of Science deserves our sincere appreciation for his support of this and other collaborative research between Cuban and United States scientists.

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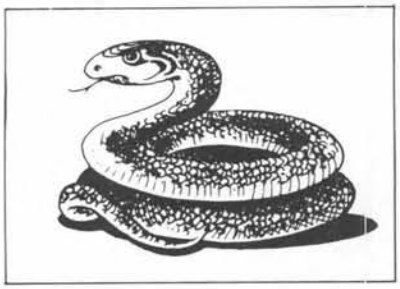
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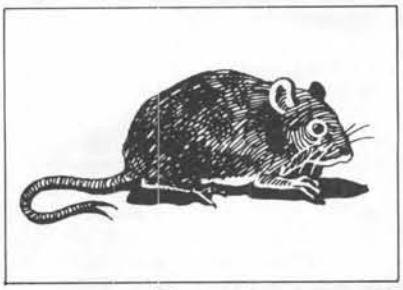
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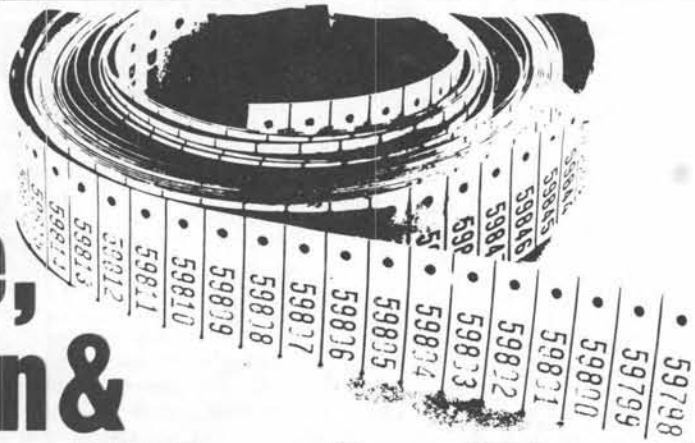
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REPRODUCTION IN CAPTIVE EYELASH VIPERS, *Bothrops schlegeli*

On 19 April 1985, two female *Bothrops schlegeli* were placed with a male in an all glass aquarium (60 X 40 X 32 cm). Female A (5 yrs. old, 640 mm SVL) and female B (10 yrs. old, 673 mm SVL) positioned themselves on various branches in the cage. Although courtship and copulation were not observed, the male was seen coiled on either female during a 26 day period. On 15 May 1985, the male was removed from the cage. Both females were offered adult mice (ca. 30 g) on 16 May, and while female A refused to feed, female B accepted the food item. On 25 June, both females refused to feed.

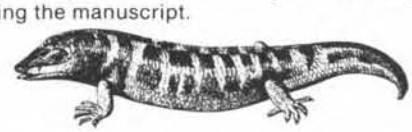
By August 1985, it was aparent by visual observation that both females were gravid. Mice were offered periodically and were refused. Both snakes were misted with water 3 times a week and drank readily. Photoperiod during gestation was 12D-12L and the temperature during a 24 hour period ranged between 19° C and 35° C under a heat lamp. On 7 January 1986, female A gave birth to 15 live neonates (not measured) without any stillborns or infertile egg masses. One week later, female A accepted food.

The gestation period of this animal was at least 237 days which is 71 days longer than reported by Antonio (1980. Herpetologica 36:231-233). Female A's last prepartum meal was 14 April 1985, giving a volitional anorexia of 268 days which is 137 days longer than reported by Antonio and at least 118 days longer than reported by Blody (1983. Herp. Review 14(2): 45-46).

Female B gave birth on 18 April 1986, to 18 live neonates ($\bar{X}$ = 3.1 g, 169 mm SVL). No stillborns or infertile egg masses were in evidence. The gestation period for female B was at least 338 days. The last prepartum meal was ingested on 16 May 1985. Feeding commenced one week postpartum, a volitional anorexia of 310 days. This is double the periods of gestation and anorexia recorded by Antonio and Blody.

ACKNOWLEDGMENTS

I wish to thank A. Dale Belcher and Candace Kroft of the Department of Herpetology, Rio Grande Zoological Park for their assistance and technical advice in preparing this note. Special thanks to Judy Chavez for typing the manuscript.



JAMES A. HITCHINER
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GEOGRAPHIC DISTRIBUTION

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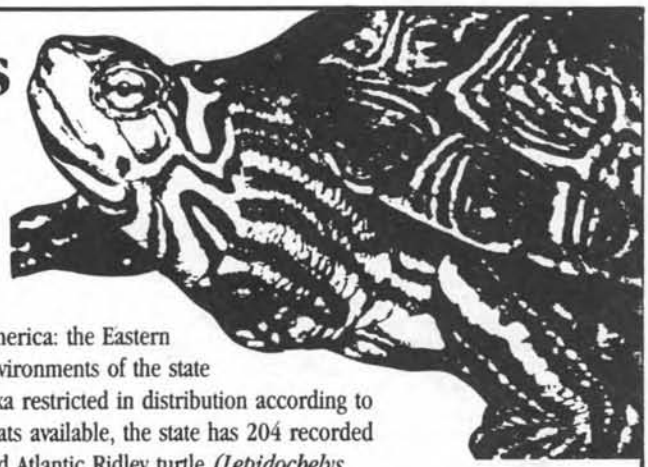
HYLA CRUCIFER (Spring Peeper). USA: WISCONSIN: Brown Co: Wooded marsh immediately south and east of the exit from U.S. Highway 41 to State Highway 32 (Lombardi Avenue) (T 24N, R 20E, S33). 29 April 1986. P.A. Cochran. Verified by P.A. Cochran. University of Wisconsin-Madison Zoology Museum (UWZM H22640). First museum record from county (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum. 205 pp.), substantiating an earlier record on the basis of call only (Mossman and Hine 1984. Wisconsin Dept. of Nat. Res., Bureau of Endangered Resources. 13 pp.).

Submitted by **PHILIP A. COCHRAN** and **KEVIN J. KNUTSEN,** Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115, USA

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CAUDATA

AMBYSTOMA TIGRINUM (Tiger Salamander). MEXICO: SONORA: Rio de la Concepcion basin, Rancho San Vicente (31° 15'05" N, 111° 21'08" W), ca. 30 km SE Sasabe. 9 November 1986. Arizona State Department of Zoology's Herpetological Collection (#23509). Rancho Santo Domingo (31° 28'10" N, 111° 50'28" W), ca. 30 km SW Sasabe, Sonora. 10 November 1986 (#23510). Both collected by A. Varela Romero, D.A. Hendrickson and L.H. Simons. Verified by T.R. Jones. Nearest localities ca. 90 km ENE in San Rafael Valley in Arizona; reports for northern Sonora are the phenotypically similar *Ambystoma rosaceum* (Jones and Collins, unpubl. data).

Submitted by **ALEJANDRO VARELA ROMERO,** Centro Ecologico de Sonora, A.P. 1497, Hermosillo, Sonora, Mexico, and **DEAN A. HENDRICKSON** and **LEE H. SIMONS,** Nongame Branch, Arizona Game and Fish Department, 2222 West Greenway Road, Phoenix, Arizona 85023, USA ●

STEREOCHILUS MARGINATUS (Many-lined salamander). USA: FLORIDA: Nassau Co: US Hwy 1, 9.2 km SE Hilliard (T3N R24E NW 1/4 S36). 11 April 1987. B. W. Mansell. Verified by P. E. Moler. Florida State Museum (UF 66529-66533) New county record, first record for Nassau River drainage, fourth Florida locality. Extends Florida range 50 km ENE. [Christman and Kochman 1975. Fla. Sci. 38(3):140-141: Christman, Campbell, Smith and Kochman 1979. Herp. Review 10(2):59].

Submitted by **PAUL E. MOLER,** Florida Game and Fresh Water Fish Commission, 4005 South Main Street, Gainesville, Florida 32601 and **BARRY W. MANSELL,** 2826 Rosselle Street, Jacksonville, Florida 32205, USA ●

SERPENTES

HETERODON NASICUS (Western Hognose Snake). MEXICO: JALISCO: Municipio Unión de San Antonio, Ejido Carrión, 25-30 km S Lagos de Moreno. 4 June 1983. R. Martínez I. Verified by G. Casas. Colección Herpetológica, Instituto de Biología (IBH 04910). New state record, extends range of the species southwestward (Morafka 1977. A biogeographical analysis of the Chihuahuan Desert through its Herpetofauna. Dr. W. Junk B.V., Publs., The Hague, viii + 313 pp.).

Submitted by **EDMUNDO PEREZ-RAMOS,** Colección Herpetológica, Instituto de Biología, UNAM, A.P. 70-153, D.F. 04510, México ●

RAMPHOTYPHLOPS BRAMINA (Brahminy Blind Snake). USA: FLORIDA: Palm Beach Co: 16 km W South Bay on State Hwy 27, pumping station #236, Lake Okeechobee. 28 March 1987. C.J. Delorey and H.R. Mushinsky. Verified by H.R. Mushinsky. Vertebrate Museum, University of South Florida (USF 1001). New county record, extends range ca. 110 km northwest of Dade Co. localities (Wilson and Porras 1983. Univ. Kansas Mus. Nat. Hist. Spec. Publ. 9:i-vi + 89 pp.)

Submitted by **CHRIS J. DELOREY** and **HENRY R. MUSHINSKY,** Department of Biology, University of South Florida, Tampa, Florida 33620, USA ●

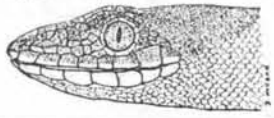
TESTUDINES

GRAPTEMYS GEOGRAPHICA (Map Turtle). USA: MINNESOTA: Morrison Co: Mississippi River, ca. 3 km S Little Falls (T129N R30W S36). 26 April 1986. T. Rossinger. Verified by J. Moriarty. J. F. Bell Museum of Natural History-Photo (JFBM-P-010). New county record, extends range 90 km upstream (nw) (Ernst 1973. J. Herp. 7:42-47).

Submitted by **JOHN J. MORIARTY,** J.F. Bell Museum of Natural History, Univ. of Minnesota, 10 Church St. S.E., Minneapolis, Minnesota 55455, USA ●

LEPIDOCHELYS OLIVACEA (Pacific Ridley). NEW ZEALAND: Kaka Point Beach. (S 46° 22", E 169° 47"). 23 May 1985. J.T. Darby. Verified by H.G. Cogger. Otago Museum (OM A87:01). This is the most southerly record for this species and the first to be recorded in New Zealand (Robb 1980. New Zealand Amphibians and Reptiles. W. Collins Publ. LTD, Auckland. 128 pp.)

Submitted by **J. T. DARBY,** Otago Museum, Great King Street, Dunedin, New Zealand ●



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NEW HERPETOLOGICAL RECORDS FROM THE SIERRA DE PERIJA, VENEZUELA

In February-March 1985 we conducted a preliminary herpetological expedition to the Serranía de Los Motilones, the southernmost region of the Sierra de Perijá, Distrito Perijá, Estado Zulia, along the Colombian-Venezuelan border. Our samplings yielded a series of specimens which represent new records of occurrence from this mountain range. Specimens are deposited in the Colección de Vertebrados, Universidad de Los Andes, Mérida (CVULA IV). All amphibians were verified by E. La Marca; all reptiles were verified by J. E. García

BUFO GRANULOSUS HUMBOLDTI. 4 km SW El Tukuko, 150 m. 28 February 1985. E. La Marca (CVULA IV-4615).

LEPTODACTYLUS WAGNERI. River at 3 km W El Tukuko. 2 March 1985. E. La Marca (CVULA IV-4616); river at 34 km (by road) SE El Tukuko. 4 March 1985. D. Borjas, J. E. García and E. La Marca (CVULA IV-4616-4625). Northwesternmost localities in Venezuela.

RANA PALMIPES. 5 km SW El Tukuko, on road to Misión San Miguel. 1 March 1985. J. E. García (CVULA IV-4626-4627). Westernmost locality in Venezuela.

AMEIVA AMEIVA PRAESIGNIS. 34 km (by road) SE El Tukuko. 4 March 1985. J.E. García (CVULA IV-4610). Extends range to the Lake Maracaibo Basin (Peters and Donoso-Barros 1970, U.S.N.M. Bull. 297, 1-293).

BASILISCUS BASILISCUS. El Tukuko, 150 m. 4 March 1985 (CVULA IV-4611); 34 km (by road) SE El Tukuko. J. E. García (CVULA IV-4612-4614).

GONATODES ALBOGULARIS ALBOGULARIS. El Tukuko, 150 m. 28 February to 4 March 1985. J. E. García, E. La Marca and P. Soriano (CVULA IV-4593-4607).

LIOPHIS MELANOTUS. El Tukuko, 150 m 1 March 1985. J. E. García and E. La Marca (CVULA IV-4608). Westernmost locality in Venezuela.

LEPTOPHIS AHAETULLA OCCIDENTALIS. El Tukuko, 150 m. 4 March 1985. J. E. García and E. La Marca (CVULA IV-4609). Westernmost locality in the country.

ACKNOWLEDGMENTS

We would like to thank Professor Pascual Soriano, of the Universidad de Los Andes, for provision of working space and for extending many courtesies leading to the completion of our trip to the Serranía de los Motilones.

Contribution No. 2 of the Sierra de Perijá Herpetological Program.

Submitted by **ENRIQUE LA MARCA,** Apartado 116, Mérida 5101, Venezuela and **JUAN ELIAS GARCIA,** Departamento de Biología, Grupo de Ecología Animal, Facultad de Ciencias, Universidad de Los Andes, Mérida 5101, Venezuela ●

BOOK REVIEWS

"VIRGINIA'S AMPHIBIANS AND REPTILES": COMMENTS AND CORRECTIONS

A recent publication (Tobey 1985. Virginia's Amphibians and Reptiles, A Distributional Survey. VA Herpetol. Soc., 114 pp.) provides the most comprehensive available distribution maps for Virginia's amphibians and reptiles. As we noted in a review of this publication (Mitchell and Pague, Herp. Rev., in press), the plotted localities were based on lists of specimens from museum and university collections unverified by the author, the literature, and observations records. Most localities are marked with black dots which represent vouchered and unvouchered records. A few localities which Tobey considered problematic are indicated by hollow dots. We have examined most of the Virginia specimens available in collections, and have had access to the support documentation for Tobey's (op. cit.) maps. In this note we correct some of the maps and focus attention on the periphery of species distributions and questionable records that require verification. Specimens referred to are deposited in the American Museum of Natural History (AMNH), National Museum of Natural History (USNM), and the University of Michigan Museum of Zoology (UMMZ).

Misidentified specimens - The Caroline Co. *Ambystoma jeffersonianum* record is based on an *A. maculatum* (USNM 48920). The *Stereochilus marginatus* locality in Amelia Co. is based on misidentified *Ambystoma opacum* larvae (USNM 196294). The three northernmost *Acris gryllus* records are *A. crepitans* (USNM 198661-2, 243993-6).

Unverified observations - Numerous range-margin localities are based only on observations. These are: *Ambystoma jeffersonianum* - Hanover Co. (Funderburg et al. 1974. Bull. Md. Herpetol. Soc. 10:57-58); *Bufo terrestris* -Surry Co.; *Limnaeodus ocularis* - Mecklenburg Co.; *Agkistrodon piscivorus* - Brunswick Co.; *Clemmys muhlenburgii* - Montgomery Co.; *Crotalus horridus* - Greensville, Halifax and Mecklenburg counties (Byrd 1728. Histories of the dividing line betwixt Virginia and North Carolina, run the year of our Lord 1728, The Westover Manuscripts, reprinted, Petersburg, VA, 1841; Byrd 1733, Journey to the Land of Eden, The Westover Manuscripts, Petersburg, VA, 1841); *Deirochelys reticularia* - central City of Virginia Beach; *Kinosternon subrubrum* - Rockingham Co.; *Opheodrys vernalis* - Bland, southwestern Giles and Washington counties; *Pituophis melanoleucus* - Augusta, Bath and Botetourt counties (Burch. 1940. Va. J. Sci. 1:35-40; Uhler, et al.. 1939. Trans. 4th N. Am. Wildl. Conf., pp 605-622); *Regina septemvittata* - Chesterfield Co. There is no specimen-supported verification of *Anolis carolinensis* in the Great Dismal Swamp National Wildlife Refuge in Virginia.

Other questionable records - Several locality records are supposedly based on specimens in museum and university collections, which we cannot find in the respective collections. We assume these records were plotted incorrectly, or were based on specimens which were subsequently reidentified. These records are: "*Ambystoma opacum* - Montgomery Co." (UMMZ): "*Amphiuma means* - Amelia Co." (USNM); "*Necturus maculosus* -Montgomery Co. and Pulaski Co." (USNM, AMNH); "*Pseudacris triseriata* - City of Virginia Beach" (USNM); and "*Rana palustris* - Accomack Co." (USNM). The specimens for the two northernmost *Desmognathus auriculatus* localities in Hanover County cannot be located in the Randolph-Macon College col-

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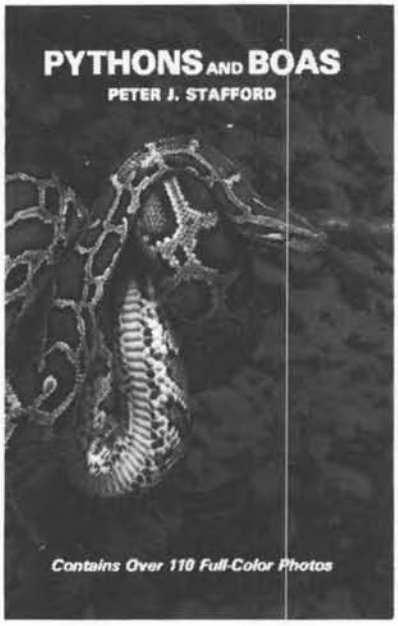
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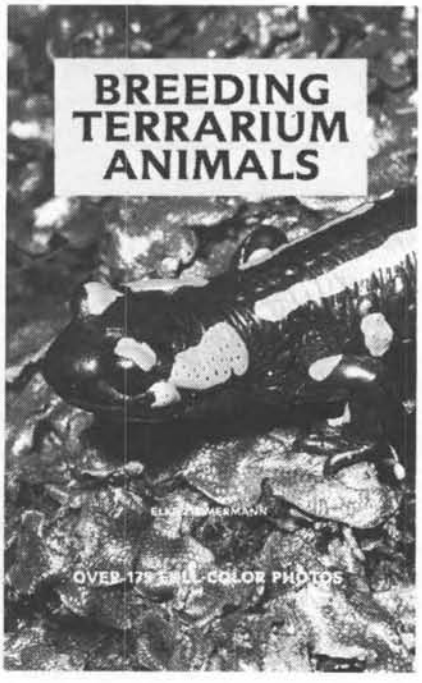
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lection and are presumed lost. Our unpublished information suggests they were misidentified *Desmognathus fuscus*.

Toads in Virginia, especially in the southeast, are occasionally difficult to identify (Blem 1979, Cat. Am. Amph. Rept. 223; pers. obs.). The putative *Bufo terrestris* (USNM 198568) from Hanover County appears to be a hybrid between *B. woodhousei fowleri* and *B. terrestris*. However, the locality lies well to the northwest of the range of *B. terrestris*, and we would not expect *B. terrestris* genetic influence in this area. In our opinion, this locality should not be included in the range of *B. terrestris*.

The southernmost locality for *Ambystoma jeffersonianum* is based on a juvenile specimen (USNM 21234), which was given to the University of Maryland in 1966. It could not be located in a recent search (R. D. Worthington and A. Wynn, pers. comm.). The northwestern Brunswick Co. specimen of *Amphiuma means* (USNM 49624) was donated to the Instituto Butantan, Brazil in 1950. These localities need verification.

We thank F. J. Tobey for allowing us access to the documentation used to develop the maps, and the following curators for allowing us to examine the Virginia specimens under their care: C. B. Knisley (Randolph-Macon College), G. R. Zug and R. W. McDiarmid (USNM), R. G. Zweifel (AMNH). A. Kluge (UMMZ) sent us a data printout for Virginia. Our Virginia research is supported by the Nongame Species Program of the Virginia Commission of Game and Inland Fisheries.

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The Encyclopedia of Reptiles and Amphibians, edited by Tim Halliday and Kraig Adler. 1986. 160 pp. 160 color photos and illustrations. Facts on File, Inc., 460 Park Avenue South, New York, New York 10016, USA. Hardbound, $24.95.

This relatively concise volume consists of a series of 19 articles, each written by a professional zoologist with expertise and/or research interests in that particular area of herpetology. The name "encyclopedia" implies a collection of information on manifold topics, and this text conforms nicely with this concept. Some general topics covered include the evolution, biology, classification and ecology of amphibians and reptiles.

The format adhered to throughout the book is logical and easily followed. Evolutionary and fossil histories of each class are presented first and are then followed by morphological, anatomical, reproductive, and other characteristics of the class. The ecologies and known distributions of species are collectively used to characterize the families. In addition, much interesting general information on familial members is included. Boxes are used to explain or describe subject matter in greater detail. A current classification of families within an order (e.g. families recognized under the order Squamata, suborder Sauria) is telegraphically presented at the end of each ordinal (or subordinal) section. A small distributional range map and the number of genera and species are included for each family. Following the family descriptions are more lengthy articles elaborating particular topics of interest, such as "Repellent Defenders, antipredator mechanisms in salamanders and newts" and "Frog Chorus, vocal communication in frogs and toads."

Approximately 160 color photographs and drawings are used effectively to illustrate species or to visually explain the text. All are of excellent quality and would be well worth the cost of the book by themselves.

Although mistakes have been kept to a minimum, a few were overlooked. The red salamander *Pseudotriton ruber* has been positioned in two families, the Salamandridae and the Plethodontidae. Nomenclatural misspellings and inconsistencies are also few in number but present (e.g. *Ascaphus truei* and *A. trueii*).

In one instance, word selection or additional explanation might have helped dispel a widely believed misconception that constrictors kill prey by crushing. The caption of a pygmy python killing a mouse states that the mouse is "crushed to death." Although the crushing of prey may sometimes occur, suffocation by constriction is the more common cause of prey death.

This encyclopedia has appeal to amateurs and professionals alike and is a book that all of us interested in amphibians and reptiles should have on our shelves and consult frequently. The information is conveyed visually and verbally in a manner appreciated by most readers. Much of the technical jargon found in other texts and scientific papers has been omitted, so the casual reader as well as the professional can readily grasp the information and concepts presented.

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The Encyclopedia of Reptiles and Amphibians by Tim R. Halliday and Kraig Adler (Editors). 1986. xvi + 144 pp. Facts on File, Inc., 460 Park Avenue South, New York, New York 10016, USA $24.95.

Ho hum! Another popular book on amphibians and reptiles? Another "coffee table" picture book? Not really. This book is something special, for it consists of well-written text and informative panels interwoven among superb, eye-caching illustrations. All of this is encompassed on 144 pages of high-quality paper (21.5 x 28 cm) in a hard cloth cover encased in an attractive dust jacket.

Nineteen distinguished herpetologists contributed sections of this book. The editors of the volume and Graham Bateman, editor of the series, have done an outstanding job of uniformity of treatment and integration of text and illustrations. The plan of the book consists of major articles introducing the two classes and separate major articles dealing with each of the three orders of amphibians and six orders and suborders of reptiles. Each

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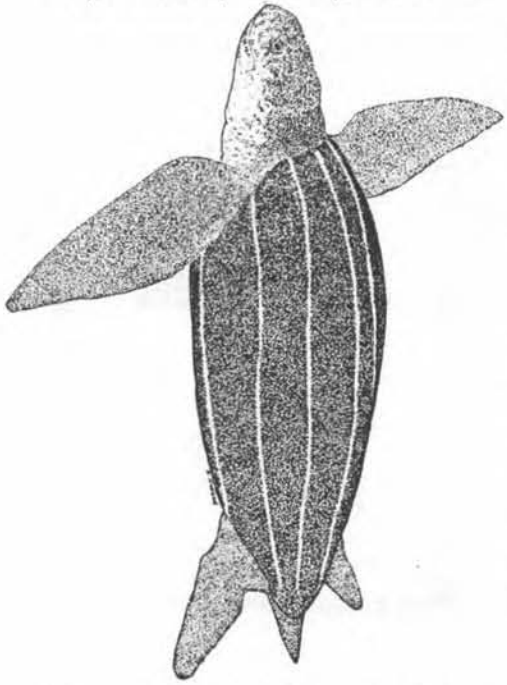
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of these 11 chapters is introduced by a factual panel giving the number of families, genera, and species, distribution (with map), summary of habitat, size, color, reproduction, and longevity. Each of the chapters dealing with the nine orders and suborders concludes with a separate description of each of the families. In those accounts of the salamanders, frogs, turtles, lizards, and snakes, fact-box summaries for each family are appended; these give the numbers of genera and species, distribution (with map), size, color, body form, and lists of species and genera referred to in the text. Ten double-page special features highlight important aspects of the biology of amphibians and reptiles.

The introductory chapter on amphibians (Kraig Adler) discusses the origin of amphibians in the classical rhipidistian-*Ichthyostega* story and provides a brief account of locomotion and a good review of the diversity of reproductive modes. This is followed by three special features (all by Adler) dealing with metamorphosis, adaptive coloration, and parental care.

The chapter on caecilians (Marvalee H. Wake) is an informative, but brief, review that emphasizes feeding, locomotion, and reproduction. The chapter on salamanders (Tim Halliday and Paul Verrell), which displays the European influence by emphasizing newts, is followed by feature articles on salamander courtship (Tim Halliday) and on antipredator mechanisms (Edmund Brodie). A more lengthy chapter on frogs (Anthony Arak) complements information provided in the chapter on amphibians. Two special features deal with frogs—locomotion (George R. Zug) and vocalization (H. Carl Gerhardt).

The introductory chapter on reptiles (Angus d'A Bellairs) includes succinct discussions of the origin, classification, skin, skeleton, and reproduction, followed by special features on dinosaurs (Alan J. Charig) and thermoregulation (Raymond B. Huey). The chapters on the groups of reptiles include turtles (Edward O. Moll), lizards (Arnold G. Kluge and Gordon Schuett), snakes (Herndon G. Dowling), amphisbaenians (Carl Gans), the tuatara (Joan Robb), crocodilians (H. Robert Bustard), and a special feature on venomous snakes and their venoms (Sherman A. Minton).



Within the accounts of the major groups there are special feature boxes on particular subjects. These include (1) finding breeding ponds by salamanders, (2) marine toads *(Bufo marinus)* in Australia, (3) frog toxins and poisons (4) longevity in turtles, (5) the versatile lizard tongue, (6) the expendable tail of lizards, (7) courtship in lizards, (8) unisexual lizards, (9) sense organs in snakes, (10) brooding behavior in snakes, (11) courtship and aggression in snakes, (12) how snakes swallow their prey, and (13) parental care in crocodilians.

Authors of each of the groups have emphasized beneficial aspects of amphibians and reptiles to humans and the decline of many kinds of amphibians and reptiles because of human exploitation and especially habitat destruction. In the fact-box summaries at the end of each account the threatened or endangered status as listed by the IUCN and the listing by CITES are given.

The illustrations are an important aspect of this book. The 113 color photographs (some covering an entire page) are for the most part excellent and in themselves provide a comprehensive view of amphibians and reptiles. Many of these photographs are not just pictures of the animals but of the animals doing something [e.g., *Chiromantis xerampelina* beating a froth nest (p. 9), *Desmognathus fuscus* brooding its eggs (p. 21), *Hyla arborea* leaping (p. 57), *Dendroaspis polylepis* hatching from an egg (p. 66), *Varanus komodoensis* feeding (p. 107), *Crotalus atrox* striking (p. 131), and especially *Crocodilus niloticus* drowning an impala (p. 141)]. The photographs are accompanied by meaningful captions. I noted only two errors in the captions. The photograph of a *Ceratophrys* (p. 37) is incorrectly identified; the individual is *C. cornuta*. The caption for the photograph of a *Liasis perthensis* coiled around a mouse (p. 121) unfortunately states that the mouse is being "crushed to death."

Four illustrators contributed to the book. Some stylized morphological drawings and paintings of dinosaurs are the work of Michael Long, whereas other generalized morphological drawings were done by Simon Driver, and a few black and white sketches were drawn by Denys Ovenden. The great majority of the artwork consists of color paintings by David M. Dennis, who, among other things, illustrated representative taxa of all of the families. Those of us who have seen original paintings by Dennis will be somewhat disappointed by the reproductions in this book, because many of them seem to lack the depth and subtle tones characteristic of his original paintings.

The book concludes with a bibliography of 103 titles and a list of 16 herpetological journals, a glossary of 320 technical terms and an index of more than 2400 entries guiding the reader to subjects, common names, scientific names, and illustrations.

There are some minor errors [e.g., the eggs of all phyllomedusine hylids are enveloped in leaves (p. 49), and centrolenids have minute eyes (p. 49)]. Also, there are some taxonomic errors [e.g., use of the generic name *Hylambates* for *Leptopelis* (p. 51), and the association of arthroleptine ranids as a subfamily of the Hyperoliidae (pp., 51, 55)] and one major inconsistency—3000 species of amphibians (p. vi) versus the more nearly correct number of 4015 (p. 2). One ancient error in the literature has persisted on page 51 in this encyclopedia, in which it is reported that *Hylambates (= Leptopelis) brevirostris* broods eggs in the buccal cavity. This was dispelled 50 years ago by G. K. Noble (see Duellman and Trueb 1986, Biology of Amphibians, p. 44). Some statements are misleading. For example, I take exception to the statement (p. 47) that ghost frogs *(Heleophryne)* are rare; they have restricted distributions. Likewise, the statement (p. 94) that there is no evidence to substantiate the decline of native species of lizards because of the introduction of exotic lizards in southern Florida may be correct in that there are no population studies providing the necessary empirical data. However, to someone like myself who was used to seeing *Anolis carolinensis* on nearly every bush in Miami in the 1950s where now *Anolis sagrei* abounds, there is no doubt that the introduction of *Anolis sagrei* had had a profound effect on the population of *Anolis carolinensis*.

The great amount of information in a very concise form is a tribute to the diligent efforts of the editors working within the constraints established by the publishers. However, the usefulness of the book would have been enhanced by the inclusion of some material and the elaboration of other subjects. For example, the morphological sections generally are weak and give no idea of skeletal diversity. Information on population dynamics, community ecology, and historical biogeography is lacking. Other special features that could have been added are (1) energy metabolism, (2) color change, (3) water economy in amphibians, (4) the tongue and feeding in amphibians, and (5) diversity of amphibian larvae with respect to habitat. Inclusion of these materials and appropriate illustrations would have added perhaps 20 pages to the book.

These minor criticisms aside, the Encyclopedia is an excellent introduction to the fascinating world of amphibians and reptiles. The book has many potential users. Professional herpetologists will want to keep a copy handy for answering those annoying queries: How long do turtles live? How many kinds of frogs are there? What is the longest snake? It is adequate as a text in an introductory undergraduate course in herpetology. I think it is more useful as a text than Goin, Goin and Zug, 1978, Introduction to Herpetology. In combination with the volumes on mammals and birds in the same series, it is an excellent reference for a course in vertebrate natural history. Because it is written in a style that can be understood and appreciated by the layperson, the book belongs in every high school library and on the shelf of every nature enthusiast. For everyone else, it is a fine addition to the coffee table, for the pictures alone are worth the price of the book.

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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

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Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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Herpetological Review

Volume 18 June 1987 Number 2

SSAR BUSINESS

AUTHORS SOLICITED FOR SALIENTIA ACCOUNTS IN CATALOGUE OF AMERICAN AMPHIBIANS AND REPTILES

Several species in the anuran fauna of the United States and Canada have had no authors assigned, or the assignments have been relinquished by their prospective authors. If you would care to volunteer to write the Catalogue account for one or more of the species listed below, please contact the undersigned. Accounts available are: *Bufo americanus, B. compactilis, B. debilis, B. punctatus, B. speciosus, Hyla arenicolor, H. chrysoscelis, H. crucifer, H. eximia, H. versicolor, Hypopachus variolosus, Pseudacris clarki, P. triseriata, Rana catesbeiana, R. pipiens, R. utricularia (sphenocephala), Scaphiopus bombifrons, S. hammondii, S. intermontanus, S. multiplicatus, Syrrhopus cystignathoides, S. guttilatus,* and *S. marnockii.*

In addition, the Catalogue is open to accounts of species, genera and higher categories from anywhere in the Americas, and authors are sought for these, too. Contact Richard G. Zweifel, Salientia Editor, Catalogue of American Amphibians and Reptiles, Department of Herpetology, American Museum of Natural History, New York, New York 10024, USA ●

HERPETOLOGY IN MEXICO— A MEXICAN PERSPECTIVE

The Regional Society Liaison Committee, in cooperation with the Zoo Liaison Committee, is proud to sponsor a morning paper session on Monday afternoon, 10 August, at the Joint Annual Meeting of The Society for the Study of Amphibians and Reptiles and The Herpetologists' League, at the Hotel Mocambo, Veracruz, Mexico.

The title of the paper session is "Herpetology in Mèxico - A Mexican Perspective." Five speakers from various Mexican Institutions have been invited to participate. They include: David Lazcano, Jr., Museo de Historia Natural, Universidad Autónoma de Nuevo Leon; Eduardo Fanti Echegoyen, Departamento de Herpetología de la Universidad de Guadalajara; Oscar Flores Villela, Curator of Herpetology, Museo de Zoología, Facultad de Ciéncias, Universidad Nacional Autónoma de Mèxico; Antonio Ramírez Velásquez, Instituto de Historia Natural, Departamento de Zoología, Chiapas Zoo; and José María Reyes, Dirección General de Conservación y Ecología de los Recursos Naturales.

The speakers will be limited to 25 minutes for their presentations and 5 minutes for questions and answers. For more information check in at the registration counter or contact Stephen Hammack, Chairman, Regional Society Liaison Committee or Donal Boyer, Chairman, Zoo Liaison Committee.

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NEWS NOTES

SMITHSONIAN REPRINTS CATALOGUE OF NEOTROPICAL SQUAMATA

The Smithsonian Institution Press has reprinted a widely used checklist of Central and South American snakes and lizards. The Catalogue of the Neotropical Squamata (Part I: Snakes, by James A. Peters and Roberto Donoso-Barros; Part II: Lizards and Amphisbaenians, by James A. Peters and Braulio Orejas-Miranda, reprint with new material by P. E. Vanzolini) includes complete primary synonymies and keys for identification in both English and Spanish. P. E. Vanzolini's update brings all the taxonomic nomenclature current through 1985 and early 1986.

This 148 page paperback is now available at $29.95 ($1.75 postage and handling for the first book, 50¢ additional for each additional book) from: Smithsonian Institution Press, P.O. Box 4866, Hampden Station, Baltimore, Maryland 21211, USA.

For those individuals with the original Catalogue, the Smithsonian Institution has published the "Addenda and Corrigenda to the Catalogue of Neotropical Squamata" as SHIS #70. This may be obtained free of charge from the Division of Amphibians and Reptiles, National Museum of Natural History, Smithsonian Institution, Washington, DC 20560, USA. Requests should include a self-addressed mailing label. ●

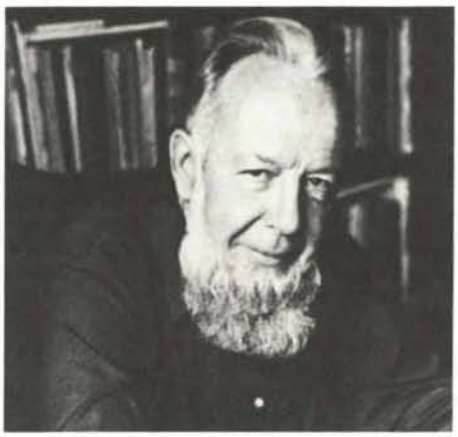
IN MEMORIAM

ANDREI GRIGORYEVICH BANNIKOV (1915-1985)

A. G. Bannikov, noted Soviet zoologist and conservationist and senior author of the best known field guide to the herpetofauna of the USSR, died of cancer in Moscow on 17 October 1985. At the time he held the Chair of Zoology at the Moscow Veterinary Academy and was vice-president of the All-Union Herpetological Committee. Although most of his 400 papers and 30 books dealt with mammals and birds, he made many important contributions to herpetology. He published detailed monographs on the ecology of the commonest species of Russian amphibians and reptiles, wrote the first significant review of the herpetofauna of Mongolia, and led the popularization of herpetology in his native land.

Professor Bannikov's major herpetological works include "Contributions to the Biology of Amphibians" (1956, with Denisova), "Amphibians and Reptiles of the USSR" (1971, with Darevsky and Rustamov), "Animal Life: Amphibians and Reptiles" (first edition 1971; second edition 1985, with Darevsky, Denisova, Drosdov and Iordansky), "Field Guide to Amphibians and Reptiles of USSR" (1977, with Darevsky, Ischenko, Rustamov and Scherbak), and "Problems of Conservation and Natural Uses of Reptiles" (1978, with Flint and Makeev).

In addition to his zoological work Bannikov was very active in conservation. He began the Red Data Book project in the USSR and organized several nature reserves in the Soviet Union. He was elected a vice president



Andrei Grigoryevich Bannikov

of the International Union for the Conservation of Nature, which in 1973 awarded him its Golden Ark prize for his conservation activities. The previous year the World Wildlife Fund presented him its Gold Medal, for conservation of the saiga antelope.

Fuller obituaries are published in: Wildlife and Wildlife Management (Moscow), issue 2, 1986, pp. 16-17; Ecology (Sverdlovsk), issue 2, 1986, pp. 95-96.

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●

ZDENEK VOGEL

"It is with regret and sadness that we announce the passing of Professor Zdenek Vogel, Zoologist and Author, at age 73, on December 9, 1986." Announcement by the Zdenek Vogel Family (Prague, Czechoslovakia)

Professor Vogel is perhaps best known from the publication of his book, *Reptile Life*, which included species of reptiles that occur in countries of Eastern Europe and USSR. At the time of its publication, the early 1950s, communication between the socialist countries and the West was virtually non-existent. This book, then, was particularly popular among herpetologists in the United States wanting to know more about herpetology in the socialist countries.

Professor Vogel had travelled to various socialist and non-socialist countries (including Cuba, Venezuela, and others) as a consultant and to pursue his herpetological interests, publishing materials intended primarily for the interested generalist. Many of his works appeared in Czech and/or German and eventually English. ●

SOCIETIES

CONFERENCE ON CALIFORNIA HERPETOLOGY

A Conference on California Herpetology will be held on 10-11 October 1987, sponsored by the regional herpetological societies of California, and hosted by the Los Angeles County Museum of Natural History.

Seventeen distinguished herpetologists and three roundtable discussions will explore aspects of California's reptiles and amphibians of interest to professional and amateur herpetologists as well as conservationists and naturalists in general. The latest research on endangered and rare species, the most recent techniques of captive propagation, and other topics will be discussed.

For further information call (818) 982-8520, (213) 744-3371, or (619) 672-1096, or write: C.H.C./S.W.H.S., P.O. Box 7469, Van Nuys, California 91409, USA

Conference fee is $30 ($25 before Sept. 25).

●

FORMATION OF A HERPETOLOGICAL ORGANIZATION IN MEXICO

In August 1985, during the VIII National Congress of Zoology in Saltillo, Coahuila, approximately 30 individuals interested in herpetology met and formed the "Comité Herpetológico Nacional" (CHN). The CHN is composed of three members of the Mexican herpetological community: M.S. Zeferino Uribe-Peña (President), Biol. Rubén Castro-Franco (Secretary), and M.S. Oscar Flores-Villela (Board Member). Addresses are given below.

The original goals of the CHN were (1) to produce a preliminary directory of Mexicans interested in the study of amphibians and reptiles, and (2) within a period of one year to organize a meeting with three main objectives: to identify the main lines of current research by Mexican herpetologists; to identify all Mexicans involved in herpetological research and their professional addresses; and to discuss the feasibility of establishing a formal herpetological society in Mexico.

The preliminary directory contains names and addresses of about 50 professionals and students (copies can be obtained from Rubén Castro-Franco). The "Primera Reunion Herpetológica Nacional" was held at the Universidad Autónoma del Estado de Morelos (UAEM), Curenavaca, Mexico, 3-5 September 1986. Eighty four persons attended. Of the 77 persons polled, 22 were professionals, among them curators, full-time researchers and technicians, 24 were undergraduate students, 13 students doing theses on herpetology, and eight graduate students. The participants belonged to seven major institutions (five universities and two institutes from Mexico) as well as one university in the United States.

- Universidad Nacional Autónoma de México
  Instituto de Biología, Estación de Biología Tropical "Los Tuxtlas", Facultad de Ciencias, Facultad de Medicina, and Escuela Nacional de Estudios Profesionales Iztacala
- Universidad Michoacana de San Nicolás de Hidalgo
  Escuela de Biología
- Universidad Veracruzana
  Facultad de Ciencias Biológicas
- Universidad Autónoma de Nuevo León
- Universidad Autónoma del Estado de Morelos
  Escuela de Ciencias Biológicas
- Instituto Nacional de Investigaciones Sobre los Recursos Bióticos
  Programa Fauna de México
- Instituto de Ecología A.C.
- Oklahoma State University
  Department of Zoology

Forty papers were presented: 14 of them were completed research projects and the remaining papers were the results of current ongoing investigations. The research covered community ecology, biogeography and faunal studies, reproduction, and taxonomy.

On the whole, the reunion was a success. Throughout the present year the CHN will focus its activities mainly on preparation for the organization of a formal society, send representatives from the Mexican herpetological community to international events (such as the World Congress of Herpetology), and meet jointly with SSAR and HL in Veracruz, Mexico, in August 1987. Also, the CHN plans to search for funds to publish a small newsletter, to promote the organization

HERPETOLOGICAL COLLECTING AND COLLECTIONS MANAGEMENT
by
John E. Simmons
1987 Herpetological Circular No. 16

This handbook is essential for anyone who collects and preserves reptiles and amphibians. It outlines techniques for collecting and preparing specimens, and details cataloging, management, and maintenance procedures that are essential to both small and large collections. Includes a comprehensive 350-entry bibliography. This circular is an excellent personnel training guide, and is a necessity for individuals, universities, and zoos who maintain or work with preserved collections.

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of courses for training Mexican herpetologists, and to help them keep abreast of current scientific advances in the world.

We wish to thank the following institutions and persons for their support and role in establishing the CHN: Biol. Salvador Santillan (Director of UAEM), Dr. José Sarukhan (Director of Instituto de Biología, UNAM), Dr. Kraig Adler (Professor of Biology at Cornell University), and the Local Meeting Committee (UAEM).

For information, suggestions and donations contact: M. S. Zeferino Uribe-Peña, Departamento de Zoología, Instituto de Biología, UNAM, Apartado Postal 70-153, México, D.F. 04510, México; or Biol. Rubén Castro-Franco, Escuela de Ciencias Biológicas, Universidad Autónoma del Estado de Morelos, Cuernavaca, Morelos, México, or M.S. Oscar Flores-Villela.

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SOPTOM

The Station d'Observation et de Protection des Tortues des Maures (SOPTOM) was founded in 1985 by French and English conservationists concerned about the decline of *Testudo hermanni* and other reptile species in the Massif des Maures. The initiative has received strong support and interest from local people and the Municipal Council of Les Mayons. International support has come from the Conservation Committee of the Societas Europaea Herpetologica, the Flora and Fauna Preservation Society and the Tortoise Specialist Group of the IUCN. The conservation programme draws on the results of research carried out by the Ecology Research Group of the University of Kent and by Dr. Marc Cheylan of the University of Montpellier.

The activities of SOPTOM include conservation (habitat restoration, egg protection, and protected rearing of juveniles, as they relate to Hermann's tortoise), park and reserve protection, observation and study, publicity and public relations, and educational productions for use in schools.

Further information may be obtained from: Bernard Devaux, SOPTOM, La Tuilière des Anges, 83340 Les Mayons, France. ●

MEETINGS

ASZ AND FIVE OTHER SOCIETIES TO MEET IN NEW ORLEANS, LA., 27-30 DECEMBER 1987

The 1987 Annual Meeting of the American Society of Zoologists with the American Microscopical Society, Animal Behavior Society, The Crustacean Society, International Association of Astacology, and the Society of Systematic Zoology will be held at the Hyatt Regency Hotel in New Orleans, Louisiana, during the traditional post-Christmas period.

The Call for Contributed Papers has been issued by ASZ, and an *August 10* deadline for receipt of abstracts of papers (oral or poster presentations) has been set.

Symposia presently scheduled are: (1) Adaptive Sex Ratios and Sex Ratio Theories, (2) Kin Recognition in Animals: Empirical Evidence and Conceptual Issues, (3) Comparative Aspects of Aging of Neuroendocrine Systems, (4) Biology of the Crocodilia, (5) Phylogeny of Immune Defense Mechanisms in Parasitic Infections, (6) Behavioral Neuromodulators: Cellular, Comparative and Evolutionary Patterns, (7) The Developmental Neurobiology of the Frog: A Symposium in Honor of Jerry J. Kollros, (8) Constraints of Bioenergetics on Animal Population Dynamics, (9) Crustacean Egg Production, (10) Adaptive Coloration in Invertebrates, (11) Aquatic Locomotion, (12) Vicariance Biogeography: Theory, Methods and Applications, (13) Is the Organism Necessary?, and (14) Science As A Way of Knowing — Form and Function.

Meeting plans include several socials, special programs, commercial exhibits and a Job Placement Service. Hotel rates are $55 for single and $60 for double rooms at the Hyatt Regency Hotel. Housing and Registration deadlines are November 20. Forms will be available mid-September.

This meeting is hosted by Tulane University, with Milton Fingerman, Claudia deGruy and Merle Mizell co-chairing the Local Arrangements Committee. For more information contact: Mary Adams-Wiley, Executive Officer, American Society of Zoologists, Box 2739 California Lutheran University, Thousand Oaks, California 91360 (telephone (805) 492-3585). ●

SINO-JAPANESE HERPETOLOGICAL SYMPOSIUM HELD AT GUANGZHOU, CHINA

The first Sino-Japanese Herpetological Symposium, proposed by the Chinese Society of Herpetologists and co-sponsored by the Herpetological Society of Japan, was held from 25 August to 5 September 1985 at South China Normal University in Guangzhou (formerly Canton), China. Seventy-three herpetologists from four countries attended this meeting, the first international herpetological meeting ever held in China. We were very sorry that Dr. Hajime Fukada, who as president of HSJ was actively involved in the planning, could not attend due to illness. Fifteen participants came from Japan, seven from the United States, one from Switzerland, and 50 were Chinese herpetologists. Pan Jionghua, R. Goris, Ding Han-po, K. Adler, J. Garzoni, M. Matsui and Zhao Ermi were selected as members of the platform party for the Opening Ceremonies.

Seventy-one papers and abstracts covering a wide range of topics (13 on systematics, 11 on faunistics, 3 on morphology and ultrastructure, 10 on ecology, 8 on physiology, 4 on developmental biology, 4 on reproductive biology, 5 on karyology, 2 on parasitology, 2 on snake-bite, 6 on toxicology, and 1 each on behavior, biochemistry, and paleontology), were presented at the symposium. Papers and abstracts were published in *Acta Herpetologica Sinica* (volume 4, pages 55-73, 133-376, 1985 and volume 5, pages 1-66, 1986). Copies of these issues can be obtained on an exchange basis by writing to me. Most of the

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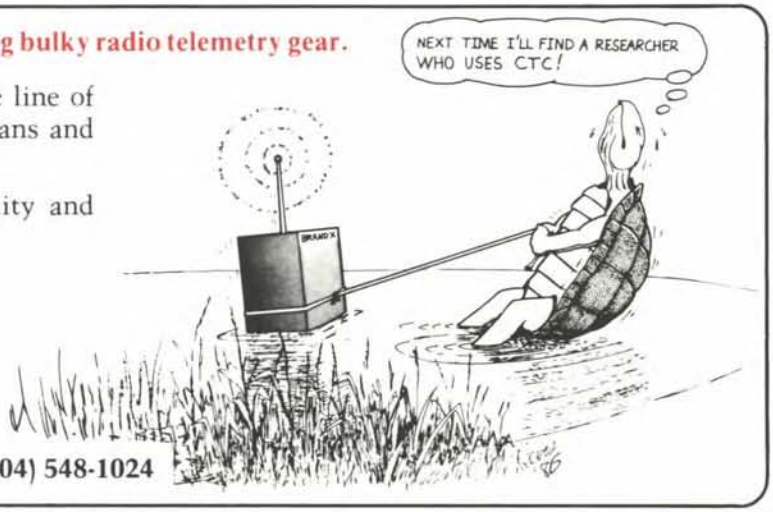
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papers were read and discussed at the sessions. Following is a list of the papers presented.

Session 1: Masafumi Matsui, chair.
Y. Sawai, Japan Snake Institute, Japan: Snakebites in the Asian area.
R. Goris, Yokohama City University, Japan: Infrared reception in snakes.
M. Kuramoto, Fukuoka University of Education, Japan: Anuran amphibians of the Ryukyu Islands and Taiwan.
T. Seto, Shimane University, Japan: Karyological studies of Hynobiidae (Caudata).

Session 2: Zhao Ermi, chair.
K. Adler, Cornell University, USA: The orientation of desert lizards.
R. Conant, University of New Mexico, USA. Zoogeography and phylogeny of the North American members of the genus *Agkistrodon.*
K. Kardong, Washington State University, USA: The rattlesnake strike—offensive and defensive behavior.
Pan J., South China Normal University, PRC: Advances in herpetological research in China.

Session 3: Ding Han-po, chair.
Pan J., South China Normal University, PRC: Amphibian fauna of the Guangdong mainland.
Fang R., Shaanxi Normal University, PRC: A new *Scutiger* from Shaanxi.
M. Toyama, Okinawa Prefectural Office of Education, Japan: Herpetofauna of Okinawa Islands.
Liu M., Liaoning University, PRC: Herpetofauna of Liaoning Province.
Yuan H., Ministry of Forestry, Xinjiang, PRC: Reptiles of Shaanxi Province.
Li D., Tsunyi Medical College, PRC: Reptiles of the karst region of Libo, Guizhou.
Zheng J., Fujian Normal University, PRC: Sea turtles along Fujian coastal region.
Zhou Y., Shenyang Normal College, PRC: Sea snakes of Liaoning Province.

Session 4: Y. Sawai, chair.
Qi Z., Shanghai Institute of Biochemistry, Academia Sinica, PRC: Human thrombin and thrombin-like enzyme from Pallas' pit-viper venom.
Wang Q., Fujian Medical College, PRC: Thrombin-like enzyme from hundred-pace pit-viper.
Zeng G., Jiangxi College of Traditional Chinese Medicine, PRC: Cobra venom and its neurotoxic components.
Sun J., Sun Yat-sen Medical University, PRC: Cardiotoxicity of cobra cardiotoxin in the rat.
Chen Y., Shanghai Institute of Biochemistry, Academia Sinica, PRC: Taxonomic significance of snake venom phospholipase A_2.
Jiang J., Dung Feng Hospital, Changzhou, PRC: Three severe symptoms caused by snake-bite.
Hong S. and Liu K. Fujian Medical College, PRC: Detoxification of crotaline venom by DTPA.
Hao W., China Medical University, PRC: Snake venom applications.

Session 5: Pan Jionghua, chair.
Liu C., South China Normal University, PRC: Distributional grouping districts of herptiles in China.
Song M., Shaanxi Institute of Zoology, PRC: A new gecko from Shaanxi Province.
M. Matsui, Kyoto University, Japan: Variation and systematics of Chinese toads.
Hu Q., Chengdu Institute of Biology, PRC: Hengduan Mountains and amphibian evolution.
T. Hikida, Kyoto University, Japan: Geographic variation of *Eumeces elegans.*
Zong Y., Shanghai Museum of Natural History, PRC: Studies on Chinese *Chinemys.*
Tian W., Chengdu Institute of Biology, PRC: Description of a new subfamily of anurans.

Session 6: Kenneth Kardong, chair.
Gao J., Fujian Normal University, PRC: Karyotypes of two species of *Microhyla.*
Wu G., Chengdu Institute of Biology, PRC: Karyotypes of *Amolops* frogs of the Hengduan Mountains.
Chen J., Nanjing Normal College, PRC: Karyotypes of three species of *Gekko.*
Yang Y., Zhejiang Medical University, PRC: Karyotypes of four colubrid snakes.
Qu Y., Zhejiang Medical University, PRC: Studies on snake blood.
Huang M., Zhejiang Medical University, PRC: Ultrastructure of snake retinas.
Zhang J., South China Normal University, PRC: Amphibian trematodes.

Session 7: C Yoshida, chair.
Wang P., East China Normal University, PRC: Heat metabolism and thermoregulation of *Elaphe.*
S. Mitsui, Kushikino Laboratory, Yomeishu Seizo Co., Japan: Food habits of mamushi in the field.
Liu L., Fujian Medical College, PRC: Fujian sea snakes and their food habits.
A. Moriya, Kushikino Laboratory, Yomeishu Seizo Co., Japan: Growth and food consumption of mamushi in captivity.
Gu H., Hangzhou Normal College, PRC: Population variation of mamushi bred on an islet.
K. Isogawa, Kushikino Laboratory, Yomeishu Seizo Co., Japan: Reproductive frequency of mamushi in nature.
Huang J., Qimen Snake-Bite Institute, Anhui, PRC: The biology of young hundred-pace pit-viper.

Session 8: Zhao Kentang, chair.
M. Toriba, Japan Snake Institute, Japan: Some problems in taxonomy of mamushi.
Kou Z., Yunnan University, PRC: *Amphiesma venningi,* a record new to China.
Jiang Y., Chengdu Institute of Biology, PRC: Studies on Chinese *Japalura* species.
H. Ota, Kyoto University, Japan: Variation of *Japalura* in Ryukyu and Taiwan.
Yao C., Northwest Normal University, PRC: Circulatory and urogenital systems of *Eryx miliaris.*
Feng X., Lanzhou Medical College, PRC: Skeletal system of *Hyla tsinlingensis.*
Wang P. and Zhou Kaiya, Nanjing Normal College, PRC: Studies on diving bradycardia of *Trionyx sinensis.*
Zhao E. and Zhang F., Chengdu Institute of Biology, PRC: Comparisons of the skeletons of four hynobiid genera.

Session 9: Kraig Adler, chair.
T. Kusano, Tokyo Metropolitan University, Japan: Population dynamics of *Hynobius nebulosus tokyoensis.*
Wen Y., Guangxi Medical College, PRC: On habits of *Ichthyophis glutinosus.*
Zou S., Xüzhou Normal College, PRC: Some changes during hibernation of *Bufo gargarizans.*
Wang P., East China Normal University, PRC: Seasonal changes in blood sugar of *Bufo gargarizans.*
Su B., South China Normal University, PRC: On food habits of 31 frog species of Guangdong.
Zhang J., Fujian Normal University, PRC: Reproductive frequency of *Rana limnocharis.*



Figure 1. Participants and guests of the Sino-Japanese Herpetological Symposium.

Ding H., Fujian Teachers University, PRC: The effects on development of toad eggs by laser radiation.

Session 10: Liu Kwang-fen, chair.

C. Yoshida, Okinawa Prefectural Institute of Public Health, Japan: Physical conditions for the hatching of habu eggs.

Liang Q., Jinan University, PRC: Studies on the growth of *Gekko gecko*.

S. Tokunaga, Kyushu University, Japan: The ecological significance of temperature-dependent sex determination in reptiles.

Zhang Y., Guangxi Normal University, PRC: The biology of *Shinisaurus crocodilurus*.

Ji D., Liaoning University, PRC: Studies on *Elaphe schrenckii*.

Chen B., Anhui Normal University, PRC: Relationships between activities and metabolic rate of Chinese alligator.

Huang C., Academia Sinica, Beijing, PRC: Nesting and hatching behavior of the Chinese alligator.

The scientific sessions went on for four days. Two additional days were arranged for local tours to the Dinghu Mountain Forest Reserve and to Sevenstar Crags, a karst region in Zhaoqing, and for a downtown tour and a visit to the biological department of South China Normal University. During the evenings there were banquets and technical videotape and motion picture presentations as well as a cruise on the Pearl River.

Following these activities on the mainland, from 1 to 5 September most persons participated in a five-day trip to Hainan Island, a survey tour to observe the fauna and flora of this tropical isle. After arrival by jet plane in the capital city of Haikou, participants travelled by two large buses along the west coast to the southernmost tip of the island, and then along the east coast back to Haikou, thus encircling the entire island. They visited the South China Institute of Tropical Crops near Nadoa, the Bawangning Mountains and the "Border of the Earth," an historic site west of San-ya. During the stay at the Bawangning Forest Station in the central mountains, participants were divided into four smaller field parties specialized by individual interest. They made the best use of the one day and two nights there in searching for turtles, lizards, and snakes as well as frogs. The following 15 species of amphibians and 25 species of reptiles were caught and observed on the island: Frogs: *Bufo melanostictus, Hyla simplex, Rana guentheri, R. limnocharis, R. livida, R. macrodactyla, Amolops ricketti, Ooeidozyga laevis, Buergeria oxycephalus, Chirixalus doriae, Polypedates leucomystax, P. mutus, Microhyla ornata, M. pulchra, Kaloula pulchra:* Turtles: *Platysternon megacephalum, Cuora hainanensis, Trionyx steindachneri;* Lizards: *Calotes versicolor, Leiolepis belliana reevesii, Hemidactylus bowringii, H. frenatus, H. garnotii, Gehyra mutilata, Eublepharis lichtenfelderi, Takydromus sexlineatus meridionalis, Eumeces chinensis, Lygosoma (Sphenomorphus)* sp., *Mabuya longicaudata, M. multifasciata, Scincella reevesii;* Snakes: *Ramphotyphlops braminus, Amphiesma stolata, Dendrelaphis p. pictus, Oligodon formosanus, Ptyas korros, Xenochrophis piscator, Enhydris plumbea, Naja naja atra* and *Trimeresurus s. stejnegeri*. A more narrative account of the Hainan excursion has been published by Adler (Bull. British Herpetol. Soc., 16:17-19, 1986).

On 1 September Drs. K. Adler and R. Goris were invited to present lectures, as representatives of our group, at Hainan University, Haikou. On the same evening Professor Lin Ying, a prominent plant ecologist and president of Hainan University, entertained all the participants with a large banquet at the Banquet Hall of Qiong Yuan (Hainan Garden Hotel). Later, the group was stranded on Hainan by a typhoon and could not leave the island until 7 September, so an impromptu extension of the meeting was convened at the hotel until we could return to Guangzhou.

The next meeting of the Chinese Society of Herpetologists will be held at Fuzhou, Fujian Province, in 1988.

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PEOPLES REPUBLIC OF CHINA ●

FEATURES

OVIPARITY IN *Leiolopisma jigurru* AND A BRIEF REVIEW OF REPRODUCTIVE MODE IN *Leiolopisma*

In describing *Leiolopisma jigurru*, Covacevich (1984) noted that "no data on breeding biology for this new species is available because only a handful of specimens are known." The species is known only from the summit of Mt Bartle Frere in tropical north Queensland, and is separated from other *Leiolopisma* species in temperate Australia by over 1500 km.

On preparing one of the paratypes of *L. jigurru* (Queensland Museum J39493, SVL = 62mm, collected 7-8 November, 1981) for clearing and alcian/alizarin staining, it was found to be a gravid female, containing 4 thickshelled oviducal eggs, two in each oviduct. Measurements of the four eggs are: 11.3 x 6.0 mm, 11.3 x 6.3 mm, 12.4 x 6.0 mm and 12.0 x 5.9 mm. The thickness of the egg-shell indicates that the species is oviparous.

Rawlinson (1974a, 1975) and Greer (1982) divided the Australian *Leiolopisma* into two groups, the *L. baudini* and *L. spenceri* groups. In those characters known for the species (midbody scales 30, colour hues lacking, long limbs, saxicoline habits), *L. jigurru* is a member of the *L. spenceri* group. However, the monophyly of these groups has not been proven. The morphological characters used to define the saxicoline to arboreal *L. spenceri* group in particular are a suite common to a number of rock-dwelling lygosomines of several genera (Covacevich and Ingram 1978, 1980; Ingram and Rawlinson 1981; Covacevich 1984) and have apparently evolved several times in response to a rocky environment.

The evolution of viviparity in cold-climate reptiles, including lygosomines, is a recurrent phenomenon (Blackburn 1982; Shine and Bull 1979; Shine 1985; but see criticisms by Tinkle and Gibbons 1977). As such, oviparity in *L. jigurru* is surprising, as the only known locality is in a cool, montane climate (Covacevich 1984). Retention of developing eggs, leading to live-bearing, is particularly disadvantageous to species which rely on agility to feed and avoid predation (Shine and Bull 1979; Shine 1980). While this may explain retention of oviparity in *L. jigurru*, which inhabits the largely bare surfaces of granite boulder fields (Covacevich 1984), it does not explain why the other species of the *L. spenceri* group, which are also saxicoline or arboreal and inhabit cold climates, are viviparous.

Leiolopisma as currently conceived (Greer 1974; Hardy 1977) is diagnosed largely on primitive characters. The only derived character state defining the genus is the presence of a windowed eyelid, a character that has evolved many times in lygosomines (Greer 1974). Both egg-laying and live-bearing species are known in the genus (*sensu* Hardy 1977; Hardy and Hicks 1980; Arnold 1980). Available data (Table 1) show little evidence of any geographic trends in reproductive mode, although they do tend to follow suggested species groupings. Oviparity has been retained in at least six species complexes within *Leiolopisma (trilineatum-duperreyi-platynotum, zia, jigurru, lichenigerum-suteri, nigrofasciolatum-greeri* and *telfairii)* from geographically distant areas, and the oviparity/viviparity dichotomy, together with the variation present in the genus in other phylogenetically useful characters (e.g., frontoparietals fused/separate, supranasals present/absent, pterygoid teeth present/absent and division of temporal scalation), suggests that further division of *Leiolopisma* may be warranted.

As *L. jigurru* is a rare species in collections (Covacevich 1984, records only 10 specimens) it is worth noting that a second specimen (R106978, N.W. peak of Mt Bartle Frere, 1440m a.s.l., SVL = 45.5 mm) of *L. jigurru* has recently been identified in the Australian Museum collection.

ACKNOWLEDGMENTS

I am grateful to J. Covacevich and A.E. Greer for arranging the specimen loan, and to A. Greer, H.G. Cogger, B.R.H. Farrow, R. Sadlier and R. Shine for comments on the manuscript. J. Robb kindly confirmed her published observations on reproductive mode in New Zealand taxa.

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BIOLOGIA CENTRALI-AMERICANA

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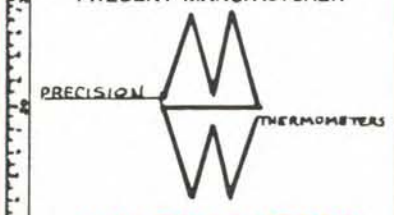
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Table 1. Reproductive mode in *Leiolopisma* species

Species and species group	Reproductive mode	Reference
Australia and Tasmania		
1. *L. baudini* species group		
L. baudini	?	
L. coventryi	viviparous	Rawlinson 1975; Greer 1982
L. entrecasteauxii	viviparous	Rawlinson 1974b; Greer 1982
L. metallicum	viviparous	Rawlinson 1974b; Greer 1982
L. zia	oviparous	Ingram and Ehmann 1981
a. *L. trilineatum* complex		
L. duperreyi	oviparous	Rawlinson 1974b (as *L. trilineata*); Rounsevell 1978 (as *L. trilineata*); Greer 1982
L. platynotum	oviparous	Greer 1982
L. trilineatum	oviparous	Greer 1982
2. *L. spenceri* species group		
L. greeni	viviparous	Rawlinson 1975; Greer 1982
L. jigurru	oviparous	this paper
L. ocellatum	viviparous	Rawlinson 1974b; Greer 1982
L. palfreymani	?	
L. pretiosum	viviparous	Rawlinson 1974b; Greer 1982
L. spenceri	viviparous	Rawlinson 1974a; Greer 1982
New Zealand and Lord Howe Is[1]		
1. *L. lichenigerum*[2]	oviparous	Cogger et al. 1983
L. suteri	oviparous	Whitaker 1968a; Towns 1975a
2. ungrouped New Zealand taxa		
L. acrinasum	viviparous	Robb 1980, pers. comm.
L. chloronoton	viviparous	Robb 1980, pers. comm.
L. fallai	viviparous	Robb 1980, pers. comm.
L. gracilicorpus (extinct?)	?	
L. grande	?	
L. homalonotum	viviparous	Robb 1980, pers. comm.
L. infrapunctatum	viviparous?[3]	West 1981a,b
L. lineoocellatum	viviparous	McCann 1955 (as *L. festivum*)
L. moco	viviparous	Melgren 1980a; Robb 1980; Lowe 1982
L. n. nigriplantare	viviparous	McCann 1955 (as *L. dendyi*); Gill 1976 (as *L.* sp.)
L. n. maccanni	viviparous	Barwick 1959 (as *L. zelandica*);
L. otagense	viviparous	Sharell 1966; Watchman 1979
L. smithi	viviparous	Whitaker 1968b; Towns 1975b; Robb 1980
L. striatum	viviparous	Melgren 1980b
L. zelandicum	viviparous	Gill 1976
Mascarene Is		
L. mauritianus (extinct)	?	
L. telfairii	oviparous	Vinson 1975; Bloxam 1977
New Caledonia and Vanuatu[4]		
1. *L. austrocaledonicum* species group		
L. austrocaledonicum	?	
2. *L. deplanchei* species group		
L. deplanchei	?	
3. *L. euryotis* species group		
L. euryotis	?	
L. steindachneri	?	
L. tricolor	viviparous	Roux 1913; Meier 1979
4. *L. nigrofasciolatum* species group		
L. greeri	oviparous	Meier 1979; Böhme 1979
L. nigrofasciolatum	oviparous	Meier 1979
5. *L. variabile* species group		
L. variabile	?	
Fiji		
L. alazon	?	

[1]species taxonomy follows Hardy (1977)
[2]grouping suggested by Towns (1974)
[3]as all New Zealand taxa except *L. suteri* have been presumed to be live-bearing (McCann 1955; Sharell 1966; Robb 1974, 1980), the existence of captive-bred *L. infrapunctatum* implies live-bearing in this species
[4]the alpha-taxonomy of the *Leiolopisma* of New Caledonia and Vanuatu is poorly known, and is currently under revision by R. Sadlier of the Australian Museum (pers. comm.). The taxonomy and species groups used here are those tentatively proposed by Zug (1985).



LIFE HISTORY NOTES

See Herp. Review 18(1) for author's instructions.

ANURA

***ATELOPUS SPUMARIUS*. VOCALIZATION.** Calls of only a few species in the genus *Atelopus* have been adequately described. We report on the call of an adult male *Atelopus spumarius* (UMMZ 182554; 19.3 mm SVL) from Loreto Province, Peru. The frog was captured along the bank of a small stream on 24 May 1985, ca. 3 km north of Nauta. The call was recorded at 26° C, on a Uher recorder Model 40001 (19.5 cm/s) and a ECM53FP Sony microphone. Five calls were analyzed on a Kay Electric Sound Spectrograph 7030A with both wide band (300 Hz) and narrow band (45 Hz) filters.

The frog called while clinging to the side of a large plastic jar and was barely audible across a quiet room. The slightly bilobed vocal sac protruded only slightly and pulsated rapidly during each twittering buzz-like call. The pulse rate during the last half of the call was faster than during the first half (Fig. 1A). The frequency increased ca. 300 Hz during the call, although the last pulse was slightly lower than the preceding one (Fig. 1B).

Lescure (1981. Bull. Mus. natn. Hist. nat. Paris. 3:893-910) described the calls of three subspecies of *Atelopus spumarius*, including one from Peru designated as *A. s. spumarius*. Our sonogram is similar to that of Lescure's for *A. s. spumarius* and the other subspecies. There are discrepancies between the measurements of call parameters however. The frequency of the calls we recorded were 200-400 Hz lower, the duration shorter, and the number of pulses only half of those reported by Lescure (Table 1). Although both Lescure's and our recordings were made from one frog each, these large differences suggest that the call of *A. s. spumarius* may vary geographically. Lescure's specimen came from Yubineta, in the Río Napo drainage, whereas our specimen was collected ca. 200 km south, from the Río Marañon drainage.

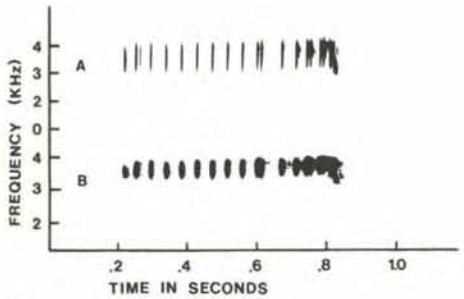


Figure 1. Vocalization of *Atelopus spumarius* analyzed with wide (a) and narrow (b) band filters.

Table 1. Frequency (Hz), duration (msec), pulses/sec, number of pulses and intercall interval (sec) for *Atelopus spumarius*.

Variable	$\bar{X}$ (S.D.)	Range
Frequency		
Beginning	3578 (98)	3450-3690
End	3900 (100)	3770-4050
Duration	680 (30)	670-710
Pulse Rate		
Beginning	23.4 (2.2)	27.5-30.6
End	61.3 (7.9)	52.2-71.4
No. of Pulses	23.4 (2.4)	20-27
Intercall Interval	2.2 (0.3)	5.4-8.0

These patterns are remarkably similar to the buzz call of *A. chiriquiensis* (Jaslow 1979. J. Herpetol. 13:141-145), which is not a member of the *flavescens* group (Lescure 1981. op. cit.). Jaslow (1979. op. cit.) reported that the buzz call was given by the male especially in response to other males and occasionally led to combat. He also gives evidence for similar buzz calls in *A. pulcher* and *A. v. zeteki* and suggests that it also serves to attract females. The frog we recorded began calling spontaneously in isolation; therefore the function of the call is speculative, but certainly was not an agonistic response.

Submitted by **ADAM ASQUITH**, Biology Department, University of New Mexcio, Albuquerque, New Mexico 87131 and **RONALD ALTIG**, Department of Biological Sciences, Mississippi State University, Mississippi State, Mississippi 39762, USA ●



***DENDROPHRYNISCUS MINUTUS*. REPRODUCTION.**
Since 1977 reproduction of *Dendrophryniscus minutus* (Bufonidae) was observed in the area of the biological station at Panguana, Peru (9°37'S, 74°56'W. elev. 260 m Schlüter 1981. Salamandra 17(3/4): 99-105; Schlüter 1984. Ökologische Untersuchungen an einem Stillgewässer im tropischen Regenwald von Peru unter besonderer Berücksichtigung der Amphibien. Diss. Univ. Hamburg. 300 pp.). Chorusing frogs of this species were found at an almost completely shaded blackwater pond from October to March (rainy season). *D. minutus* was active on the forest floor by day, but oviposition occurred mainly at night.

Until now different authors suggested (Duellman and Lynch 1969. Herpetologica 25(4):231-240) or described (Crump 1974. Misc. Publ. Mus. Nat. Hist. Univ. Kansas 61:1-68), that *D. minutus* deposited its eggs in water. In Panguana the reproductive mode of this species is quite different. Using Duellman's outline of 29 reproductive modes in anurans (Duellman 1986. Biology of Amphibians. McGraw Hill, New York), *D. minutus* fits mode No. 18. During amplexus females (X = 20.5 mm SVL) deposit their clutches, which consist of two gelatinous strands of about 250 to 350 mm (photograph in Schlüter 1984. Op. cit.: p. 76) on leaves, twigs, and roots up to 50 cm above water level. Somtimes strands can be found in contact with water. Developmental time to hatching takes six days (air temperature between 24 and 26 °C).

Observations on captive larvae show that larvae adhere to roots etc. at different water depths on the first day after hatching and drop into the water. From the second day onward, they remain horizontal on the bottom, sometimes moving short distances by slow movements.

Submitted by **ANDREAS SCHLÜTER,** Staatliches Museum für Naturkunde in Stuttgart, Sektion Herpetologie, Schloss Rosenstein, Rosenstein 1, D-7000 Stuttgart 1, F. R. Germany. ●

RANA CATESBEIANA (Bullfrog). **FEEDING.** Although bullfrogs are known to prey upon birds (see summary in Bury and Whelan 1984. U.S. Fish and Wildl. Serv., Res. Publ. 155:1-23), most avian species taken are those which frequent aquatic habitats. Here I report the first record of predation on an adult golden-crowned sparrow *(Zonotrichia atricapilla).*

On 16 October, 1986 at 1016 h, an adult male bullfrog (114 mm SVL) was captured while I was electroshocking for fish on the San Joaquin River at Durham Ferry State Recreation Area, San Joaquin County, California. Upon capture, the frog disgorged a fresh adult golden-crowned sparrow. The bird was apparently ambushed by the frog in the concrete riprap next to the river when it came to get a drink in the foggy, early morning hours. The bullfrog had an injured right eye (opaquely colored) which did not respond, as the left eye did, to the collector's hand movements.

My thanks to Greg W. Gerstenberg for assisting in the bullfrog capture. The specimen and its prey have been deposited in the herpetology collection of the California Academy of Sciences (CAS 162076).

Submitted by **MARK R. JENNINGS,** Department of Herpetology, California Academy of Sciences, Golden Gate Park, San Francisco, California 94118, USA ●

CAUDATA

AMBYSTOMA TIGRINUM CALIFORNIENSE (California Tiger Salamander). **PREDATION.** On 8 June 1986 at midday we saw an *A. t. californiense* larva swim out of a pond and wriggle onto land near the Hastings Natural History Reservation in Monterey County, California. A few seconds later, a *Clemmys marmorata* (western pond turtle) surfaced ca. 0.5 m away and looked around briefly before sinking below the water's survace. We believe that the salamander larva was attempting to avoid predation by the pond turtle. That evening, at the same site, we found a large (ca. 11 cm) adult *Rana aurora* (red-legged frog) that had just swallowed a larval *A. t. californiense.* This is the only known account of *R. aurora* preying upon *A. t. californiense.*

We would like to thank Harry W. Greene of the Museum of Vertebrate Zoology, University of California, Berkeley for his comments on an earlier version of the manuscript.

Submitted by **KEVIN S. BALDWIN**, Department of Biological Sciences, University of California, Santa Barbara, California 93106 and **RUTH A. STANFORD**, 2509A San Antonio, Austin, Texas 78705, USA ●

TARICHA TOROSA (California Newt). **CARRION ATTRACTION.** On 20 February 1984 I discovered the intact carcasses of two domestic cows in a remote portion of the Tuolumne River canyon in the foothills of the central Sierra Nevada, California. The site was an open grassy clearing 40 m from the river and a small tributary stream. Both carcasses were in full sunlight and the odor of putrefaction could be detected 30 m away. On one carcass a subadult *T. torosa* (64 mm SVL) was found crawling over the sternal region. On the other carcass I found two newts, a subadult (55 mm SVL) crawling back and forth over the front forelimbs, and an apparent female (68 mm SVL) resting in a shaded niche under the vertebral spine. To test the hypothesis of chance dispersion, the area within a 60 m diameter circle around the carcasses was searched; no additional newts were discovered. Next, the largest newt was moved one meter and released with its head pointing away from the carcass. It reoriented immediately and returned to its original position under the cow.

The newts were photographed and then observed continuously from 1030 to 1050 h during which time the largest newt did not move except when I disturbed it. The other two newts crawled with exaggerated locomotory movements and appeared to rub their ventral surfaces against the hairy hide of the carcasses. By 1230 h the carcasses had been in the sun for several hours and no newts were observed on or around them. I was unable to revisit the site but on 24 February

newts were still associated with the carcasses (Joe Medeiros, pers. comm.).

A search of the literature failed to reveal previous reports of terrestrial salamanders being attracted to carrion. Carcasses of large native mammals, especially mule deer, *Odocoileus hemionus*, are not rare in this part of the Sierra Nevada and represent an unpredictable but rich food source if they are infested by necrophagous fly maggots. However, none of the newts exhibited feeding behavior even though thousands of maggots were within a few centimeters in the mouths of both cows. Although it is possible that the newts had already fed and were satiated, I hypothesize that the newts were attracted by pheromones produced by other newts that had previously visited the carcasses or by a false chemical signal that mimicked newt sex attractant. My observations were made early in the breeding season when responsiveness to pheromones is strongest. The trance-like condition and ventral rubbing observed in two of the newts is similar to parts of the courtship behavior of *Taricha* described by Davis and Twitty (1964. Copeia 1964(4):601-610). Whatever the proximal cause of attraction, the detection and localization of putrefying carcasses should not present a significant physiological or behavioral hurdle for an organism with such dramatic chemosensory and orienteering capabilities (Twitty 1955. J. Exp. Zool. 129: 129-148; Grant et al. 1968. Science 160: 1354-1355).

Submitted by **STEVEN R. MOREY**, Department of Biology, University of California, Riverside, California 92521, USA ●

SAURIA

***ANOLIS LIMIFRONS*. PREDATION.** Although the small neotropical lizard *Anolis limifrons* is well studied, abundant, and thought to suffer high predation (Andrews and Rand 1982. *In:* Leigh, Rand, and Windsor, eds., The Ecology of a Tropical Rainforest, pp. 405-412), actual observations of predation on this species are rare. On 17 October 1985, we were collecting *Anolis limifrons* in forest near the Rio Aqua Salud of the Parque Nacional Soberania, Panama. Just after having captured a female from the base of a large tree, we noticed another lizard dart into a cavity at the base of a buttress, where it was pounced upon by a large spider (*Cupiennus* spp., Family Ctenidae). The spider successfully held the lizard as it struggled, retreated into a burrow with the lizard when we attempted to capture it, and only released the lizard when we began to excavate the burrow. When released, the lizard was unable to move, although it could pull its legs under itself when placed on the ground. It was dead within a half hour.

Birds, mammals, and snakes are the most obvious potential predators of *Anolis limifrons*, but this observation demonstrates that arachnids are also capable of taking adults of this species and may represent a significant source of mortality.

Submitted by **BRIAN C. BOCK** and **MANUEL QUINTERO**, Smithsonian Tropical Research Institute, Box 2072, Balboa, Panama. ●

***CNEMIDOPHORUS GULARIS GULARIS* (Texas Spotted Whiptail). REPRODUCTION.** On 1 May 1986, at 1750 h CDT we stopped at El Sauz, Starr Co., Texas, to search for syntopic contacts between *C. g. gularis* and the parthenogenetic *C. laredoensis*. Immediately upon leaving the vehicle mating behavior was observed between a male and female of *C. g. gularis* between Texas Farm Road 649 and dense growths of bunchgrasses. This behavior occurred in a microhabitat of scattered clumps of bunchgrasses between which were open sandy spaces free of debris (Fig. 1A). The mating sequence commenced when a male (estimated SVL between 65 and 72 mm) poked his head into the entrance of a freshly dug burrow (Fig. 1A, arrow), whereupon a female (estimated SVL between 64 and 69 mm) emerged from the burrow. The female moved a few cm from the burrow entrance; the male followed, assumed a position alongside the female, and placed his right forelimb over her body at the level of the axillary region (Fig. 1A). As the female continued to move slowly forward, the male kept pace undulating his pelvic region against the left flank of the female and occasionally vibrating his tail. The female remained docile and made no attempt to escape. As they moved ahead very slowly, the male positioned his pelvic region so as to alternately undulate it against the flank of the female and to rub the female's body with his cloaca (Fig. 1B). Using the right hindlimb as a counter balance, the male brought his cloaca into contact with the cloaca of the female (Fig. 1C). The male then very deliberately grasped the right flank of the female in his jaws and copulation with the right hemipenis was initiated. In Fig. 1D it can

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John Coborn has made a lifetime study of zoological subjects – especially herpetology. He has been keeper, then curator, of reptiles and aquarium at a zoological park, and then moved on to be director of a zoological garden. He has organised several national and international herpetological symposia, founded a herpetological society, written many books and articles and made numerous appearances on radio and TV.

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Figure 1A-D. Mating pair of *Cnemidophorus gularis gularis* at El Sauz, Starr Co., Texas.

be seen that the tail of the female is arched against the ground to neutralize the torsion effect produced by the position of the male. Following the assumption of the copulatory position, no well-defined movements of the mating pair were noted.

To gain information on the intensity of the act of copulation with reference to intrusive (i.e. threatening) stimuli, an attempt was made to slowly approach the pair as closely as possible after several minutes of observation. Although we decided not to collect the animals, both could have been easily captured (possibly by hand). Certainly, any number of predators could have captured them such was their mating intensity. *C. g. gularis* is ordinarily quite wary; the species can seldom be approached closer than 5-10 m.

In due course, the male released the female, possibly as a result of our intrusion, and slowly moved away stiff-legged, tail arched to the left, right hemipenis dragging in the sand, and disappeared into the stand of bunchgrasses. The female moved a few centimeters and disappeared into the burrow. This sequence was observed within 30-45 minutes of the end of the daily activity cycle in early May (CDT ca. 1800-1830), thus it does not appear that copulation in *C. g. gularis* is a lengthy process.

We know of no other instance of mating behavior in *Cnemidophorus* photographed under natural conditions. Lombard (1949. Copeia 1949:234) described an instance of copulation in *C. tigris* and Carpenter (1962. Amer. Midl. Nat. 67:132-151) described and diagrammed courtship in *C. sexlineatus*. Saxon (1968. Southwest. Nat. 13:54-55) photographed a copulating pair of captive *C. tesselatus* (involving a rare male) and Neaves (1971. Breviora 381:1-25) presented photographs showing captive male *C. inornatus* attempting to copulate with females of parthenogenetic forms. These descriptions are very similar to the behaviors we photographed at El Sauz suggesting courtship behavior is evolutionarily conservative in the genus *Cnemidophorus*.

Submitted by **JAMES M. WALKER, JAMES E. CORDES,** and **MARK A. PAULISSEN**, Department of Zoology, University of Arkansas, Fayetteville, Arkansas 72701, USA ●

***CORYTOPHANES CRISTATUS*. NESTING.** Field observations on the neotropical iguanid lizard *Corytophanes cristatus* are rare due to its apparent low population densities and cryptic morphology and behavior. At 1140 h on 25 June 1986, I encountered a female *C. cristatus* nesting on a trail along a ridgetop in primary wet tropical forest, ca. 600 m elevation, at Rara Avis, Heredia Province, Costa Rica. The female had already completed excavating the nest and oviposited five eggs. Her defensive behavior corresponded well to the description by Davis (1953. Fieldiana: Zoology 35:1-8) for captive lizards: She remained motionless until captured for measurement, but moved to the entrance of the nest when released, displaying laterally by expanding her nuchal crest and throat fan, and gaping and lunging during my attempts to measure the nest and eggs.

The nest was located in the middle of the trail, which contained less leaf litter than the surrounding forest but probably received comparable amounts of sunlight. The nest was ca. 50 mm in diameter and 95 mm in depth. The female measured 120 mm SVL and the top egg in the clutch mass was 20 mm in length, comparable to the values reported by Ream (1964. Herpetologica, 20:239-242) for a clutch laid by a captive female.

Interestingly, the vaulted anterior surface of the lizard's nuchal crest was caked with soil (Fig. 1). This may have resulted from her having wedged her head into the nest chamber during its construction, but another observation (J. Stout, pers. comm.) of a female *C. cristatus* nesting in a trail at the nearby La Selva Biological Station suggests that this structure may be actively employed as a scoop for excavation during nesting.

Thanks to A. Bien for providing accomodations and J. Stout for sharing her field observations.

Submitted by **BRIAN C. BOCK,** School for Field Studies, 376 Hale Street, Beverly, Massachusetts 01915, USA (Current address: Smithsonian Tropical Research Institute, Box 2072,. Balboa, Panama). ●



Figure 1. Female *Corytophanes cristatus* at the entrance to her nest, with soil visible in the depression of the anterior surface of her nuchal crest.

GEHYRA, HEMIDACTYLUS, AND ***NACTUS*** (Pacific Geckos). **EGGS AND HATCHLINGS.** These field and laboratory observations in Fiji and Tonga provide new information on the early life histories of several gecko species. *Gehyra oceanica* (Oceanic Gecko). Tonga

('Eua) - Eggs spherical; n = 7; dimensions $\bar{X}$ = 12.4x14.0 mm, range 12-13x12-15 mm; mass $\bar{X}$ = 1.25 g, range 1.1-1.5 g; hatchlings, hatched within 2 weeks in laboratory; SVL $\bar{X}$ = 33.7 mm, range 33-35 mm; caudal length (CL), $\bar{X}$ = 29.7 mm, range 28-32 mm; mass $\bar{X}$ = 0.83 g, range 0.75-0.92 g. Fiji (Viti Levu) - Eggs spherical; n = 4; dimensions $\bar{X}$ = 12.3x14.0 mm, range 12-13x13-15 mm; mass $\bar{X}$ = 1.18 g, range 1.1-1.3 g. Fiji (Rotuma) - Communal nesting, 23 eggs in palm axil, other communal clutches of 4, 10 and 15+ eggs; eggs spherical, hardshelled; n = 10; dimensions $\bar{X}$ = 12.5x13.5 mm, range 11.8-13.1x12.6-14.0 mm; mass $\bar{X}$ = 1.26 g, range 1.0-1.4 g; hatchlings, hatched within 2 weeks in lab; n = 4, SVL $\bar{X}$ = 33.6 mm, range 33. 1-34.2mm; CL $\bar{X}$ = 32.0 mm, range 29-34 mm; mass $\bar{X}$ = 0.9 g, range 0.8-1.0 g; hatched in May.

Gehyra vorax (Giant Oceanic Gecko). Fiji (Viti Levu) - Eggs spherical, hard-shelled; n = 2; dimensions $\bar{X}$ = 18x20 mm; mass = 3.9 g; laid in captivity 29 Dec. 1985.

Hemidactylus garnotii (Fox Gecko). Tonga ('Eua) - Eggs spherical; n = 1; dimensions 9x10 mm; mass 0.6 g; hatchlings, n = 3; SVL $\bar{X}$ = 27.3 mm range 27-28 mm; CL $\bar{X}$ = 20.0 mm, range 19-21 mm; mass $\bar{X}$ = 0.31 g, range 0.28-0.36.

Lepidodactylus lugubris (Mourning Gecko). Tonga ('Eua) - Hatchling, n = 1; SVL 25.0 mm; mass = 0.23 g. Fiji (Viti Levu) - Eggs spherical, hard-shelled; communal nest of 15 *lugubris* eggs (11 previously hatched) with 11 smaller ellipsoidal eggs (unidentified, ca. 5.6x7.5 mm, 9 previously hatched) beneath large horizontal rock slab, all glued to rock surface, found 15 June 1986; n = 2; dimensions $\bar{X}$ = 8.6x9.7 mm, range 8.5-8.7x9.5-9.9 mm; mass $\bar{X}$ = 0.4 g.

Nactus pelagicus (Pacific Slender-toed Gecko). Fiji (Viti Levu) - Eggs ellipsoidal, leathery-shelled; n = 5; dimensions $\bar{X}$ = 7.0x13.0 mm, range 6.5-8.0x12.0-14.0 mm; mass $\bar{X}$ = 0.44 g, range 0.39-0.49 g.

Submitted by **JOHN R. H. GIBBONS** (deceased), School of Natural Resources, The University of the South Pacific, Suva, Fiji, and **GEORGE R. ZUG,** Department of Vertebrate Zoology, National Museum of Natural History, Washington, DC 20560, USA ●

PTYCHOZOON LIONATUM (Gliding Gecko). **EGG GUARDING.** Egg guarding in geckos is apparently rare. Upon reviewing the literature only two references of such behavior could be found and both in reference to *Ailuronyx sechellensis* (Seychelles giant skin-sloughing gecko or bronze gecko) (High 197_.) The Natural History of the Seychelles, 64; McKeown and Miller 1984. 8th Ann. Reptile Symp. on Captive Propagation and Husbandry 96-101).

On 1 September 1985 a female gliding gecko, *Ptychozoon lionatum*, laid a clutch of two eggs on the side of her terrarium placed on display in the herpetarium at the Oklahoma City Zoo. Thereafter she could always be found in close proximity to the eggs and for relatively brief periods ranging from 15 minutes to an hour each day could be found with her tail and one hind leg draped over the eggs. Any attempt by the keeper to approach the eggs with his hand drew an immediate aggressive display—the female would rapidly approach the intruder with mouth opened. No physical contact with the keeper occurred. On several occasions, however, she was noted to drop with mouth-open onto the head of the leaf frogs (*Megophryes*) which ventured near the eggs. This behavior was repeated until the frog departed the area. Eleven subsequent clutches have been laid by this female, each followed by a similar egg-guarding behavior.

Submitted by **TIM TYTLE**, 12105 Camelot Drive, Oklahoma City, Oklahoma 73120 and **SCOTT WHEELER** and **DAVID GROW**, Herpetarium, Oklahoma City Zoo, 2101 N.W. 50th Street, Oklahoma City, Oklahoma 73111, USA ●

SERPENTES

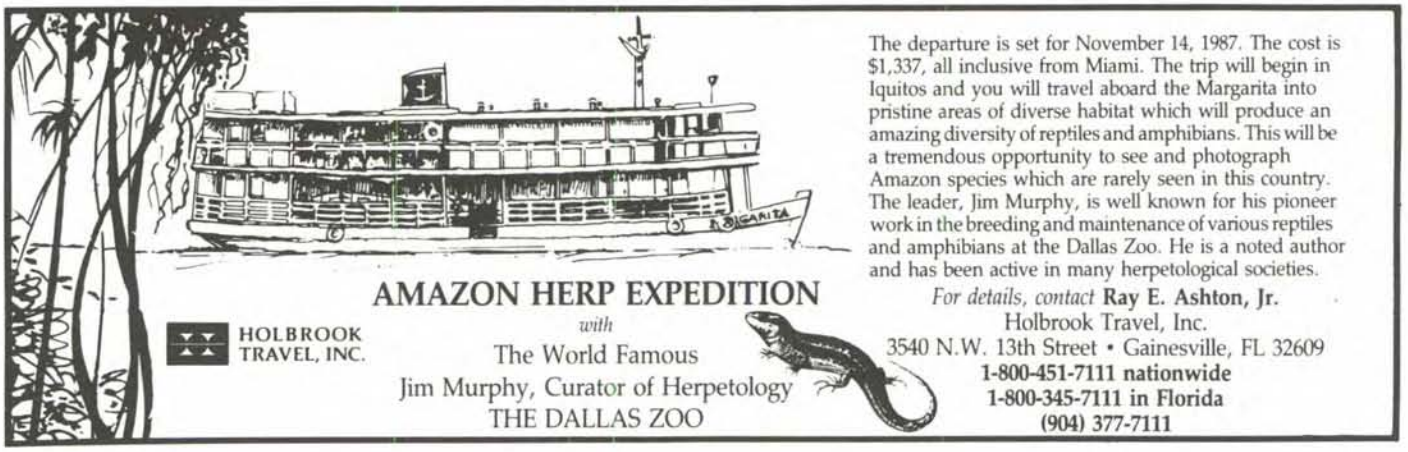
EUNECTES MURINUS (Anaconda). **REPRODUCTION.** On 29 October 1986 we found a female *Eunectes murinus* in an open sunny site between fruit trees in an abandoned farm on the Rio Cuieiras (a tributary of the Rio Negro 60 km N Manaus, Amazonas, Brasil). The site was ca. 100 m from the river and an old shed skin and a large patch of dead grass nearby implied that the animal had been there a long time. When approached, the snake made no attempt to flee or attack. The snake (SVL 3.85 m TL 4.5m) (killed by a local inhabitant) contained 45 eggs ($\bar{X}$ mass = 400 g). Each egg contained a well developed embryo ($\bar{X}$ mass 34.2 g; X SVL = 34.4 cm; $\bar{X}$ TL 40.6 cm; n = 10). Clutch size is probably size dependent in snakes and this record falls between the clutch size given by Afranio do Amaral (1976. Serpentes do Brasil 2nd Ed., Editora da Universidade de São Paulo, São Paulo, 36 pp.) for *Eunectes*, who states "20-30 as normal, sometimes 40 or more," and Cunha and Nascimento (1978. Ofídios da Amazônia, Vol. 10, As Cobras da Região leste do Pará, Publ. Avulsas Mus. Paraense Emílio Goeldi 31:51) who state "around 70." We have not found any field records of clutch size in relation to adult body size for *Eunectes murinus*.

Submitted by **J-M. HERO** and **ANGELO dos SANTOS**, Depto Ecologia, Instituto Nacional de Pesquisas da Amazônia. Caixa Postal, 478, 69000 Manaus, Amazonas, Brasil. ●

LAMPROPELTIS TRIANGULUM HONDURENSIS (Honduran Milk Snake). **MAXIMUM SIZE.** Williams (1978. Systematics and natural history of the American milk snake Publ. Biol. and Geol. No. 2 Milwaukee Public Museum, p. 50) cites 1228 mm TL as the maximum length of 23 males examined and 1512 mm TL the maximum of 18 females examined. A male, estimated to be 8 years old, died in my collection and was measured at 1496 mm SVL and 1702 mm TL, far surpassing Williams' measurements. The specimen was desposited in the Buffalo Museum of Science.

Submitted by **HENRY J. COHEN**, 24 St. Johns Pl., Buffalo, New York 14201, USA ●

OPHEODRYS VERNALIS (Smooth Green Snake). **BEHAVIOR.** The usefulness of behavior in establishing phylogenetic relationships is enhanced to the extent that some behaviors are shared by species known to be closely related. I here report a behavior exhibited by *Opheodrys vernalis*, rhythmic lateral head movement (RLH), previously described as a basic motor pattern of the congeneric *O. aestivus* (Goldsmith 1984. Southwest. Nat. 29:445-452). This behavior was performed by two captive *O. vernalis*, collected 24 July 1986 in Marinette Co., Wisconsin, on several occasions within several weeks of capture. As



observed by Goldsmith (*op. cit.*), RLH occurred both when snakes were moving and when stationary and at a rate of ca. once per second. RLH occurred in bouts that ranged from as few as 2-3 to over 20 back-and-forth movements, and it occurred with the anterior portion of the body both raised off of and in contact with the cage bottom. It was elicited whenever the snakes moved around the cage after being removed from cover and replaced on the cage bottom. Whether in this context RLH corresponded to a predator defense mechanism through mimicry of moving branches (Collins 1974. Amphibians and reptiles in Kansas. Univ. Kansas Mus. Nat. Hist., Pub. Ed. Series, No. 1, 283 pp.), or to enhancement of binocular vision (Henderson and Nickerson 1977. British J. Herpetol. 5:663-667; Henderson and Binder 1980. Milwaukee Publ. Mus., Contrib. Biol. Geol., No. 37, 38 pp.) during exploratory behavior, is unknown.

Since RLH has been reported for a number of unrelated genera of arboreal snakes (Henderson and Binder, op. cit.), this particular behavior is not necessarily diagnostic of taxonomic affinity. Interestingly, on the basis of its preference for open habitat (Smith 1961. Bull. Ill. Nat. Hist. Surv. 28, 298 pp.; Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Publ. Mus., Milwaukee, Wisconsin, 205 pp.; personal observation), *O. vernalis* probably is much less arboreal than *O. aestivus* or the other species for which RLH has been reported.

Submitted by **PHILIP A. COCHRAN**, Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115, USA ●

RHADINAEA MONTANA (Nuevo Leon Yellow-lipped Snake). **HABITAT.** On 18 July 1972 a single ♀ specimen of this species was collected at Ojo de Agua at Pablillo, Nuevo León, México at 2134 m near a spring under an imbedded rock in a marshy area along the edge of a ditch in a pine-oak habitat with cultivated fields nearby. The spring has been capped and an irrigation ditch leads to the fields and village. According to Myers (1974. Bull. Amer. Mus. Nat. Hist., 153(1):89-91) only four specimens of this species are known; nothing is recorded concerning elevations or habitats. The specimen was deposited in the collection of Ernest A. Liner (EAL 3095).

Submitted by **ERNEST A. LINER**, 310 Malibou Blvd., Houma, Louisiana 70364-2598 and **ALLAN H. CHANEY**, Department of Biology, Texas A & I University, Kingsville, Texas 78363, USA ●

TYPHLOPS MONENSIS (Mona Island Blind Snake). **PREDATION.** An adult *Typhlops monensis* (ca. 2.4 g; 175 mm SVL) was recovered from the bill of a snowy egret, *Egretta thula*, at Sardinera Beach, an altered portion of southern Mona Island, Puerto Rico. The snake was recovered after I pursued the bird for 2 minutes; the bird then dropped the specimen to the grass. This beach has more mesic and introduced vegetation than the rest of the island. The bird was discovered (on 21 July 1986 at 1544 h) at a shady location covered with grass, elevation ca. 5 m, on a partially cloudy day. The snake showed evidence of being bitten at both ends. The head was severely crushed, and portions of the body had lacerations probably caused by bites. The specimen has been deposited in the Museum of Biology of the University of Puerto Rico-Rio Piedras.

Submitted by **ENRIQUE HERNÁNDEZ-PRIETO**, Department of Environmental, Population, and Organismic Biology, Campus Box B-334, University of Colorado, Boulder, Colorado 80309-0334, USA ●

TESTUDINES

GRAPTEMYS GEOGRAPHICA (Map Turtle). **ADULT MORTALITY.** The Weaver Dunes, a sand prairie and Nature Conservancy preserve in Wabasha County, Minnesota, includes two nesting areas for turtles from adjacent wetlands. *Graptemys geographica* and *Chrysemys picta* from Halfmoon Lake, a backwater of the Upper Mississippi River, nest along the eastern edge (Section 8), whereas *C. picta* and *Emydoidea blandinqii* from wetlands along the Old Channel of the Zumbro River nest in the western portion (Section 7). During a herpetofaunal survey of the Weaver Dunes (Cochran 1986. Prairie Naturalist, in press), I collected evidence of mortality of nesting female *G. geographica* and *C. picta*.

From 10-15 June 1985, I found remains of 22 turtles (13 *Graptemys*, and 8 *Chrysemys*, 1 unidentified) in Section 8. Nineteen were in or near the oak savannah ecotone between open prairie and forest habitat just inside the crest of a ridge separating dunes and backwater; three were found in densely wooded habitat on the riverine side of the ridge from <1 m to 30 m from the water's edge. All turtles were found within a linear distance of roughly 500 m, but many were clumped within much smaller distances. For example, five turtles, including both species, were found within a distance of 20 m.

Only one dead turtle, a *Chrysemys picta*, was found in Section 7.

Dead turtles could be divided among three general classes of decomposition: (1) recent -shell completely articulated with scutes intact, insides hollowed out, but with scavenging insects still present and majority of inguinal and axillary skin in position (mortality presumably occurred during current year), (2) intermediate - shell partially disarticulated and scutes peeling [presumably mortality during the previous year, as Metcalf and Metcalf (1978. Herpetologica 35:93-96) indicate that exfoliation of scutes begins about four months after death] and (3) old - bones of shell bleached and largely disarticulated (mortality at least two years previously?). Not included in the counts above were occasional single weathered bones. All *Graptemys* in category (1) were identifiable as adult female *G. geographica*. Those in categories (2) and (3) could not all be identified but were most likely *G. geographica* based on known habitat and nesting habits.

Predation is the most likely cause for the observed mortality of nesting turtles. Although shells of turtles in category (1) were intact, heads and/or legs were removed, and surrounding grass and vegetation were sometimes matted down. Location of most turtles in edge habitat reflects a foraging pattern common to many predators. At least one family of foxes has denned within Section 8 in recent years; other potential predators include coyotes, raccoons, skunks, and opossums. The possibility remains that at least some mortality was due to another cause, such as thermal stress in the harsh sand prairie habitat, and was followed by scavenging.

Presence of turtles in several stages of decomposition suggests that predation has continued for at least several years. This conclusion is bolstered by a photograph of a bleached skeleton, identified as a *Chrysemys picta*, that appeared with a newspaper article on the Weaver Dunes in 1982 (Linsley 1982. St. Paul Dispatch, June 2, pp. 1A, 6A). Moreover, predation was not confined to the Nature Conservancy property. During summer, 1985, R. Vose (pers. comm.) observed over 10 dead *Graptemys* and *C. picta* on private land adjoining the southern end of the Nature Conservancy property (also in Section 8, but adjacent to a different backwater, Pritchard Lake).

This work was supported by a grant from the Minnesota Chapter of the Nature Conservancy.

Submitted by **PHILIP A. COCHRAN,** Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115, USA ●

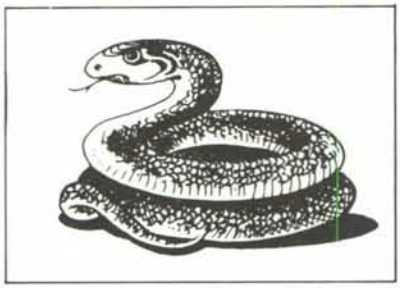
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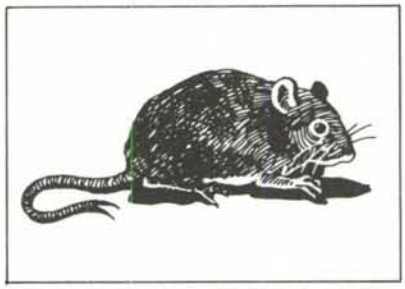
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ANURA

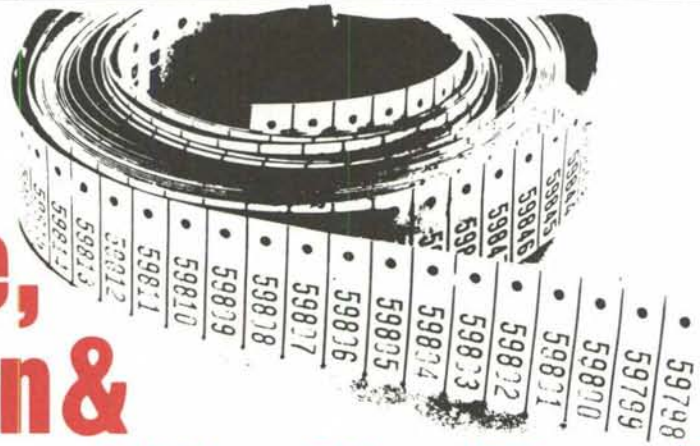
BUFO VALLICEPS VALLICEPS (Gulf Coast Toad). USA: MISSISSIPPI: Jones Co: 32.2 km S Laurel. 6 June 1968. Mary C. Maples. Mississippi Museum of Natural Science (MMNS Acc. No. 1100). Extends range 158 km NNE coastal Mississippi record and 113.6 E nearest Louisiana record. Stone Co: 30.6 km W Wiggins, SH 26. 7 April 1968. Mary C. Maples. (MMNS Acc. No. 1100). Extends range 62.6 km N coastal Mississippi record and 39.5 km E nearest Louisiana record. Both verified by Harold A. Dundee and Douglas A. Rossman. New county records (Conant 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America; Tulane University records).

Submitted by **HAROLD A. DUNDEE**, Department of Biology, Tulane University, New Orleans, Louisiana 70118, and **DOUGLAS A. ROSSMAN**, Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana 70803, USA ●









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DENDROBATES ERYTHROMOS. ECUADOR: PICHINCHA PROV: 2 km E El Esfuerzo, 350 m. 9 May 1986. G. Vigle. Verified by G. Vigle. Museum of Comparative Zoology, Harvard University (MCZ 108887). Previously known only from the type-locality (Vigle and Miyata 1980. Breviora 459:1-7), extends range 25 km NNE.

Submitted by **GREG VIGLE**, Department of Herpetology, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, USA ●

RANA SYLVATICA (Wood Frog). USA: ARKANSAS: Baxter Co: 5.3 km E Big Flat (T16N, R13W, S22). 14 February 1987. S. E. Trauth. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 6519-6525; 6532-6543). New county record, extends range E along Arkansas-Missouri border (Cline and Tumlison 1985. SSAR Herp. Review 16(4):115).

Submitted by **STANLEY E. TRAUTH**, Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, **MICHAEL E. CARTWRIGHT**, Arkansas Game and Fish Commission, Sylamore Experiment Station, Calico Rock, Arkansas 72519, and **WALTER E. MESHAKA** and **PHYLLIS CHAFFIN**, Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, USA ●

CAUDATA

NECTURUS MACULOSUS MACULOSUS (Mudpuppy). USA: WISCONSIN: Brown Co: Suamico River, west shore Green Bay (bay). January 1986. D. Wiersma. Verified by M. Reed. Bay Beach Wildlife Sanctuary Collection (626). New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Publ. Mus. 205 pp.).

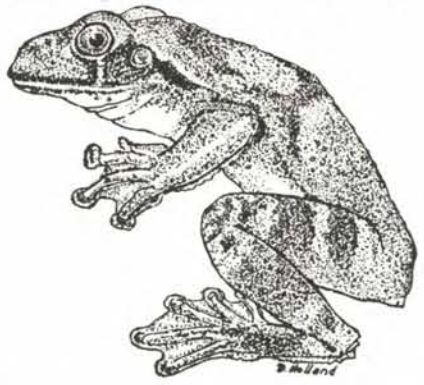
Submitted by **MICHAEL REED**, Bay Beach Wildlife Sanctuary, Green Bay, Wisconsin 54302 and **JAMES R. HODGSON**, Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115, USA ●

PLETHODON NETTINGI (Cheat Mountain Salamander). USA: WEST VIRGINIA: Tucker Co: 2.7 km SE Olson Fire Tower (4.8 km NE town of Hendricks). 8 June 1985. D. Hollingsworth; 26 June 1985. T. K. Pauley, T. Rodgers and A. Moser. Verified by T. K. Pauley. West Virginia Biological Survey (WVBS 4677-4678). Extends range 6.3 km NNW Mozark Mountain, Tucker Co. (Pauley 1981, W. Va. Academy of Science, 53(2):31-35). Lowest elevation (951 m) recorded for this species. The previous low elevation was 1052 m (Pauley op. cit.)

Submitted by **THOMAS K. PAULEY**, Natural Sciences Division, University of Pittsburgh at Bradford, Bradford, Pennsylvania 16701, USA ●

PLETHODON WEBSTERI (Webster's Salamander). USA: MISSISSIPPI: Claiborne Co: 4.1 air km S Rocky Springs Ranger Station at intersection of Owens Creek and Natchez Trace Parkway (T13N,R4E,S60, ne/4). 7 February 1987. D. Dickerson. Verified by T. L. Vandeventer and R. A. Young. Mississippi Museum of Natural Science (MMNS 2239). New county record, third disjunct locality in Mississippi (Highton 1986. Catalogue of American Amphibians and Reptiles, 384.1 -384.2).

Submitted by **TERRY L. VANDEVENTER**, Living Reptile Museum, 303½ E. Main St., Clinton, Mississippi 39056 and **ROBERT A. YOUNG**, Department of Pharmacology and Toxicology, University of Mississippi Medical Center, Jackson, Mississippi 39216, USA ●



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ANOLIS CAROLINENSIS PORCATUS (Green Anole). USA: HAWAII: Island of Hawaii: Hilo. University of Hawaii at Hilo campus. 14 May 1986. T. Moniz and M. Kealamakia. Bernice P. Bishop Museum (BPBM 11084). 18 July 1986. Hilo. Manuku Lane. C. Severangce (BPBM 11085). Verified by Allen Allison. Extends range 8 km southeast. (McKeown 1978, Hawaiian Reptiles and Amphibians China Color Printing, Inc., Taiwan 80 pp.). Additional sightings have been made on the leeward side of Hawaii, 75 km northeast of Hilo.

Submitted by **JOHN G. CHAN**, Biology Discipline, University of Hawaii at Hilo, Hilo, Hawaii 96720-4091 and **TERENCE MONIZ** and **MARK KEALAMAKIA**, MBRS Program, University of Hawaii at Hilo, Hilo, Hawaii 96720-4091, USA ●

CNEMIDOPHORUS LEMNISCATUS. BRAZIL: AMAZONAS: Manaus. 21 July 1986. T. C. Avila-Pires and A. Lima. Verified by T. C. Avila-Pires and D. Peccinini-Seale. Museu Paraense Emílio Goeldi (MPEG/SAURIA 14411-14412). The *C. Lemniscatus* species complex has not been recorded from Manaus. The specimens are morphologically and karyotypically similar to population "E" from the Amazon River (Peccinini-Seale and Frota-Pessoa 1974. Chromosoma. 47:439-451). This records colonization of a new region by *C. lemniscatus*, probably transported in trucks to the scrap metal yard. Study supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico, grant 40.8064/84 ZO.

Submitted by **TERESA CRISTINA S. DE AVILA-PIRES**, Departamento de Zoologia, Museu Paraense Emílio Goeldi, C.P. 399, 66001 Belém, Pará, Brasil, **DENISE PECCININI-SEALE**, Departamento de Biologia, Instituto de Biociências, Universidade de São Paulo, C.P. 11461, 05499 São Paulo, Brasil, and **WILLIAM MAGNUSSON**, Departamento de Ecologia, Instituto Nacional de Pesquisas da Amazônia, C.P. 478, 69000 Manaus, Amazonas, Brasil. ●

CNEMIDOPHORUS SEXLINEATUS VIRIDIS (Prairie-lined Racerunner). USA: TEXAS: Llano Co: 14.2 km W jct 1431 and State Hwy 29, Bradford Ranch. 30 June 1986. University of Arkansas, Department of Zoology (UADZ 2149) and 1 August 1986 (UADZ 2150). J.E. Cordes. Verified by J.E. Cordes and J.M. Walker. New county record (Trauth, 1980. Unpubl. PhD. Dissertation, Auburn Univ., Auburn, Alabama. 212 pp.). Previously known from county by Wisconsin age fossil (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2). Specimens collected under authority of Texas Parks and Wildlife permit No. 61.

Submitted by **JAMES E. CORDES** and **JAMES M. WALKER**, Department of Zoology, University of Arkansas, Fayetteville, Arkansas 72701, USA ●

GERRHONOTUS LIOCEPHALUS INFERNALIS (Texas Alligator Lizard). USA: TEXAS: Burnet Co: 9.7 km S and 6.4 km W Burnet, Longhorn Cavern State Park. March 1986. M.S. Calaway. Verified by J.E. Cordes and J.M. Walker. University of Arkansas, Department of Zoology (UADZ 2164). New county record, fills hiatus between Llano (Rakowitz, Fleet, and Rainwater, 1983. SSAR Herp. Review 14(3):85-89), Blanco, Travis, and Williamson counties (Raun and Gehlbach, 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2). Specimen collected under authority of Texas Parks and Wildlife permit No. 61 and State Park permit No. 9-86.

Submitted by **JAMES E. CORDES** and **JAMES M. WALKER**, Department of Zoology, University of Arkansas, Fayetteville, Arkansas 72701, **MICHAEL S. CALAWAY**, Longhorn Cavern State Park, Park Road 4, Burnet, Texas 78611, USA ●

HOLBROOKIA LACERATA (Spot-tailed Earless Lizard). USA: TEXAS: Sutton Co: 62.8 km W Junction (Kimble Co) on I-10. 26 October 1986. A. S. Bridegam. Verified by W. G. Degenhardt. Museum of Southwestern Biology, University of New Mexico (MSB 47752). New county record, fills gap between Valverde, Crockett, Schleicher, and Menard counties (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2.) and Edwards County (Karges 1979. SSAR Herp. Review 10(4):119-121.) .

Submitted by **AMY S. BRIDEGAM** and **BRIAN E. SMITH**, Museum of Southwestern Biology, Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA ●

LEPIDODACTYLUS LUGUBRIS (Mourning Gecko). INDIAN OCEAN: NORTH KEELING ISLAND: 24 km N main atoll of the Cocos (Keeling) Islands. March 22, 1986. Collected by D. Williams, T. Stokes, P. Goh and A. N. bin Anthoney. Verified by H. G. Cogger. Australian Museum (AM R 120928-120929). First terrestrial reptile collected from this island, confirming Gibson-Hill's (1948, J. Malay Branch Roy. Asiatic Soc. 21:68-108) reference to reports of a gecko by Cocos residents.

Submitted by **TONY STOKES**, Government Conservator, Australian National Parks and Wildlife Service, Christmas Island, Indian Ocean, 6798, Australia and **HAROLD G. COGGER**, the Australian Museum, PO Box A285, Sydney South, 2000, Australia ●

PHYLLODACTYLUS TUBERCULOSUS INGERI (Inger's Tuberculate Gecko). MEXICO: QUINTANA ROO: Tulum Archaeological Zone (119 km S Cancun). 20 September 1982. L. L. Grismer. Verified by L. L. Grismer. San Diego Natural History Museum (SDNHM 64882-64883). First record from the Mexican portion of the Yucatan Peninsula. 271 km north of nearest locality, Altun Ha ruins, Belize (Dixon 1964. New Mexico St. Univ. Sci. Bull. 64(1):1-139).

Submitted by **L. LEE GRISMER**, Department of Biology, San Diego State University, San Diego, California 92182 and **MARTA S. GRISMER**, 1602 Via Cancion, San Marcos, California 92069, USA ●

TROPIDURUS TORQUATUS. BRASIL: AMAZONAS: Manaus. 21 July 1986. T. C. Avila-Pires and A. Lima. Verified by T. C. Avila-Pires. Museu Paraense Emílio Goeldi (MPEG/SAURIA 14408-14410). Extends range 700 km S of Boa Vista. Specimens are morphologically similar to *T. torquatus* (MPEG/SAURIA 3920, 3938, 3939) from Boa Vista. Introduced, possibly transported in trucks to the scrap metal yard. Study supported by Conselho Nacional de Desenvolvimento Científico e Tecnológico, grant 40.8064/84 ZO.

Submitted by **TERESA CRISTINA S. DE AVILA-PIRES**, Departamento de Zoologia, Museu Paraense Emílio Goeldi, C.P. 399, 66001 Belém, Pará, Brasil and **WILLIAM E. MAGNUSSON**, Departamento de Ecologia, Instituto Nacional de Pesquisas da Amazônia, C.P. 478, 69000 Manaus, Amazonas, Brasil ●

SERPENTES

LEPTOPHIS AHAETULLA PRAESTANS (Northern Green Frogger). MEXICO: OAXACA: Juchitán Dist: Palomares. December 1970. T. MacDougall. Verified by H. M. Smith. University of Colorado Museum (UCM 52510). New state record, southernmost record in México, extends range 115 km S of Isla Veracruz (Smith and Smith 1976. Synopsis of the Herpetofauna of Mexico, vol. 3:127, 201). The citation for Oaxaca in the latter work (under the name *Ahaetulla occidentalis)* was from Sumichrast (1873. Archs. Sci. Phys. Nat. 46:246) "This species (perhaps *A. occidentalis,* Gthr.) inhabits the western part of the isthmus of Tehuantepec" (translated from French). No state can be inferred with certainty from this statement, since the western part of the isthmus includes parts of both Oaxaca and Veracruz.

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LAMPROPELTIS TRIANGULUM POLYZONA (Veracruz Milk Snake). MEXICO: OAXACA: Juchitán Dist: Palomares. December 1970. T. MacDougall. Verified by H. M. Smith. University of Colorado Museum (UCM 52501). New state record, southernmost locality, extends range about 40 km SSW Jesús Carranza, Veracruz (Williams 1978. Milwaukee Public Mus. Publs. Biol. Geol. 2:258 pp.).

Submitted by **GONZALO PÉREZ-HIGAREDA**, Estación de Biología Tropical Los Tuxtlas, Apartado Postal 51, Catemaco, Veracruz, México and **HOBART M. SMITH**, Department of Environmental, Population and Organismic Biology, University of Colorado, Boulder, Colorado 80309-0334, USA ●

MASTICOPHIS FLAGELLUM TESTACEUS (Western Coachwhip). USA: TEXAS: Jim Wells Co: 7.2 km N Alice on U.S. 281. 28 September 1986. S. P. Tabor and J. W. Dragoo. Verified by M. Retzer. Texas Cooperative Wildlife Collection (TCWC 64579). New county record, fills hiatus between Nueces, Kleberg, and Duval counties (Raun and Gehlbach. 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **STEPHEN P. TABOR** and **JERRY W. DRAGOO**, Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843, USA ●

NERODIA SIPEDON SIPEDON (Northern Water Snake). USA: WISCONSIN: Milwaukee Co: Greendale, 1.1 km S Grange Ave on Loomis Rd (T5N, R21E, S3). 22 October 1986. D. E. Vogelsang. Verified by R. W. Henderson. Milwaukee Public Museum (MPM 22855). New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milw. Publ. Mus. 205 pp.).

Submitted by **JAMES F. DROUGHT**, Department of Biological Sciences, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin 53201, USA ●

RAMPHOTYPHLOPS BRAMINUS (Brahminy Blind Snake). NEW CALEDONIA: Noumea: Magenta: rue du Cdt. Mersuay. November 1986 California Academy of Sciences (CAS 162092-162094), 12 December 1986 (CAS 162095-162096), 18 December 1986 (CAS 162097), 22 December 1986 (CAS 162098). A. M. Bauer, L. Wishmeyer and A. Renevier. Verified by A. M. Bauer. First confirmed record (Peters. 1878. Preuss. Akad. Wiss. Berlin 1877:415-423) of a terrestrial snake from New Caledonia and farthest extension of this parthenogenetic species into the Southwest Pacific (Hahn 1980. Das Tierreich 101:1-93). Reports are that this species is widespread in southern and eastern New Caledonia, primarily in areas of human activity. I thank the Service des Forêts et du Patrimoine Naturel for permission to collect in New Caledonia.

Submitted by **AARON M. BAUER**, Department of Zoology and Museum of Vertebrate Zoology, University of California, Berkeley, California 94720, USA ●

NOTEWORTHY RECORDS OF AMPHIBIANS AND REPTILES FROM TLAXCALA, MEXICO

The paucity of herpetological records from the Mexican State of Tlaxcala has been noted (Smith and Smith 1976, Synopsis of the Herpetofauna of Mexico., Vols. III and IV, John Johnson, N. Bennington, Vermont). These new records are based on specimens housed in the Colección Herpetológica, Instituto de Biología, Universidad Nacional Autónoma de México (IBH), and the Museo de Zoología "Alfonso L. Herrera," Facultad de Ciencias, UNAM (UNAM). All specimens were collected and verified by the authors.

PSEUDOEURYCEA CEPHALICA MANNI. Acopinalco del Peñón. 26 May 1979. (IBH 2894). First state record (Smith and Smith, 1976. Vol. IV).

PSEUDOEURYCEA LEPROSA. 3 km SW Tlaxco. 3 October 1976. (IBH 3084). Extends range 42 km N La Malinche (Sánchez de Tagle 1978. BS Thesis, Facultad de Ciencias, UNAM 91 pp.).

SPEA HAMMONDI MULTIPLICATA. 3 km WNW Tlaxcala City. 1 August 1976. (IBH 2955); 500 m SW Tlaxco. 3 October 1976. (IBH 2956); 4 km N Apizaco. 22 July 1979. (IBH 2957). New state record (Smith and Smith 1976. Vol. IV).

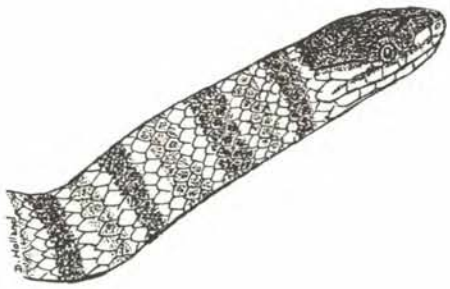
EUMECES BREVIROSTRIS BREVIROSTRIS. 3 km WNW Tlaxcala City. 1 August 1976. (IBH 3008); 4 km W El Carmen Tequexquitla. 20 October 1979. (IBH 3010); 3 km SSW Huamantla. 13 October 1979. (IBH 3009); San Lucas Tecopilco. 26 May 1979. (IBH 3011). New state record (Smith and Smith 1976. Vol. III).

CNEMIDOPHORUS ALPINUS. 3 km SSW Huamantla. 13 October 1979. (UNAM 744); 4 km W El Carmen Tequexquitla. 25 May 1979. (UNAM 742-743). New state record, extending the range 90 km W from the only reported locality (Maslin and Walker 1965. Univ. Colorado Studies Biol. Ser. 19:1-8).

CROTALUS INTERMEDIUS INTERMEDIUS. 3 km WNW Tlaxcala City. 8 August 1976. (IBH 3464-3465). First state record, extends the range 100 km W (Klauber 1972. Rattlesnakes. Vol. I, 2nd. Ed., Univ. California Press., Berkeley, Ca.; Armstrong and Murphy 1979. Spec. Publ. Univ. Kansas Mus. Nat. Hist., 5:1-88.; Campbell 1982. Southwestern. Nat. 27:353.).

CROTALUS SCUTULATUS SALVINI. Mpio. El Carmen Tequexquitla. 27 August 1985. (IBH 6128). First record near the type-locality since 1921 (Klauber 1972. op cit., Armstrong and Murphy 1979 op cit.).

Submitted by **OSCAR SANCHEZ-HERRERA**, Instituto de Biología, UNAM, Ap. Postal 70-153, Mexico, D.F., 04510. and **GERARDO LOPEZ-ORTEGA**, Departamento de Biología, Universidad Autónoma Metropolitana, Av. Michoacan y Purísima, Iztapalapa, México, D.F. ●



BOOK REVIEWS

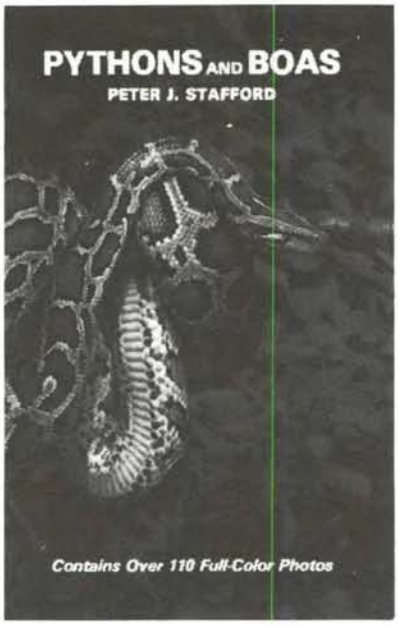
Biology of the Reptilia. Vol. 14, Development A, edited by Carl Gans, Frank Billett and Paul F. A. Maderson. 763 pp. Price $60.00, clothbound; Vol. 15, Development B, edited by Carl Gans and Frank Billett. 731 pp. Price $79.95, clothbound. 1985. John Wiley & Sons, New York.

I read these latest two volumes of *Biology of the Reptilia* during Super Bowl month last January. It didn't take me long to realize that the timing was more than mere coincidence. After attempting to tackle these enormous tomes—each one, at around 750 pages, is a Bear of a book—I now know what it must feel like to be a New England Patriot.

Biology of the Reptilia has come to represent an invaluable source of information for many topics of reptilian biology. The latest two contributions, encompassing any and all aspects of reptilian development that have been scientifically investigated, are worthy additions to the series. As stated explicitly in the preface to volume 14, a primary aim of these books is to address the paradox that, despite their morphological, physiological, and ecological diversity, reptiles as a group have been neglected in studies of major features of vertebrate development. Thus, while the editors have sought "to summarize the state of our knowledge of developmental pattern in this diverse group of organisms," and to identify "the major gaps that remain" (v. 14, p. vii), they also have taken on the task of promoting the increased use of reptiles by developmental biologists generally.

We learn early on how serious they are. For example, the introductory chapter to volume 14, authored by editors Billett, Gans, and Maderson, begins with an historical résumé of *Entwicklungsmechanik* and its tendency to ignore reptiles as experimental subjects. It soon focuses, however, on "practical considerations," which includes identification of interesting developmental phenomena that can be studied only in reptiles, such as temperature-dependent sex determination, appropriate species to use and their availability, and even recipes for various histological fixatives. Finally, the chapter closes with two

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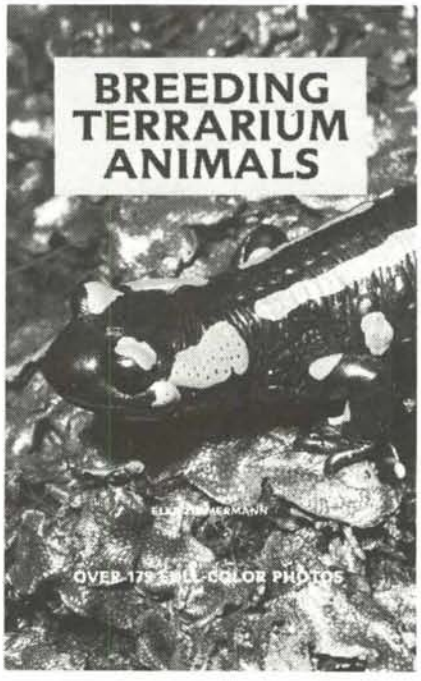
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appendices—one listing sources of serial sections, the other listing the literature of normal development. This sets a pattern of comprehensive treatment and careful attention to detail that is generally characteristic of all that follows.

The two-volume set is organized around two themes, one taxonomic, one topical. Each major taxon is treated in at least one chapter that summarizes past developmental studies concerning that group; it also reviews known aspects of reproductive biology. Complementing these general chapters are a number of additional chapters that focus on particular topics that are particularly well studied. Volume 14 includes those chapters dealing primarily with turtles, crocodilians, and *Sphenodon;* volume 15 includes those for squamates, although reference to other reptiles is included at times. The following is a list of the chapter topics and authors. Volume 14: Introduction: Why Study Reptilian Development? (Billett, Gans, Maderson); Oocytes (Hubert); Turtles (Ewert); Marine Turtles (Miller); Crocodilians (Ferguson); The Tuatara (Moffat); Integument (Maderson); Immunity (Cooper, Klempau, Zapata); Pituitary (Pearson); volume 15: Squamata (Hubert); Lepidosaurian Reproduction (Saint Girons); Limbs and Embryonic Limb Reduction (Raynaud); Genital System (Raynaud, Pieau); Autotomy and Regeneration (Bellairs, Bryant); Parthenogenesis (Darevsky, Kupriyanova, Uzzell); Placentation and Gestation (Yaron); Ecological Aspects of Viviparity (Shine).

As would be expected of such a distinguished international array of researchers (and editors), all the treatments are of high quality. What distinguishes several chapters, however, and what makes these books much more than simply a catalogue or even a review of prior studies, is the wealth of significant and valuable data that are published here for the first time. For example, the two accounts of turtle embryology by Ewert and by Miller—which together span an impressive 254 pages—include a tremendous amount of previously unpublished descriptions of organogenesis, egg sizes, incubation periods, embryonic diapause and aestivation, and other subjects. Perhaps of interest to a wider range of biologists is Miller's presentation of an annotated, illustrated table of developmental stages from first cleavage (prior to oviposition) to hatching that is generally applicable to all marine turtles, and an analogous (albeit postoviposition) developmental table for crocodilians by Ferguson. Publication of these data represents a tremendous contribution to the embryology of non-squamates. Similarly, the extensive study of parthenogenesis in Eurasian *Lacerta* by Darevsky and colleagues, much of which is published in Russian journals (and typically written in Russian), is reviewed extensively in his chapter (co-authored by Kuprinova and Uzzell). This should be relished by those with a consuming interest in the general phenomenon of parthenogenesis, but who have been reared largely on a diet of North American *Cnemidophorus.*

Finally, these two volumes provide an opportunity to assess at least in a general sense the current state of reptilian developmental biology. Two aspects seem especially prominent. First, most of what is known about even the most fundamental aspects of reptilian development comes from study of only a relative handful of species, and much of this is exclusively descriptive. By the editors' own account, probably fewer than 100 of the 6,000 extant species, or less than 2 percent, have been studied in any respect. And while it is not reasonable to expect that every unstudied species has a novel pattern of gastrulation or limb chondrogenesis that will force revision of textbook descriptions of basic vertebrate development, it is also unfair to assume that no significant features remain to be discovered. The description of a novel pattern of gastrulation in the hylid frog *Gastrotheca* is an example of one such recent discovery in amphibians (del Pino and Elinson 1983). Certainly, consideration of additional species will bring handsome rewards. The fact that most of what has been done is descriptive can be attributed to most experimentalists having fixed on a very few species of typical "laboratory" vertebrates, none of which is a reptile. Admittedly, it is difficult to imagine reptilian subjects for developmental studies that could be more convenient than frogs which can be made to breed almost on cue and chick eggs which can be dialed up from your local hatchery. Nevertheless, the organ culture work of Raynaud, Ferguson, Maderson, and others clearly shows that this valuable procedure is feasible with reptiles, and perhaps easier than analogous methods for mammalian systems.

Second, the diversity of developmental phenomena documented in even the relatively few species studied poses a number of intriguing evolutionary questions that remain to be addressed. Contributing to the timeliness of these volumes is the fact that evolutionary biology in the last few years has witnessed a dominant interest in development, especially in the developmental mechanisms that underlie morphological transformation during phylogenesis. Some of the most dramatic transformations in vertebrates involve reptiles, thus the more that can be known about reptilian development, the better. As revealed by the comprehensive reviews provided in these volumes, a meaningful synergism between these two disciplines as applied to study of the evolution of reptiles remains largely in the future. Thanks to the latest installments of the *Biology of the Reptilia,* however, that day may now be closer at hand.

LITERATURE CITED

Del Pino, E. M., and R. P. Elinson. 1983. A novel developmental pattern for frogs: Gastrulation produces an embryonic disk. Nature 306:589-591.

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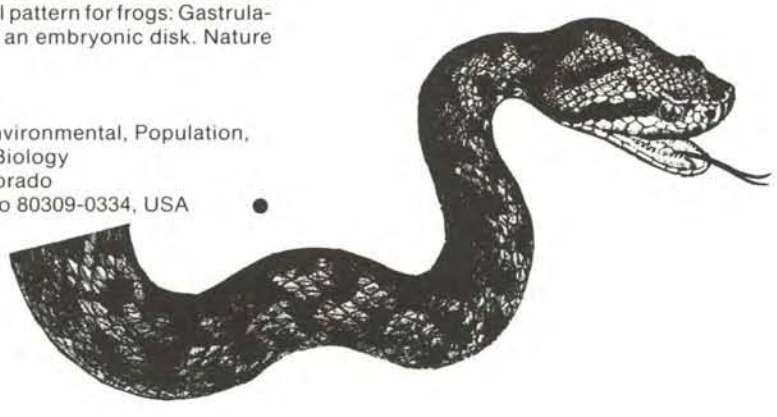
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The Snakes of Honduras, 2nd Edition, by Larry David Wilson and John R. Meyer. 1985. Milwaukee Public Museum (800 Wells St., Milwaukee, Wisconsin 53233), 150 pp., 124 figs. (20 in color), cover frontis (color); soft cover. $29.95 plus $1.50 shipping and handling.

In its 8½ x 11 in (21.6 x 27.7 cm) format, conforming in size with standard business stationery of this country, the excellent illustrations and double-column text of this seminal work are displayed to unusual advantage. Gross features include an excellent, scholarly 18-page essay, liberally illustrated, on the surprisingly complex environmental parameters of Honduras, embracing physiography, geological history, climate, vegetation and ecologic formations.

Keys and species accounts occupy the bulk of the book—109 pages— and are exceptionally useful in providing information on each species as a whole, as well as Honduran material, and critically evaluating the significance of that information. This section thus is of importance to the study of snakes of all adjacent regions, including northern South America, all of Central America, Mexico and even the United States; although based on but one small area (Honduras), the perspective extends far beyond those limits, making the study a reference work of exceptionally broad usefulness and influence.

Excellent as the two preceding sections are, the third, entitled "Present-day Distributional Patterns," is the apogee of scholarship in this remarkable work. Methods of statistical analysis are applied to determine correlation between distribution and physiographic region, ecological formations and elevation, revealing eleven broad distributional patterns of Honduran snake species. Impressive also are the lengthy tables specifying the distribution of each snake species with physiographic regions, ecological formations and elevation.

The information provided in this work indicates a remarkably complete knowledge of the snakes of Honduras; certainly the level of analysis is far better than for any other country in the Americas. Yet all is not known, even yet; the authors point out that the Montane Rainforest (of Cerro Santa Bárbara and possibly Cerro Cangrejal) is "virtually unknown" ophidiologically, and two physiographic regions (the Motagua Plain and the Aguán-Negro Plain) are "virtually or totally unknown." Another unknown, despite all of the species-oriented correlation already completed, is the extent of geographic correlation found in intraspecific variation.

Beautifully executed and scholarly though this work is, indeed setting a new, remarkably high standard for faunistic studies, much remains to be done before the subject is exhausted, as the authors make clear. The present step is nevertheless uniquely noble.

Generally, scientific publications are content to reveal scientific erudition insofar as the talents and labors of their authors permit; it is the accepted norm to be detachedly impersonal. It is both refreshing and sobering that Wilson was willing to put a bit of his other self into this work, and the editors to accept it, even briefly, in a compellingly eloquent preface, and in a few other introductory paragraphs as well where the sentimentality of a sensitive, caring person comes hauntingly through to the reader. The book was not produced by a sophisticated machine. One wishes that the author's voice could be amplified and multiplied many times over, for his goal is the vision of all who can see beyond the thickets of personal, immediate concern but who have had little power to convert vision to reality.

As the second edition of a work first appearing in 1982, the 1985 version maintains the earlier-established, basic framework, with numerous superimposed modifications throughout, primarily involving 21 excellent color photographs by Louis Porras and Jim Bridges (unfortunately not including the splendid portrait of *Bothrops schlegeli* that graced the cover of the first edition). The number of species dealt with was increased from 91 to 95, and the discussion of systematics of numerous species was revised. Thus the work constitutes an invaluable reference work providing a concise overview of the present state of knowledge for every species treated—a veritable gold mine of current knowledge and sources thereof.

Accordingly, it is incumbent upon everyone who has benefited from the first edition to acquire the second, even with the misgiving that before long a third edition may well be along. And even more importantly, anyone interested in any regional biotic study, or in the broader problems of Central America, who have not profited from the first edition, should not miss the second.

HOBART M. SMITH
Environmental, Population and Organismic Biology
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Lions and Tigers and Bears. A Guide to Zoological Parks, Visitor Farms, Nature Centers, and Marine Life Displays in the United States and Canada, by Jefferson G. Ulmer and Susan Gower. 1985, Garland Publishing, Inc., New York. 230 pp. $20.

The only thing missing from the title is "Oh, my!" This book is merely an assemblage of U.S. and Canadian facilities which exhibit live animals. The main body contains a listing of over 850 zoos, parks and display areas alphabetically by state and cities within the state. Canadian listings follow those of the U.S. Compilations appear to be summaries of questionnaire forms submitted to all the listed attractions. The listings are in typewriter type, which, for this kind of book, is probably adequate.

Some information regarding individual facilities is misleading. The Cleveland Metroparks Zoo, for instance, is reported to have a saltwater aquarium (which it didn't at the time the book was published) and reptiles (no reptile house and only a few turtles and tortoises mixed in with other exhibits.) The hours for the CMZ were given as 9 - 5 daily (correct) and 9 - 7 in summer (The only day the zoo is open to 7 is Sunday.) If this entry is any indication as to the validity of the others, the book is highly suspect as to its overall accuracy.

The best information is contained in the visitor notes section of the preface. Sound advice that should be well taken includes the type of clothing to wear: "Dress in loose comfortable clothes and a well-broken-in pair of walking shoes or lightweight boots. Add rain gear, sweaters, coats, gloves, and other foul-weather items as the climate requires." Another sound suggestion: "Although some zoos permit the admittance of household pets, it is generally a good idea *not* to bring them to any zoo/park area; pets can spread diseases to other animals and cause unnecessary disturbances." I love this paragraph: "Have your group leave radios, alcoholic beverages, smoking materials, and other non-essentials outside of the zoo/park area—these items are generally unwelcome (and often prohibited) on zoo/park grounds. DO bring cameras, binoculars, notebooks, field guides, and your teeming, unaltered senses, ready for a day of natural excitement!"

In the general information section of the preface, items covered include what kinds of guest facilities may be found in zoos/parks, the possibility of educational programs offered to teachers and students; and the suggestion that if a trip is planned for large groups it is almost mandatory to write or call well ahead of the visit for any special arrangements that are to be made in advance.

Also in the general information section many special zoo and park words and terms are defined for the edification of the non-zoological lay person. Among these are "docent," "braille-sensory exhibits," "native animals," and "wildlife rehabilitation programs."

And then what follows in the main body of the book is about as interesting as reading the dictionary. The litany of entries begins with the Birmingham, Alabama Zoo and concludes 218 pages later with Swan Lake—not the ballet, but the Christmas Hill Nature Sanctuary in Victoria, British Columbia. In between is information guaranteed to be obsolete faster than a Guinness Book of Records entry. It will certainly be obsolete long before the book's acid-free 250 year life paper deteriorates. A number of black and white animal photos break up the monotony of the written material.

Visitors to the various facilities listed would get up-to-date information by writing or calling; nearly all public zoos and other animal parks have colorful informational brochures available free to anyone. A 22¢ stamp would be a slightly better investment than the $20.00 price of LIONS AND TIGERS AND BEARS. Oh, my!

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HERPETOLOGICAL REVIEW EDITORIAL POLICY

The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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MJR

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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (four issues per year), **Herpetological Review** (four issues per year), and occasional issues of **Facsimile Reprints in Herpetology.** Members may purchase other Society publications at reduced rates.

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Herpetological Review

Volume 18 March 1987 Number 1

1987 JOINT ANNUAL MEETING

The 30th Annual Meeting of

THE SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

and The 35th Annual Meeting of

THE HERPETOLOGISTS' LEAGUE

with

The 2nd Annual Meeting of

EL COMITE NACIONAL HERPETOLOGICO, MEXICO

HOSTED BY EL INSTITUTO DE BIOLOGIA, U.N.A.M

in

Veracruz, Veracruz, Mexico

9-15 August 1987

Universidad Nacional Autonoma de Mexico was established in 1910. It now has 308,000 students and an academic staff of 30,000, 1700 of which are devoted to scientific research. The university has branches throughout Mexico. The largest branch, known as "Ciudad Universitaria," (CU) is in Mexico City, covering 733 hectares on a lava flow at the southern edge of the city.

In 1929 the Institute of Biology was formed. There are now 14 institutes and seven centers for scientific investigation. The primary function of these institutes and centers is research, integrated with teaching. Other departments and faculties within UNAM are primarily devoted to teaching and offer degrees at the bachelors, masters, and doctoral levels. Within the Institute of Biology a doctoral program in ecology is offered.

The Institute of Biology at the present time consists of three departments: Botany, Ecology, and Zoology. There are also the field stations of Chamela in Jalisco and Los Tuxtlas in Veracruz, and the Botanical Garden in Mexico City. A total of 150 academic staff comprise the Institute of Biology. Included in this group are nine herpetologists, five investigators and four technicians.

Meeting Site

The meeting will be held in Veracruz, Veracruz at Hotel Mocambo, a large sprawling Spanish style hotel located 300 m from the beach on the Gulf of Mexico. Average daily temperatures and humidities are lower than they were for either Tampa or Springfield and the possibility of drenching thunderstorms is also less likely in August. Veracruz is a pleasant tropical port city with a population of 300,000. Mocambo is located at the south end of the city, a direct 10 min from the airport by taxi. Housing, meals, papers, and social sessions all will be in the Hotel Mocambo complex. Paper sessions will be held in air conditioned rooms.

Registration

The registration fees are $30 regular, $15 student or spouse/guest. This includes the meeting costs, refreshments for the breaks, the registration social, the Monday night wine and cheese social, the BBQ and chile cookoff, live musical groups, and refreshments at the auction. Only persons with name badges will be admitted to the social or scientific events. The spouse/guest category is provided for persons accompanying regular members or student members and who will NOT be attending the paper sessions.

Anyone registering after May 1 will be charged an additional $15. Exceptions will be made for all attendees coming from countries where it is difficult to obtain funds in US $ or Pesos Mexicanos. They can pay at the meeting registration desk IF they have sent in the preregistration forms and requested a waiver. Fees may be paid in either US $ or Pesos Mexicanos at the current rate of exchange.

Currency

Mexico's currency is the peso, and the current rate is $850 per dollar US. Inflation and fluctuation of the peso according to the world petroleum prices make it impossible to guarantee prices in pesos. VISA, Mastercard, American Express, Bancomer, Banamex, Carnet, and Diners cards are accepted at most major hotels and restaurants. Foreign checks on US banks will be accepted for registration fees and prepayment of hotels and meals. Travelers checks, credit cards, Pesos Mexicanos, US $, international money orders, or checks drawn on Mexican banks will be accepted at the meeting site. Money can be changed in the banks at the Mexico City airport or at the meeting site, no problem.

Transportation

AIR: Make your reservations to Veracruz, Veracruz. There is only one airport. Ray Ashton is "handling" discount airfares from the USA to Veracruz through the travel agency:

Holbrook Travel, Inc.
3540 N.W. 13th Street
Gainesville, FL 32609, USA

Call Toll Free: in Florida 1-800-345-7111, other states 1-800-451-7111

When calling, identify yourself as one of "those" wanting bargain rates to the SSAR-HL conference. Ray lists roundtrip fares from 11 major USA cities to Veracruz (with a transfer in Mexico City) ranging from $296 (Miami) to $458 (Seattle).

BUS: ADO and AU offer first class bus service to Veracruz from Mexico City as well as border towns. Second and third class buses also are available.
PRIVATE VEHICLE: The roads from Laredo or Brownsville, Texas provide a scenic direct route to Veracruz. Hotel Mocambo is located on the main highway at the south edge of Veracruz.

In order to enter Mexico, it is necessary to have TWO documents: A current passport OR a notarized copy of a birth certificate; AND a driver's license with photograph OR a voter's registration card.
TAXI: Free shuttle service will be available from the airport to Mocambo on Saturday and Sunday. Present taxi rates are $2.50 US/person from the airport to Mocambo.
TRAIN: Train service is available from Mexico City to Veracruz, providing many hours to view the scenic countryside. However it is not recommended for the unadventurous.
RENTAL VEHICLES: International rental agencies have offices at the airport on Mexico City and in Veracruz (Avis, Hertz, National). VW bugs are the most common and economical way to go, but VW buses and larger cars may also be rented.

Housing and Food

Hotel Mocambo is offering a package rate of six nights with meals (five breakfasts, four dinners, one supper) for a special price of $200 US per person (double occupancy) or $250 (single occupancy). Meals only are $60. Meals will be served buffet style, with a large selection of regional cuisine for all palates. (We will have total control of the menu, water and disinfecting of vegetables for those concerned about such things.) The midday meal, also buffet style featuring local seafood, will be served as the large meal of the day. All other meals, except the Thursday night fiesta, are paid for in your registration fee. Meals may be purchased separately or in the many inexpensive seafood restaurants and taco stands located on the beach within 5 min walking distance of Mocambo. Veracruz has hundreds of restaurants; a complete restaurant guide will be provided at the registration desk.

Rooms without meals are $35 single or $18 per person double occupancy. The rooms are deluxe—air conditioning, private shower with hot and cold water, private bathroom, cable TV, telephone, room service. The entire Hotel Mocambo complex has been reserved for this meeting, including tennis courts, swimming pools, jacuzzi, and bars, but space is limited to 140 rooms. The rooms will be filled by those registering promptly.

Meeting registration & housing reservation forms are included with the final call for papers (see below). But don't worry if you are late in registering. Ample space has been reserved at five hotels within easy staggering distance of Mocambo (within 500 m). Veracruz has hundreds of other hotels, motels, and hostels ranging in price from $3-50 per night, depending on your customs. If you have a special need, write. We are sure to be able to satisfy nearly everybody in Veracruz in their quest for economy and comfort.

Camping

Two camping—trailer parks are located within 2 km of Hotel Mocambo. Both have bathrooms, showers, and full hookups. Present rates are $.25 per day per person. These are within 10 min walking time (for Society officers).

Parking

If you drive or rent a vehicle, no problem. Free parking with security guard is available at Mocambo.

Business Meetings

Inter-society Liaison Committee—1930, Aug. 8 Room B
SSAR Board Meeting—1000, Aug. 9 Rm. B
HL Board Meeting—1300, Aug. 9 Room C
Inter-society Liaison Committee Meeting—1300, Aug. 12 Room C
SSAR Business Meeting—1730, Aug. 13 Room A
HL Business Meeting—1730, Aug. 14 Rm. A

Collecting

Collecting is discouraged by the SSAR, the HL, the CNH, and the organizers of this meeting. It is illegal to collect, possess or transport Mexican wildlife without a permit. Attendees are asked not to bring live reptiles or amphibians onto the meeting grounds unless this has been previously cleared with the meeting co-chairpersons in writing. Permits may be obtained to collect reptiles and amphibians for scientific purposes. Application procedures appear below.

Scientific Sessions

HL Distinguished Herpetologist Lecture: Henry Fitch

CNH Invited Speaker: Miguel Alvarez del Toro (Tentative)

Call for Papers. The final call for papers was mailed to all members in January. Deadline for the receipt of abstracts *and* preregistration is 1 May 1987. Abstracts will not be accepted unless accompanied by the preregistration fee (except for those speakers from countries where there is a problem transferring currency, and who request to pay on site). Papers "by title only" are no longer accepted. Papers may be presented in either English or Español. If time and space become limited, papers will be scheduled in order of receipt. Papers will be limited to 12 min for presentation and three min for discussion.

Poster Sessions. Posters do not have to be limited to flat presentations to hang on walls. Be innovative. We will try to accommodate even the wildest ideas with the resources we have available.

Awards

The Herpetologists' League will make awards ($$) for the Best Student Paper and the Best Student Poster.

EXTRA SPECIAL ACTIVITIES

Herpetological Art and Photo exhibit. All those wishing to display materials are welcome to do so. Please bring all exhibits mounted and ready to hang.

Photo Contest (new this year, sponsored by the CNH).
Theme: Neotropical Reptiles and Amphibians.
Format: Color prints, 8 x 10 in ONLY (no other sizes), mounted on neutral colored mounting board 11 x 14 in.
Prize Categories: Turtles, Snakes, Lizards, Anurans, Salamanders, Other (Dinosaurs, Crocodilians, Caecilians, Herpetologists in compromising positions, etc.) Prizes will be awarded in each category.
Limit: Three photos per registrant (total regardless of category). Bring your mounted photos to the registration desk. Photos will be exhibited throughout the meeting.

Herpetological Exam. Marty Crump has again agreed to coordinate this ever-popular event to test your knowledge of the field of herpetology. This year's exam will feature neotropical herps and will be available in Spanish and English versions. Prizes will be awarded to the winners, and proceeds will be used to support the SSAR Grants-in-Herpetology program.

Exhibits. The foyer of Hotel Mocambo will provide a congenial and convenient locality for commercial exhibitors. For exhibit applications or further information, contact:

Ruth Zantzinger
2108 Cherry Street
Philadelphia, Pennsylvania 19103, USA
Tel. (215) 557-0182

Socials and other Special Events

Sunday: Registration social with tropical entertainment.

Monday Night: Wine and cheese social.

Tuesday Night: Auction (Sponsored by SSAR). Now a tradition, Joseph T. Collins will again coordinate the auctioning of herpetological items. Please bring or send all items to be donated. A tax-deductible receipt will be given for all donations. Complimentary beverages will be provided throughout the auction.

Wednesday Night: Mexican beach barbecue with a chile con carne cookoff with music by a marimba group. Film: Tropical rainforest in Mexico. Synchronized slide presentation on Estacion de Biologia Los Tuxtlas.

Thursday Night: Seafood extravaganza with entertainment provided by Universidad Veracruzana Ballet Folklorico. ($10.)

Friday: Field Trips.
Mt. Orizaba to observe salamanders
The wetlands of Lerdo de Tejada to observe turtles
Volcan Santa Martha to observe cloud forest herps
Estacion de Biologia Los Tuxtlas to observe neotropical forest and wetland reptiles and amphibians

In addition a SCUBA diving trip is planned for the coral reef off the coast of Veracruz. A diving excursion to Puerto Morelos, Quintana Roo can also be easily arranged.

Family Entertainment

Bilingual guides will be available throughout the week for shopping tours to the local

markets, trips to museums, historical sites (San Juan de Ulua—prison of the Spanish Inquisition; first Catholic church in the New World), archeological sites, and aquarium. No guides will be necessary to reach the beach.

Live Exhibits

We will not have all Mexican species represented, but we will have the largest display ever presented at an SSAR/HL meeting. Natural backgrounds will be available for photography.

Collections

Anyone wishing to examine specimens at any of the collections in Mexico should make prior arrangements with the curators to do so before or after the meeting, not during the meeting.

DEADLINES

May 1: Abstracts and résumés of all papers and posters.
Preregistration payment for those submitting papers.
Preregistration payment for those not wishing to pay an extra late registration fee of $15.
Housing registration and meal package registration.

August 1: Final day for 80% refund of registration fees.

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TELEPHONE 5-50-5215, ext 4905 or 4906, 5-50-5002

A copy of the official call for papers can be obtained by contacting either one of the co-chairpersons or James F. Berry, Department of Biology, Elmhurst College, Elmhurst, Illinois 60126, USA. Tel. (312) 279-4100. ●

REGULATIONS TO OBTAIN SCIENTIFIC COLLECTING PERMITS FOR MEXICAN WILDLIFE

Many investigators have inquired about the procedures for obtaining collecting permits so they may collect specimens while in Mexico for the SSAR/HL meeting in August. The following information should answer all such questions.

Investigators must send **all** of the required material, without exception, to the embassy of your country in Mexico City. The embassy must certify the documents and send them to:

Direccion General de Conservacion
Ecologica de Los Recursos Naturales
Rio Elba #20 - 8o Piso
Col. Cuauhtemoc.
06500 Mexico, D.F.

The required documents consist of:

1) Letter of support from your institution certifying the proposed research and/or collecting.

2) Letter certifying that you agree to pay the expenses of a Mexican technician during the field work in Mexico. (This gives Mexican students a chance to learn with professionals, establishes contacts both for the foreign investigator as well as the Mexican student, and makes it easier for the project to function logistically).

3) Letter from a Mexican institution or investigator endorsing the project.

4) Curriculum vitae of investigator and two passport size photographs.

5) Copy of project proposal with justification of why you need to collect the animals and how you are going to do it.

The project proposal needs to include:

a) Common and scientific names of all species to be collected (even if you do not know which species occur in an area you must at least include a hypothetical list or your proposal will not be considered) and the number of individuals of each species.
b) Collecting and transporting methods. If you plan to tag animals you must include a list of the types of tags to be used and the number series.
c) Localities where the investigations or collecting are to be carried out.
d) Period of investigation or collection (exact starting and ending dates).
e) Locality where you will be leaving Mexico (which border town or airport).

When the collecting permit is approved La Direccion General de Conservacion Ecologica de los Recursos Naturales will send a telegram to the investigator informing him or her of acceptance and requesting an international money order for the amount specified according to the Ley Federal de Derechos Vigente. (This amount is subject to change so no amount can be stated at this time.)

If permission is granted to collect or study Mexican wildlife for scientific purposes the investigator must comply with the following regulations:

1) Deposit 40% of the total of the specimens collected, properly preserved and with the collecting data, in one of the Mexican scientific institutions dictated by the DIRECCION GENERAL DE CONSERVACION ECOLOGICA DE LOS RECURSOS NATURALES.

2) Establish contact with the delegates of SEDUE in the states where you are to make the investigation or collection.

3) Comply with the regulations required by LA DIRECCION GENERAL DE SANIDAD Y PROTECCION AGROPECUARIA Y FORESTAL DE LA SARH for the exportation of live animals.

4) Once the field work is completed you must send within 30 days to DIRECCION GENERAL DE CONSERVACION ECOLOGICA DE LOS RECURSOS NATURALES a copy of the results of the field work in the format of the approved project and a copy of the field book listing the specimens collected. When the data are published, reprints of the scientific articles resulting from the investigation must also be sent.

ABSOLUTELY IMPORTANT

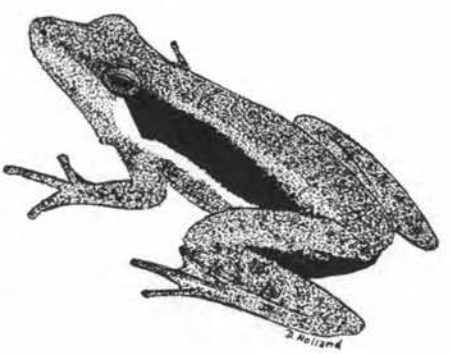
ALL OF THE REQUIRED DOCUMENTS, INCLUDING DIPLOMATIC CERTIFICATION FROM YOUR EMBASSY, MUST BE RECEIVED BY THE DIRECCION GENERAL DE CONSERVACION ECOLOGICA DE LOS RECURSOS NATURALES AT LEAST 30 DAYS PRIOR TO THE STARTING DATE OF THE PROPOSED INVESTIGATION OR COLLECTING, OR THE STARTING DATE *WILL* BE DELAYED.

The above is the latest material I personally received from SEDUE (2 December 1986). Please note the emphasis in the requirements for granting permission to collect for SCIENTIFIC INVESTIGATION. General collecting for museums or personal collections is not endorsed and permits for such activities will not be issued. Because of past abuses by both scientists and hobbyists as well as by representatives of biological supply houses, the regulations are set up as they are. They are not done to intimidate individuals or to prevent legitimate scientific investigation or collecting in Mexico but to protect the native fauna and discourage the abuses that occurred in the past.

RICHARD C. VOGT ●

SPONSORSHIP OF NON-U.S. MEMBERS

SSAR is expanding its sponsorship of non-U.S. members by requesting contributions to a fund established to defray the membership dues of herpetologists in countries that face difficulties with exchange of foreign currency. We encourage your participation in this program. Please contact our Treasurer, Dr. Henri C. Seibert, if you can assist in the identification of colleagues who can benefit from this program. ●



SSAR BUSINESS

SSAR CONTRIBUTORS

Once again we are pleased to recognize those individuals who have financially aided the Society by becoming Contributing or Sustaining members for the year 1986 and also those who have supported the Grants-in-Herpetology fund. A statistical analysis would reveal a very high positive correlation between those who have contributed in 1986 and those who have contributed in previous years. To all of you, new or old, we offer our thank you. H.C. Siebert, Treasurer.

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SSAR ELECTION RESULTS

The results of the 1986 SSAR Election are as follows:

President-elect: Hugh R. Quinn
Secretary: James S. Jacob
Treasurer: Henri Seibert
Board - Regular: Lynne Houck
Board - Non-U.S.: James P. Bogart

A total of 508 members voted in this election. The vote for president-elect was a tie between the two candidates, and the final decision was made by the Board of Directors.

The Society extends its gratitude to the Nominating Committee (Hugh R. Quinn, Chair) and to the SSAR Elector (J. Eric Juterbock) for their hard work, and to the outgoing President and Board Members for their service during their terms. ●

SSAR PROGRAMS FOR REGIONAL HERPETOLOGICAL SOCIETIES

The SSAR has developed three new programs to promote interactions between it and regional herpetological societies and to enhance the membership of both.

1. Individuals who join the SSAR *through their regional society* will have $2 of their SSAR dues credited to to their own society's treasury. This program is designed to encourage people to join the largest and most diverse international herpetological society, to enhance the membership of the SSAR, and to reward regional herpetological societies for participating in the program.

2. Regional herpetological societies are now eligible for a 25% discount on all orders of $30 or more for SSAR publications. This discount may only be applied to post-publication prices and is valid during the calendar year 1987. Orders must be placed by an officer of the regional society.

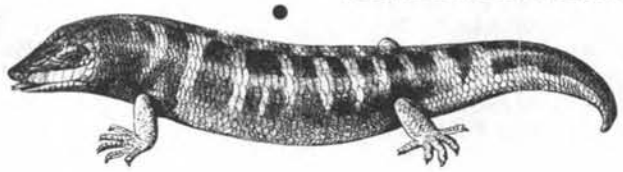
3. Two sets of plates from the new SSAR book **Turtles of Venezuela** have been sent to each regional society in the USA. The plates may be sold, auctioned, given away as prizes, or used in any other way deemed appropriate by the regional society officers.

Officers of all regional herpetological societies in the USA have been sent detailed information about these programs. This information is available to anybody who requests it.

STEPHEN HAMMACK
Regional Societies Liaison Chairman ●

CRESTED IGUANA DISCOVERER DIES

We regret to report that John R.H. Gibbons, discoverer of the Fijian crested iguana, and his family drowned in a boating accident on 15 November 1986. His friends, colleagues and the entire herpetological community mourn the loss of Dr. Gibbons and his family. ●



NEWSNOTES

VOLUNTEER PROGRAM AT AMNH SOUTHWESTERN RESEARCH STATION

Approximately 20 volunteer positions are open in 1987 at the Southwestern Research Station of the American Museum of Natural History in Portal, Arizona. The volunteer program is run annually and offers students in the biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging at the Station are provided to volunteers in exchange for four hours per day of routine work chores, with the remaining time available for research activities.

Volunteers are needed between 10 March and 1 December and are appointed for part of this period, with a minimum appointment of four to six weeks. Faculty knowing of promising students should alert them to this opportunity for professional experience toward, development of, and evaluation of their career goals.

Applicants for positions from March through May should submit forms by 15 February, summer volunteers, June through September, by 1 April. The program is open to both undergraduate and graduate students, who may pursue their own research projects.

For application forms, write: Resident Director, Southwestern Research Station of The American Museum of Natural History, Portal, Arizona 85632, USA. (602) 558-2396 ●

EUTHANASIA OF REPTILES AND AMPHIBIANS

The Universities Federation for Animal Welfare and the World Society for the Protection of Animals have formed a Working Party on Reptiles and Amphibians. The aim of this group is to collate and disseminate information on the humane euthanasia of amphibians and reptiles.

Persons having information on this subject, in the form of technical data or individual experiences, are asked to write to: U.F.A.W., 8 Hamilton Close, Potters Bar, Herts EN6 3QD, England. ●

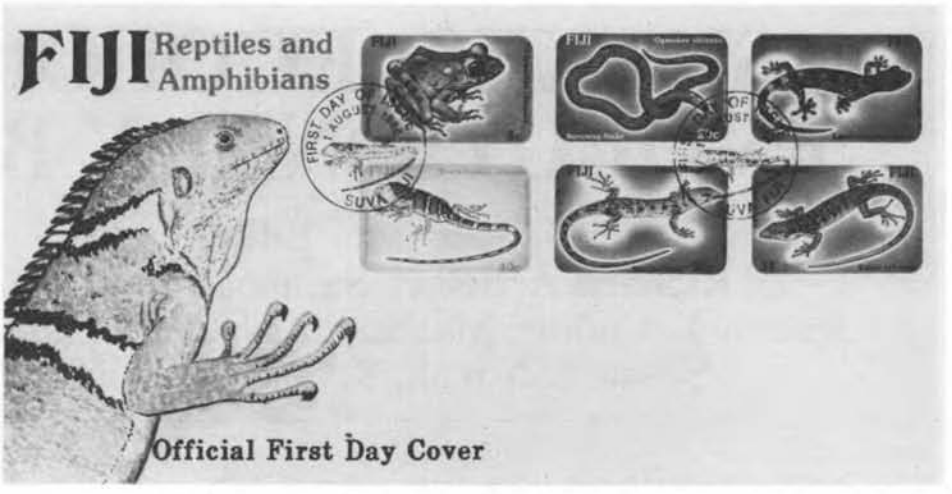
WISCONSIN HERP SPECIMEN RECORDS WANTED

If you maintain a collection of preserved amphibian or reptile specimens from Wisconsin, please send a listing of these specimens to me (if you have not already done so). Include locality data and collection date. We are collecting and verifying all Wisconsin specimen records as part of an intensive survey of amphibian and reptile distribution in Wisconsin. Send to Gary S. Casper, Section of Vertebrate Zoology, Milwaukee Public Museum, Milwaukee, Wisconsin 53233, USA ●

VOLUNTEERS SOUGHT FOR SEA TURTLE TAGGING PROJECT

The Caribbean Conservation Corporation, Inc., managers of the Green Turtle Research Station in Tortuguero, Costa Rica, is seeking volunteers to help with the sea turtle tagging project for the 1987 season. Departures for the 13 day program, including a trip to the Monteverde cloud forest, are: July 6, 13, 20, 27, August 3, 10, 17, 24. The cost of this tax deductible research travel program is $1,395, all inclusive from Miami. Volunteers will work with the research team as they tag and collect data on nesting green, hawksbill, and leatherback turtles.

Arrangements for volunteers are being made by Holbrook Travel, Inc. For an application or further information, contact: Ray E. Ashton, Jr., Holbrook Travel, Inc., 3540 N.W. 13th Street, Gainesville, FL 32609. Or call 1-800-451-7111 (in Florida, 1-800-345-7111). ●



CRESTED IGUANA STAMP

The Crested Iguana, an exquisite new species first described in *Journal of Herpetology* in 1981, is featured on a 40¢ stamp issued 1 August 1985 by the Fiji Government. This is part of a set of 6 stamps on Fiji reptiles and amphibians available from Philatelic Bureau, G. P. O. Box 100, Suva, Fiji. Prices for set: F$2.43 mint or cancelled, F$2.67 first day cover (approximate conversion rate F$1.03 = US $1.00); use International Money Order, payable to Postmaster. ●

SOCIETIES

BRITISH HERPETOLOGICAL SOCIETY MEETINGS 1987

Meetings are held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1, and generally start at 7:00 pm. For further details and membership, please write to BHS, c/o Zoological Society of London, Regent's Park, London NW1 4RY, England. As always, *SSAR members* and other North American herpetologists visiting or passing through London *are most welcome.*

February 24. Dr C.J. McCarthy: Sea snakes.

March 24. A.G.M. (see separate Agenda), followed by Keith Corbet: 'Biogenetic reserves' and conservation of European herpetofauna.

April 29. Dr T.R. Halliday: Reproductive cycle and life history of newts.

May 28. Education - the link between captive breeding and conservation: the work of the Education Committee. Speakers: Vic Taylor (Chairman); Colin Fitzsimmons; Dr Graham Walters; Peter Curry. Details to be announced later.

June 27. Dr J. Samour: Biomedical survey of the Aldabran giant tortoise population in the Seychelle Is (Indian Ocean). A special Saturday afternoon lecture, starting at 2:30 pm. Joint meeting with the British Chelonia Group.

July 22. Amphibia and reptiles worldwide: Their care and breeding. A discussion organized by the Captive Breeding Committee (Chairman: Simon Townson). Members are encouraged to bring live animals, preserved specimens, amphibian voice recordings and 35 mm slides for display and to illustrate discussions.

September 24. Care and breeding of amphibia and reptiles: an open meeting. Contributions from members - slides, live animals etc. There will be facilities for the sale and exchange of members' private stock.

October 13. Mike Linley: Herpetofauna of New Zealand.

November 18. Dr C.J. Reading: Ecology of the common toad *(Bufo bufo)* with reference to breeding strategies.

Please note that the name of the Society's journal has been changed to *The Herpetological Journal* to reflect better the subject matter of papers published.

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HUNGARIAN HERPETOLOGICAL SOCIETIES

Information on herpetological societies in Hungary has been received from Zoltán Takács (Division of Toxinology, Hungarian Ichthyological and Herpetological Society), Szeged.

MAGYAR AKVARISTA ÉS TERRARISTA ORSZÁGOS EGYESÜLET - Hungarian Ichthyological and Herpetological Society. Founded 1984.
Secretary: Á. Balkay, Gépmadár utca 12, 1106 Budapest X.
President: Dr K. Pinter, Epitö utca 12, 1184 Budapest XVIII.
Publication: Akvárium és Terrárium, a periodical (presently being licensed); quarterly.

TIT HERPETOLÓGIAI ÉS TERRARISTA SZAKKÓR - Society for the Popularization of Scientific Knowledge: Herpetological and Terraristic Section. Founded 1980.
Address: Bocskai utca 37, 1113 Budapest XI.
President: T. Fehér, Rózza utca 8, 2013 Pomáz.
Chairman, Herpetological and Terraristic Section: Dr. Z. Korsós, Zoological Department, Hungarian Natural History Museum, Baross utca 13, 1088 Budapest.
Publication: Terrarium, periodical; triannually.

M.R.K. LAMBERT
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MEETINGS

ALL FLORIDA HERP CONFERENCE

The tenth annual All Florida Herpetological Conference and Show will be held April 11-12 at the Florida State Museum, University of Florida, Gainesville, Florida. Registration and program information is available from Rhoda Bryant, Florida State Museum, Museum Road, Gainesville, Florida 32611, USA. (904) 392-1721. ●

ASIH 67th Annual Meeting

The American Society of Ichthyologists and Herpetologists and the American Elasmobranch Society will hold their annual meetings at the New York State Museum, Albany, New York, 21-26 June 1987. The meetings will include symposia, workshops, field trips, contributed-paper and poster sessions, exhibits, social events and business meetings. Symposia and workshops will include: Biology of Unisexual Vertebrates; The Role of Introduced Fishes, Amphibians, and Reptiles in Natural Systems; Reproduction in Tropical

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Techniques
Collecting and Life-History Techniques, *Henry S. Fitch*
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All contributed-paper and poster sessions, symposia and workshops will be held at the State Museum in the Cultural Education Center of the Empire State Plaza. Housing will be available at nearby Siena College or at several hotels in Albany. Planned social activities will be held at various locations in the greater Albany area. Since Albany is at the eastern terminus of the Erie Canal it is readily accessible from all parts of the Continent; more modern forms of transport can also be used. All people interested in fishes, amphibians and reptiles are invited to attend. Additional information can be obtained from Robert A. Daniels, New York State Museum, CEC 3132, Albany, New York 12230, USA. ●

FIRST SOUTH AMERICAN CONGRESS OF HERPETOLOGY

The first South American Congress of Herpetology is scheduled for 21-24 September 1987 in Tucumàn, Argentina, under the sponsorship of the Asociación Herpetologica Argentina - PNHERP CONICET. Sessions will include invited presentations, contributed papers, and workshops. Contributed papers (including abstracts in Spanish) will be accepted until 30 June 1987. For registration materials and further information, write to Dr. Raymond F. Laurent, Asociación Herpetologica Argentina - PRHERP CONICET, Miguel Lillo 251, 4000 San Miguel de Tucumàn, Argentina. ●

UK JOINT HERPETOLOGICAL SOCIETY SYMPOSIUM

The first UK Joint Herpetological Society Symposium was held in the lecture theatre of the London Zoological Society, Regent's Park, London on 14 September 1986. It was attended by one-hundred-and-seventy delegates.

Papers presented were: Breeding *Bombina maxima* (Bob Bray); Frogs of Sarawak (Chris Mattison); Reptiles and amphibians of Gregory National Park, N.W. Territories, Australia (Paul Edgar); Veterinary aspects of reptile husbandry (Rob Harper); Reproduction of Hermann's tortoise and the problem of their disposal (Don Reid); Environmental lighting (Dave Blatchford); Amphibian Husbandry (Mike Linley); and Captive breeding of tropical and temperate reptiles in Pennsylvania (John Brunner).

This highly successful event was organized by Jon Coote. The proceedings will be published in the near future.

DAVID BLATCHFORD
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SCOTLAND ●

FEATURES

NOTES ON THE FEEDING BEHAVIOR OF A JUVENILE MUD TURTLE *Kinosternon scorpioides*

Kinosternon scorpioides (Linnaeus, 1766) ranges from Mèxico to Argentina (Pritchard 1979), where it is often found in murky bodies of water (Freiberg 1972; Acuña et al. 1983). Despite its wide distribution, little is known of its natural history (Pritchard 1979). Excluding parasitological and systematic papers, most information about the species can be found in Teska (1976), Acuña et al. (1983), Pritchard and Trebbau (1984) and papers cited therein.

We know of no reports about the hatchling and early juvenile stages, which are known only from uncaptioned drawings in Gunther (1902). A presumed hatchling is recorded from Cayenne (Pritchard and Trebbau 1984). The following notes regard behavior in captivity of a single individual of *K. s. cruentatum*, and are published because our many attempts to obtain further specimens failed.

At the beginning of the 1983 dry season, two *K. scorpioides* were hand-collected while they were motionless in a bed of mud and leaf trash in Central Costa Rica (San Pedro de Pavas, San José Province). Adults of the species have been reported at this pool (Acuña et al. 1983). At capture, the specimens measured: length of plastron 3.8 and 4.9 cm; carapace 5.0 and 5.2 cm; width of plastron 3.3 and 4.7 cm; carapace 4.8 and 4.8 cm. Their plastral hinges were not functional. One individual died within 20 hours; the other survived approximately 3 months in an opaque aquarium (6 x 7 x 16 cm, with 336 cm^3 of water and a small stone as dry section). The observations reported here are based on the longest-surviving turtle. Both specimens are deposited in the Museum of Zoology of the University of Costa Rica (MZ:X-0012).

FEEDING BEHAVIOR AND FOOD ACCEPTANCE

The turtle approached an object put in the aquarium to ca. 1 cm, with head turned laterally, viewing it with only one eye ("visual examination"). Adult insects and Culicid mosquito larvae that were placed in the water often tried to escape as a result of such approach, generally with success. Biting action was accompanied by strong suction of water, which seemed to help capture small prey (e.g. Culicid larvae). A similar mechanism has been described in taxonomically distant species, e.g. *Chelus fimbriatus* (Pritchard 1984, personal comm.). If the prey was a fast swimmer (e.g. a hemipteran), the turtle normally abandoned the chase after one or two unsuccessful biting attempts. Its general foraging and feeding behaviors were similar to those of temperate Kinosternids (see Mahmoud 1968; Hulse 1974).

We believe that the visual sense of this turtle was of key importance in the location and

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VOLUNTEERS NEEDED TO HELP WITH THE SEA TURTLE TAGGING PROJECT FOR THE 1987 SEASON

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Table 1. Food acceptance of a juvenile *Kinosternon scorpioides* turtle

FOOD ITEMS OFFERED	NUMBER OFFERED	NUMBER CONSUMED
Culicid mosquito larvae	697	634
Juvenile *Aplexa fuliginea* snails (length about 1 mm)	79	0
Live flies *	28	26
Adult *A. fuliginea* snails (length about 1 cm)	21	15
Aquatic oligoquete worms (length about 1 cm)	9	3
Aquatic oligoquete worms (length about 10 cm)	5	4
Dead Culicid mosquitoes	3	0
A. fuliginea egg capsules	3	0
Water hyacinth *(Eichhornia crassipes)*	3	0
Dead beetles	2	0
Dead ants (length about 3 mm) *	1	0
Cabbage leaves *	1	0
Live spiders *	1	1
TOTAL	853	683 (80%)

* Foods that were not collected in the turtle's habitat, and were offered only for comparative purposes.

recognition of food, as suggested by the following observations. 1. When 34 Culicid larvae were introduced into the aquarium and the aquarium was placed into a light-tight bag for 46 hours, none of the larvae were eaten. However, as soon as the aquarium was exposed to daylight, the turtle started to consume the larvae. The experiment also suggests that the turtle could not locate the larvae by olfactory or tactile stimuli. 2. The turtle approached inorganic dark objects in the aquarium as described above ("visual examination"). 3. By observing suspended silt flow as suggested by Carr (1952), we saw that it rarely sniffed food.

When eating prey that was difficult to swallow, such as large earthworms, the turtle showed rhythmic inflations of the neck, which apparently aided ingestion. Finally, the neck was fully extended and bent upwards until the food was totally swallowed. Undesired food parts were expelled orally with a spurt of water.

Table 1 shows that a wide variety of prey was accepted, including live oligochaete worms, snails, flies, and mosquito larvae. When several of these items were available, the turtle ate the larvae first. Mosquito larvae were immediately recognized as food when first offered, and on one occasion, 148 of them were consumed within 24 hours. The food of adult *K. scorpioides* consists of tadpoles, crustaceans, insects and their larvae, Poeciliid fishes, molluscs, and worms (Fiasson 1945; Acuña et al. 1983).

ACKNOWLEDGMENTS

We thank A. Chacón, R. Acuña, D. C. Robinson, C. H. Ernest and several anonymous reviewers for comments on the manuscript. Our special thanks to P.C.H. Pritchard for a very interesting dialogue on this matter and for his encouragement.

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ANTIPREDATOR RESPONSES OF *Rana tigerina* TO A CROW

At 1500 h on 9 January 1984 we observed an Indian Crow *(Corvus splendens)* attack an adult frog *(Rana tigerina)* 90 mm SVL. The observation was made at the Madras Snake Park, Madras, India, where frogs of many species are released into enclosures as food for monitor lizards *(Varanus)*. The crow attacked the frog on the ground and carried it to the stone wall of the lizard pen. The frog emitted a series of mercy screams audible to us at a distance of 5 m. The crow pecked repeatedly at the ventral surface of the frog with the beak closed but did not break the skin of the frog. After a number of pecks the frog righted itself and assumed a defensive posture with the body inflated and the hind limbs extended; this posture was very similar to that reported for other species of *Rana* (Altig 1972; Formanowicz and Brodie 1979; Hinsche 1926).

As the *R. tigerina* assumed the defensive posture the crow pecked it on the dorsal surface of the body several times and finally on the hind leg, flipping the frog onto its dorsum. After being flipped the frog remained immobile. The crow shook its head with the bill open and wiped its open bill on the substrate; this is typical of distasteful responses of other birds to amphibians (e.g. Howard and Brodie 1973; Johnson and Brodie 1975). The crow walked 2 m from the frog then flew to a nearby tree; it returned once to the frog for a few seconds but did not peck it again. The crow then flew away. We observed the frog for an additional 5 min during which it remained motionless on its dorsum. We then retrieved and examined the frog. The skin had not been broken by the pecking of the crow. The frog then righted itself and hopped. We kept the frog for 24 h and it did not appear to be injured in any way.

We observed a crow eating another (longer-legged) *Rana* in an adjacent pen later the same day.

We conclude from these observations that: 1) Crows do attack frogs, and 2) *Rana tigerina* has a skin secretion sufficiently unpalatable to repulse crows. Observations such as this along with carefully designed experiments will allow us to more fully understand the antipredator mechanisms of frogs.

We are grateful to Romulus Whitaker for allowing us to make these observations at the Madras Snake Park and to a Smithsonian Foreign Currency grant supporting our travel.

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RANGE PORTRAYAL AND REALITY: "BIAS" OR SCALING PROBLEM?

Recently, Axtell (1983) claimed that most maps of the distribution of the eastern hognose snake, *Heterodon platyrhinos*, were biased in not showing certain fine details of the range. Specifically, he contended that such maps should be drawn with collection localities marked with dots and map outlines drawn with dash lines to accentuate ambiguity (where it exists). Included in the maps he mentioned were those by Wright and Wright (1957), Platt (1969), Conant (1975) and Blem (1981). At the risk of being accused of being a proponent of inaccuracy, I present in this note some arguments that show that these maps are not biased but are constrained by scaling problems.

First, it should be noted that map size restricts the potential degree of accuracy of *H. platyrhinos* maps. For example, Axtell's (1983) map accurately shows the distribution of *H. platyrhinos* along rivers in the high plains of Texas and Oklahoma. If a similar scale had been used by mappers of its total distribution, the resulting maps would be slightly larger than 100 X 100 cm. Obviously, field guides or catalogues of these dimensions are not likely to be useful or produced at reasonable costs. Furthermore, the loss of accuracy that results from the use of smaller maps in no way satisfies the definition of "bias" (i.e., introduction of systematic error).

Secondly, my original map (Blem 1981) included all major tributaries and clearly showed the riparian nature of the distribution of *H. platyrhinos*. In a logical attempt to conserve space and expense, editors of the ASIH catalogue reduced the size of the map and omitted the drainages when the map was redrawn. However, the account clearly states that the species "extends westward along river valleys." Platt's (1969) description of this distribution is similar. Although Conant (1975) and Wright and Wright (1957) do not make this point clear, their maps do achieve their purpose (i.e., to show the general distribution of this species).

Thirdly, while locality dots are excellent features in maps covering relatively small areas, the dots themselves create confusion on large scale maps. On my map of the U. S. distribution of *H. platyrhinos* the dots (which are very small) cover an area equal to approximately 40 km in width. Axtell's range expansion (76 km) would scarcely be visible on this scale and its importance would be minimized. If one attempts to draw a "dot map" with dots of about 1 mm in diameter and a scale of 1 mm = 1 km, a map of the distribution of *H. platyrhinos* would be about 27 cm X 24 cm and a U. S. map would be 43 cm x 29 cm. Such maps would be unwieldy, but smaller scales would obscure drainages (many major tributaries are less than 1 km wide) and even then range expansions of less than 20 km would be difficult to map.

Finally, I agree with Axtell that knowledge of uninhabited areas within outlined ranges on large scale maps is important. In fact, this problem is as significant for the hognose snake as the western edge portrayal. For example, there are huge areas in states like Ohio (Blem 1972) that seem devoid of hognose snakes. However, on the scale that field guide maps are drawn, one cannot expect to show these details. Also, since all ranges are subject to change and are seldom certain, map boundaries would always be drawn in dash lines.

In summary, I do not agree that major maps of *H. platyrhinos* are biased or greatly inaccurate. For their purpose they are perfectly appropriate. More detailed distributional analyses are the province of state publications or monographs, or, if sufficient interest exists, large encyclopedic atlases.

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MORE ACCURATE RANGE PORTRAYAL, EVEN ON SMALLER MAPS? AXTELL'S ANSWER TO BLEM'S PROTESTATIONS

First, I want to stress that I would be the last individual to argue that map portrayal is anything more than a gross representation of reality, but the closer we can come to some ideal representation the more informative our maps become.

Second, a brief statement to describe how I viewed the 1983 manuscript as it was being prepared, since my perception at that time differed considerably from the interpretation Blem has given it (see above). I was using the map of *H. platyrhinos* as an example, a vehicle if you will, to express some of my longstanding concerns about how we portray organismal distributions on maps. My basic argument was for an approach that adds physical and/or environmental information as well as individual dot records during map preparation. With these additions we might begin to understand and appreciate how distributions conform to landforms, soils, geology, vegetation or any other environmental factor that may be of interest.

Third, I'll now address Blem's two specific criticisms, i.e., my use of the word *bias* and what I'll call the *size problem* (Blem calls it *scaling*), especially with regard to small (i.e. catalogue and fieldbook-sized) maps. In my 1982 publication I asserted that all previous *H. platyrhinos* maps had presented a biased portrayal of reality because the method of mapping over-generalized information known to the mappers. At the time I didn't consider this a direct criticism of any of the earlier mappers (although now I can see that it certainly could have been taken that way) because they had simply practiced conventional mapping techniques that had been in use for decades. However, I was criticizing a mapping method that I believed had outlived its usefulness. Perhaps I should have used the term *generalized portrayal* instead of *biased portrayal*, but with the term bias I wanted to emphasize the way I believe our maps affect a reader's perceptions of distribution patterns. Their interpretation of these patterns almost certainly is influenced (or biased) by such maps, and if the maps are generalized then their interpretations probably will also be generalized. The question I ask is: Do we wish to continue perpetuating such inaccuracies in the name of simplicity and easy comprehension, or should we try to do something about it? I believe I've answered that question, at least for myself. Although I did not directly address the small map problem in my 1983 publication, it was partially considered in the comparative maps shown at the bottom of Fig. 1. Those maps were included to illustrate how different two mapping approaches could be when compared. I used no locality dots on the maps, which were prepared to match the fieldbooks style. While Blem's (see above) interpretation makes it seem that I was advocating dot records on **all** maps, my sentence on page 193 ["2) Actual locality (dot) maps **should** be prepared **whenever possible** so that investigators can interpret such range information independently" (bold face not in original)] clearly indicates that I was not that dogmatic. I agree that one does run into scaling problems when drawing small maps. Obviously you can't get as much on a postage stamp sized map as on a 100 x 100 cm map, but we all

know that small maps are usually drawn larger first and then reduced for publication. Not a great deal of clarity is lost during this process because everything is reduced proportionately. And if a line or a dot can be drawn on paper, it can still be clearly seen even after considerable reduction. As an example of this, I first enlarged Conant's (1975) range map of *H. platyrhinos* 308 per cent on a Xerox copier; then I redrew it (using various dot map sources, i.e., Anderson 1965; Blem 1981; Conant 1951, 1975; Platt 1969; Smith 1961; Vogt 1981; and Webb 1977) and finally I reduced the map photographically back to Conant's original publication size. The result along with Conant's original map, is presented below as Fig. 1. This map shows many peripheral records (except for Texas) as isolated dots. It draws attention to certain problematic regions in several states (i.e. Oklahoma, Missouri, Iowa, Illinois, Indiana, Michigan, Ohio, and West Virginia) where further investigation may be needed to establish more accurate range boundaries (and possibly to generate future explanations for those patterns so they can later be tested). Question marks appear in South Carolina, Kentucky, Tennessee, and Louisiana because Blem (1981) portrayed few records for any of these states (i.e. 4, 6, 4 and 4 respectively). As a reader, I am not sure whether these were "token" localities to fill in map space, or whether there are distributional peculiarities in these states that need closer examination.

We also need to be more cognizant of local distributions in states reportedly having pandemic occurrence of particular organisms. For example, Mount's (1975) dot map of *H. platyrhinos* range in Alabama suggests that there may be many areas in that state where the eastern hognose does **not** occur, yet his caption for Fig. 216 states that "the species is believed to occur statewide, or essentially so." By including such a statement, Mount may have unintentionally reduced interest in *Heterodon* distribution in Alabama by a significant amount, for if most investigators believe that this snake has a statewide distribution, then why try to report a new county record, or why try to find out why *H. platyrhinos* does or does not occur in some particular area?

In closing, I'm still convinced that we can make both large and small maps better; that we can with proper map presentation, encourage the accumulation of new and more enlightening geographic information, and with this information be better able to find why animals are where they are and possibly even how they came to be there.

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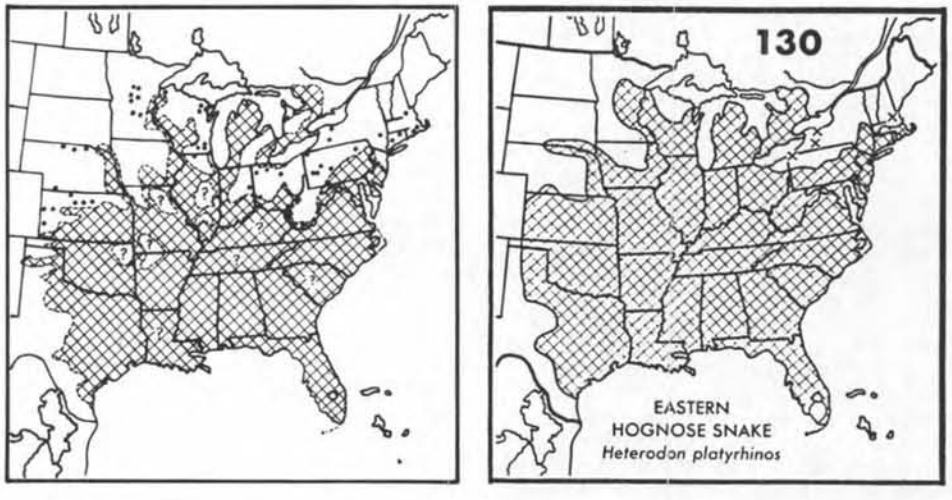


Figure 1. Comparative maps of *Heterodon platyrhinos* range. Left, modified map; right, courtesy of Roger Conant and Houghton Mifflin Co. See text for additional information.

MORE ACCURATE RANGE PORTRAYAL: CONCLUSIONS

Since Axtell has recanted his use of the term "bias," our debate seems to boil down to subjective evaluations, i.e., do "tiny dots" maps improve upon traditional line maps, and do these maps accurately show fine detail, particularly at the edge of the range.

As a student of "edge of the range" phenomena, I especially appreciate Axtell's efforts to map range limits precisely. However, dots on small maps do not improve upon an accurately drawn line. I feel that Axtell's redrawn version of Conant's (1975) hognose snake map supports this observation. Dot maps drawn at the appropriate scale are a distinct improvement; "tiny dot maps" only give the impression of accuracy.

Dot maps present an additional problem. At what "dot density" do we stop drawing dots and simply indicate that the species may occur throughout the range? Nearly every species has disjunct populations at the edge of the range; drawing dots for all of these would require more effort than field guides warrant. In some species the distances between many locality records are greater than Axtell's hognose snake range expansion. Do we draw all of these records as dots and redraw the maps every few years as records accumulate? It seems to me that such maps should be the goal of more localized studies or perhaps could be compiled by a committee of distributional herpetologists selected from national societies.

In conclusion, I too encourage accuracy in mapping and accuracy in distributional data where it is appropriate. We definitely have much to learn about the biology of range limits. Let's just not get carried away with adding dots to maps.

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SOME RECENT INTRODUCTIONS OF REPTILES IN THE CAYMAN ISLANDS, WEST INDIES

Minton and Minton (1984. SSAR Herp. Review 15(3):77) reported the presence of *Anolis sagrei* in the vicinity of George Town, Grand Cayman, Cayman Islands, where it outnumbered the endemic *Anolis conspersus* "in about a 2 to 1 ratio."

In early 1986 we noted the continued presence of *Anolis sagrei* in George Town and South Sound areas, and documented introductions of *Elaphe guttata guttata* on Grand Cayman and *Anolis maynardi* on Cayman Brac. It is our belief that both *Anolis sagrei* and *Elaphe guttata* arrived recently in the Cayman Islands from south Florida with nursery stock used for landscaping.

Elaphe guttata guttata (Corn Snake). GRAND CAYMAN: Golf Course, Brittania Condominiums, 3.5 km N of Harbor, George Town 11 September 1985. University of Florida (UF 63455-63456). The initial specimen was killed by workmen as they unloaded exotic shrubbery and trees imported by ship to Grand Cayman from a nursery located in the Miami area. These workmen also reported seeing other individuals at the same time, but were unable to kill them before they escaped. In January 1986, the second specimen was caught by a workman at the condominium.

Anolis maynardi. CAYMAN BRAC: 2.4 km SW of Stake Bay, "The Creek" settlement. 31 Jan 1986. (UF 63457). Other specimens were seen on trees adjacent to the Cayman Brac Airport and 1 km E of airport. People who live between the Airport and The Creek know these green lizards, and reported often seeing them on trees in their yards. No specimens were seen elsewhere on the island. Mrs. Cynthia Scott, a lifelong resident of the Brac and avid naturalist, remembered that these lizards first appeared in her yard in the mid-1970s. *Anolis maynardi* is endemic to Little Cayman and was probably accidentally transported to the Brac on commodities shipped across the 11 km wide seaway that separates the two islands.

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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Knoxville Zoological Park, Box 6040, Knoxville, Tennessee 37914, U.S.A.

CAPTIVE *Phrynosoma solare* RAISED WITHOUT ANTS OR HIBERNATION

Horned lizards (genus *Phrynosoma*) are dietary specialists on various genera of ants (Hotton 1955; Pianka and Parker 1975; Whitford and Bryant 1979; Rissing 1981; Munger 1984). Their poor feeding and survival in captivity has long been attributed to lack of, or insufficient, ants in the diet (Wynne 1981; Switak 1984); it was presumed that ants contain a nutrient not available in other food items offered. Recently some workers have achieved success at breeding *Phrynosoma* in captivity (Baur 1973, 1979a, 1979b, 1984; Montanucci 1983) by feeding ants and other insects, utilizing ultraviolet or natural light, and hibernating animals in winter. Mayhew (1965) reported one species, *P. m'calli*, to be an "obligatory hibernator." This report on *P. solare* demonstrates that horned lizards can be raised to two years of age (adult) without ants in the diet, suggesting that factors other than ants were responsible for earlier failures and current successes, and notes that hibernation may not be "obligatory," at least in young animals of this species. Nevertheless, ants in the diet and/or annual hibernation may be beneficial to some captive horned lizards.

METHODS

An adult female *P. solare* (114 mm snout-vent length, 81.9 g) was collected near Huerfano Butte, Santa Rita Mountains, Pima Co., Arizona, on 2 July 1983, and was maintained in an aquarium (see below). Thirty-two eggs were laid underground sometime between 26-30 July 1983 and were removed and placed on damp vermiculite in a plastic bag (method of Zweifel 1961) on 7 August 1983 for incubation. Embryos were removed from the clutch for study throughout incubation and ten live hatchlings emerged 15-18 September 1983, of which eight were raised.

Hatchlings were fed *Drosophila* sp., hatchling crickets *(Acheta domesticus)*, and tiny mealworms (*Tenebrio* sp.); the latter two items were dusted with Theralin ® (Lambert-Kay Division, Carter Wallace Inc., Cranbury, NJ), a vitamin-mineral powder containing Vitamin D_3. As the hatchling lizards grew in size, fruit flies were discontinued and larger-sized crickets and mealworms were used. The rear legs of larger crickets were removed to facilitate prey capture. At no point were ants fed to these lizards.

Lizards were sprayed several times a week with a mist of water for drinking. Care was taken to wet the head thoroughly and to continue the misting until an individual learned to drink in this fashion. Spraying continued throughout the period during which the lizard's jaw-motion indicated ingestion of water.

The hatchlings were maintained, as was their mother, in an open-topped, glass-walled aquarium (25x50x30 cm high) in a windowless, air-conditioned/heated building at the University of Arizona, Tucson. Lighting was provided by two 122 cm long fluorescent bulbs, one 40W Vita-Lite® (Duro-lite Lamps, Inc., Fair Lawn, NJ) and one F40CW Lifeline Sylvania® (NAP Consumer Electronics, Knoxville, TN), suspended crosswise above the aquarium, 50 cm from the 3-5 cm-deep sand substratum. A Sylvania 250W heat lamp was placed 45 cm above the substratum at one end of the cage. After the loss of three hatchlings (possibly due to metabolic bone disease) by November, 1983, the Vita-Lite was combined instead with a Sylvania 350 40W Blacklight. Daylength was maintained at 10 h until 21 May 1985, when the aquarium and the one remaining lizard were moved to Portal, Arizona, where, due to the presence of windows, daylength varied with natural lighting. Color photographs (Kodachrome 25), mass, and snout-vent length (SVL) were periodically taken of individual lizards. X-ray photography was used to examine the longest surviving lizard for evidence of metabolic bone disease.

RESULTS AND DISCUSSION

The five lizards remaining after November 1983 continued to feed and grow throughout the winter until the colony was infected by an eye/mouth infection in the spring. One lizard died 10 May 1984, after a period of not feeding due to a mouth infection. Two others, in poor condition and losing weight due to eye infections, were sacrificed 17 June 1984 in an attempt to arrest spread of the disease. On 29 May 1984 the infection had been diagnosed as *Klebsiella oxytoca* and *K. ozonae*. The snout-vent lengths of these three, nearly adult-sized (Howard 1974) lizards, were 64, 74, and 79 mm. The remaining two lizards continued to feed and grow, attaining 89 mm SVL (49.1 g) and 97 mm SVL (73.7 g) by 6 December 1984 and 91 mm SVL (43.3 g) and 104 mm SVL (93.2 g) by 3 May 1985. The largest individual, a female, at this point outweighed, in less than two years, the gravid female (mother) at time of capture. The smaller of these two lizards was sacrificed on 13 May 1985 due to recurrence of the eye infection and weight loss.

Although a small male was placed in the cage with the remaining female during part of the summer, apparently she did not breed. She stopped feeding in late summer, perhaps in response to daylength or temperature changes at her new location and died 22 September 1985 (110 mm SVL), two years after hatching. Autopsy revealed large fat bodies and 25-30 oviducal unshelled eggs; many of these were bloody and one had been passed prior to death.

Throughout their lives in this study, five captive, growing lizards passed through one winter, and two of these passed through two winters, without cessation of feeding or reduced activity, indicating that younger animals of this species, at least, are not "obligate hibernators." Perhaps there are physiological differences between individuals and/or between species of horned lizards in terms of hibernation.

As mentioned above, ants were specifically excluded from the diet. In spite of this, lizards

fed and grew rapidly. The only problems noted with the prey used as food resulted from prey size and escape behavior. Horned lizards generally use their tongues in a manner similar to toads (Sherbrooke 1981) to retrieve and ingest ants. Potential food items that are either not active enough to approach the lizards (mealworms), too heavy for tongue-mediated lifting into the mouth (large mealworms, large crickets), or competent at rapid escape (crickets with intact hindlegs), frequently escape ingestion. The lizards tire of failing to catch them and learn to ignore their presence. Therefore, the size and mobility of food items is critical in maintaining healthy horned lizards in captivity.

Because many ants bite or sting them, horned lizards tend to panic if surrounded by numerous prey items. They should be fed ants in small numbers (Knowlton 1946; Baur 1973; Montanucci 1983). An observation on ten captive *P. modestum* suggests that small crawling crickets are "perceived" by horned lizards as not only appropriate food items, but as ants. This occurred when a number of lizards in an aquarium retreated, walking backwards while continuing to feed, as they would with ants (they do not "like" ants to get behind them), before a front of advancing hatchling crickets that had been dumped in large numbers into one end of the tank.

Earlier failures at captive raising of horned lizards were probably due to insufficient attention being given to prey size and mobility, method of providing water, thermoregulatory needs, Vitamin D_3 and sufficient amounts of proper minerals in the diet, and ultraviolet radiation, rather than to lack of ants in the diet. Attention to these requirements has proved highly successful in establishing laboratory colonies of *Cnemidophorus* (Cole and Townsend 1977; Townsend 1979; Townsend and Cole 1985) and *Phrynosoma* (Montanucci 1983). The loss of the three youngest hatchlings of *P. solare* in this study is tentatively attributed to insufficient ultraviolet radiation for proper calcium metabolism. In order to verify healthy calcium metabolism in the two-year old *P. solare*, it was x-ray photographed on 18 July 1985 (Fig. 1). Limb and other bones lack evidence of metabolic bone disease (compare with photograph in Townsend and Cole 1985).

Captive *P. solare* in this study were seen to extrude their tongue and ingest small pebbles, in a manner similar to feeding behavior. Pebbles were later passed in the scats. The length of time they remain in the stomach (Fig. 1) or other parts of the digestive tract is not known. Other horned lizards, *P. cornutum* and *P. modestum* have also been observed, during extensive behavioral observations in natural habitats, to ingest pebbles and soil which turn up in their scats (pers. obs.). Sand (Loennberg in Milne and Milne 1950) and stones (Tanner and Krogh 1973) have been reported previously, but no significance has been attributed to them other than incidental objects inadvertently ingested. My observations lead me to suggest that horned lizards deliberately eat these substratum objects. Four possibilities for such behavior come to mind: pebbles/sand/soil 1) are used to grind insects in the stomach, 2) physically remove or control digestive tract nematodes,



Figure 1. X-ray of *Phrynosoma solare* on 18 July 1985, nearly two years after hatching in captivity. Note lack of metabolic bone disease (limb bones all intact and joints not degenerating) and a group of pebbles in the stomach (dark spots at posterior right).

3) serve as a source of minerals in the diet, or 4) are mistaken for immobile prey.

Townsend and Cole (1985) report hatchling *Cnemidophorus* eating unwashed, ocean beach sand (fragments of invertebrate shells — not quartz sand; pers. comm. Townsend and Cole). Since lizards in this study continuously ingested pebbles despite lacking intestinal nematodes, I currently favor the insect grinding and mineral hypotheses; these ideas need study. Horned lizards have well-developed taste buds (Schwenk 1985) that could play a role in selecting mineral-particles for ingestion.

Many species of horned lizards harbor large numbers of intestinal nematodes, reported as *Skrjabinoptera phrynosoma* in *P. cornutum*, and probably the same species occurs in *P. solare* (Lee 1955, 1957). Lee (1957) establishec that ants are the intermediate hosts in the parasite cycle, requiring ingestion by horned lizards. Consistent with this observation, and in contrast to the condition of their wild-collected mother, autopsy of the five largest *P. solare* raised in captivity without ants revealed no nematodes in the digestive tracts.

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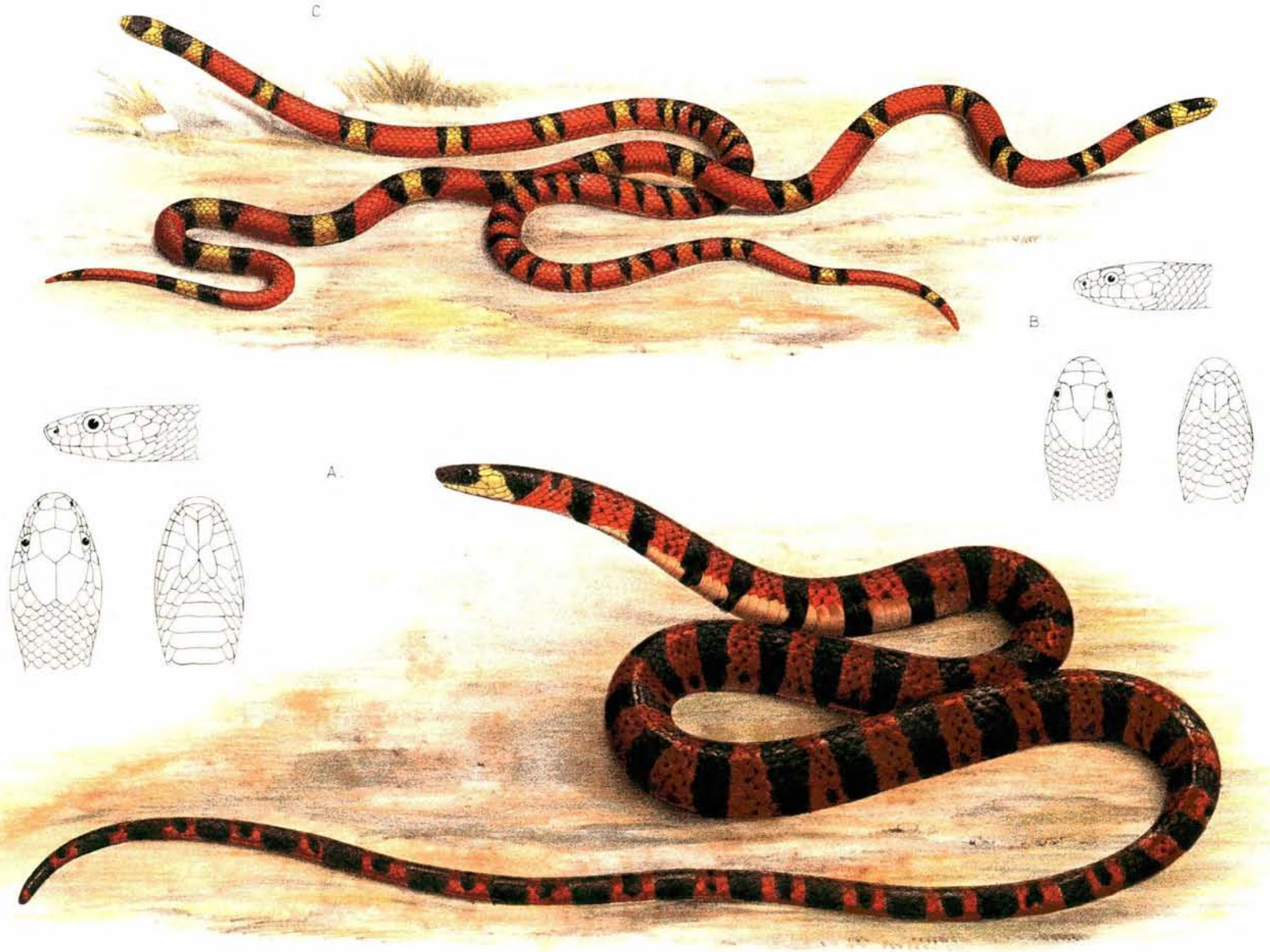
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TECHNIQUES

A METHOD FOR ESTIMATING RESIDUAL YOLK MASS IN HATCHLING CROCODILIANS

During the later stages of embryonic development, birds and reptiles typically internalise the vitelline sac, which contains a supply of yolk (Romanoff 1960; Ewert 1979; Ferguson 1985). The residual yolk (Romanoff 1960) thus formed represents a significant source of nutrition for the immediate post-hatching period. The selective advantages of residual yolk masses have been speculated upon by a number of authors (for example Ferguson and Joanen 1982, 1983 and Packard et al. 1981). To measure the amount of residual yolk accurately, hatchlings need to be sacrificed, but this precludes their use in further experiments. Furthermore, sacrificing large numbers of crocodilian hatchlings cannot sometimes be justified on conservation grounds (Gans and Pooley 1976). We derived a simple method for predicting residual yolk mass from abdomen dimensions in *Crocodylus johnstoni,* which has allowed us to use residual yolk mass as a variable in experiments which examine the relationship between incubation environment and post-hatchling growth and survivorship. The method should be applicable to other crocodilians and perhaps lacertilians.

Thirty-seven *C. johnstoni* hatchlings from eggs incubated at different temperatures were sacrificed on the day they hatched. Prior to administering a lethal overdose of Nembutal (Sodium pentabarbitone), each hatchling was laid on its back and had the maximum width of the abdomen from right to left (A in centimetres) and the maximum width of the umbilical scar (U in centimetres) measured with calipers. Total hatchling mass (residual yolk mass plus hatchling mass), head length, snout-vent length and total length were also measured (Table 1). After death, the residual yolk was removed and weighed (Table 1).

Table 1. Means and variances for seven parameters measured on a sample of 37 *C. johnstoni* hatchlings. Lengths and widths given in centimetres, masses in grams.

VARIABLE	MEAN	VARIANCE
Head length	3.72	0.035
Snout-vent length	11.72	0.265
Total length	25.22	1.563
Total mass	47.20	36.522
Residual yolk mass	10.03	15.579
Abdomen width	3.55	0.131
Yolk scar width	0.77	0.094

Least squares multiple regression analysis (Genstat) was used to predict residual yolk mass (in grams) from combinations of the measurements taken. Both A and U accounted for significant amounts of the total variance in residual yolk mass (83%, $F_{1,33} = 353.57$, $P < 0.001$, and 7% $F_{1,33} = 32.23$, $P < 0.001$ respectively). Additionally, various transformations of the parameters measured were computed (square root, square, natural logarithm) and then tested in the regression in an attempt to improve the overall fit. The square transformation used was computed as the square of an individual's deviation from the sample mean for a particular parameter. This allows a statistically sound method to model a parabolic relationship. Of those tested, only the square of the deviation of each individual hatchling's mass from the mean mass of the sample 47.2 g (WTSQ) accounted for a significant amount of the total variance (2%, $F_{1,33} = 8.38$, $0.01 > P > 0.001$).

The model which explained most variation (92%) in residual yolk mass was:

ln(residual yolk) = -1.055 + 0.843A + 0.459U - 0.0019WTSQ

The natural logarithmic transformation generates an asymmetrical error equivalent to approximately $\pm$ 1 g. For an independent sample of animals (n = 8), which died on the day of hatching or were sacrificed as part of another experiment, prediction errors ranged from 0.0 g (0%) to 1.8 g (19%), and averaged -0.1 $\pm$ 1.1 g (SD).

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YOU *CAN* SET DRIFT FENCES IN THE CANOPY!

Quantitative and qualitative methods exist for sampling the terrestrial herpetofauna in tropical rainforests. These include searching leaf litter in the buttresses of trees (Inger 1980), forest litter plots (Scott 1976, 1982), and setting drift fences with pit and funnel traps (Vogt and Hine 1982). However, no one has developed a technique for systematically sampling herpetofauna in the canopies of tropical rainforests. A large percentage of the tropical herpetofauna is arboreal and many "rare" species may be so only because they are rarely encountered when sampling forest floors.

When discussing these problems with Dr. George Zug in December 1980 he could think of no solutions either, but replied: "You can't set drift fences in the canopy, Dick!" In 1981 after moving to Estación de Biología Tropical "Los Tuxtlas" in the evergreen rainforest of southern Veracruz, Mexico, this problem became a reality.

After several abortive attempts, a convenient and inexpensive design (Fig. 1) was developed which catches reptiles and amphibians systematically at different strata of the forest canopy. The main feature is a system of four pulleys, a pair of which is attached to the two highest parallel branches 15 m apart on two trees. A 1 cm diameter nylon rope is threaded through each of the pulleys. Attached at various distances on the rope are "walkways" made of plastic window screening. The 90 cm-wide screening is cut in 15 m lengths. Galvanized wire is then threaded along the entire length on both edges of the screening and a length inserted crosswise at 1 m intervals to give support and maintain the shape of the "walkway." A 1 m length of 5 mm steel rod is tied at each end of the screening

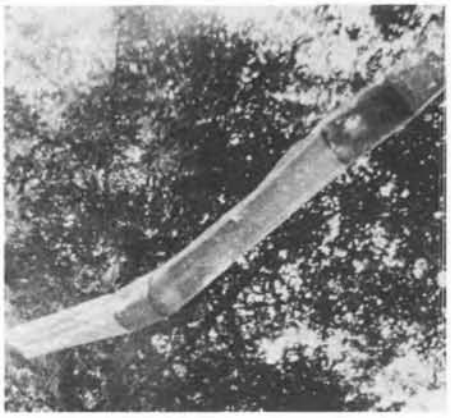


Figure 1. Aerial drift fence set at 15 m. Note the two funnel traps and the guide line extending from the left trap.

to maintain a flat entrance onto the "walkway." Two funnel traps (1 m x 0.8 m) constructed of 8 x 8 mm galvanized wire mesh are sewn onto the walkway with galvanized wire at 5 m intervals. The mouths of the funnel traps take up the entire width of the walkway so that any animal moving along the walkway is directed into the trap. A guide line of 8 mm nylon cord is attached to both sides of each funnel trap so that when the walkway is hoisted to its desired height these ropes can be pulled tight and tied to trees or rocks to prevent it from inverting during winds and rains.

Walkways have been successfully used at three different levels on the same set of ropes: 3 m, 10 m, and 15 m. The 1 m level can be set without hanging it on ropes. The advantage of the pulley system is that once the pulleys are installed the traps can be easily checked at regular intervals with little effort. It is easiest to check the traps by lowering both ends simultaneously. This technique requires a site where the walkway will abut as many trees and branches as possible yet be sufficiently open to raise the walkways to different heights. This system is not efficient for short term use, but is well suited for long term studies where the traps can be set for long periods and checked at intervals of two to five days depending on the density of the herpetofauna.

During the initial testing of the "walkways" snakes (*Leptodeira annulata, Leptophis mexicana, Oxybelis aenas*), lizards (*Anolis humilis, Corytophanes hernandezi, Sceloporus variabilis, Iguana iguana, Basiliscus vittatus*), anurans (*Smilisca baudini, S. cyanosticta*) and salamanders (*Bolitoglossa platydactyla*) were captured in the traps at various levels. To date, no long term and intensive use has been carried out due to time and labor constraints. However, I plan to use these walkways in conjunction with terrestrial drift fences to sample the herpetofauna at all strata of the rainforest.

ACKNOWLEDGMENTS

The development of this technique would not have been possible without the assistance of "los monos de arboles" Rodolfo Dirzo, Santiago Sinaca, and Guillermo Ibarra. The ground crew of Marcelo Paxtian Sinaca and Gonzalo Perèz Higareda was equally important for the success in placement of the traps.

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LIFE HISTORY NOTES

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ANURA

BUFO MELANOSTICTUS (Asian Common Toad). **DENSITY.** This species is the most abundant amphibian in Guangdong Province, China (Pan, Liu, and Qian 1985. Acta Herp. Sinica 4(3):200-208). It is ranked among the six most economically important anurans in Guangdong by Su (1985. Acta Herp. Sinica 4(4):313-319) because of its role in insect predation. No population density estimates have been published. We conducted a mark-recapture study at the Mangrove Protection Station headquarters, Dong Zhai Kong, Kingsan County, Hainan Dao, Guangdong, 15-23 April, 1986. Data were analyzed by the multiple catch method of Tanner (1978. Guide to the study of animal populations, Univ. Tennessee Press, Knoxville: 186 pp.). We used average travel distance, 21 m, to add an edge to our plot and calculated 80 individuals per hectare with 95% confidence limits 56-153. The population was 82% females measuring 75-107 mm SVL ($\bar{X}$ = 90). Males measured 69-80 mm SVL ($\bar{X}$ = 74). No breeding was observed during our study. The habitat was edificarian, ornamental garden and agricultural and, about 4 m above sea level. Our work was supported by The Conservation Agency and Earthwatch, The Center for Field Research.

Submitted by **JAMES D. LAZELL,** The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835, USA, and **LIAO WEI-PING,** Guangdong Institute of Entomology, Guangzhou, Guangdong, Peoples' Republic of China. ●

CAUDATA

AMBYSTOMA MACULATUM (Spotted salamander). **REPRODUCTION.** The gelatinous matrix surrounding the egg clutches of some anurans has thermal properties (Hassinger 1970. Herpetologica 26:49-51; Savage 1970. Brit. J. Herpetology. 3:57-66; Seale 1982. Copeia 1982:627-635). Communal egg deposition in early breeding ranid frogs, such as *Rana sylvatica* and *R. temporaria,* magnifies thermal buffering by insulating eggs against cold water. Lykens and Forester (1986. Herp. Review 17:45) suggested that communal egg deposition might also provide an advantage in reducing dessication in egg masses stranded by receding pond waters. I report herein similar properties associated with the egg masses of the salamander *Ambystoma maculatum,* and an instance of aggregative egg deposition in this species.

I have twice observed stranding of egg masses of *A. maculatum* at a vernal-autumnal kettle pond (maximum surface dimensions 30 X 20 m, maximum depth 1.5 m) located in Culvers Gap, Sandyston, Sussex Co., New Jersey. This pond is surrounded by mixed deciduous-eastern hemlock woods, which shade the pond vicinity much of the day. On 15 May 1977 ca. 25 individual egg masses were found stranded up to 0.7 m from the

shoreline of the pond. I estimate that some masses had been exposed for at least one week. Each mass contained living embryos and some hatchlings within the mass or on its surface.

On 27 May 1986 at least 80 masses of *A. maculatum* were stranded 0.2 - 4 m from the shoreline. The furthest mass was about 50 cm above the current water level. None of the masses was dried or crusted, although most were no longer as firm as masses in water. Virtually every mass retained living embryos or had hatchlings beside, on, within or underneath it. Hatchlings wriggled vigorously and in rain might have been able to return to the pond over the wet, matted leaves, even if a rising water level did not inundate the masses.

In 1978 I enclosed a nearly permanent pond (surface 25 X 12 m, depth 1.5 m) with a drift fence in the Delaware Water Gap National Recreation Area, Sandyston, Sussex Co., NJ. Seven-hundred-ninety-six *A. maculatum* (362 females) entered the pond. Most egg deposition occurred 10-12 April. Aggregations of 10-80 individual egg masses resulted. Most masses were deposited in shallow water and often on the bottom. Receding water levels stranded some masses for up to 35 days; these developed a dry crust. Eggs in individually deposited masses and the smaller aggregates did not survive this period, but eggs in the inner, protected masses of the four largest aggregates (40-80 masses) survived and hatched after they were once again submerged following heavy rains. Overall, only about a third of the eggs in an estimated 200 stranded masses did not survive this prolonged exposure.

Daytime temperatures within masses in the pond were consistently higher than ambient water temperature by as much as 4.0° C. The relation of the temperatures within stranded masses to ambient air temperatures was variable; temperatures directly beneath stranded masses were 1.7-2.0° C lower than internal mass temperatures.

This report documents properties of egg masses and the hatching of eggs in a terrestrial environment which allowed survival despite fluctuating pond levels. These properties may be particularly important for the eggs of *A. maculatum* in which embryonic development may exceed 50 days (Bishop 1941. N. Y. State Mus. Bull. 324:1-365).

Submitted by **STEPHEN NYMAN,** Department of Zoology, University of Rhode Island, Kingston, Rhode Island 02881, USA ●

SAURIA

CROTAPHYTUS COLLARIS COLLARIS (Eastern Collared Lizard). **SEASONAL ACTIVITY.** In most of the range of *Crotaphytus collaris*, emergence from winter dormancy usually occurs between late March and early April. However, *C. c. collaris* could appear sooner if favorable climatic conditions were present. To my knowledge, the following report represents the earliest activity record for *C. c. collaris*.

On 19 February 1986 in Somervell Co., Texas, 12.4 km NE Glen Rose off U.S. 67 on co. rd. 406, a young adult male *C. c. collaris* (SVL = 81 mm) was observed basking on an exposed (southwest-facing) cherty limestone outcropping at ca. 1100 h. As I approached the lizard, it took shelter under a nearby tire innertube. I removed the lizard and used a Schulteis quick-reading thermometer to obtain a cloacal temperature of 35.6° C (air temperature = 25.8° C; substrate temperature = 36.2° C). The lizard appeared to be in good condition, and as part of an ongoing investigation of saurian hematozoans, blood samples were taken from a toe-clipped digit (also used to permanently mark the specimen). I photographed and released the lizard.

Numerous investigations on the ecology of *C. c. collaris* have included information on seasonal activity of the species. Interestingly, only the related reticulate collared lizard *(C. reticulatus)* of extreme southern Texas and adjacent Mexico has been reported to emerge sooner (Feb. 8; Montanucci 1971. Herpetologica 27:183-197). This instance of early emergence by a collared lizard in northcentral Texas is nearly one month prior to previous reported dates of emergence. I have previously found hibernating *C. c. collaris* in shallow limestone hibernacula (McAllister 1983. Herp. Review 14:73-74) on 1 March at an air temperature of 29.4° C; the earliest record of activity was 10 April (air temperature = 30.6° C).

I thank Mr. Jim Riddle for access to his property and Stephen P. Tabor for assistance in collecting. I also thank Dr. Stanley E. Trauth for critically reviewing this note.

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, 4500 S. Lancaster Road, Dallas, Texas 75216, USA ●

PLICA UMBRA. **NESTING.** On 17 September 1983, we found 2 egg shells and one egg of *P. umbra* in the hollow shell of the rachis of a dead palm frond which was draped over a branch 150 cm above the ground in primary rainforest 25 km E of Manaus, Amazonas, Brazil. A fourth egg was on the ground below the palm and apparently had recently fallen there. The egg shells had small slits in the ends, indicating that the eggs had hatched and were not victims of predation. The egg on the ground appeared to have been laid recently and showed no sign of development. The egg in the leaf contained a fully-formed lizard which subsequently hatched. The hatchling measured 3.8 cm SVL, 11.4 cm TL, and had a mass of 1.54 g. On 23 September 1984, A. Andrade A. Filho found two eggshells and two eggs of *P. umbra* in the leaf litter accumulated among the leaf bases of a sessile palm ca. 1 km from the first nest. One egg hatched the same day and the other hatched between one and three days afterward.

Plica umbra normally produces 2-3 eggs per clutch (Hoogmoed 1973. The Lizards and Amphisbaenians of Surinam. Dr. W. Junk, The Hague: 419 pp; Rand 1982. Clutch size in Brazilian iguanid lizards. Herpetologica 28:171-178). In each nest reported here there were eggs at different stages of development. Either the species nests communally or females reuse nest sites.

Submitted by **WILLIAM E. MAGNUSSON** and **ALBERTINA P. LIMA,** Departamento de Ecologia, Instituto Nacional de Pesquisas da Amazônia, Caixa Postal 478, 69000 Manaus, Amazonas, Brazil ●

SERPENTES

CROTALUS SCUTULATUS SALVINI (Huamantlan Rattlesnake). **BEHAVIOR.** Rattlesnake behavior is generally considered stereotypic, although behavioral variations do exist. Some of these differences in behavior (courtship, combat, etc.) might be considered slight while others are distinctive and of special interest. We have observed a unique behavior in four specimens of *C. scutulatus salvini* in which the neck region is spread laterally in a "hood-like" display without flattening the rest of the body. This behavior is quite striking and has been observed in both males and females. Only the anterior portion of the neck is flattened, exposing the lighter interspaces between the scales (Fig. 1). This neck flattening behavior is different from the body flattening known to occur in several rattlesnake species, including *C. s. scutulatus* (Mojave rattlesnake). It differs significantly from the behavior reported by Armstrong and Murphy (1979. The Natural History of Mexican Rattlesnakes, Mus. Nat. Hist. Spec. Pub. 5:1-88, Lawrence) in which an adult *C. s. scutulatus* flattened its head and trunk against the substrate and elevated its tail without rattling, a behavior we have frequently observed. It also differs from the bloating of the neck or body regions, which Carpenter and Ferguson (1977. *In:* Biology of the Reptilia, C. Gans and W. Tinkle, eds., Academic Press, NY, Vol. 7: p 506.) recognized as sterotyped behaviors in several rattlesnake forms, including *C. s. scutulatus*.



FIGURE 1. Neck-spreading behavior of *Crotalus scutulatus salvini* in threat posture.

This neck-spreading display in *C. s. salvini* appears to be a defensive or threatening posture, sporadically exhibited when the snake is provoked or threatened. The behavior occurred more frequently and was most notable in one aggressive male while standing its ground in a lateral "S" position (Fig. 1). It would maintain the neck-spread for up to three minutes. However, the display has also been observed on two occasions in an extremely docile specimen. On neither occasion did this snake rattle or pose defensively. Both incidences occurred while the snake

was being removed from its cage and lasted ca. three seconds. Another specimen in the field refused to coil, but flattened its neck while retreating backwards, with the anterior portion of its body elevated ca. 30° above the substrate. This snake remained directionally oriented to the collector and the peculiar position appeared similar to the defensive posture rattlesnakes assume against kingsnakes.

The *C. s. salvini* discussed in this report were collected in the vicinity of El Limon Totalco near the border of the states of Puebla and Veracruz, Mexico. We thank the Direccion General de Fauna Silvestre, Republica de Mexico for permits issued in 1975, which made these observations possible.

Submitted by **JAMES L. GLENN,** Venom Research Laboratory, Veterans Administration Medical Center and Hogle Zoological Gardens, Salt Lake City, Utah 84148, USA. and **HOWARD E. LAWLER,** Lower Vertebrate Department, Arizona-Sonora Desert Museum, Tucson, Arizona 85743, USA ●

ELAPHE VULPINA VULPINA (Western Fox Snake). **BEHAVIOR.** Aggregations of gravid or hibernating *Elaphe v. vulpina* have been reported by Smith (1961. Ill. Nat. Hist. Surv. Bull. 28(1):208) and Vogt (1981. Natural History of Amphibians and Reptiles in Wisconsin, Milwaukee Public Museum, Milwaukee, WI pp. 138-140.).

On 2 July 1984 an aggregation of 16 *E. v. vulpina* were found at 1800 h beneath a large (1.5 m x 2.0 m) piece of metal (portion of a silo roof) lying on the ground in an abandoned barnyard in DuPage County, IL. The surrounding habitat was disturbed prairie and reclaimed agricultural land. The temperature was 70-75° F with a heavy overcast. With the exception of one subadult female, all of the snakes were gravid and of average size (1.0 -1.3 m). Most of the snakes were coiled individually in depressions beneath the metal groundcover although several were lying in mouse runs. Upon exposure, none of the snakes made any effort to escape to the tall grass surrounding the metal, although two individuals attempted to escape down rodent burrows. The piece of groundcover described has frequently harbored fox snakes, especially on cool days or during evening hours. However, males as well as females would be found, and the number of specimens at any one time would never exceed three or four. On this and other occasions *Thamnophis radix* and *Thamnophis sirtalis semifasciatus* were found in association with the *E. v. vulpina*. The largest female *E. v. vulpina* was collected, and she deposited 24 adherent eggs on 13 July 1984, all of which hatched on 28 August 1984. The female and hatchlings were subsequently released at the above location.

Submitted by **ROBERT A. YOUNG,** University of Mississippi Medical Center, Jackson, Mississippi 39216, and **TERRY L. VANDEVENTER,** Director, Living Reptile Museum, Clinton, Mississippi 39056, USA ●

HYPSIGLENA TORQUATA JANI (Texas Night Snake). **BEHAVIOR.** Recent accounts have documented stereotypical behavioral responses of the night snake to perceived predatory threats (Mitchell 1985. Herp. Review 16:55-56; Hayes 1985. Herp. Review 16:79-81). I captured 136 *H. t. jani* in pitfall traps over a 6-year period during the course of a study on lizard ecology in southcentral New Mexico. Most snakes reacted to being removed from a trap by writhing and rapid crawling movements, but at least 11 exhibited an unusual coiling response, illustrated in Figs. 1-3. Snakes were not kept inordinately in hand, and the sequence typically began when a snake was placed on the ground. The final testing coil (Fig. 2) was achieved within 3-5 seconds and maintained (Fig. 3) despite such treatment as being turned upside down. Several snakes were observed for ca. 5 min after being placed under shrubs (usually *Larrea*); all snakes maintained the coiling posture until after I had left. The behavior was manifested by both juveniles and adults. The etiology of this behavior is of interest because of its low-frequency, long-term persistence in a natural population. The opportunity to make these observations was partially supported by grants from the O'Neil Fund, Carnegie Museum of Natural History. I thank Steve Wondzell for taking the photographs.



1



2



3

Figures 1, 2 and 3. Coiling behavior of *Hypsiglena torquata jani.*

Submitted by **ANDREW H. PRICE,** Department of Biology, New Mexico State University, Las Cruces, New Mexico, 88003, USA. Present address: Texas Natural Heritage Program, General Land Office, Stephen F. Austin Building, Austin, Texas 78701, USA ●

LEPTOPHIS AHAETULLA. **FOOD.** At 1230 h on 7 September 1986 we found a *L. ahaetulla* eating a gecko, *Thecadactylus rapicauda*, in primary rainforest at Reserva Florestal Ducke, 25 km E of Manaus, Amazonas, Brazil. The snake (SVL 73 cm, TL 125 cm, mass 43 g) had already swallowed the tail but released the gecko (SVL 10.5 cm, mass without tail 21 g) when we approached. Both animals were marked and released. Our observation confirms that *L. ahaetulla* is diurnally-active and that nocturnally-active vertebrates are common prey items (Cunha O.R. and F.P. Nascimento, 1978. Ofidios da Amazônia, VOL 10 As cobras da região leste do Pará, Publ. Avulsas Mus. Paraense Emílio Goeldi 31:102-104) suggesting that it seeks out nocturnal reptiles and amphibians in their diurnal refuges.

Submitted by **J-M HERO** and **W. MAGNUSSON,** Dept Ecologia, Instituto Nacional de Pesquisas da Amazônia, Caixa Postal 478, 69000, Manaus, Amazonas, Brasil ●

STORERIA DEKAYI DEKAYI (Northern Brown Snake). **BEHAVIOR.** Head hiding and death feigning are defensive displays exhibited by many species of snakes when confronted by a potential predator (see review by Carpenter and Ferguson 1977, *In*: Gans and Tinkle, eds. Biology of the Reptilia, Academic Press, New York Vol. 7, pp. 335-554). In this note I report both of these displays for the first time in *Storeria d. dekayi.*

On 26 April 1986, I captured a ca. 26 cm *S. d. dekayi* at Point Pelee National Park, Ontario, as it crawled across a path. After placing the snake on the ground and poking at its body with my fingers for about 90 sec, the snake responded by hiding its head under coils of the body.

I captured a second ca. 10 cm individual underneath corrugated metal at the University of Michigan Biological Station (UMBS) near Pellston, Michigan, on 7 July 1986. When I placed this individual on a dirt road and attempted to photograph it, the snake repeatedly crawled off. After several recaptures over 5 min, the snake's body ceased moving and became flaccid; the snake refused to move or turn over even when placed on its back. After the snake was returned to its cage, normal activity resumed, suggesting that it had been feigning death. When I released the snake on 11 July, I placed it on the ground and repeatedly poked at it with my fingers; after ca. 60 sec it responded by hiding its head.

On 16 August 1986, I captured a third ca. 21 cm individual at the same location where I caught the second snake. When placed on the ground and prodded with fingers, the

snake responded by hiding its head after about 120 sec.

Head hiding has not been previously reported in any snakes from the genus *Storeria*. All three of the *S. d. dekayi* individuals which I caught attempted to escape; only after a period of time when the snakes were unable to escape did they exhibit head hiding, suggesting that head hiding is a secondary escape method used only when flight is no longer possible. In contrast with *S. d. dekayi*, none of three northern redbelly snakes (*S. o. occipitomaculata*) (12-17 cm total body length) which I caught in July 1986, at UMBS and Wilderness State Park, Michigan, exhibited head hiding or death feigning when prodded with fingers for several minutes.

The scarcity of reports of death feigning in *S. dekayi* suggests that death feigning is rare in this species.

This study was suported by a grant-in-aid from the University of Michigan Biological Station.

Submitted by **FLOYD E. HAYES,** University of Michigan Biological Station, Pellston, Michigan 49769, USA. Present address: 11208 Montgomery Road, Beltsville, Maryland 20705, USA ●

TESTUDINES

GRAPTEMYS VERSA (Texas Map Turtle). **MAXIMUM SIZE.** Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton-Mifflin Co., Boston. 429 pp.) gave a maximum size of 127 mm CL for *Graptemys versa*.

During June and July of 1986, a mark-recapture study was begun on the turtle population of the South Llano River on the Texas Tech University Center at Junction, Kimble Co., Texas. The South Llano River of the Edwards Plateau region is a tributary of the Colorado River in which *Graptemys versa* is an indigenous species.

A total of 170 turtles was tagged and released, including a series of 42 *Graptemys versa*. Eight female *Graptemys versa* had CL measurements greater than previously reported: 134 mm, 136 mm, 137 mm, 146 mm, 151 mm, 167 mm, and two with CL of 171 mm. The mass of the largest female was 581 g. Photographs of the largest turtles were taken before release as a record of their size.

The mark-recapture project was funded by The Texas Tech University Graduate School—Texas Tech Center at Junction Summer Faculty/Student Summer Grant and by the International Center for Arid and Semi-Arid Land Studies.

Submitted by **JOEL M. MCKINNEY,** Department of Biological Sciences, Texas Tech University, Lubbock, Texas 79409, USA ●





GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Curent Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full—no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged). Photographs may substitute for a preserved specimen only when the live specimen could not be collected, e.g. it was a protected species or it was found in a protected area. Photographs must be deposited in a university or museum collection and the catalog number(s) provided.

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

ANURA

HYLA SQUIRELLA (Squirrel Treefrog). USA VIRGINIA: Fairfax Co: Great Marsh, Mason Neck National Wildlife Refuge. 22 May 1984. S. W. Gotte. Verified by J. C. Mitchell and C. Pague (George Mason University 2205). New county record, extends range ca. 180 km north Surry County (Tobey 1985. Virginia's Amphibians and Reptiles: A Distributional Survey, Virginia Herpetological Society vi + 114 pp.).

Submitted by **STEVE W. GOTTE** and **CARL H. ERNST,** Department of Biology, George Mason University, Fairfax, Virginia 22030, USA ●

CAUDATA

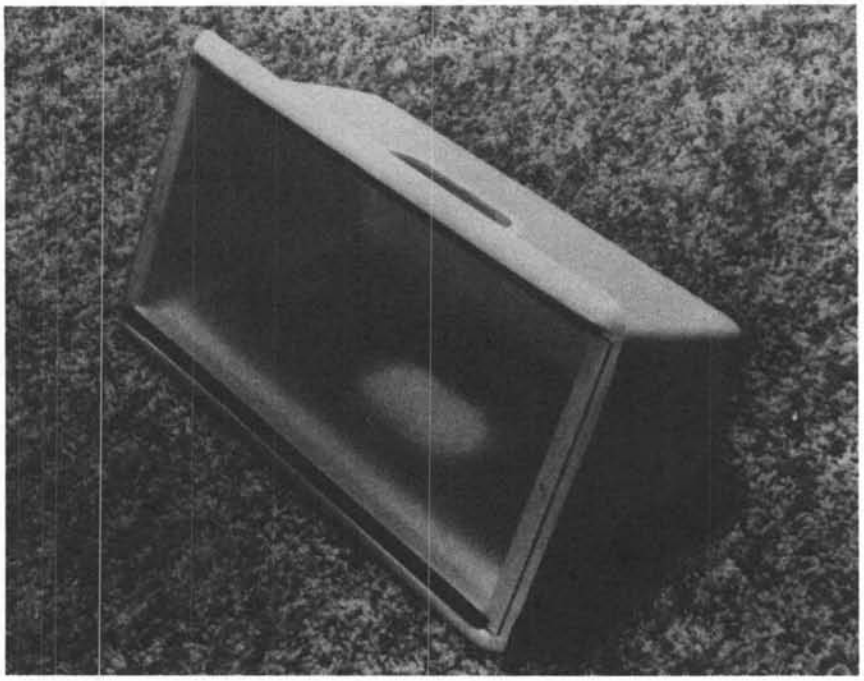
AMBYSTOMA TIGRINUM TIGRINUM (Eastern Tiger Salamander). USA: ARKANSAS: Sharp Co: 2.2 km E Center (T17N, R5W, S11). 8 November 1986. W. W. Byrd and A. J. Johnson. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 6248). New county record (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

Submitted by **STANLEY E. TRAUTH, WILLIAM W. BYRD** and **ARLIS J. JOHNSON,** Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, USA ●

NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS (Central Newt). USA: WISCONSIN: Waukesha Co: Kettle pond, 1.5 km S State Hwy 59 on County S (T5N, R17E, Sec. 29). 3 July 1986. J. F. Drought, Verified by R. W. Henderson. Milwaukee Public Museum (MPM 22534). New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Publ. Mus. 205 pp.).

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Submitted by **JAMES F. DROUGHT,** Department of Biological Sciences, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin 53201, USA

SAURIA

ANOLIS CAROLINENSIS (Green Anole). USA: FLORIDA: Monroe Co: Marquesas Keys (largest island, unnamed, 24°35'21", 82°08'42"). 15 May 1986. C. K. Dodd, Jr. and E. E. Possardt. Verified by C. K. Dodd, Jr. National Museum of Natural History (USNM 259125-259126). Other specimens seen on second unnamed island (24°33'30", 82°07'24"). First records with exact locality data for the Marquesas Keys. Fowler (1906. Proc. Acad. Nat. Sci. Philadelphia, 58:77-113) reported *Anolis carolinensis* from the Marquesas, but none were collected (E.V. Malnate, pers. comm.) and precise localities were not provided. Duellman and Schwartz (1958. Bull. Florida St. Mus., Biol. Sci., 3(5):324-361) did not report *Anolis* from the Marquesas although two specimens, collected in 1938 but lacking precise locality data, are deposited in the Florida State Museum (UF/FSM 1029).

We thank personnel from the National Key Deer Refuge for providing logistical support. Collections were funded through the Endangered Species Program of the U. S. Fish and Wildlife Service.

Submitted by **C. KENNETH DODD, JR.**, National Ecology Center, U. S. Fish and Wildlife Service, 412 N.W. 16th Ave., Room 250, Gainesville, Florida 32609, and **EARL E. POSSARDT,** U. S. Fish and Wildlife Service, 2747 Art Museum Drive, Jacksonville, Florida 32207, USA

CNEMIDOPHORUS GULARIS GULARIS (Texas Spotted Whiptail). USA: TEXAS: Runnels Co: 8.0 km W Ballinger downstream from Kuhn Lake Dam on the Colorado River. 13 June 1984. University of New Mexico, Museum of Southwestern Biology (MSB 42257). U.S. 67 crossing at Elm Creek, Ballinger. 14 June 1984. (MSB 42290). 8.0 km NW Ballinger, Lake Ballinger. 17 June 1984. (MSB 42362). N. J. Scott, Jr., L. A. Fitzgerald, J. N. Stuart, K. Nislow and R. Brooks. Verified by C. T. McAllister. New county record. Fills distributional hiatus in mid-Colorado River watershed between Coleman and Coke counties (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, and **NORMAN J. SCOTT, JR.,** and **BRIAN E. SMITH,** Museum of Southwestern Biology and Department of Biology, The University of New Mexico, Albuquerque, New Mexico 87131, USA

LEIOCEPHALUS CARINATUS (Curly-tailed Lizard). USA: FLORIDA: Highlands Co: 3.2 km S Sebring along US 27, 0.5 km NW junction with County Road 17A. 31 May 1986. J.N. Layne. Verified by J. N. Layne. Archbold Biological Station Collection (ABS 1012). First Florida record outside SE coastal region. Extends range ca. 156 km NW Palm Beach (Palm Beach Co.) and 224 km N Miami (Dade Co.) (Wilson and Porras 1983. Univ. Kansas Mus. Nat. Hist. Spec. Publ. 9:1-89). Specimen probably transported from the Palm Beach or Miami areas. US 27 is a major N-S highway through peninsular Florida, which also has served as a major northward dispersal route for *Anolis sagrai* (Godley et al. 1981. Herp. Review 12:84-86).

Submitted by **JAMES N. LAYNE,** Archbold Biological Station, P.O. Box 2057, Lake Placid, Florida 33852, USA.

PHRYNOSOMA CORNUTUM (Texas Horned Lizard). USA: TEXAS: Somervell Co: 3.9 km NNE Nemo on County Rd 406. 29 June 1986. C. T. McAllister. Verified by C. T. McAllister. Photograph deposited in Carnegie Museum of Natural History (CM Acc. 33267.1). First county record. Fills hiatus between Erath and Johnson counties (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, USA.

PHRYNOSOMA DOUGLASSII BREVIROSTRE (Eastern hort-horned Lizard).USA: WYOMING: Sublette Co: Farson Fossil Fish Beds, 21 km N and 12 km E of Farson, T27N R105W S23, elevation 2110 m. 22 August 1986. P. S. Corn and L. J. Gingerich. Verified by R. B. Bury. National Ecology Center, U. S. Fish and Wildlife Service (BS/FC 4374) New county record, extends range 15 km N Sweetwater Co. record (Baxter and Stone 1985. Amphibians and Reptiles of Wyoming, 2nd ed. Wyoming Game and Fish Dept., Cheyenne vi + 137 pp. Third record from the Green River drainage above Flaming Gorge Reservoir. The elevation is slightly higher than the limit of 1980 m in Wyoming given by Baxter and Stone.

Submitted by **PAUL STEPHEN CORN** and **L. JANELLE GINGERICH,** United States Fish and Wildlife Service, National Ecology Center, 1300 Blue Spruce Drive, Fort Collins, Colorado 80524, USA

SERPENTES

ALSOPHIS VUDII (Bahamian racer). BAHAMAS: BERRY ISLANDS: Chub Cay. 16-18 March 1986. B. I. Crother and J. B. Slowinski. Verified by J. M. Savage. University of Miami (UMRC 8637-39). First record for Chub Cay. The only prior record for the Berry Islands is Great Harbor Cay (Schwartz and Thomas 1975. Carnegie Mus. Nat. Hist. Spec. Publ. No 1, 216 pp.).

Submitted by **BRIAN I. CROTHER** and **JOSEPH B. SLOWINSKI,** Department of Biology, University of Miami, P.O. Box 249118, Coral Gables, Florida, 33124, USA

CHIRONIUS GRANDISQUAMIS. HONDURAS: DEPT. DE CORTES: nr San Pedro Sula. April 1986. J. Shanahan. Verified by M. Smith. University of Colorado Museum (UCM 55761). Eighth known specimen from Honduras, new department record, westernmost locality for the species, extends range 56 km SW of the nearest record (Wilson and Meyer 1985. The Snakes of Honduras, Milwaukee Public Mus. x + 150 pp.)

Submitted by **WILLIAM MOSS,** 13752 East 13th Circle, Apt. B104, Aurora, Colorado 80011 and **KEVIN FITZGERALD,** Alameda East Veterinary Hospital, 9870 East Alameda, Denver, Colorado 80231, USA

ELAPHE GUTTATA EMORYI (Great Plains Rat Snake). USA: TEXAS: Johnson Co: 16.1 km W Rio Vista, 2.4 km SSW Cleburne State Recreation Area on FM 200.8 June 1986. C.T. McAllister. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 5983). New county record (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2) extends range east from Somervell Co to near the zone of intergradation with *E. g. guttata* (Raymond and Hardy 1983. Southwest. Nat. 28:105-107).

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, USA.

NERODIA CYCLOPION CYCLOPION (Green Water Snake). USA: ARKANSAS: Mississippi Co: Big Lake National Wildlife Refuge (T15N, R9E, S35). 4 October 1985. W. H. Neasbitt. Verified by S. E. Trauth. Arkansas State Museum of Zoology (ASUMZ 4807). New county record (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

Submitted by **STANLEY E. TRAUTH** and **WALTER H. NEASBITT,** Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, USA

REGINA RIGIDA RIGIDA (Glossy Crayfish Snake). USA: FLORIDA: Osceola Co: 9.7 km SE Kenansville, off US 441 at Mills Ranch (T 31S, R 34E, Sec 8). 24 July 1986. J. Kappes. Verified by D. L. Auth. Florida State Museum (UF/FSM 65351). Extends range ca. 140 km S Volusia County record (UF/FSM 4842) (Ashton and Ashton 1981. Handbook of Reptiles and Amphibians of Florida. Part One. The Snakes. Windward Publ., Inc., Miami, Fl. 176 pp.).

Submitted by **DAVID L. AUTH** and **RICHARD FRANZ,** Department of Natural Sciences, Florida State Museum, Museum Road, University of Florida, Gainesville, Florida 32611, and **JOHN J. KAPPES, JR.,** Department of Wildlife and Range Sciences, University of Florida, Gainesville, Florida 32611, USA

SEMINATRIX PYGAEA (Black Swamp Snake). USA: ALABAMA: Escambia Co: 12.9

km NE Brewton (T3N, R11E, SE¼ Sec. 19). 12 March 1986. M. Bailey. Verified by R. Mount and G. Folkerts. Auburn University Museum photograph collection (AUM P-101-P-103). New county record, and first record west of Conecuh River. Extends range approximately 34 km NNW of nearest (Florida) locality (Moler and Mansell 1985. SSAR Herp. Review 16 (2):60) and 42 km WNW of nearest Alabama locality (Mount 1975. Alabama Agr. Exp. Sta. i-vii, 347 pp.).

Submitted by **MARK A. BAILEY,** Department of Zoology and Wildlife Science, Auburn University, Alabama 36849-4201, USA ●

SISTRURUS MILIARIUS STRECKERI (Western Pygmy Rattlesnake). USA: ARKANSAS: Marion Co: 5.1 km S Oakland (T20N, R15W, S15). 16 September 1986. W. B. and B. A. Trauth. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 6249). New county record (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

Submitted by **STANLEY E. TRAUTH,** Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, USA ●

THAMNOPHIS ELEGANS VAGRANS (Wandering Garter Snake). USA: NEW MEXICO: Bernalillo Co: Albuquerque, lagoon S Old Town Bridge. 13 July 1986. J. N. Stuart. Museum of Southwestern Biology, University of New Mexico (MSB 47534). Tijeras, Tijeras Creek at NM Hwy 14. 6 July 1981. J. N. Stuart. (MSB 37802). Torrance Co: 3.2 km W Tajique, Cañon de Tajique. 24 October 1982. J. N. Stuart and E. R. Stuart. (MSB 37696). Manzano, Manzano Lake. 2 May 1965. D. T. Jennings. (MSB 12480). 20.8 km SE Mountainair, NM Hwy 14. 1 August 1973. D. Murphy. (MSB 26500-07). 3.2 km NW Willard. 17 May 1969. J. D. Garcia. (MSB 19421). All verified by J. N. Stuart. Partially fills hiatus in central New Mexico (Fitch 1983. Cat. Amer. Amphib. Rept. 320:1-4).

Submitted by **JAMES N. STUART,** 512-A Columbia Drive SE, Albuquerque, New Mexico 87106, USA ●

TROPIDOCLONION LINEATUM ANNECTANS (Central Lined Snake). USA: OKLAHOMA: LeFlore Co: 8 km ESE Bokoshe, Brazil Creek Floodplain. 20 May 1986. W. Fesperman. Verified by S. Fox. Oklahoma State University Museum of Zoology (OSUS R5024). New county record, extends range ca. 81 km SE of previous range (Webb 1970. Reptiles of Oklahoma. Univ. Oklahoma Press, Norman. xi + 370 pp.) and into Ouachita Biotic District.

Submitted by **WILLIAM FESPERMAN,** Oklahoma State University Department of Zoology, Stillwater, Oklahoma 74078, USA. ●

TRIMORPHODON TAU TAU (Mexican Lyre Snake). MEXICO: NUEVO LEON: 6.1 km NW Iturbide. 24 August 1985. D. A. Blody, R. Brown, S. Hammack and D. Heckard. Verified by J. A. Campbell. University of Texas at Arlington (UTA 16145). New state record. Extends range ca. 150 km NWW (McDiarmid and Scott 1970. Los Angeles Co. Mus. of Nat. Hist. 179:1-44).

Submitted by **DAVID A. BLODY,** Fort Worth Zoological Park, 2727 Zoological Park Drive, Fort Worth, Texas 76110, **RICHARD BROWN,** 506 Thomas Chapel, Arlington, Texas 76014, **STEVE HAMMACK,** Dallas Zoo, 621 E. Clarendon Drive, Dallas, Texas 75203 and **DAVID HECKARD,** Abilene Zoological Gardens, Box 60, Abilene, Texas 79604, USA ●

TYPHLOPS BIMINIENSIS. BAHAMAS: BERRY ISLANDS: Frazer's Hog Cay 17-18 March 1986. B. I. Crother and J. B. Slowinski. Verified by J. M. Savage. University of Miami (UMRC 8620-8621). First record for the Berry Islands (Schwartz and Thomas 1973. Carnegie Mus. Nat. Hist. Spec. Publ. No 1, 216 p.)

Submitted by **BRIAN I. CROTHER** and **JOSEPH B. SLOWINSKI,** Department of Biology, University of Miami, P.O. Box 249118, Coral Gables, Florida 33124, USA ●

VIRGINIA VALERIAE VALERIAE (Eastern Earth Snake). USA: OHIO: Athens Co: 5 km NW of Coolville, Carthage Twp., Sec. 5SW. 15 June 1986. T. Denbow. Verified by H. C. Seibert and S. M. Moody. Ohio University Vertebrate Collection (OUVC 8429). New county record, northeasternmost locality in the Ohio River Valley Ohio.

Submitted by **SCOTT M. MOODY,** Department of Zoological and Biomedical Sciences Vertebrate Collection, Ohio University, Athens, Ohio 45701, USA. ●

TESTUDINES

CHRYSEMYS PICTA MARGINATA (Midland Painted Turtle). USA: WISCONSIN: Milwaukee Co: Hales Corners, 1.0 km S Grange Ave. on 92nd Street. 5 September 1986. J. F. Drought. Verified by R. W. Henderson. Milwaukee Public Museum (MPM 22541). New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Publ. Mus. 205 pp.).

Submitted by **JAMES F. DROUGHT,** Department of Biological Sciences, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin 53201, USA ●

TRIONYX SPINIFERUS SPINIFERUS (Eastern Spiny Softshell). USA: WISCONSIN: Milwaukee Co: Franklin, 1.5 km S College Ave. on 92nd Street. 31 August 1986. J. F. Drought. Verified by R. W. Henderson. Milwaukee Public Museum (MPM 22542). New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin, Milwaukee Publ. Mus. 205 pp.).

Submitted by **JAMES F. DROUGHT,** Department of Biological Sciences, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin 53201, USA ●

NEW DISTRIBUTIONAL RECORDS FOR REPTILES AND AMPHIBIANS IN BROWN COUNTY, WISCONSIN

Relatively little attention has been paid to the herpetofauna of Brown County in northeastern Wisconsin, with published documented records for only *Rana pipiens, R. clamitans,* and *Thamnophis sirtalis* (Vogt 1981). In addition, eight species of anurans *(Bufo americanus, Hyla crucifer, H. versicolor, Pseudacris triseriata, Rana catesbeiana, R. clamitans, R. pipiens, and B. sylvatica)* were reported from Brown County, based on data collected by R. M. Korb, as part of a statewide acoustic survey of breeding choruses (Mossman and Hine 1984. The Wisconsin frog and toad survey: establishing a long-term monitoring program. Wisconsin Dept. of Nat. Res., Bureau of Endangered Resources. 13 pp.): these records are based on calling males and are not substantiated by preserved specimens. The purpose of this note is to present new information on the Brown County herpetofauna, based on recent collections and specimens that have accumulated at the St. Norbert College Biology Department and the Bay Beach Wildlife Sanctuary.

All preserved specimens listed below have been cataloged in the University of Wisconsin-Madison Zoological Museum (UWZM) or the Bay Beach Wildlife Sanctuary (BBWS). The former were verified by P.A. Cochran; the latter were verified by R.M. Korb.

ANURA

BUFO AMERICANUS (American Toad). Wooded area immediately south and east of the exit from U.S. Highway 41 to State Highway 32 (Lombardi Avenue) (T-24N, R-20E, Sec. 33). 16 August 1984. P.A. Cochran, J.A. Cochran and A.G. Cochran. (UWZM-H 22611).

HYLA VERSICOLOR (Gray Treefrog). Baeten's woods (T-23N, R-20E, Sec. 7). April or May 1978. J.R. Hodgson. (UWZM-H 22612).

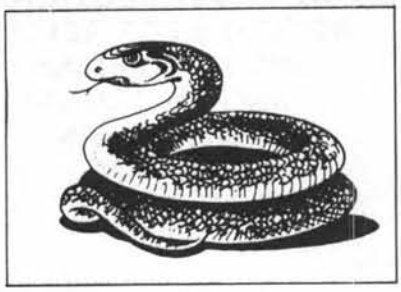
PSEUDACRIS TRISERIATA (Striped Chorus Frog). Temporary pond between St. Norbert College baseball field and C. and N.W. railroad tracks, De Pere (T-23N, R-20E, Sec. 28). April 1976 or 1977. J.R. Hodgson. (UWZM-H 22613).

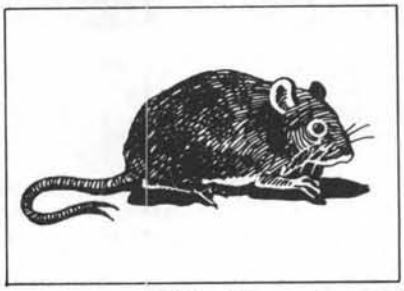
RANA SYLVATICA (Wood Frog). Wooded area immediately south and east of the exit from U.S. Highway 41 to State Highway 32 (Lombardi Avenue) (T-24N, R-20E, Sec. 33). 16 August 1984. P.A. Cochran, J.A. Cochran and A.G. Cochran. (UWZM-H 22614).

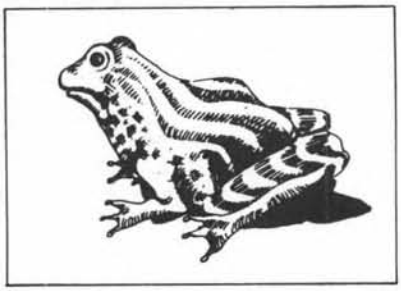
CAUDATA

AMBYSTOMA LATERALE (Blue-spotted Salamander). Wooded area immediately south and east of the exit from U.S. Highway 41 to State Highway 32 (Lombardi Avenue) (T-24N, R-20E, Sec. 33). 26 August 1984. P.A. Cochran and J.A. Cochran. (UWZM-H 22615).

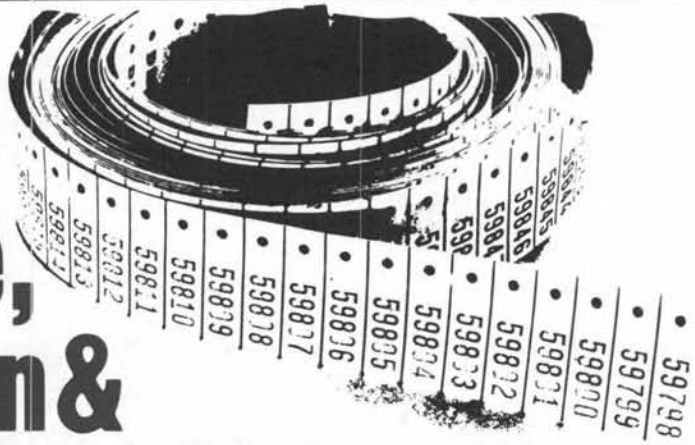
PLETHODON CINEREUS (Redback Salamander). Ravine downstream from Kittel's Falls (T-23N, R-21E, Sec. 32). 8 September







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1984. J.A. Cochran, P.A. Cochran, J.R. Hodgson, A.G. Cochran and J.Y.S. Hodgson. (UWZM-H 22616).

TESTUDINES

CHELYDRA SERPENTINA (Snapping Turtle). Duck Creek, Brown County Park (T-24N, R-19E, Sec. 25). 8 May 1985. J.R. Hodgson and J.A. Cochran. (UMZM-H 22627).

CHRYSEMYS PICTA MARGINATA (Midland Painted Turtle). Duck Creek, Brown County Park (T-24N, R-19E, Sec. 25). Late spring, 1983. W. Baeten. (UWZM-H 22617).

CLEMMYS INSCULPTA (Wood Turtle). Trout Creek (T-24N, R-19E, Sec. 15, NE 1/4). 30 April 1982. R.M. Korb. Shell preserved in BBWS collection (RE 016). State Highway 29 just west of County Road FF (T-24N, R-20E, Sec. 12). 19 May 1985. P.A. Cochran and J.R. Hodgson (UWZM-H 22628).

EMYDOIDEA BLANDINGI (Blanding's Turtle). Bay Beach Wildlife Sanctuary, Green Bay (T-24N, R-21E, Sec. 29). April 1982-March 1985. R.M. Korb. Several photographs in BBWS collection (J 1108-J 1120, J 1201-J 1204).

PSEUDEMYS SCRIPTA (Slider). East River at Mason Street Bridge in Green Bay, 28 March 1981. R.M. Korb. Shell preserved in BBWS collection (RE 01). Undoubtedly an escaped or released pet.

SERPENTES

DIADOPHIS PUNCTATUS (Ringneck Snake). Baeten's woods (T-23N, R-20E, Sec. 7). 22 May 1971. M. Baeten, (UWZM-H 22618).

ELAPHE VULPINA (Fox Snake). State Highway 57 and County Road A (T-25N, R-22E, Sec. 29). R. Zimmerman. Adult held alive in BBWS display (RE 233) and photograph on file (J 1219).

LAMPROPELTIS TRIANGULUM (Milk Snake). Brosig Street, Green Bay (T-23N, R-21E, Sec. 9). 25 September 1983. L. Russell. Preserved in BBWS collection (RE 09).

OPHEODRYS VERNALIS (Smooth Green Snake). Bay Beach Wildlife Sanctuary, Green Bay (T-24N, R-21E, Sec. 29). 14 September 1972. G. Bunker. (UWZM-H 22619).

STORERIA DEKAYI (Brown Snake). Green Bay. 13 October 1981. Preserved in BBWS collection (RE 08).

STORERIA OCCIPITOMACULATA (Redbelly Snake). Abandoned mink ranch south of County Road G (T-23N, R-21E, Sec. 32). 28 April 1971. G. Bunker. (UWZM-H 22620). 6 May 1974. J.R. Hodgson. (UWZM-H 22621).

THAMNOPHIS SIRTALIS (Common Garter Snake). Abandoned mink ranch south of County Road G (T-23N, R-21E, Sec. 32). 25 June 1971. G. Bunker and J.R. Hodgson. (UWZM-H 22622). 29 September 1971. J. Hinkley. (UWZM-H 22623).

We thank all individuals who contributed specimens and Andrew Cochran, Joseph Cochran, and Jay Hodgson for assistance in the field.

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BOOK REVIEWS

Species of Special Concern in Pennsylvania, edited by Hugh H. Genoways and Fred J. Brenner. 1985. Special Publication No. 11 of the Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. vi + 430 pp., illus. + maps. $30.00.

State-based biological surveys are a nationwide trend, founded on the rationale that efforts to protect native species are often initially most effective when carried out at the state level. This publication presents the results of an assessment of Pennsylvania's flora and fauna by the recently formed (1979) Pennsylvania Biological Survey, an organization created by the National Audubon Society in collaboration with Pennsylvania's Game Commission, Fish Commission, and Department of Environmental Resources. More than fifty biologists, both amateur and professional, affiliated with almost thirty different academic institutions, volunteered their time and expertise to contribute to this large (21 x 28 cm), clearly organized and well-illustrated reference.

The book begins with three excellent, although technically challenging, introductory sections that describe Pennsylvania's aquatic and terrestrial habitats, physiographic provinces, and drainage patterns. Because so much of the problem of species protection is based on habitat preservation, these sections provide the habitat descriptions and the specific example localities that in turn give perspective and focus to attempts to preserve especially unusual areas within the boundaries of the Commonwealth.

The book presents the results of the survey and follows the overall organization of a successful survey published several years ago by the state of Florida. The Pennsylvania survey uses the same large taxonomic divisions (plants, invertebrates, fish, amphibians and reptiles, birds, mammals); the same status categories (endangered, threatened, vulnerable, undetermined, extirpated, recently extinct) and the same format for individual species (description, range, habitat, basis of status classification, recommendations).

Each large taxonomic division is given a separate chapter, and each of these chapters represents the efforts of a different subcommittee. The choice of these taxonomic divisions reflects the public interest in the orga-

nisms within each division, and the information available on those organisms, rather than the actual endangered species in each division. Consequently, the survey has one chapter on plants, one chapter on invertebrates, and four chapters on vertebrates. Because the total number of Pennsylvania vertebrates is reasonable, the subcommittees that compiled the four vertebrate chapters can be confident that most species deserving of special concern have been identified, categorized, and described. The sheer number of Pennsylvania plant species presented problems to the subcommittee attempting to survey for plants at risk, and in the case of the invertebrate subcommittee, the vast numbers of invertebrate species, coupled with the limited information available on invertebrate distribution and abundance in Pennsylvania, proved to be overwhelming. The plant subcommittee dealt successfully with their dilemma by limiting their survey to vascular plants, but the invertebrate subcommittee carried the concept of limited coverage too far and opted to designate only species in those taxonomic categories that represented areas of expertise for individual committee members. Despite the committee's explanation of this decision in the introduction to the invertebrate chapter, a list of invertebrates at risk that has one flatworm species (Refton cave planarian) and 61 insect species, including 34 from the Order Odonata (dragonflies), 25 from the Order Lepidoptera (butterflies and moths) and 2 from the Order Coleoptera (beetles) is so skewed as to lose credibility.

Except for this difficulty with the selection of invertebrate species, the subcommittees have done an excellent job of reviewing appropriate literature and recruiting expert individuals to participate in the Pennsylvania Biological Survey. Each species account is written by a single expert, and the academic and field credentials of these experts are impressive. The book does a truly admirable job of summarizing the current state of knowledge for each of the species covered. The one-species, one-author format provides the reader with an easily identified source of additional information on any of the species of special concern.

The problems that exist in this book are not due to the content, which is of uniform high quality, but rather with matters of style and graphic presentation. These problems arise because the book is obviously intended for multiple audiences, ranging from professional botanists, zoologists, and ecologists, to untrained citizens of the state of Pennsylvania who are seeking information on endangered species or habitats. Because the book is the work of committees, there are stylistic inconsistencies from chapter to chapter. For example, common names are capitalized in the chapter on birds, but not in any of the other chapters. Are birds more "proper" than other organisms? More distracting are the rather subtle changes in writing style, both from chapter-to-chapter, and sometimes from species-to-species. In general, the entries in the chapters on plants, amphibians and reptiles, and birds are especially readable, perhaps because amateurs have often been involved in the study of these organisms and so communication with interested laypersons is a more frequent experience. Some contributors have difficulty giving up a formal scientific writing style that isn't appropriate in this book. For example, John S. Hall writes, in his entry on the Allegheny woodrat (p. 364): "During 1978 and 1979, John S. Hall, Albright College, conducted a survey of bat populations in caves. . . During that survey Hall (personal communication) noted a general absence of woodrat signs. . ." Laypersons not familiar with the traditions of scientific writing may wonder if there are two John S. Halls, both teaching at Albright College, or if there might be a single Professor Hall who makes appointments to communicate with himself. A minor complaint, but one that is easily clarified within the traditions of formal scientific writing, as John D. Groves did in his clearly-written description of the coastal plain leopard frog as he explained his sources of information in a much more direct fashion (p. 264): "The following information is derived from published statements. . .and from personal observations of this species in Maryland."

The layout of the book is unnecessarily awkward. Like other recent volumes in the Carnegie Museum Special Publication series, it is based on a two-column per page format. In this case, however, the two columns are frequently interrupted by page-wide, or at least more than one-column-wide, photographs and state maps. These illustrations create disruptive blank spaces along the sides of the pages, which, when coupled with visually indistinct headings for individual species, make locating species and reading the entries unusually difficult. In almost all of these situations, the problem could have been easily avoided by reducing the state maps and the photographs to one-column width (as has already been done very effectively with the North American distribution maps that accompany each entry), and placing them consistently within the text on each species.

The illustrations are sometimes poorly designed or conceptually misleading. The "Map of Pennsylvania streams" (p. 32) is actually a diagram of watershed boundaries, and the state maps that accompany each species lack county names, so it is difficult to relate the county-based text account of locations to the state map. Some of the illustrations would have benefited from the aids to graphic design and lettering that have recently become widely available.

These lapses in presentation do not detract from the scholarship or the effectiveness of the book as a scientific reference, but they are aspects that may disappoint laypersons who have become used to higher standards in their sourcebooks. Popular writing in natural history is now frequently quite eloquent, as demonstrated by authors as diverse as David Attenborough, Lewis Thomas, John McPhee, and Stephen Jay Gould, and graphic presentation has become quite sophisticated, as exemplified by the books produced by The National Geographic Society and also by most of the popular field guides, especially those edited by Roger Tory Peterson. Consequently, the stylistic shortcomings of "Species of Special Concern in Pennsylvania" may limit its appeal to one of its major intended audiences.

For scientists, however, the volume is of unquestionable value. Not only does it provide a wealth of information about Pennsylvania species and the persons who study them, but it also represents, as the published version of the Pennsylvania Biological Survey results, a major step in the protection and preservation of endangered species within the Commonwealth. The persons drawn together by the Survey form a core group to monitor the progress of conservation within the state. Taken together with biological surveys in neighboring states, and growing pressure for a national biological survey, the project is a hopeful sign for the preservation of habitats and species in the heavily industrialized northeastern United States.

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The Tungara Frog: A Study in Sexual Selection and Communication, by Michael J. Ryan. The University of Chicago Press. 1985. $14.95 paper, $33.00 cloth.

This study on the reproductive behavior of the tungara frog demonstrates that females preferentially choose larger males because the 'chuck' portion of their mating call has a lower frequency. On the other hand, the 'whine' portion of the call is sufficient for species recognition. Increasing the number of 'chucks' makes for an increasingly attractive mating call to the female; competition from neighboring males will stimulate complexity of the call. However, the fringe-lipped frog-eating bat selects complex-calling frogs and so a compromise between maximizing mate attraction and minimizing predation has evolved.

These are but some of the interesting results of this well-documented study made in both field and laboratory. It definitely establishes the intricacies of anuran mating systems and should reactivate studies on the details of mating in our "better known" frogs—the formerly accepted view of the passive role of the female is now obsolete. This is an exciting book that exemplifies the better aspects of field observation, that introduces new dimensions to the comprehension of anuran communication, the role of female choice, the effects that calling has on predation and energetics and the benefits of forming aggregations, and that discusses the role selection has had in molding these activities. It is must reading for herpetologists, especially those not up on mating strategies in frogs.

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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

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Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (four issues per year), **Herpetological Review** (four issues per year), and occasional issues of **Facsimile Reprints in Herpetology.** Members may purchase other Society publications at reduced rates.

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Individuals are encouraged to join at the higher membership categories. Money from such support substantially helps promote the publications and services of the SSAR. For information about SSAR membership, write to:

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Herpetological Review

Volume 17 December 1986 Number 4

29TH ANNUAL MEETING HELD AT SOUTHWEST MISSOURI STATE UNIVERSITY

The 1986 Annual Meeting of the Society for the Study of Amphibians and Reptiles was held jointly with the Herpetologists' League in Springfield, Missouri, USA, during 10-15 August. Local Committee Co-Chairmen Robert Wilkinson and Don Moll hosted a relaxed, but informative, gathering of herpetologists from around the world on the campus of Southwest Missouri State University.

SSAR BOARD OF DIRECTORS MEETING

The annual meeting of the Board was held on Sunday, 10 August, under the chairmanship of SSAR President Sherman Minton. All Board members were present plus other officers, editors, committee chairs, and guests. The Board met for 7 hours and discussed annual reports submitted by each Society officer, editor, committee, and coordinator. The financial status of the Society was the primary topic of discussion throughout the meeting. Decisions of the Board were announced at the annual business meeting of the Society and are described in the following information.

BUSINESS MEETING

A. Call to Order

President Sherman Minton called the 1986 business meeting of the Society for the Study of Amphibians and Reptiles to order at 16:44 h on 12 August in room 2 of Temple Hall on the campus of Southwest Missouri State University in Springfield.

B. President's Report:

President Minton made the following statement regarding the financial state of the Society. During the past several years, the Society has financially emulated the Federal government. The Society was operating approximately one-half a fiscal year ahead relying on increases in membership to maintain adequate cash flow. Since membership has plateaued, such a management technique is too risky to continue. Some Society budgets have also been overexpended. A long-standing investment of $15,000, which had been yielding a high rate of return, unexpectedly collapsed. The value of the bonds remains in question since both companies are involved in bankruptcy proceedings. In view of this series of events, it has been necessary to take certain remedial steps. The 1986 budget has been reduced by approximately 15%, with finances to be reviewed in March and budgetary cuts restored as much as possible. There has been a modest increase in dues; this change was approved by the Board prior to the change in our investment portfolio. There will be a decrease in the number of pages in the *Journal of Herpetology*. This reduction will be offset partially by using different techniques in layout and printing of the *Journal* which results in an increase of approximately 4% more words per page. Grants-in-Herpetology awards have been curtailed for 1987. Donations and proceeds from the 1986 Herpetology Exam held during the Springfield meeting will be used to fund at least one graduate student category grant. SSAR hopes to restore the grants program as originally conceived in all or most categories during 1988.

C. Secretary's Report

Secretary James Jacob stated that he would not review actions taken at the annual meeting of the Board of Directors since all major decisions are being announced during the Business Meeting. He did, however, announce that a membership campaign aimed at members of regional herpetological societies would be undertaken. The campaign will enlist the aid of regional societies by permitting them to retain $2 from the dues of each of their members who becomes a member of SSAR through the regional society. He encouraged SSAR members with contacts among regional herpetological societies to promote this program, pointing out that it is beneficial to both SSAR and the regional organizations.

D. Treasurer's Report

Treasurer Henri Seibert pointed out that most of the items pertaining to the fiscal status of the Society had been announced by the President. He did, however, make the following announcement: (1) Because of increased production costs, the Board found it necessary to increase dues by $5 for regular members, $3 for student members, and $10 for institutions. Sustaining membership will be $50; contributing will be $75. (2) Fiscal management of the Society is being changed so that only receipts from one fiscal year can be used for expenses incurred during that same fiscal year. In the past, money from one fiscal year has been used to pay bills from another fiscal year. The 1986 budget has been reduced to approximately $78,100 in order to meet the new fiscal management format. As a result, we will have to pare expenditures to a bare minimum; and there will be a temporary decrease in some ancillary services normally provided by the Society. (3) The SSAR membership list is now being maintained on a Society microcomputer at the office of the Treasurer. We can now produce our own mailing labels. This capability should help eliminate recent problems with the mailing list which occurred while the list was being maintained by Allen Press. We will save $2,000 per year by maintaining our own membership list. (4) The Treasurer announced that the Board approved offering life memberships again. Seibert asked James Christiansen, Chair of the SSAR Long-range Planning Committee, to explain the offer. Christiansen stated that the Society will make life memberships available for a cost of $550 until 31 December 1986. He pointed out that members can protect themselves from future dues increases by taking advantage of this offer. Individuals in the 27% tax bracket will receive a tax break of $150, thereby reducing the real cost to $400. Life membership funds will not be used to finance current operations; rather, they will be placed in a separate fund with members' annual dues being paid from interest earned by the money. Christiansen pointed out that the life membership fund will be intensively managed in order to earn the highest possible rate of return in conservative investments. He encouraged members to take out life memberships, pointing out that now is time to take advantage of the tax break. (5) Seibert announced that members may pre-pay dues, at the current rate, for a period of up to three years. In view of the possible changes in the tax laws, pre-payment will insure a full deduction under the current statutes on the 1986 tax return. The Treasurer encouraged members to take advantage of either the pre-payment or life membership offer.

E. Publications Secretary's Report:

Publications Secretary Douglas Taylor reported that sales from his office were average. He announced that he is not selling as many copies of *Turtles of Venezuela* as he would like, but this is probably due to the fact that advertisements did not get out as quickly as we had hoped. Taylor announced that *Herpetology of Costa Rica* will be available soon. Pre-publication cost will be $25, with a regular price of $30. Herpetological Circular No. 15, *Cannibalism in Reptiles: A Worldwide Review* by Joseph C. Mitchell will be out shortly. The pre-publication price is $3; the regular price will be $4.

F. Editors' Reports

1. *Contributions to Herpetology*

Editor Kraig Adler announced that Number 3 in the Contributions to Herpetology series, Jay Savage and Jaime Villa's *Introduction to the Herpetofauna of Costa Rica* will be delayed because publication announcement did not appear in the September 1986 issue of *Herpetological Review*. Society members will be able to take advantage of the pre-publication price until 31 December 1986. Number 4 in the Contributions to Herpetology series, *Salamanders of China* by Zhao Ermi and Hu Qxiong, will be published in 1987.

2. *Facsimile Reprints in Herpetology*

Editor Kraig Adler announced that plans are underway to issue reprints of Daudin's *Histoire Naturelle des Rainettes* and Gunther's volume on reptiles and amphibians in the *Biologia Centrali-Americana* series in late 1987.

3. *Catalogue of American Amphibians and Reptiles*

Recently appointed Editor Jaime Villa announced that the *Catalogue* is on schedule for 1986. A comprehensive index will be produced soon. Villa stated that there is a need for authors for *Catalogue* accounts. He pointed out that the Society would like to complete the North American accounts as soon as possible. The Editor announced that he is undertaking an aggressive posture in order to speed the publication of accounts; and that a one-year limit has now been imposed for the production of an account. Villa stressed the usefulness of the *Catalogue* to the herpetological community, pointing out that it provides the most comprehensive summary available of a taxon. He noted that it has been necessary to publish a number of non-North American accounts because of delays in completion of North American accounts. Villa reiterated the need for volunteers to prepare accounts, stressing the need for accounts to be completed in one year. Villa encouraged potential authors to contact him.

G. Committee Reports

1. Conservation Committee

President Minton announced that the Conservation Committee is working on a system for assigning monetary value to amphibians killed in environmental accidents. The document will be comparable to one which has already been prepared for fishes. Minton commented that the Committee may expand the system in the future to include reptiles.

2. Meeting Sites Committee

President Minton announced that SSAR has accepted an invitation from Richard Vogt to host the 1987 annual meeting in Veracruz. The Society also accepted an invitation from the University of Michigan to participate in a three-way meeting of SSAR, the Herpetologists' League, and the American Society of Ichthyologists and Herpetologists in Ann Arbor in 1988. Dates for the meeting are still under discussion.

At the request of President Minton, Vogt discussed plans for the Veracruz meeting. He pointed out that a meeting in Mexico will be at a slower pace than many of our previous gatherings. Meeting announcements will be mailed out in January. Deadlines for pre-registration and submission of contributed papers will be in May. The meeting site will be the Hotel Mocambo, which is located in the southern part of Veracruz. The hotel has 110 rooms, beach access, tennis courts, and is located approximately 400 meters away from another hotel which has 400 rooms. A trailer park is located within 2 km of the hotel. Food at the hotel will be under the control of the Local Committee, but there are a number of restaurants nearby. A number of historical sites are close to the city. Field trips to these areas, as well as to the biological station at "La Tuxtlas," Mount Orizaba, and other sites will be available. Collecting for non-scientific reasons will not be permitted, but information will be sent to pre-registrants regarding application for permits. Information on travel arrangements to Veracruz will be forthcoming.

3. Grants-in-Herpetology

Sandy Echternacht announced the Grants-in-Herpetology awards for 1986. **Graduate Student Herpetological Research:** Barry Sinervo (University of Washington) "Thermal physiology of growth in field populations of *Sceloporus* lizards: Genetic and environmental aspects"; John L. Carr (Southern Illinois University) "Phylogenetic analysis of the Neotropical emydid genus *Rhinoclemmys*." **Herpetology-oriented Conservation:** Franz J. Kutka (Iowa State University) "The threat of habitat acidification to the Ambystomatid salamanders of Michigan." **Field Work:** Byron Wilson (University of Washington) "A study of latitudinal patterns of mortality in *Uta stansburiana*."

4. Kennedy Award

President-elect Norman J. Scott announced that Shawn R. Crowley of the University of New Mexico was the winner of the 1986 Kennedy Award. His article on "Insensitivity to desiccation of sprint running performance in the lizard, *Sceloporus undulatus*" was chosen as the best student authored paper or note published in the *Journal of Herpetology*.

5. Nominating Committee

President Minton presented the following slate of candidates for office in 1987 as recommended by the Nominating Committee and approved by the Board of Directors. **President-Elect:** Hugh Quinn (Houston Zoological Gardens, Houston, Texas, USA) and Edward

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Moll (Eastern Illinois University, Charleston, Illinois, USA). **Secretary:** James S. Jacob (Glendale College, Glendale, Arizona, USA). **Treasurer:** Henri C. Seibert (Ohio University, Athens, Ohio, USA). **Director (USA):** Lynne Houck (University of Chicago, Chicago, Illinois, USA) and Robert Aldridge (Saint Louis University, St. Louis, Missouri, USA). **Director (Non-USA):** James Bogart (University of Guelph, Ontario, Canada) and Michael R. K. Lambert (Tropical Development and Research Institute, London, UK).

President Minton called for nominations from the floor. No further nominations were made and James Christiansen moved that nominations cease. The motion was seconded by George Pisani and approved by a voice vote. A ballot will be sent to all active members by first-class mail.

6. Resolutions

On behalf of SSAR, George Pisani offered the following resolutions:

1. **Whereas** Bob Wilkinson and Don Moll most generously volunteered on reasonably short notice to host the 1986 annual meeting; and,
   Whereas they have most capably orchestrated what has been a fine, well organized and interesting meeting; and, **Whereas** various trunk airlines into Springfield have done much good for the field of herpetology by boosting the cardiovascular rate and fitness of certain of the field's most distinguished persons; therefore,
   Be it resolved that the Society for the Study of Amphibians and Reptiles and the Herpetologists' League offer their most sincere thanks to Bob, Don and their unnamed cadre of hardworking students who have made it possible for us to meet in Springfield.
2. **Whereas** the following persons have given generously of their time and stolen freely from departmental and personal budgets to serve SSAR in a variety of vital roles in late 1984 through 1985; and,
   Whereas they have served the Society capably; and,
   Whereas the Society hopes that by shamelessly lauding them here it can again recruit them to other tasks, therefore,
   Be it resolved that SSAR expresses its appreciation to the following individuals: George Pisani, President; Carl Gans, Immediate Past-president; Linda R. Maxson and Hugh R. Quinn, Directors; the late James P. Bacon, Chair of the Grants-in-Herpetology Committee.
3. **Whereas** the Herpetologists' League this year celebrates the 50th anniversary of their journal, *Herpetologica;* and,
   Whereas this is an outstanding milestone for any society; therefore,
   Be it resolved that the Society for the Study of Amphibians and Reptiles extends its congratulations to the Herpetologists' League on this occasion.
4. **Whereas** Stephen G. Tilley has served the Society with distinction in many essential ways over the years; and,
   Whereas his most recent contribution as Editor-in-Chief of the *Catalogue of American Amphibians and Reptiles* has maintained the high quality of that publication; and,
   Whereas Steve has momentarily escaped from Society work to pursue the vagaries of research; therefore,
   Be it resolved that SSAR expresses its deep appreciation to Stephen Tilley and presents him a plaque in acknowledgement thereof.
5. **Whereas** Marty Crump has again spent considerable time and effort organizing, promoting and conducting the Herpetology Exam; and,
   Whereas her determination to encourage people to forsake their egos and take the exam has resulted in the accumulation of several hundred dollars to seed the 1987 Grants-in-Herpetology Fund for SSAR; therefore,
   Be it resolved that SSAR offers its most sincere gratitude to Marty Crump for the fine work she has done.
6. **Whereas** Ben Greishaw is a most talented artist and long-time exhibitor at these joint meetings; and,
   Whereas he most generously donated his time and talents to design the logo for the Springfield meeting; therefore,
   Be it resolved that the Society for the Study of Amphibians and Reptiles and the Herpetologists' League extend their most sincere thanks to Ben Greishaw for his work.
7. **Whereas** the ecosystems of the Cuatro Ciénegas basin, Coahuila, Mexico, are unique and have extremely high biological value; and,
   Whereas people of the city of Cuatro Ciénegas are expressing their concern over recent construction activities currently threatening the aquatic resource values of great natural diversity in an area of the basin; therefore,
   Be it resolved that two scientific societies, the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, consisting of over 330 scientists from several coun-

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tries in the international scientific community, including México, meeting jointly at Southwest Missouri State University, Springfield, Missouri, USA, on 10-15 August 1986, support any efforts of the citizens of Cuatro Ciénegas to protect and preserve the unique natural environments of the Cuatro Ciénegas basin and their rich fauna and flora.

H. Transfer of Gavel and Adjournment

President Minton asked President-elect Scott to come forward and accept the SSAR gavel as a symbol of the transfer of the Presidency which will officially take place on 1 January 1987. Scott asked if there was any further business. There being none, George Pisani moved, and Jim Jacob seconded, that the meeting being adjourned. The motion passed by voice vote and President-elect Scott declared the meeting closed at 17:26 h.

Respectfully submitted,
James S. Jacob
Secretary ●

SSAR COMMITTEES FOR 1986-1987

Following the Springfield meeting, President Minton appointed the following committees and coordinators for the current year to report to the Board at the Veracruz meeting in 1987. Individuals with important matters pertaining to the activities of Society committees should contact the relevant committee chair. Addresses for committee chairs are included on the inside rear cover of each issue of *Herpetological Review*.

Conservation: William S. Brown (Ch.), John L. Behler, William E. Cooper, Nat B. Frazer, M.R.K. Lambert, Paul E. Moler, Patricia Riexinger, and Peter J. Tolson.

Grants-in-Herpetology: Thomas H. Fritts (Ch.), Steven D. Aird, Robert N. Bader, Dale Belcher, Arthur C. Echternacht, Darrel Frost, and Michael V. Plummer.

Kennedy Student Award: J. Eric Juterbock (Ch.), Robert E. Gatten, Ken R. Marion, John S. Mecham, Andrew H. Price, and Laurie J. Vitt.

Long-range Planning: James L. Christiansen (Ch.), Ralph Axtell, Carl Gans, James S. Jacob, Sherman A. Minton, George R. Pisani, Henri C. Seibert, and Douglas H. Taylor.

Meetings: Henry R. Mushinsky (Ch.), James R. Dixon, and James S. Jacob.

Nominating: Kraig Adler (Ch.), Martha L. Crump, Harold A. Dundee, Max Hensley, James S. Jacob, and Martin J. Rosenberg.

Regional Society Liaison: Steven H. Hammack (Ch.), Fred Antonio, Mike Bumgardner, Brint Spencer.

Zoo Liaison: Donal Boyer (Ch.), Dennis W. Herman, James A. Hitchiner, Brint Spencer, and Ruth Zantzinger.

Association for Systematics Collections Coordinator: Max Nickerson.

Common and Scientific Names Coordinator: Joseph T. Collins.

Translations Coordinator: Robert D. Aldridge. ●

EXHIBITORS WANTED FOR 1987 JOINT SSAR-HL MEETING

The local committee for the 1987 SSAR-HL meeting in Veracruz, Mexico is in the process of contacting possible exhibitors for the meeting. Any individual or organization is welcome to display herpetologically-oriented material (except live animals). The following information may be useful to potential exhibitors.

Registrants: Biologists, college professors, zoo and museum personnel, state and federal wildlife officials, graduate students in biology and serious lay persons with interests in amphibians and reptiles.

Previous exhibitors: Publishers, used-book companies, biological supply companies, manufacturers of animal collecting and housing equipment, artists (with animal themes), tee-shirt sellers, and travel services.

Cost: $125 for each table (approx. 4x6 feet). Artists who sell materials created by themselves will be charged $125 or the equivalent in donated arts or crafts; such persons are expected to be actively engaged in their work at the exhibit area.

Colleagues in Mexico, Central and South America are urged to recruit exhibitors from their areas. Displays of native arts and crafts with herpetological themes would be particularly welcomed.

Exhibitors (or commercial organizations which will not have exhibits at the meeting) are also invited to place advertisements in the meeting program booklet. Full page, copy ready ads will cost $125; smaller ads will cost proportionately less.

For exhibit applications or further information, contact:

Ruth Zantzinger
2108 Cherry Street
Philadelphia, Pennsylvania 19103, USA
(215) 557-0182 ●

THANKS TO REVIEWERS

The editor would like to acknowledge the following individuals who reviewed manuscripts for *HR* during the past year. Their service to the Society is greatly appreciated.

Ray Ashton
Ralph W. Axtell
George Balazs
Susan Barnard
James F. Berry
Charles C. Carpenter
Archie Carr
Ellen Censky
Joseph T. Collins
Harold Dundee
Carl Ernst
Martin Feder
Gary Ferguson
John Ferner
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Interested parties are encouraged to contact the Managing Editor. Donations to the society are tax deductible.

*High Tech ●

SSAR GRANTS-IN-HERPETOLOGY — 1987

The Society for the Study of Amphibians and Reptiles announces that proposals are now being accepted for the 1987 Grants-in-Herpetology Program. This program is designed to provide financial support to deserving individuals or organizations engaged in research on or conservation of amphibians and reptiles. In contrast to previous years in which awards were offered in several categories, awards in 1987 will be made only for graduate research projects. This restriction is due to lack of funds for this program. Other categories of awards will be re-instituted in future years if sufficient funds are available. All applicants must be members of the SSAR and are limited to the submission of one proposal per year. Two awards will be made in the Graduate Student Research in Herpetology category in 1987.

GRADUATE STUDENT RESEARCH IN HERPETOLOGY. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only. Applications must be accompanied by a letter of support from the student's major advisor or committee chairperson.

Each proposal must include the following elements: A) ABSTRACT; B) BACKGROUND AND OBJECTIVES of the proposed project, in terms of its relevance to herpetology; C) METHODS of carrying out the research or conducting the project; D) ITEMIZED BUDGET for the project which should not exceed $430; E) CURRICULUM VITAE for the applicant; and F) LETTER OF SUPPORT. The proposal must be typed, double spaced, and must not exceed five pages excluding cover page, abstract, bibliography, budget, and curriculum vitae.

All proposals must be submitted in duplicate and postmarked no later than 1 MARCH 1987. Failure to meet the deadline or to follow the guidelines may result in elimination of the proposal from consideration. The awards will be announced by 15 April 1987. Submit proposals to:

Thomas H. Fritts, Chair
SSAR Grants-in-Herpetology Committee
U.S. Fish and Wildlife Service
Department of Biology
University of New Mexico
Albuquerque, New Mexico 87131, USA

Successful applicants will be expected to submit to the SSAR a written report of their research or project results within a reasonable time after the project year is completed. They are also encouraged to submit the results of their work for publication in the *Journal of Herpetology* or *Herpetological Review*.

Financial contributions by SSAR members, institutions, and other interested benefactors can increase the number of awards in this program. Your tax-deductible contribution to this program will be appreciated by the Society and will directly benefit meritorious research. Contact the President of SSAR for additional information on contributing to the Grants-in-Herpetology Program. If you are employed by an organization which will match donations made to nonprofit educational organizations, please notify your employer that you have made a donation to the Grants-in-Herpetology Program. ●

HR DEADLINES

Contributors of Newsnotes, Regional Society activities, Meeting notices and other dated material to ***HR*** please note: Deadlines for receipt of such material for the March, June, September and December issues are 1 January, 1 April, 1 July and 1 October, for the respective issues. ●

NEWSNOTES

SMITHSONIAN RESEARCH FELLOWSHIPS

The Smithsonian Institution announces its research fellowships for 1987-1988 in the fields of Social and Cultural History, History of Art, History of Science and Technology, Earth Sciences, Anthropology and Biological Sciences. In the biological sciences, fellowships will be awarded for studies in tropical biology, ecology, systematics, natural history, evolutionary biology, animal behavior and pathology, paleobiology, marine biology and environmental studies.

Fellowships are awarded to support independent research in residence at the Smithsonian in association with the research staff and using the Institution's resources. Stipend and tenure period vary for senior postdoctoral fellows, postdoctoral fellows, predoctoral fellows and graduate students and range up to $25,000 per year. Awards are based on merit. Applications are due 15 January 1987.

For further information, write to:
Smithsonian Institution
Office of Fellowships and Grants
Desk F
7300 L'Enfant Plaza
Washington, D.C. 20560, USA ●

GREEN TURTLE RESEARCH STATION

The Caribbean Conservation Corporation announces the availability of the Green Turtle Research Station to scientists and students desiring accommodations and support for field research on the northern Caribbean coast of Costa Rica. During July, August and September the Station serves as the field quarters for Dr. Archie Carr's research on the Atlantic green sea turtle *(Chelonia mydas mydas)*. With the employment of a full-time bilingual manager the CCC is able to keep the Station open the year round for research and field classes. The Station can accommodate up to 16 people in private dormitory rooms. Food is provided by a full-time cook in a communal dining room. Boats are available for groups and individuals.

For further information contact:
David Carr, Executive Director, CCC
P.O. Box 3942
Tallahassee, Florida 32315, USA ●

ECOLOGY/CONSERVATION FELLOWSHIPS

The MORTON B. RYERSON FELLOWSHIP is established through funds contributed by the Chicago Community Trust. Applications are being solicited for fellowships-in-residence to begin anytime in 1987.

Open to any student, with preference to graduate students, the fellowship awards a monthly stipend of $800, plus room, for any period from two to nine months. Fellows are granted full and private use of a comfortable four-room log cabin with kitchen, spectacularly situated amidst floodplain, hardwood forest on the banks of the DesPlaines River in the Edward L. Ryerson Conservation Area, managed by the Lake County Illinois Forest Preserve District.

Fellows will be expected to conduct independent field research on any topic relating to ecology and/or conservation in northern Illinois forests. Cooperation with a local interpretive nature center is encouraged, but the research project is paramount.

Applicants should send a two to three page proposal, a resume or CV, two letters of recommendation, and a proposed schedule of residency at the Ryerson Conservation Area.

Address application or requests for complete fellowship description to:
Dr. John W. Fitzpatrick
Chairman
Morton B. Ryerson Fellowship
Committee
Department of Zoology
Field Museum of Natural History
Roosevelt Road at Lake Shore Drive
Chicago, Illinois 60605, USA

Deadline for receipt of 1987 application is 1 February 1987. ●

LEGISLATIVE ALERT

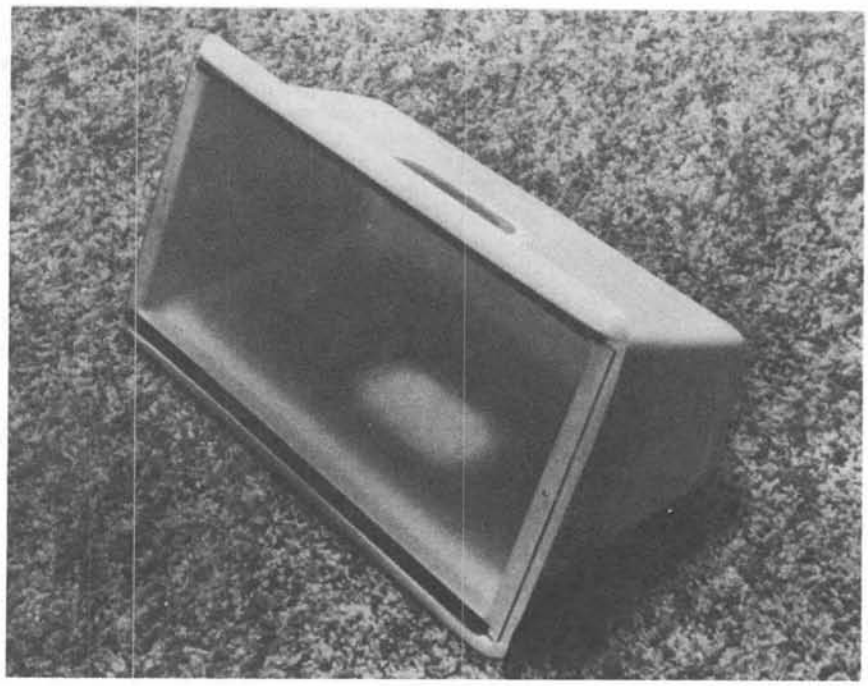
Proposed reclassification of ranched Nile crocodile populations in Zimbabwe from endangered to threatened by similarity of appearance. The U.S. Fish & Wildlife Service proposed (7 March 1986, FEDERAL REGISTER; comment period closed 10 July 1986) to reclassify ranched populations of *Crocodylus niloticus* under section 4 of the Endangered Species Act. At present, there are five crocodile ranches in Zimbabwe. Ranched specimens, after reclassification under CITES from Appendix I to Appendix II in 1983, may be traded commercially under export permit from the country of origin and the permit requirements of the U.S. Fish & Wildlife Service under the proposed designation of threatened by similarity of appearance. This proposed rule recognizes the improved status of the ranched populations and, if approved as a final rule, will allow regulated trade of live animals and whole skins as long as CITES requirements are met and the laws of Zimbabwe are followed. It will not change protection given to the wild population of *C. niloticus* in Zimbabwe and elsewhere in Africa —these are listed as endangered under the Endangered Species Act and will remain in Appendix I of CITES.

Proposed reclassification of the American alligator throughout the remainder of its range to threatened due to similarity of appearance. The U.S. Fish & Wildlife Service proposed (FEDERAL REGISTER, 2 June 1986; comment deadline 1 August 1986) to reclassify *Alligator mississippiensis* in the states of Alabama, Arkansas, Georgia, Mississippi, North Carolina, Oklahoma, and South Carolina from its present classification of endangered or threatened, to threatened due to similarity of appearance. This has already been finalized in Florida, Louisiana, and Texas. The proposed change is based on evidence that the species is no longer biologically endangered or threatened. According to the U.S. Fish & Wildlife Service, alligator populations in the seven affected states are relatively stable, reflecting improvements in management of alligators in recent years through the activities of federal agencies, states, and private groups. Reclassification would reduce restrictions on states for future management and research and would be a formal recognition by the Service that the American alligator is biologically secure throughout its range. A final rule would result in removal of federal agency responsibilities under section 7 of the Endangered Species Act. States would have the option of harvesting alligators, although any such taking will continue to be strictly regulated by the Service's special rule on all taking and commerce in American alligators and their parts, as well as by the Lacey Act which prohibits interstate commerce in illegally taken wildlife or their products. This proposed action, if implemented, would not be an irreversible commitment on the part of the Service. Relisting is possible if the status of the species changes or if states materially change their plans or actions in a way that may threaten the species.

Proposed listing of the Alabama red-bellied turtle as a federally threatened species. The U.S. Fish & Wildlife Service proposed (FEDERAL REGISTER 8 July 1986, comment deadline 8 September 1986) to list *Pseudemys alabamensis* as a threatened species under the Endangered Species Act. This species has a restricted distribution (lower Mobile River floodplain in Baldwin and Mobile Counties, Alabama) and nesting occurs in only one known area, a sand beach on a privately-owned island. The turtles' recruitment rate is declining due to human disturbances on the nesting grounds (e.g., by three-wheeled vehicles and other heavy human uses during the nesting season). The turtle has a small

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average clutch size (6 eggs) and specimens are being taken by headlights and dip nets for the pet trade and by trawling during winter for sale as food. Although more research is needed, federal listing of the Alabama red-bellied turtle will accomplish a coordinated effort to conserve this species not available by other means.

Proposed listing of the western population of the gopher tortoise as a federally threatened species. The U.S. Fish & Wildlife Service proposed (FEDERAL REGISTER 8 July 1986, comment deadline 8 September 1986) to list all populations of *Gopherus polyphemus* occurring in Alabama west of the Tombigbee and Mobile Rivers, in Mississippi, and in Louisiana, as threatened under the Endangered Species Act. In this portion of the species' range, the historic habitat has been reduced by more than 80% and adverse forest management practices continue to threaten the tortoises' habitat, particularly on the ca. 70% of gopher tortoise habitat held in ownership by the forest industry and by private individuals. Females take approximately 20 years to reach maturity, and the mean clutch size is small (5.8 eggs/clutch). Documented human predation rates ("gopher pulling" and taking for pets) and road mortality may already be at a level that would offset annual recruitment. Population densities have declined by an estimated 67% in Alabama and 91% in Louisiana, according to a recent survey. Existing regulatory mechanisms (listed by Mississippi as an endangered species, considered a game animal in Alabama with no open season, recently protected within DeSoto National Forest by the U.S. Forest Service, and Lacey Act prohibitions against interstate commerce) are inadequate to assure protection of the western population of *G. polyphemus*. Federal listing of the gopher tortoise will accomplish a coordinated effort among federal, state, and private agencies to conserve the western populations of this species not available by other means.

Final rulemaking: determination of the Concho water snake to be a threatened species. The U.S. Fish & Wildlife Service (FEDERAL REGISTER 3 September 1986) has determined that *Nerodia harteri paucimaculata* is a threatened species under the authority of the Endangered Species Act. A final decision on the determination of critical habitat for the Concho water snake will be published in a separate notice by January 1988. Historically, the Concho water snake occurred over about 276 river miles of the Colorado and Concho Rivers in Texas. Now, it is distributed discontinuously over a reduced range of about 199 miles in ten counties of Texas. The known populations are currently vulnerable due to low numbers and the threat of further loss of habitat from dam impoundments and downstream effects from reservoir construction. Stacy Reservoir, on the Colorado River, is an additional reservoir planned within the remaining range of the Concho water snake. This proposed impoundment would inundate 32 miles of the Colorado River and 14 miles of the Concho River, or 35% of the proposed critical habitat for the species. An extensive but unknown amount of habitat downstream from the dam could also be affected, depending on the amount and timing of water releases from the reservoir. Overall, the Service estimates that 48% of the proposed critical habitat and 76% of the individual snakes that have been located occur within the area expected to be primarily affected by the construction and operation of Stacy Reservoir, as proposed. Federal listing of the Concho water snake will solidify the efforts of SSAR and other herpetological groups, as well as federal and state agencies, to assure the preservation of this species in the Concho and Colorado Rivers in Texas.

WILLIAM S. BROWN
Chairperson, Conservation Committee SSAR
Department of Biology
Skidmore College
Saratoga Springs, New York 12866, USA ●

MEETINGS

TURTLE SYMPOSIUM HELD IN VERACRUZ

On March 4-8, 1986, the third symposium of the Freshwater Turtle Ecology Group met at Estación de Biología Tropical "Los Tuxtlas" near Catemaco, Veracruz, Mexico. The meeting was coordinated by Richard C. Vogt, C. J. McCoy, and Oscar Flores Villela. Participants arrived from Brasil (1), Canada (1), Mexico (19), and USA (25). Thirty-four papers were presented along the general theme of Neotropical Freshwater Turtle Ecology in the following categories:

Ecology: Gustavo Aguirre Leon, R. Bruce Bury, J. Whitfield Gibbons, Dale Jackson, Ed Moll, Don Moll, David Morafka, Debra Moskowitz, and Salvador Morales V.
Systematics: James Berry, John Carr, John L. Iverson, Dale Jackson, John M. Legler, C. J. McCoy, Peter Meylan, Anders Rhodin, Michael Seidel, and Robert Webb.
Reproduction: James Berry, Justin Congdon, Oscar Flores Villela, and Joseph Mitchell.
Sex Determination: Ronald Brooks and Richard C. Vogt.
Genetics: John W. Bickham and Brian Hanks.
Morphology: Robert W. Winokur.
Embryology: Michael Ewert, Horacio Merchant L., Irma Villalpando, and Brulio Centerno.
Age Determination: George R. Zug.

In addition to the formal paper sessions evening informal slide presentations were held including: Turtles of Brasil, Herpetofauna of Los Tuxtlas, Turtles of India, My Favorite Turtle Shots. A field demonstration of radio telemetry used in conjunction with turtle dogs was also held in one of RCV's nearby study areas. A monograph volume is being prepared by 24 of the participants who have submitted titles.

RICHARD C. VOGT
Investigador Titular
Estación de Biología "Los Tuxtlas"
U.N.A.M.
Ap. Post. 94
San Andres Tuxtla, Veracruz, Mexico ●

GOPHER TORTOISE RELOCATION SYMPOSIUM

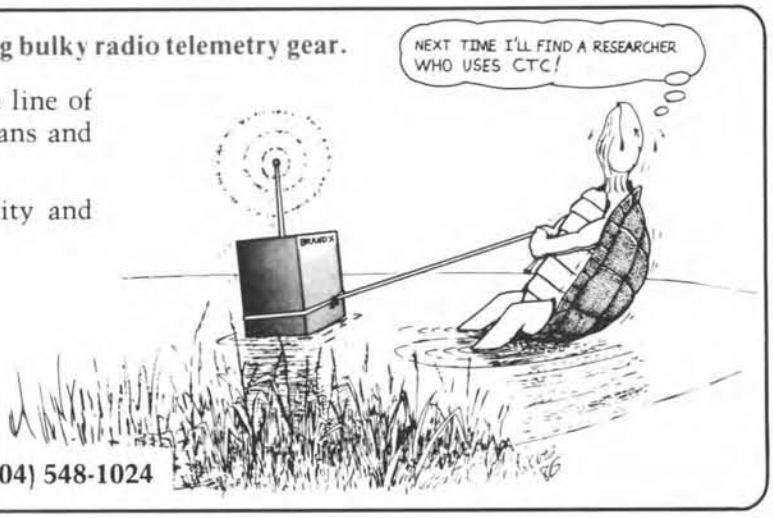
The Florida Game and Fresh Water Fish Commission, the Gopher Tortoise Council and the Florida State Museum will co-sponsor a symposium to evaluate the effectiveness of gopher tortoise *(Gopherus polyphemus)* relocation as a management technique and/or a mitigative measure in instances of conflict-

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ing land use objectives. The symposium will take place at Hume Auditorium, University of Florida, Gainesville, Florida on 27 June 1987.

The symposium is open to any and all who may be interested. This announcement also serves as a CALL FOR PAPERS. For further information contact:

Don A. Wood
Division of Wildlife
Florida Game and
Fresh Water Fish Commission
620 South Meridian
Tallahassee, Florida 32301, USA ●

FEATURES

IMPORTATION OF LIVE SNAKES AND SNAKE PRODUCTS INTO THE UNITED STATES, 1977-1983

During the course of preparing a review on the worldwide status of snakes (Dodd, in press), a significant amount of information on trade in both live snakes and snake parts and products into the United States, available only in unpublished or difficult to obtain U.S. government reports, was summarized. Limited space precluded publishing these data in the review, but inasmuch as the United States is a major consumer of wildlife products (King 1978) and since these data provide a valuable insight on what may be a serious threat to many species of snakes, it seemed desirable that such data be disseminated more widely than presently available.

To estimate the volume of legal trade, I summarized raw data contained in reports prepared by the Wildlife Permit Office of the U.S. Fish and Wildlife Service for the years 1977-1983. These data were assembled as part of the responsibility of the United States to monitor trade in species listed in the Appendices of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), specified by Article VIII, paragraph 6.

Commerical importation of species listed on Appendix I is generally banned, unless a reservation is taken in accordance with Article XXIII of the Convention, though such species may be imported for scientific research or other purposes by obtaining a permit issued by the importing and exporting countries. Commercial trade in Appendix II species is allowed if the exporting country issues appropriate permits, though national law may supercede the requirements of the Convention (CITES 1973).

RESULTS AND DISCUSSION

Between 1977 and 1983, 246,314 live specimens of 44 species listed on Appendices I and II were imported legally into the United States (Table 1). The vast majority were boids, which is not surprising since the entire family Boidae is listed in Appendix II. By far the most popular species was *Boa constrictor* from Central and South America. In general, the trade in most species neither increased nor decreased markedly during these years, with the exception of imports in 1979. In that year, there were very large numbers of boas *(B. constrictor)* and pythons *(Python molurus* and *P. reticulatus)* imported, making 1979 the year with the greatest total imports. After 1979, importation of these species decreased substantially.

The data on snake parts and products are difficult to assess and interpret. This is because skins may be imported or exported as pieces, finished products, or as whole skins. Sometimes shipments are recorded not in article counts, but in poundage, meter, or square meter lots. At the same time, species may or may not be correctly identified, shipments may include items produced from many different species, and species may be imported and reexported many times prior to final destination. It is not uncommon for shipping labels to indicate species being imported from locations halfway around the world from where they occur naturally.

To obtain an estimate of trade in such products, I tabulated statistics on the five most common CITES imported species, all of which were boids. These data show that a very large number of products from these species were brought legally into the United States between 1977 and 1983 (Table 2). Nearly 620,000 whole skins, 50 uncatalogued lots, 376,000 m, 17000 m^2, and 5600 kg of skins were imported during this time span. Since commercial breeding programs do not occur for any of these species, all specimens used to supply this trade must come from natural populations.

A formula for estimating how trade figures may be converted into the number of individual specimens needed to supply such trade is unknown and may be impossible to reliably develop for snakes. For instance, if one assumes the average commercial boa skin from South America to be 2.5 m (W. King, pers. comm.), then in 1983, the 89125 m of imported skins would translate into 35,650 individuals. Similarly, it would be possible to estimate how many skins would be needed to weigh one kg, or how many m^2 are found per average 2.5 m skin, and then extrapolate these figures to determine the number of individual snakes. However, it still would be difficult to obtain an overall estimate because of the lack of data on the number of skins required to manufacture each finished item. In addition, the sizes of unfinished leather goods and pieces are unknown, and many shipments contained uncatalogued lots which cannot be assessed.

The figures in Tables 1 and 2 represent legal trade since all required permits for both export and import, where necessary, were obtained prior to entry into the United States. For such importation, it is automatically

The World Congress of Herpetology announces the

FIRST WORLD CONGRESS OF HERPETOLOGY

11–19 September 1989
at the University of Kent, Canterbury (U.K.)

This international congress will be the first of a series occurring at regular intervals at venues around the world. Such a meeting will enable all persons interested in herpetology to meet and exchange information to promote the advance of knowledge and the conservation of the world's amphibians and reptiles. The congress will consist of topical symposia, poster sessions, plenary speakers, workshops, displays, excursions, and meetings of ancillary groups. Subjects and moderators of symposia will be announced well in advance so that potential participants can volunteer. The meeting will be open to all persons. Registration will begin 1 January 1988.

For further details and mail listing, write: Dr. Ian R. Swingland, World Congress of Herpetology, Rutherford College, University of Kent, Canterbury, Kent CT2 7NX, United Kingdom.

Sponsoring organizations and individuals are welcome. For further details write: Dr. Marinus S. Hoogmoed, Rijksmuseum van Natuurlijke Historie, Postbus 9517, 2300 RA Leiden, The Netherlands.

assumed that the exporting country has complied with CITES provisions by the mere issuance of a permit, unless there is substantial evidence that the export permits were not properly issued. It is readily apparent, however, that while the permits issued by some governments are technically legal, the intent of CITES as specified in Article IV, Paragraphs 2A and 3, may not be followed when export permits are issued.

CITES requires that prior to issuing an export certificate or permit for species (defined in Article I(a) to mean any species, subspecies, or geographically separate population thereof) taken commercially and listed on Appendix II, the Scientific Authority of the country involved must advise that such export "will not be detrimental to the survival of that species" (Paragraph 2A). Paragraph 3 further states "Whenever a Scientific Authority determines that the export of specimens of any such [Appendix II] species should be limited in order to maintain that species throughout its range at a level consistent with its role in the ecosystems in which it occurs and well above the level at which that species might become eligible for inclusion in Appendix I, the Scientific Authority shall advise the appropriate Management Authority of suitable measures to be taken to limit the grant of export permits for specimens of that species." Both statements imply that there should be some biological data on the status of species in trade prior to issuing export permits. In the case of many of the species in Table 1 and all of the species in Table 2, necessary biological data on which decisions can be made as to whether export may or may not adversely affect wild populations do not exist for any country.

The figures in Tables 1 and 2 also do not represent some of the more common species in trade and not listed by CITES during these years, such as the Indian rat snake, *Ptyas mucosus*. Hemley (1983) reported that for only two months in 1982, 4,849 skins and 98,006 products (direct imports) and 44,231 skins and 217,983 products (indirect imports) worth $3.2 million U.S. dollars of this one species were imported into the United States. In India, Inskipp (1981) reported that between

Table 1. Live snakes listed under CITES imported into the United States. ( ) indicate the number of additional shipments for which the number of snakes was not recorded.

Species	1977	1978	1979	1980	1981	1982	1983	Totals
Acrantophis dumerili					1			1
A. madagascariensis						12		12
Boidae		388	1557		57	2	2	2006
Aspidites melanocephalus						2		2
Boa constrictor	4571(9)	12202(40)	56707	19064	14805	4171	1613	113133(49)
Calabaria reinhardtii		3			7	68	6	84
Candoia sp.			2	3				5
Candoia aspera					9			9
Candoia bibroni			2					2
Chondropython viridis	112	132	712	276	8	2	4	1246
Clelia clelia					4			4
Corallus annulatus							3	3
C. caninus		6	6	29	130	102	277	550
C. enydris		268(3)	495	1078	1598		820	4259(3)
Epicrates sp.	147	200(1)	725	1		102	108	1283(1)
E. angulifer			2	4	1		8	15
E. cenchria		407(19)	2429	63	487	190	66	3642(19)
E. chrysogaster				2				2
E. exsul						4		4
E. fordi		(1)	19	60	99	58	161	397(1)
E. gracilis		(3)	11	19	93	54	112	289(3)
E. inornatus				5	4			9
E. striatus		(5)	72	650	1154	883	801	3560(5)
E. subflavus				4	4	1	6	15
Eryx colubrinus			781	18	53			852
E. conicus		399		131		1		531
E. jaculus				2			18	20
E. johni				209				209
Eunectes sp.		5	22	23				50
E. murinus		88	228	306	194	118	223	1157
E. notaeus	(25)	(2)			57	2	3	62(27)
Hydrodynastes gigas		(2)	1	4	42			47(2)
Liasis albertsii	32	53	11	12	4	6		118
L. childreni						2		2
L. mackloti	14	14				2		30
L. papuanus		20						20
Loxocemus bicolor							1	1
Morelia spilotes		4	7		5			16
Python sp.	100		1019	1	120		10	1250
P. amethistinus		6	80					86
P. curtus	62	572	215	161	129	180	73	1392
P. molurus	993	6681	17309	5487	3536	5590	5443	45039
P. regius	40	1552	3377	2987	2570	982	2646	14154
P. reticulatus	1924	9622	16978	5747	3942	4447	4744	47404
P. sebae	1	786	1136	334	257	200	51	2765
P. spilotus							1	1
P. timoriensis			42	4	2		1	49
Sanzinia madagascariensis					40			40
Tropidophis sp.			2	2		8	14	26
T. greenwayi							295	295
T. haetianus			2	15	26	24	99	166
Totals	7996(34)	33408(76)	103949	36701	29438	17213	17609	246314(110)

1971 and 1974, 118,585 raw snake skins (other than *Python*), and 1971 and 1975, 5,034,584 tanned snake skins were exported. Between 1976 and 1979, 3,075,664 individual skins plus 26,200 additional kilograms of tanned skins were exported. Most of these skins were *Ptyas* and were exported to Europe, Australia, and Japan. India has now banned commercial export of this species.

European countries and Japan (major importers), along with African, South American, and other Asian countries (major exporters), keep trade statistics of varying degrees of accuracy. Although not readily available, such statistics show high levels of trade both in the past and present. For instance, Bruno (1973) recorded 14,760 live colubrids and 51,210 viperids imported into Italy from 1968 to 1970 for commercial purposes. In India, Joseph (1982) reported illegal trade still accounts for several hundred thousand skins per year at the same time that protective legislation has significantly reduced legal trade. The level of trade worldwide in both legally and illegally traded specimens of live snakes and snake products must be enormous, but unfortunately is impossible to accurately quantify.

Until data on the biology and life histories of snake species in trade are forthcoming, the impact of commercial take on the status of species listed in CITES appendices will remain unknown. Considering that many heavily traded species, such as sea snakes, are not listed in CITES appendices, that the extent of illegal trade is certainly massive, and that the habitats of many of these snakes, particularly the larger boids, are being threatened by deforestation and other human-related activities, such trade figures are sobering and cause for concern.

ACKNOWLEDGMENTS

I thank Kevin Enge for assistance in reviewing the data and Susan Lawrence, Federal Wildlife Permit Office, for providing the unpublished 1983 U.S. CITES report. F. Wayne King and Richard Seigel provided valuable comments on the manuscript.

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C. KENNETH DODD, JR.
National Ecology Center
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Table 2. United States imports of snake products from the five species most heavily in trade and listed under provisions of CITES. ( ) indicate the number of additional shipments for which exact numbers were not recorded.

Species	Unfinished Products		Finished Products						Stuffed/ Preserved
	Skins	Leather	Belts	Briefcases	Handbags	Shoes	Wallets	Unspecified	Specimens
1977									
Boa constrictor	266(10)					444(7)			
Eunectes murinus						31.5(4)			
E. notaeus	108.5(16)		588			33.5			
Python molurus	1382 (1762 m)								
P. reticulatus	5505	1301				7114(5)			
1978									
Boa constrictor	9130(6)	147	4959		3773	9606	211		
Eunectes murinus	5070					3328			
E. notaeus	1750(11)				11257	2626			
Python molurus	674(5) (1000 m)		2802		2046	52549(3)			
P. reticulatus	17498 (618 m)	3284(1)			18	16898(6)			
1979									
Boa constrictor	11392		1473	24	2536(6)	33264	24	25(6)	
Eunectes murinus	802	45 (685 m²)	189		117	1864			
E. notaeus	1737(1)					624		(2)	
Python molurus	49057 (1000 m, 8594 m²)	1349 (638 m²)	700	205	3279(1)	35509	200	25(2)	
P. reticulatus	30158 (1000 m, 8594 m²)	1291	975	1	771(5)	29311(1)	2	5857(2)	
1980									
Boa constrictor	23572 (5116 m)	80 (99 m)	12855	368	6369	33066	232	1655	3
Eunectes murinus	16734 (2449 m)	2612 (1180 m)			110	3748			
E. notaeus	2446				735				
Python molurus	6941 (4367 m)	1925 (3152 m)	273	25	124	2109		200	
P. reticulatus	76726 (30990 m)	4047 (18699 m)	3458	4	3023	76567	512	4877	

Species	Unfinished Products		Finished Products						Stuffed/ Preserved
	Skins	Leather	Belts	Briefcases	Handbags	Shoes	Wallets	Unspecified	Specimens
1981									
Boa constrictor	54719 (8294 m)		41		3214	304189		28187	5
Eunectes murinus	20024 (20882 m)				52	25995		1505	
E. notaeus	880 (5148 m)				5	2226			
Python molurus	22263 (19819 m)		22		292	5402		277	1
P. reticulatus	116826 (93556 m)		76		5748	176204		23784	
1982[a]									
Boa constrictor	6847 (9847 m, 3282 kg)	123;161728						2	
Eunectes murinus	5496 (2834 m, 1141 kg)	0;22116							1
E. notaeus	13568 (15765 m)	0;1906(1)							
Python molurus	9665 (3234 m, 241 kg)	10;11424 (250 m)							
P. reticulatus	37425 (39186 m, 259 kg)	245;114711(1)						1(1)	
1983[a]									
Boa constrictor	6572 (89125 m)	1714;165843 (12 kg)							6
Eunectes murinus	21 (1239 m)	244;1172							
E. notaeus	6286 (3 m;41 kg)	12;1226							
Python molurus	5979 (2188 m)	431;34657							
P. reticulatus	51002(1) (16886 m, 42 m^2, 685 kg)	2624;241947						4	4
Totals	618625.5(50) (376308 m, 17230 m^2, 5647 kg)	778214 (3[b]) (23380 m, 12 kg)	28411	627	43469(12)	822308(26)	1181	66399(13)	20

a. For 1982 and 1983 data, small finished items (belts, handbags, watchbands, wallets, shoes and other misc. items) were lumped together, as were large items (incl. briefcases and garments). These data are provided in the "Leather" column with the first number the number of large items, the second the number of small items.
b. Large and small items lumped for 1982 and 1983 to provide the total.

RESUSCITATION OF A COMATOSE GREEN TURTLE

Fewer sea turtles would drown from incidental capture in shrimp trawls and other fishing gear if better resuscitation procedures were used. The current recommended practice is to hold a comatose turtle out of water in either a prone or supine position, and see if it revives over a period of 1 to 24 h. The turtle's posterior should be elevated if held prone. If placed on its back, the plastron should be periodically compressed ("pumped") by hand or foot (Hopkins and Richardson 1984). The actual manner in which these manipulations may foster resuscitation has not been described. Presumably they are aimed at ventilating the lungs, draining water from the respiratory passages and lungs, and promoting cardiovascular function. It is unknown what percentage of comatose turtles are revived, or what the survival rate of revived turtles is following release. From the high frequency of beach strandings adjacent to certain shrimp trawling areas, considerable mortality apparently takes place (Shoop and Ruckdeschel 1982), although it is not known whether attempts were made to resuscitate these turtles.

The resuscitation of a comatose green turtle, *Chelonia mydas*, at Johnston Atoll (lat. 16° 45'N, long. 169° 31'W) in November of 1983 provided a new perspective on the problem, and suggested the use of additional therapy. During a tagging study employing large mesh nets in algal foraging pastures, an entangled subadult green turtle (68 kg, 76 cm carapace length) became snagged on coral 2 m deep making it unable to surface. The seawater temperature was 27.5° C. The turtle was submerged for at least 30 min before emergency retrieval could be carried out from a small boat. When it was brought to the surface there were no signs of life except for contraction of the tail when extended manually. The turtle was placed on its back and the plastron pumped every 2-3 min for 1 h following rescue, but no resuscitation was evident. Upon close examination, it was determined that the movement of air caused by pressing on the plastron was only taking place into and out of the esophagus, and not the trachea. At all times the glottis, a longitudinal slit posterior to the tongue, remained tightly shut and

SNAKES: ECOLOGY AND EVOLUTIONARY BIOLOGY

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could only be opened by forcing a finger into it. When the finger was withdrawn, the glottis immediately returned to the closed position. To hold the glottis open and permit the passage of air, a 40-cm piece of 10 mm outside diameter, 7 mm inside diameter, plastic tube was inserted 2 cm. With the turtle prone, the lungs were then ventilated by gently blowing into the tube at irregular intervals over the next hour. No water drained out through the tube, although fluid apparently from the stomach came out of the mouth. After being seemingly lifeless for over 2 h, the turtle suddenly raised its head well into the air and took a deep breath. For the next 30 min distinct breaths gradually became more frequent and the tube was finally removed. Movement of the flippers also gradually resumed. The turtle was left prone for the next 11 h in a confined area. In the morning it was found active and appeared fully recovered. A large quantity (1.5 kg) of voided feces was present. When released, the turtle swam a short distance near the surface, took a breath, and dove out of sight in a normal manner.

Dead green turtles of various sizes which I have examined have all shown a closed glottis, like the comatose specimen reported here. This appears to be the normal state, serving to prevent the inhalation of seawater. The glottis appears to open only with the outward movement of the hyoid apparatus and gaping of the mouth to take a breath. Closure of the glottis in the green turtle, or any other sea turtle species, has not been previously mentioned in connection with resuscitation efforts. If the goal is to ventilate the lungs, then an open air passage must be established. The insertion of a small plastic tube is a simple and convenient way to meet this objective. In addition, since the lungs are located dorsally, under the carapace, the prone position for resuscitation would seem best to avoid compression from the heavy food-laden digestive tract and other organs.

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OBSERVATIONS ON LIVE *Azemiops feae*, FEA'S VIPER

Rare and poorly known even within its natural range of southern China and adjacent southeast Asia, *Azemiops feae* nevertheless occupies a strategic phylogenetic position within advanced snakes. The first specimen collected was in Burma by the European explorer M. L. Fea. This find was reported by Boulenger in 1888, who named the monotypic species in honor of Fea and allied the snake with *Atractaspis* and *Causus*. However, the most recent attempt to establish its phylogenetic relationship (Liem et al. 1971) concludes that *Azemiops* is a distant, but primitive evolutionary line within the Viperidae. Character comparison places it between the genera *Causus* on the one hand and *Agkistrodon* on the other (Marx and Rabb 1972). The implication that *Azemiops* was an early offshoot of the mainline of vipers gives it an important position within the radiation of viperids.

In China, *Azemiops* has been reported in the southern provinces—Yunnan, Guizhou, Sichuan, Guangxi, Fujian, Jiangxi, and Zhejiang (Zhao and Zhao 1981). To this range is added, of course, Burma (Boulenger 1888) and preserved specimens in the Museum National D'Histoire Naturelle (Paris) with collection locations of North Viet Nam and Tibet. To summarize Zhao and Zhao (1981), this species is montane (100-2000 m in altitude), seasonal (active 7 March to 24 November), and crepuscular; it is found at roadsides, along rice fields, in straw or grass, and even beside or within homes.

Over the last several years, we obtained living specimens from China that arrived in the United States in November. The actual field collectors have not released details, but the snakes were presumably caught in the wild shortly before shipment when the snakes would be preparing for hibernation. Observations of these living snakes, supplemented by preserved specimens, give a clarified picture of these very primitive vipers.

Azemiops feae goes by several common names: Fea's viper (after its discoverer), jade-belt snake (reference presumably to the broken ring pattern along its body), and white-headed viper (actually a misleading name). In life, the head of *Azemiops* is burnt orange to yellow, with a symmetrical pattern of dark rust colored spots. When preserved, this head color bleaches to white, the presumed source of its latter common name. The tongue is banded. The body is gray black. Beginning at the neck, the body is crossed by orange rings, one or two scales wide. These rings are often disconnected dorsally so that each side is slightly offset (Fig. 1). The rings do not continue across the belly. The belly is evenly cream colored with a slight pinkish tinge. Two (2) of fifteen (15) individuals had bobtails, cleanly healed, likely the result of a natural injury.

When threatened, all displayed a distinctive defensive behavior. Characteristically the body would be flattened and thus laterally widened; the usually oval head was reconfigured into more of a triangular shape by outward flaring of the back of the jaws (quadratomandibular joints). Some vibrated their tails rapidly. If intimidated at close range the snake would strike toward the threatening object with mouth open, sometimes erecting, other times not erecting the fangs. One vigorous strike reached over 18 cm in a snake 63 cm in total length. The disturbed *Azemiops* sought cover (e.g. hidebox) when available, or escape.

The only report of stomach contents is of a common gray shrew (Marx and Olechowski 1970). In captivity, we found all generally reluctant to feed. Those that did, usually ate (newborn mice) unseen overnight. The three observed predatory strikes were newborn

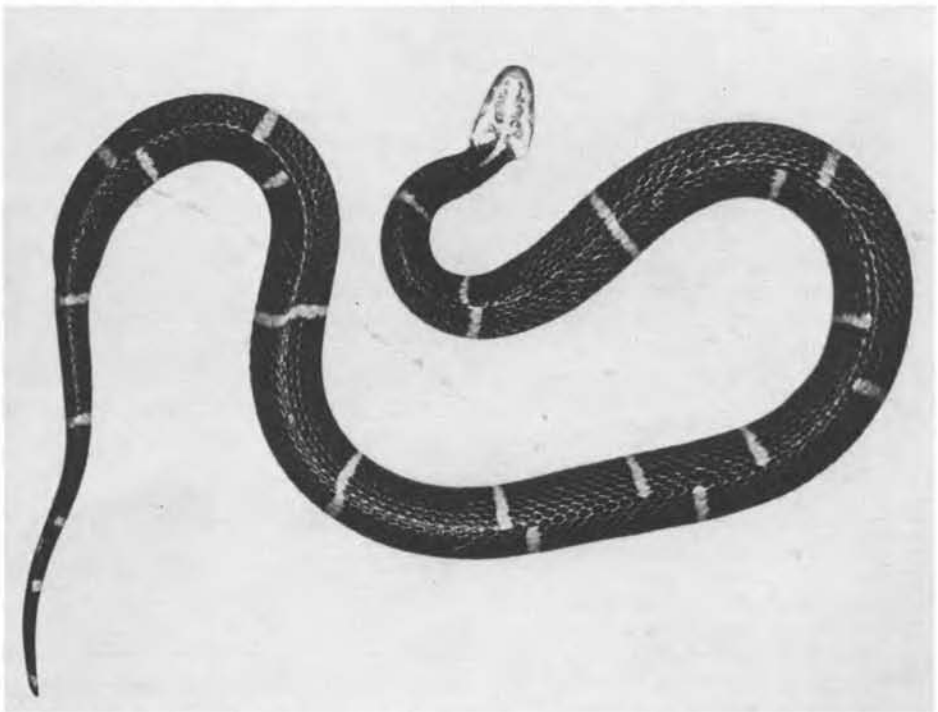


Figure 1. *Azemiops feae*, Fea's viper. In life the head is orange to golden with dark brown mottling or spots symmetrically placed. The body is gray-black, crossed by orange rings that may be continuous (e.g. first and third rings in neck) or broken (e.g. second and fourth rings). The pictured individual, a male, was 45.4/9.1 cm snout-vent/tail length respectively.

mice which were not released but held in the jaws. None showed an interest in small amphibians (*Rana pipiens, Ambystoma macrodactylum*), fish (guppies), or lizards (*Anolis*) although this could reflect a general loss of appetite prior to hibernation.

All live *Azemiops* were kept individually or in pairs in terraria with 2-3 cm of potting soil on the bottom, temperature gradients (15-33° C), hide boxes, and loose cover (paper). The light cycle was 12L/12D upon arrival but two weeks later reduced to 8L/16D I. Water was available ad libitum. Although they would push at the potting soil with their snouts, no burrowing activity was observed. Hide boxes within the cooler temperatures were preferred (15-20° C). Despite the continuous presence of water in shallow dishes, and observed occasional drinking, the snakes seemed especially susceptible to dehydration as evidenced by weight loss (up to 10% in 30 days in some).

Within five weeks of their arrival, histological examination (H & E, light microscopy) of the left ovaries of two females revealed three and five ovarian follicles, the largest approximately 1.5 x 8 mm. Neither ovaries nor reproductive tracts suggested oviparity or viviparity. One testis from each of five males was similarly examined. In all the males, the seminiferous tubules were up to three cell layers thick, lumina were conspicuous, and stages up to advanced spermatids and spermatozoa were present, although neither were numerous.

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METHOXYFLURANE ANESTHESIA IN *Crotalus:* COMPARISONS WITH OTHER GAS ANESTHETICS

Each anesthetic technique has its advantages and limitations. Most have been reported in veterinary journals, rather than in herpetological publications, and are unfamiliar to many herpetologists. Because of their veterinary orientation, most of these publications assume familiarity with anesthetic agents and access to gas anesthesia machines. This paper combines my observations on inhalation anesthetics in rattlesnakes with published studies and technical information on these agents. It is hoped that increased familiarity with anesthesia will promote nondestructive research methods in herpetology wherever feasible.

Three types of anesthesia have been employed with reptiles. Cold-induced narcosis is perhaps the oldest technique, but also the

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least useful, because restraint is generally short-lived. In addition, Northcutt and Butler (1974) reported necrotic changes in brain from such treatment. Injectable anesthetics have the disadvantage of dose-dependency. That is, it is necessary to know the weight of the snake before administering the anesthetic. Use of injectable agents is complicated by the fact that mammalian and avian doses are unpredictable in reptiles (Sedgwick 1980). Great differences in responses of different taxa to the same anesthetic have also been reported (Brazenor and Kaye 1953; Betz 1962). Thus one must have considerable experience with both the species and the anesthetic in question. For instance, Glenn et al. (1972) reported that the mass-proportional dose (mg/kg) of Ketamine HCl required to attain a given plane of anesthesia varies with the mass of the snake, large snakes requiring larger mass-proportional doses. Such variability presumably exists for other anesthetics. Because injectable anesthetics are usually processed by the liver and kidneys, toxicity problems may arise, particularly if there is pre-existing liver or kidney dysfunction. Lastly, injectable agents necessitate handling of unanesthetized specimens, which is precisely what some users of anesthetics wish to avoid.

In contrast to injectable agents, inhalable anesthetics are simple to use because they do not require calculation of mass-proportional doses. Depth of anesthesia may be judged by such criteria as loss of the righting reflex, absence of the tongue-withdrawal reflex, failure to respond to a tail pinch, and gradual loss of muscle tone. These agents may be administered in any closed cage or container with a transparent side, obviating handling of specimens prior to anesthesia. Since inhalable anesthetics are expelled primarily through the lungs, anesthesia may be readily reversed by tracheal intubation. Gas anesthetics injected i.p. in rats are metabolized at levels of 1.5-10% (Chenoweth 1965).

Four substances have been used as inhalable anesthetics: diethyl ether, chloroform, halothane, and methoxyflurane. Ether is undesirable because of its explosive nature. It is also ineffective against crotalid snakes. An adult *Crotalus v. viridis* that I placed in a concentrated ether atmosphere showed no signs of anesthesia after over two hours. Sedgwick (1980) reported similar difficulties. Chloroform may be used as an inexpensive terminal anesthetic for some applications, but is not generally recommended. Lumb and Jones (1984) report that chloroform is directly cardiotoxic, and that it decreases liver and kidney function. It may also act directly on blood vessel musculature as a vasodilator. The resultant drop in blood pressure can produce shock. Chloroform is also known to be hepatotoxic in humans and is suspected as a carcinogen; thus, its use involves safety hazards.

Despite their high potency (4x and 8x that of ether, respectively), halothane and methoxyflurane are both non-irritating to respiratory tissues, and have been recommended for reptilian anesthesia (Hackenbrock and Finster 1963; Gandal 1968). Nonetheless, they affect snakes quite differently. Despite the attractiveness of halothane's price and shorter induction time, it causes high mortality if anesthetic concentrations are not regulated with a gas anesthesia machine. Differences between the two agents will be discussed hereafter, along with a possible explanation for halothane's lethality.

METHODS

The principal advantages of methoxyflurane are its simplicity and consistency. Dosage is determined by duration of exposure to the anesthetic, not the volume employed, provided that concentrations adequate for induction are achieved. A wide-mouth, one-gallon mayonnaise jar or a closed, glass-fronted cage will suffice. Several mls of anesthetic are poured onto an absorbent in the container bottom and the specimen's behavior is observed to determine the initial depth of anesthesia. Snakes usually become hyperactive within one to three minutes after exposure to the anesthetic. This resembles an accelerated "searching" behavior. Although some specimens become somewhat violent, no injuries have been observed. This hyperactive phase is followed by an abrupt depression of activity. Complete inactivity occurs in *Crotalus* in 5-15 minutes. As the depth of anesthesia increases, specimens next lose their righting reflex. This is easily determined by turning the jar or cage. Respiration diminishes more or less concurrently with the righting reflex. Cessation of respiration is due to progressive paralysis of the skeletal musculature. When the tail-pinch reflex disappears the animal may be safely removed from the anesthetic. Most *Crotalus* require 15-25 minutes to reach this stage. Most snakes lose control of the posterior trunk and tail near the time respiration ceases and they regain control of these portions of the body first during re-emergence. After respiration stops, muscle tone gradually vanishes until the animal becomes flaccid. Ideally, anesthesia should be no deeper than that required by the procedure to be performed, to shorten recovery time. For major surgical procedures or extended morphological studies, the flaccid state is desirable, although respiration should be assisted during the procedure to mitigate acidosis. Anyone who has attempted measurements of body length on well-preserved large snakes will appreciate the ease and accuracy of this approach.

The snake's anesthetic plane may be determined by noting muscle tone. Oxygenation can be monitored by the color of oral mucous membranes. If the mouth begins to lose its normal pink color, a fire-polished glass tube is inserted into the glottis and the animal is inflated (to normal volume) by mouth and deflated by hand several times. This should be done every 5-10 minutes. Normal coloration returns immediately. At the end of surgical procedures or other manipulations of the animal, it should be ventilated until it is able to breathe on its own for ten or fifteen minutes.

DISCUSSION

Animals anesthetized with methoxyflurane emerge from anesthesia quite predictably. Muscle tone returns gradually and when activity resumes, it is subdued. With halothane, emergence is not predictable. On one occasion, I was making dorsal scale row counts on a large rattlesnake, when it suddenly surged forward, looking about and actively flicking its tongue. There had been no indication that recovery was imminent. This was not an isolated incident. Relapses following initial recovery are common with inhalable anesthetics. These have been attributed to warm temperatures or excessive activity during recovery, so that oxygen demand exceeds delivery capability (Brazenor and Kaye 1953).

Mortality of snakes associated with methoxyflurane has been reported only once. Burke and Wall (1970) attributed deaths of two *Naja* and one *Ophiophagus* to this anesthetic. I have had only two fatalities, despite over 150 uses on rattlesnakes and kingsnakes. Both were rattlesnakes that had been force-fed heavily under anesthesia. Neither was breathing when left to recover overnight and neither was manually ventilated to assist recovery. This was also true of the three cobras discussed by Burke and Wall (1970). Elapids may be hypersensitive to this agent, as has been reported for halothane (C. Gans, cited by Burke and Wall 1970); however, I suspect that the absence of any post-anesthetic care was the principal cause of the elapid deaths.

By contrast, halothane causes high mortality in *Crotalus* without careful regulation of anesthetic concentrations. Fatalities have also been reported in most domestic animals and in pronghorn antelope. This may be explained in part by the physical properties of halothane. A concentration of 2-4% is generally employed for induction, followed by a maintenance concentration of 0.8-1.2% (Lumb and Jones 1984). At 20° C, however, halothane vaporizes to about 32%, roughly 10-fold higher than the proper induction level and 40 times higher than safe maintenance levels. By contrast, methoxyflurane, which requires comparable induction concentrations, vaporizes to only 3.5%. This makes initial overdosing difficult.

Snakes that fail to emerge from halothane anesthesia suffer massive pulmonary edema. Five to ten mls of plasma may be poured out of such snakes (80-100 cm long). In reptiles pulmonary arterial pressures are similar to systemic arterial pressures (Burggren 1977, 1982) and may exceed mammalian values by 5-fold. Colloid osmotic pressure, which counterbalances plasma filtration into non-vascular spaces, is lower in reptiles than in mammals. Blood plasma loss is 10 to 20-fold greater in turtle lungs than in mammalian lungs. Whether this fluid is identical to blood plasma drawn directly from blood vessels is not known. Vessel walls present a partial barrier to blood proteins, but reptilian blood vessels are evidently less able to restrict protein leakage than those of mammals (W. W. Burggren pers. comm.). In *Chrysemys scripta* net plasma loss amounts to 20-30% (Burggren 1982). Preliminary observations suggest that snake arterial pressures and pulmonary "leakiness" are similar to those in *Chrysemys* (W. W. Burggren pers. comm.). Lumb and Jones (1984) report that halothane produces hypotension amounting to a decline of 20-40 mm Hg in dogs. Burggren (pers. comm.) has observed increased blood pressure in reptiles anesthetized with halothane, and it seems likely that increased blood viscosity resulting from plasma loss accounts for the hyperten-

sion in reptiles.

Whether pulmonary plasma loss was the sole cause of the rattlesnake deaths I observed is not clear. Halothane apparently acts upon the vagus nerve to cause bradycardia (Lumb and Jones 1984), which increases with the depth of anesthesia. Deutsch (1971) reported that halothane causes direct myocardial depression. Halothane also sensitizes the myocardium to arrhythmias induced by catecholamines. It is possible that increased blood viscosity resulting from pulmonary plasma leakage exacerbates halothane-induced bradycardia to cause cardiac arrest. Whether halothane acts directly on pulmonary blood vessels to increase their plasma permeability is not clear, but given the lengths of time that snakes can be anesthetized without breathing, cardiac failure seems a more likely cause of death than fluid interference with oxygen transfer.

The methoxyflurane procedure outlined above has also been successfully employed for obtaining liver biopsies from sceloporine lizards (P. Thompson and J. W. Sites pers. comm.). After recovery from surgery these lizards were marked and released at their capture localities. Preliminary recapture data did not indicate increased mortality resulting from the anesthesia-biopsy procedure.

Animals should not be released until well recovered from anesthesia because of possible relapses and because of temporary residual effects that might result in increased predation. Residual effects are possible, in part, because of methoxyflurane's high fat solubility. It is exhaled by mammals in detectable quantities up to 48 hours post-surgery (Lumb and Jones 1984).

In contrast to ether, chloroform and halothane, methoxyflurane appears safe and effective for squamate reptiles, even under conditions where anesthetic concentrations are not controlled. It is especially safe when specimens are manually ventilated to accelerate their recovery.

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ANOMALOUS RECORDS OF THE OCCURRENCE OF *Paleosuchus trigonatus*

It has generally been considered that the distributions of *Paleosuchus trigonatus* and *P. palpebrosus* are largely coincident or that *P. trigonatus* occupies an "inner circle" and *P. palpebrosus* extends further on the perimeter of the distribution (Medem 1967, 1983). In sympatric areas one species is usually common and the other rare (Medem 1967, 1981, 1983). Surveys are lacking for many areas but the general distributions can be obtained by linking the peripheral localities given by Medem (1983) in a minimum convex polygon similar to that used in home range studies (Rose 1982). To avoid including large areas on the periphery that contained no records we included the condition that points should be joined only if separated by less than 1000 km (Fig. 1).

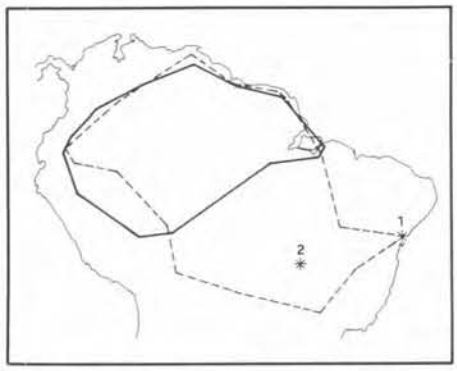


Figure 1. General distributions of *Paleosuchus trigonatus*, solid line; and *P. palpebrosus*, broken line. Asterisks represent anomalous outlying localities for *P. trigonatus*.

The two species are obviously largely sympatric over the Amazon basin, the southern part of the Orinoco basin and the coast between. However, with two exceptions, all localities south of the Amazon basin on the high plains of the Brazilian shield or on the coast are of *P. palpebrosus*. It is those two exceptions which will be discussed here.

The localities "Ciudad de Bahia" (Fig. 1, "1") and "Aruanã" (Fig. 1, "2") given by Medem (1983) are 1300 km apart and are 1300 and 1400 km, respectively, from the closest locality records for *P. trigonatus*. Neither locality supports the dense tropical forest with small blackwater streams which is typical of the greater part of the range of *P. trigonatus*.

"Ciudad de Bahia" (= Salvador) has been questioned as a locality for *P. trigonatus* before (Hoogmoed and Gruber 1983). Spix (1825) described *Jacaretinga moschifer* from "Ciudad de Bahia." Vaillant (1898) considered *Jacaretinga moschifer* to be a composite, the description based on *P. palpebrosus* but the figure based on *P. trigonatus*. Medem (1967, 1983) considered the figure to be based on *P. trigonatus* and so synonimized *J. moschifer* with *P. trigonatus*. Other localities nearby have *P. palpebrosus* and Medem (1967) considered it highly unlikely that the exact location at which Spix collected still supports crocodilians as it now forms part of the city of Salvador. We agree with Vaillant (1898) and Hoogmoed and Gruber (1983) that Spix's explicit mention of four rows of dorsal scutes between the hind legs indicates that *J. moschifer* is based on a *P. palpebrosus*. A confusing drawing is not sufficient evidence to consider that this locality is valid for *P. trigonatus*.

The locality record of Aruanã is based on a skull labelled "Aruanã" seen by Medem in the Parque Educativo Goiânia, in October 1973 (Medem 1983:159). One of us (MY) visited the Parque Educativo Goiânia (a zoo) in February 1985 and attempted to locate the skull. The director of the zoo said that all skulls exhibited at the zoo had been prepared by Prof. José Hidasi and that the material had been returned to him. Prof. Hidasi was unable to locate the skull in his collection and thought he may have donated it to someone. However, he said that material in his collection labelled Aruanã had come through the port of Aruanã but was not necessarily col-

lected there. Prof. Hidasi provided the following statement in a letter dated 30 August 1985 (translation from original in Portuguese):

> Attending the request of our colleague Dra. Megumi Yamakoshi I give my opinion about a skull of *Paleosuchus trigonatus*, mentioned in the book by Dr. Frederico Medem, entitled "Crocodilos da Amèrica do Sul."
>
> After examining our collections, I come to the conclusion that the skull mentioned possibly entered through the Port of Aruanã, as happened with many other animals and not that it was collected in Aruanã. It could have arrived there as easily from the Pantanal of Mato Grosso, as from regions of Belém-Pará.

The Pantanal of Mato Grosso represents the southernmost limit of the distribution of *Paleosuchus palpebrosus* and the region of Belém, Pará has many confirmed localities of *P. trigonatus* (Medem, 1983:158). Obviously the meaning of "Aruanã" on the label seen by Medem is too imprecise to be of any zoogeographic relevance. It is unfortunate that Dr. Medem did not meet Prof. Hidasi when he was in Goiânia.

We hope that much more collecting of crocodilians will be done on the high plains of the Brazilian shield and the area around Salvador, but until some evidence is obtained, zoogeographic hypotheses should be based on the assumption that *P. trigonatus* does not occur there.

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RITUALIZED COMBAT IN CAPTIVE DUMERIL'S MONITORS, *Varanus dumerili*

Ritualized combat has been reported in several species of varanids [*Varanus bengalensis* (Auffenberg 1981; Deraniyagala 1957), *V. salvator* (Honegger and Heusser 1969; Vogel 1979), *V. gilleni* (Murphy and Mitchell 1974; Carpenter et al. 1976), *V. giganteus* (Waite 1929)]. No accounts of ritualized combat in *V. dumerili* have been reported. This paper identifies the behavioral acts involved in male combat behavior of *V. dumerili* and describes the sequence of acts in typical encounters. Comparisons are made between the agonistic behavior of *V. dumerili* and that of other species of varanids.

Three males were acquired on 24 March 1982 and were initially housed together in a 1.9 m long cattle tank. One of the males died on 12 June 1983. An additional male and a female were acquired on 2 April 1983 and were housed separately in 93 cm long fiberglass Ranger cages. Measurements for the individuals involved in the observations are provided in Table 1.

The exhibit cage in which the behavioral observations were made measures 1.6 m x 1.6 m x 2.4 m high with a 137 cm x 150 cm glass front. A pool occupies ca. two-thirds of the floor with a simulated river bank on the sides and back ranging in height from 40 to 57 cm and in width from 25 to 53 cm. Tree limbs anchored at the rear extend to a height of 150 cm at the front of the exhibit, where two 250 watt infrared heat lamps provide a temperature of about 36° C on the perches during the day. The air temperature in the exhibit ranges from 25 to 29° C. Fluorescent bulbs provide light from 0600-1630 h, which is supplemented by light from skylights.

Table 1. Length and mass of *Varanus dumerili* involved in the behavioral observations.

Sex/No.	SVL (cm)	Total L (cm)	Mass (gm)
Male 1	44.5	105.0	1625
2	38.5	92.5	1260
3	42.0	91.8	1350
Female	40.0	89.2	1025

On 4 August 1983, the three males and the female were transferred to the exhibit. On 2 September 1983, male 2 was removed and on 6 September, the two remaining males were observed in agonistic behavior including a combat embrace. Male 3 was removed from the exhibit and housed separately, and thereafter all males were kept individually either on exhibit or in cattle tanks. The female remained in the exhibit cage during the entire period. Observations were made when a male was introduced to the female and an already present "resident" male or when two males were introduced to the female. The initial observation was not documented, but ten staged introductions were recorded in written form, supplemented by photographs and audio and video tape recordings. The introductions took place between 21 September 1983 and 17 November 1983. Observation periods averaged 13 minutes (4 to 35) and were terminated by the removal of one of the males when action waned or when there was concern for the health of one or both of the animals.

BEHAVIORAL INVENTORY

TONGUE FLICKING: rapid extension and retraction of the tongue
HEAD JERKING: rapid spasmodic lateral movement of the head
PROBING: pushing or nudging the other lizard with the snout
CLAWING: raking the dorsum of the other lizard with the claws of the forelimbs
INFLATING: dorso-ventral expansion of the body, increasing profile
TOPPING: climbing on top of the other lizard, either partially with the fore part of the body, or completely with the entire body
BITING: gripping with the teeth
TAIL TIP WAG: lateral movement of the tail tip
FLATTENING: dorso-ventral flattening of the body and pressing against the substrate, reducing profile. Eyes are sometimes closed
BOTTOMING: pushing under the other lizard's body, with head under vent and pelvic region under head
RETREAT: purposeful movement away from the other lizard
COMBAT EMBRACE: ventro-ventral clutching with forelimbs gripping other lizard's body. This can occur while both maintain a bipedal stance, or while lying on the substrate side by side or with one atop the other
SNOUT THRUST: pushing the opponent's throat while engaged in combat embrace
HEAD CROSSING: switching head from one shoulder of opponent to the other, performed repeatedly and simultaneously by both lizards

The following sequences of events in aggressive encounters were subjectively determined from the observations.

A male is placed in the exhibit with the female and another male. One of the males begins TONGUE FLICKING and HEAD JERKING and as he approaches the other male, the HEAD JERKING becomes more vigorous. He moves toward the posterior of his opponent, TONGUE FLICKING against the pelvic area, and then PROBES and/or BITES him on the legs or flank. These aggressive behaviors are usually accompanied by INFLATION and CLAWING of the dorsum by the aggressor. The aggressor then begins TOPPING with the other lizard twisting toward him and gripping him. They then rise up into a bipedal COMBAT EMBRACE (Fig. 1). While in the bipedal stance, both lizards push with the upper torso and employ HEAD CROSSING and SNOUT THRUSTING apparently in attempts to throw the other off balance. After a period of a few seconds to half a minute, one succeeds in toppling the other and both fall to the substrate, either side by side or with one in the superior position. They may regain the bipedal stance while still in the embrace, or

break apart and initiate another COMBAT EMBRACE. COMBAT EMBRACES occur repeatedly until one of the males tires and retreats. He may be followed by the other male with TOPPING and/or BITING. The animal in the inferior position FLATTENS, accompanied by TAIL TIP WAGGING. The sequence of retreat and pursuit may continue until one male is removed. In four of the ten staged encounters, both males exhibited aggressive behavior following the sequence above and escalated into combat embraces. In introductions where no ritualized combat was observed, one male typically reacted submissively at the onset and the interaction consisted of the dominant harassing the subordinate with TOPPING, CLAWING and BITING. The subordinate FLATTENED and TAIL TIP WAGGED while trying to escape.

Biting occurred in all of the introductions and on three occasions minor lacerations resulted. In two of the trials, the lizards had to be separated because it seemed that no resolution was developing and serious injuries were likely to occur.

Dominant and submissive lizards could generally be identified from the outset of an introduction and dominance did not clearly correlate with residency. In the six introductions involving a resident, the introduced animal was dominant twice. Size also did not appear to effect dominance. The mass difference between specimens 1 and 2 was substantial (Table 1) and yet the latter dominated in three of seven introductions. Dominance shifts occurred between males 1 and 2 over the course of the introductions but these shifts did not appear to be the result of a development within an interaction.

Although the female was in the exhibit with the males, no courtship behavior was observed. In one of the introductions, a male exhibited pelvic tonguing and subsequent topping of the female, but then continued to follow the introduced male he had been chasing. On another occasion, a male approached the female while excitedly pursuing the other male. The female reacted by flattening and defecating. The male then bit her, she retreated, and he resumed his pursuit. The female showed no interest in the males during or after any of the introductions.

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Figure 1. Two male *Varanus dumerili* engaged in a combat embrace while in a bipedal stance.

Ritualized combat involving a combat embrace has been reported in several species of varanids. Bipedal combat as seen in *V. dumerili* was described for *V. bengalensis* (Auffenberg 1981; Deraniyagala 1957), *V. salvator* (Honegger and Heusser 1969; Vogel 1979), and *V. giganteus* (Waite 1929). *Varanus gilleni* did not exhibit the bipedal stance, but instead engaged in a tetrapodal configuration during combat (Murphy and Mitchell 1974; Carpenter et al. 1976). Body arching while in a lateral embrace was seen in *V. gilleni* (Murphy and Mitchell 1974; Carpenter et al. 1976), *V. bengalensis* (Deraniyagala 1957; Auffenberg 1981) and *V. salvator* (Vogel 1979). Body arching was not observed in *V. dumerili*. The only behaviors observed in the present study not mentioned in previous reports were head crossing and bottoming. Head crossing was seen in all introductions in which bipedal combat embraces were observed. Bottoming occurred several times, but was only exhibited by male 2, and may have been an individual peculiarity.

Auffenberg (1981) suggests that the purpose of ritualized combat in varanids is to demonstrate superior strength by forcing the opponent's body down to the substrate, thus establishing dominance without inflicting injury. In addition, it appears that in most varanids, ritualized combat occurs between lizards which are nearly equal in size (Murphy and Mitchell 1974; Deraniyagala 1957), when fighting would most likely be prolonged and thus result in injuries. It is not surprising that when the males are well matched, combat is recurrent and dominance shifts occur (Auffenberg 1981; Murphy and Mitchell 1974).

The occurrence of damaging bites in *Varanus dumerili* seems to contradict the theory that ritualized combat reduces the chance of injury. However, it is quite probable that the serious biting resulted from an inability of the submissive animal to escape. When opponents were involved in vigorous combat, biting was nearly absent and the goal appeared to be to establish dominance by toppling an opponent and landing on top.

The motivation for male-male combat in *V. dumerili* is difficult to determine. In other varanids, access to females appears to be stimulus for male combat behavior but it does not seem to be a major determinant of reproductive success (Auffenberg 1981; Murphy and Mitchell 1974). In the present study and in the work of Murphy and Mitchell (1974), territorial defense did not appear to be the motivation for combat. Clearly, field studies are needed to determine why male varanids engage in ritualized combat.

ACKNOWLEDGMENTS

We would like to thank the staff of the National Zoological Park's Department of Herpetology for assistance with this study, and especially the curator, Dr. Dale L. Marcellini for reviewing the manuscript. We are also grateful for the typing done by Susan Lynch and Laurie Bingaman.

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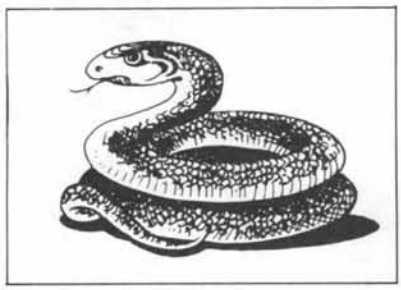
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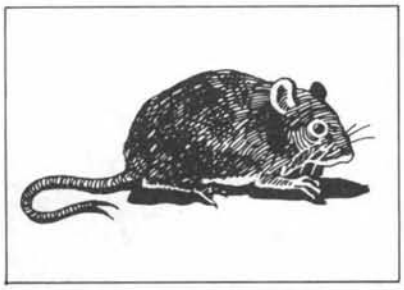
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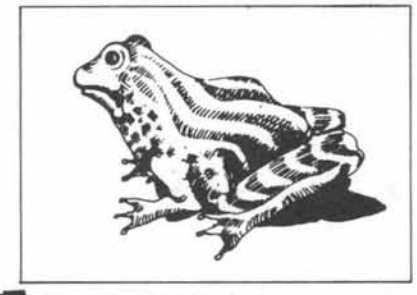
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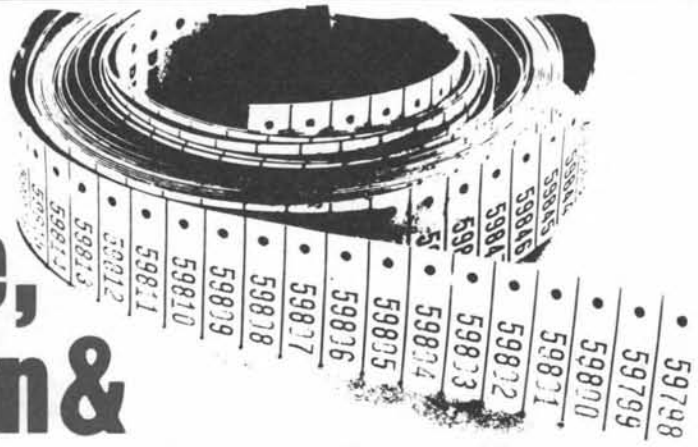
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ANESTHESIA OF SNAKES *(Pituophis melanoleucus* and *Python regius)* FED ETHER-KILLED RATS

It is preferable to feed captive snakes prekilled, rather than live, adult mice and rats. Live rodents are capable of injuring the snakes during the capture and killing of the prey (Kauffeld 1969). Rodents may be killed, stored frozen, and then thawed for use as snake food. I have found it expedient to use ether to kill large numbers of rodents for snake food. After etherizing, rodents are exposed to the air for several minutes before freezing in order to allow remaining traces of ether to vaporize. Snakes in my collection readily accepted these rodents, and I have used this method for eight years with no apparent problems.

On 20 September 1984, I was given several frozen rats for use as snake food. Two of these were thawed to feed a 152 cm *Pituophis melanoleucus sayi* (captive for 2.5 yr) and a 95 cm *Python regius* (captive for 1.5 yr). The thawed rats had a strong odor of ether, so they were not fed to the snakes until the fumes had dissipated. Both snakes readily ate the rats, the *Pituophis* at 1900 h, 23 September 1984, and the *Python* at 1000 h, 24 September. The rats had been thawed on the same days they were fed to the snakes.

The snakes, kept in cages at 27° C, were not disturbed for ca. 24 hr after feeding. When they were examined, both initially appeared dead. Heartbeats were eventually detected, and after extensive handling the snakes very slowly extended their tongues. Their breathing rates were slow but were not measured. Although the snakes appeared to be on a deep plane of anesthesia, both blocked attempts to force regurgitation by forming a kink in their bodies anterior to the food mass.

The snakes were comatose for approximately 60 h after feeding. They then began crawling with difficulty in response to manipulation. Neither snake responded to movements around their heads, nor did they respond to touches on their heads. Their pupils did contract in response to bright light. The snakes appeared fully recovered ca. 72 hr after feeding.

Evidently some ether remained on or in the rats fed to the snakes. Because the rats were not used until the ether fumes were undetectable, they likely had been killed with an excessive amount of the anesthetic, and had taken some into their digestive or respiratory tracts, where it could not vaporize. Although neither snake was permanently harmed by the experience, a fatal overdose could easily have occurred. To avoid this problem, I urge others to avoid using ether to kill food animals, or to lightly anesthetize them prior to killing by another method (e.g., dislocation of cervical vertebrae). Frozen and thawed food animals with a detectable ether odor should not be used to feed snakes.

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ANURA

DENDROBATES AURATUS (Poison Arrow Frog). **PREDATION.** On 23 February 1986, at 0845 h, on a small beach of River Dantas (called Nairi by the local Indian population), at the upper, northern border of the Barbilla Biological Reserve, el. 200 m, the senior author observed a *D. auratus* jumping into the river and attempting to swim upstream. In a few seconds, the frog was captured and swallowed whole by a young, ca. 20-25 cm long "machaca" or *Brycon guatemalensis* (Characidae), a common fish in this river.

B. guatemalensis is known to feed on fruits of *Ficus* spp. and others, which fall into the water from nearby trees (Hedstrom unpubl.). The same fruits have been found in *B. guatemalensis*, which in spite of its five rows of rather sharp teeth, and apparently aggressive behavior is not known to be carnivorous (W. Bussing, pers. comm.). Perhaps the fish mistook the frog for a fallen fruit.

Poison arrow frogs are bad swimmers. At Amubri, in southern Talamanca, Costa Rica, a *D. auratus* jumped into a pond and apparently was unable to return to the surface again. It looked as if it was about to "drown," when rescued by the junior author. However, during drier periods in the tropical wet forest, *D. auratus* has been observed to congregate in wet areas, i.e. near small streams (Myers and Daly 1976. Bull. Am. Mus. Nat. Hist. 157(3):175-262.

We thank Dr. W. Bussing and Dr. D. Robinson, at the University of Costa Rica, for identifying the fish species and comments on an earlier draft of the manuscript, respectively.

Submitted by **INGEMAR HEDSTROM,** Department of Zoology, Uppsala University, Box 561, S-751 22 Uppsala, Sweden (Present address: Faculty of Agronomy, Insect Museum, University of Costa Rica, San José, Costa Rica), and **FEDERICO BOLAÑOS,** Escuela de Biología, University of Costa Rica, San José, Costa Rica. ●

CAUDATA

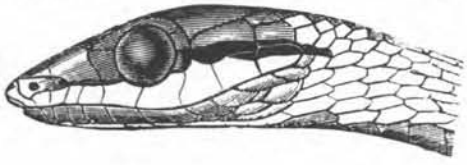
ENSATINA ESCHSCHOLTZII OREGONENSIS (Oregon ensatina). **REPRODUCTION.** A total of three natural nest sites for this subspecies has been reported from western Washington state [Norman and Norman 1980. Bull. Chicago Herp. Soc. 15:99-100; Jones and Aubry 1985. Herp. Review 16(1):26]. These reports describe nest site micro-habitat preference for western Washington populations of this subspecies in qualitative terms.

On 25 May 1986, the discovery of two further brooding females in logs near Woods Creek Rd., ca. 8 km N of Monroe, Snohomish Co., Washington, provided an opportunity to quantitatively compare the sites in terms of dimensions and situation. Overall qualitative situation was similar to that previously reported.

Data for nest site A is followed by respective data for nest site B after appropriate heading. Time of discovery: 1605 h; 1705 h. Depth in log: 6 cm; 4 cm. Height of nest from forest floor: 35 cm; 35 cm. Shortest distance from nest chamber to end of log: 20 cm; 135 cm. Length of decomposing log: ca. 5.9 meters; incalculable. Diameter of log: ca. 61 cm; ca. 61 cm. Greatest length of egg chamber: 10 cm; 5 cm. Greatest height in nest chamber: 3 cm; 2.5 cm. Greatest width of nest chamber: 3 cm; 4 cm. Number of eggs: 9; 8. Diameter of eggs: $\bar{X}$ 6 mm; $\bar{X}$ 5 mm. Greatest length of egg cluster: 19 mm; 16.5 mm. Width of egg cluster perpendicular to greatest length: 15 mm; 11 mm. Female SVL: 56 mm; 51 mm. Light conditions: shade; shade. Distance between nest sites: 29 m.

Contrary to earlier reports, specific examination of the egg clusters revealed no adherence to the substratum. One adult male and two juvenile *Ensatina*, all exhibiting characteristic coloration, were recorded at the same locality on 25 and 26 May 1986. *Plethodon vehiculum* was present in similar situations but never in the same log as *Ensatina* (N=8 logs). Voucher specimens are deposited in the James R. Slater Museum of Natural History, University of Puget Sound, Tacoma, WA.

Submitted by **BRADFORD R. NORMAN,** 21015 86th Ave. SE, Snohomish, Washington 98290, USA ●



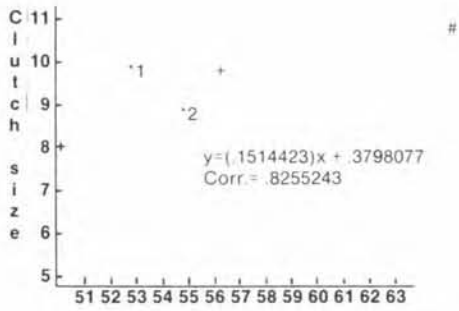


Figure 1. Linear regression of clutch size versus snout-to-vent length of brooding females for all known nest sites of *Ensatina eschscholtzii oregonensis* reported from western Washington. *=Norman field notes (1980); +=present report; #=Jones and Aubry (1985). 1=Discrepancy in clutch size between field notes and published report, lower value from field notes utilized for regression analysis. 2=A ninth egg retained in abdomen of female, not considered in regression.

SAURIA

LEIOCEPHALUS SCHREIBERSI (Curly-tailed Lizard). **TAIL AUTOTOMY.** Much literature has been devoted to tail autotomy in lizards as an adaptation for avoiding predation (Arnold 1984. J. Nat. Hist. 18:127-169; Bellairs and Bryant 1985. *In:* C. Gans and F. Billett (eds.), Biology of the Reptiles, Vol. 15, Development B. Pp. 301-410. John Wiley and Sons, New York.; Congdon et al. 1974. Science 1984:1379-1380; Daniels 1983. Herpetologica 39:162-165; Vitt 1983. Herpetologica 39:151-162). Because observations of predation in the field are rare, there has been considerable use of the frequency of regenerated tails in field populations as evidence for predation pressure. However, tail breaks really represent injuries of unknown origins and could result from conspecific fights as well as failed attempts of predators (Schoener 1979. Ecology 60:1110-1115; Schoener and Schoener 1980. Copeia 1980:839-850; Vitt et al. 1974. Copeia 1974:990-993; Tinkle and Ballinger 1972. Ecology 53:570-584). Still another source of tail autotomy, and one not commonly considered, is courtship. Where male-male fighting can explain tail breaks in males, courtship accidents are an alternative explanation to attempted predation as a cause for regenerated tails in females. The following anecdote illustrates how observed female tail breaks could be the result of courtship.

On 17 June 1985 at 1530 h on a beach 6 km south of Montrois, Haiti, we were conducting a population census of *Leiocephalus schreibersi* and saw a large male *L. schreibersi* make a quick dash of ca. 0.5 m and grab a retreating adult female by her tail. She struggled and her tail was severed. Approximately 2.5 cm of the tail segment lay wriggling vigorously on the ground as the male lunged and secured a neck hold on the female before she moved again. This was followed by copulation which lasted only several seconds. The male then released the female and performed several bouts of head bobbing as the female moved away. The tail, which was still undulating ca. 30 cm from the male, attracted his attention. The male moved over to the tail and ate it.

Submitted by **THOMAS A. JENSSEN,** Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061, USA and **DALE L. MARCELLINI,** National Zoological Park, Washington, D.C. 20008, USA ●

SERPENTES

CROTALUS LEPIDUS LEPIDUS (Mottled Rock Rattlesnake). **REPRODUCTION.** This subspecies has been known to have litter sizes of 2 to 8 offspring. On 18 July 1972 at Ojo de Agua at Pablillo, Nuevo Leon, Mexico a gravid female (SVL 520 mm) was collected by Ernest A. Liner, Richard M. Johnson and Allan H. Chaney. On 1 August 1972 she gave birth to 9 young. They measured 146-178 mm; $\bar{X}$ = 165.7 mm. The mother (EAL 3096) and the young (EAL 3293) were deposited in the private collection of Ernest A. Liner.

Submitted by **ERNEST A. LINER,** 310 Malibou Blvd., Houma, Louisiana 70364-2598, USA and **ALLAN H. CHANEY,** Department of Biology, Texas A & I University, Kingsville, Texas 78363, USA ●

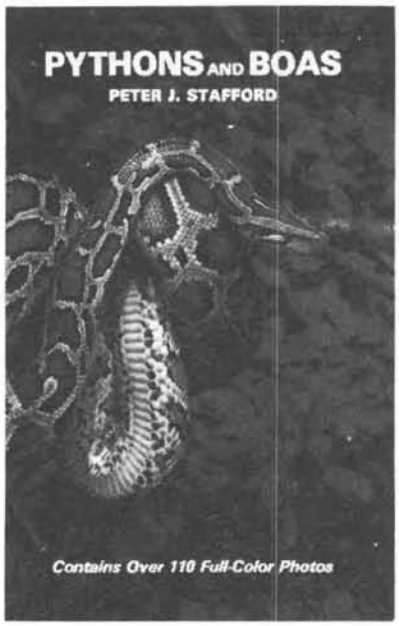
CROTALUS PRICEI MIQUIHUANUS (Miquihuanan Twin Spotted Rattlesnake). **REPRODUCTION.** Armstrong and Murphy (1979. Special Publ. 5, Univ. Kans. Mus. Nat. Hist., pp. 42-43) reported on the only two known litters (4 and 5) of this subspecies. On 20 July 1985 a gravid female (SVL 303 mm) was collected 1.8 km N Las Mimbres (by road) at jct. San Juan de Mimbres road, 2499 m, Nuevo Leon, Mexico by Ernest A. Liner and Allan H. Chaney. She died on 24 July 1985 before giving birth, but 6 full term young were removed by dissection. The four males ranged from 114 to 116 mm SVL, $\bar{X}$ = 115 mm. The two females ranged from 118 to 120 mm SVL, $\bar{X}$ = 119 mm. The mother is now cataloged as EAL 5021 and the young as EAL 5033 in the private collection of Ernest A. Liner.

Submitted by **ALLAN H. CHANEY,** Department of Biology, Texas A & I University, Kingsville, Texas 78363, USA and **ERNEST A. LINER,** 310 Malibou Blvd., Houma, Louisiana 70364-2598, USA ●

TESTUDINES

STERNOTHERUS MINOR (Loggerhead Musk Turtle). **SIZE.** On 18 March 1986 a large male *Sternotherus minor* was collected by Carlos D. Camp and David P. Keener on the east bank of the Ocmulgee River at the Georgia 16 bridge, Jasper Co., Georgia. Carapace length (CL) of the specimen was 144 mm while carapace width measured 99 mm. This specimen exceeds the maximum CL of both males (124 mm) and females (133 mm) examined by Iverson (1977. Copeia 1977(3):502-517) as well as the record for the species (135 mm) given by Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Cen-

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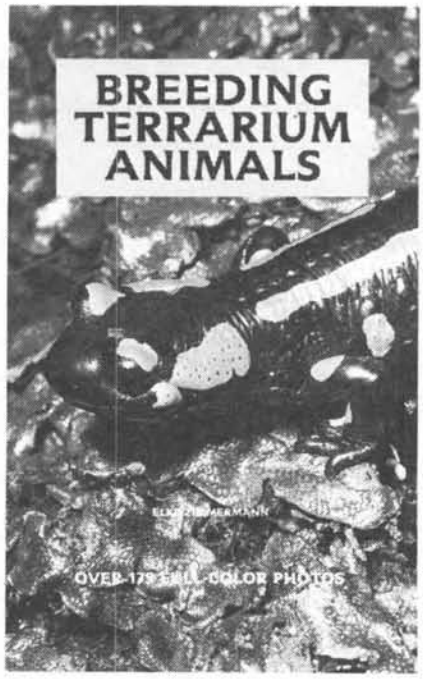
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tral North America. Houghton Mifflin Co., Boston). The specimen was deposited in the University of Georgia Museum of Natural History (UGMNH 20233).

Submitted by **CARLOS D. CAMP,** Biology Department, Piedmont College, Demorest, Georgia 30535, USA ●

TRIONYX SPINIFERUS (Spiny Softshell Turtle). **SIZE.** A possible record size for an undetermined subspecies of *Trionyx spiniferus* was exhibited by a female specimen captured 4 October 1985 in Ouachita Parish, Louisiana. The specimen, exhibiting a deep camouflage pattern on the carapace typical of old females, had a mass of 11.7 kg and possessed the following morphometry: carapace length = 54.0 cm, carapace width at widest point = 40.6 cm, plastron length = 36.2 cm and tail length = 22.2 cm. The female was taken in 5 ft of water by a 3 ft diameter hoop net in a paper plant impoundment, Wham Brake, located ca. 10 mi NE of Monroe, Louisiana off the south shoreline about 1 mi W of the spillway. Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston) listed the upper limit in carapace length for *T. spiniferus* as 18 in (46 cm); and Lagler (1943. Amer. Mid. Nat. 29:257-312.) mentioned "more than 16 in (40.6 cm)" as maximum size.

Subspecies designation was not assigned to the large female *Trionyx* because of physical changes associated with age, sex, and intergradation. In Mississippi, Arkansas, and Louisiana there are intergraded populations of *T. spiniferus* that have characteristics of the three subspecies, *harwegi, spiniferus,* and *aspera* (Carr 1952. Handbook of Turtles, Comstock, Ithaca.).

Submitted by **JOHN H. HALK,** Department of Biology, Northeast Louisiana University, Monroe, Louisiana 71209, USA ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

ANURA

BUFO DEBILIS DEBILIS (Eastern Green Toad). USA: TEXAS: Johnson Co: 14.5 km NE Glen Rose on County Rd. 1234, Ken Fry Ranch. 8 June 1986. C. T. McAllister. Arkansas State University Museum of Zoology (ASUMZ 5997). Somervell Co: 1.6 km SW Nemo off FM 199 on County Rd. 402. 22 and 29 June 1986. C. T. McAllister. (ASUMZ 6013-6014, 5970-5976). Both verified by S. E. Trauth. New county records, fill north-south distributional gaps in a four-county area (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2) and near eastern edge of species' range (Conant 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston xviii + 429 pp.).

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216 and **KENNETH L. FRY,** Star Route, Box 39A, Nemo, Texas 76070, USA. ●

GASTROPHRYNE OLIVACEA (Great Plains Narrowmouth Toad). USA: NEW MEXICO: Luna Co: 8.8 km E and 1.6 km S Hermanas. 27 June 1986. W. G. Degenhardt. Verified by W. G. Degenhardt. Museum of Southwestern Biology, The University of New Mexico (MSB 47045). New state record. Venter unmarked; dorsum grey with some spotting; femur and tibia spotted, but spots do not form a distinct bar when the limb is folded. Subspecies is problematic.

Submitted by **WILLIAM G. DEGENHARDT,** Museum of Southwestern Biology, Department of Biology, The University of New Mexico, Albuquerque, New Mexico 87131, USA. ●

HYLACTOPHRYNE AUGUSTI LATRANS (Eastern Barking Frog). USA: NEW MEXICO: Otero Co: New Mexico Hwy 506, 9.7 km N Texas state line, T25S-R18E-S34. 19 August 1985. A. H. Price. Verified by A. H. Price. New Mexico State University (NMSU 6545). New county record, extends range ca. 85 km west of Pecos River drainage across Guadalupe Mountains (Schmitt et al. 1985. Handbook of species endangered in New Mexico, AMPH/LE/HY/AU: 1-2. New Mexico Dept. of Game and Fish, Santa Fe). The species may occur relictually throughout the Otero Mesa, New Mexico and the Diablo Plateau, Texas. Collection supported by Contract No. 516.6-74-10, Endangered Species Program, New Mexico Dept. of Game and Fish.

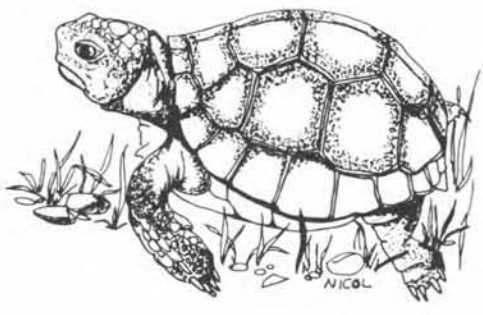
Submitted by **ANDREW H. PRICE,** Department of Biology, New Mexico State University, Las Cruces, New Mexico 88003. Present address: Texas Natural Heritage Program, General Land Office, Austin, Texas 78701, USA. ●

PSEUDACRIS STRECKERI STRECKERI (Strecker's Chorus Frog). USA: ARKANSAS: Sebastian Co: 5 km E Slaytonville. 25 March 1986. W. Fesperman. Verified by S. Fox. Oklahoma State University Museum of Zoology (OSUS A6323). New county record, extends range into mountainous section of Arkansas River Valley Region (Dowling 1957. Occas. Papers Univ. Arkansas Mus. 3, 51 pp.).

Submitted by **WILLIAM FESPERMAN,** Oklahoma State University, Department of Zoology, Stillwater, Oklahoma 74078, USA. ●

SCAPHIOPUS HOLBROOKII HOLBROOKII (Eastern Spadefoot). USA: OHIO: Washington Co: City of Belpre. 22-25 June 1986. J. Hill and S. Moody. Verified by D. Rice and S. Moody. Ohio University Vertebrate Collection (OUVC 8490-8493). New county record, third record for Ohio. (Green 1948. Copeia 1948(1):65). Extends range ca. 48 km E of Northernmost locality, Athens (Wasserman 1968. Cat. Amer. Amphib. Rept. 70.1-70.4).

Submitted by **SCOTT M. MOODY,** Department of Zoological and Biomedical Sciences, and Ohio University Vertebrate Collection, Ohio University, Athens, Ohio 45701, USA. ●



CAUDATA

AMBYSTOMA GRACILE (Northwestern Salamander). USA: ALASKA: Chichagof Island: Pelican (Lat. 57°57'N, Long. 136°13'W). Five adults collected (14/7/81, 6/1982, 6/1985, 9/1985) by residents and students of M. A. Davidson, PHS teacher. Verified by R. P. Hodge and M. A. Davidson. Tongass Historical Society Museum (THSM P32, 101, 102, P33). Extends range 437 km NW of May (Mary) Island (Hodge 1976. Amphibians and Reptiles of Alaska, the Yukon & Northwest Territories, Alaska Northwest Pub. Co., Anchorage xi + 89 pp.).

Submitted by **ROBERT PARKER HODGE,** c/o Tongass Historical Society Museum, 629 Dock Street, Ketchikan, Alaska 99901, USA. ●

HEMIDACTYLIUM SCUTATUM (Four-Toed Salamander). USA: ARKANSAS: Cleburne Co: 3.5 km W Concord (T12N R8W S19). 17 April 1984. T. Tharp. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 6020). New county record (Dellinger and Black 1938 Occ. Pap. Univ. Arkansas Mus. 1:1-47; Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51) first record for Ozark Mountain Region in Arkansas (Conant 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston xviii + 429 pp.).

Submitted by **STANLEY E. TRAUTH,** Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, and **RONALD S. CALDWELL,** Department of Biology, Austin Peay University, Clarksville, Tennessee 37044, USA. ●

TESTUDINES

CLEMMYS MUHLENBERGII (Bog Turtle). USA: TENNESSEE: Johnson Co: 2 km SW Shady Valley. 27 May 1986. D. W. Herman and J. L. Warner. Verified by D. W. Herman. Photographs deposited in North Carolina State Museum of Natural History (DWH 86.14). New state record. Seehorn (1982. Reptiles and Amphibians of the Southeastern National Forests. USDA Forest Service Southern Region. Atlanta, Georgia. i-iii + 85 pp.) mistakenly included Tennessee in the distribution of *C. muhlenbergii* without documentation. Extends range ca. 40 km NW Ashe Co., North Carolina (Herman 1986. SSAR Herp. Review 17(1):24) and 90 km SW Grayson Co., Virginia (Nemuras 1974. Virginia Wildl. June:7-9).

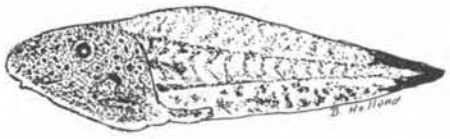
Maps and assistance provided by Paul Somers, Tennessee Department of Conservation. Field work supported by the Education and Conservation Committee, Atlanta Zoological Society.

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Zoo Atlanta, 800 Cherokee Ave. SE, Atlanta, Georgia 30315 and **JAMES L. WARNER,** 7 Gaylord Drive, Wilton, Connecticut 06897, USA. ●

SAURIA

CNEMIDOPHORUS GULARIS GULARIS (Texas Spotted Whiptail). USA: TEXAS: Andrews Co: 5.6 km NW Andrews on FM 1967, NW shore Shafter Lake. 5 August 1971. K. Kettle. Sul Ross State University (SRSU 2388). Irion Co: 6.4 km W Mertzon. 1 May 1977. R. Stapp. (SRSU 4359). Both verified by J. F. Scudday. New county records fill gaps in distribution between east central Lea County, New Mexico, and Martin, Reagan and Tom Green counties, Texas (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, USA and **JAMES F. SCUDDAY** and **MARK NELSON,** Department of Biology, Sul Ross State University, Alpine, Texas 79832, USA. ●



BOOK REVIEWS

Virginia's Amphibians and Reptiles, A Distributional Survey, by Franklin J. Tobey. 1985. Privately published by the Virginia Herpetological Survey. 114 pp.

This publication is the result of the primary activity of the Virginia Herpetological Society during the period 1958-1980 and, more than anything else, is a tribute to the untiring efforts of one amateur herpetologist, F. J. Tobey. Most of the publication presents the set of distribution maps for Virginia's amphibians and reptiles. Common and scientific names follow Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston). Each specific locality is represented by a black dot on county-outlined maps. There are two maps per page and each has several lines of text on distributional notes, historical records and literature notations. In addition, there are maps illustrating physiographic regions and major drainage patterns, and line drawings of the three venomous snake species. An index is included and is cross-referenced with Conant's field guide. The publication is 8½ x 11 inches in size. The only printing problems were slightly blurred pages (50, 59) in one of our copies, and some of the scientific names (in italics on the maps) printed lightly, although all can be read. The scientific name of *Thamnophis sauritus* is incorrect, but we found few typographical errors. The map for *Eurycea bislineata wilderae* is out of place.

We commend Tobey on the much needed compilation of a massive data base. He has taken great pains to seek out literature records from obscure sources. The historical information alone credits the work. In addition, Tobey has included an interesting, although somewhat rambling, discussion of the origins of attitudes toward amphibians and reptiles, sources and fate of introduced species, sources of the survey data, conservation, and the justification for preserved material. Much of this is useful advice, especially for the general reader.

One of our primary concerns is that the locality records are largely based on unverified lists of specimens from museum and university collections and that an undetermined number are based on unverified observations reported to Tobey via correspondence. Virtually all localities are represented by solid black dots, including literature and correspondence records. It would have been desirable to distinguish between verified and unverified sites. The problems generated by these procedures attest the need to verify (reidentify) specimens, at the very least at range margins, before localities are posted on distribution maps. Acceptance of unverified and unverifiable information is a dangerous practice.

The proper treatment of subspecies is a controversial point. Tobey has clarified his view by including as an appendix a note written by the late James A. Peters to the Virginia Herpetological Society in 1965. This note provides an excellent summary of the subspecies concept and points out the pitfalls encountered with attempts to apply a typological view. Yet, the maps of each subspecies are presented separately in the Virginia survey. This only reinforces misunderstandings of the subspecific taxon and, in our experience, proves confusing to many potential users of the survey. The succinct mention of a few localities with intergrades does little to clarify the misunderstanding.

Once the most important distributional problems are clarified (Mitchell and Pague, in press, Herp. Review), the maps in this publication can be considered reasonably accurate and useful. Despite the errors, F. J. Tobey and other VaHS workers are to be commended for the efforts they have put into this long-term project. The result certainly demonstrates the contribution an amateur herpetological society can make. These maps provide the basis for further elucidation of the ranges of these species in Virginia. In particular, amateur herpetologists now have the basis for determining where the distributional gaps are and can make contributions to our understanding of biogeographical patterns. Because these maps are the most comprehensive to date, they will also be useful to those studying distributional patterns on a national scale.

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HERPETOLOGICAL REVIEW EDITORIAL POLICY

The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (four issues per year), **Herpetological Review** (four issues per year), and occasional issues of **Facsimile Reprints in Herpetology.** Members may purchase other Society publications at reduced rates.

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Individuals are encouraged to join at the higher membership categories. Money from such support substantially helps promote the publications and services of the SSAR. For information about SSAR membership, write to:

Henri C. Seibert
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Ohio University
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Herpetological Review

Volume 17 September 1986 Number 3

SSAR BUSINESS

1987 ANNUAL MEETING

The 1987 SSAR/HL Annual Meeting will be held 9-15 August in Veracruz, Veracruz, Mexico. The Institute of Biology of the National Autonomous University of Mexico will be the host institution. The meeting site will be Hotel Mocambo, a large hotel with an informal atmosphere located 10 min from the airport on the south end of Veracruz, 200 m from the beach. There are eight other large hotels in the immediate vicinity as well as two camping/trailer parks within 2 km.

Besides the low prices, congenial atmosphere, excellent food, tropical refreshments, and tropical weather, there are numerous interesting ecosystems to *observe* herps in their natural habitats. Field trips are being planned to Mt. Orizaba, the swamps of Lerdo de Tejada, Estación de Biología Tropical "Los Tuxtlas," and Volcan Santa Martha. Family excursions will include the Mayan ruins of Tajín, San Juan de la Ulúa (prison of the Spanish Inquisitions), local museums, and tourist shopping. Local entertainers including, but not limited to, Marimba, Mariachis, and Salsa groups will perform nightly. Time permitting, there will also be paper sessions.

Discount air fares have been arranged. Contact Ray Ashton at Holbrook Travel, 3520 NW 13th Street, Gainesville, Florida 32609, phone 1-800-451-7111. Please specify to receptionist that you are making reservations for the SSAR/HL conference.

Richard C. Vogt and Gustavo Casas Andreu are co-chairpersons for the meeting.

RICHARD C. VOGT
Estación de Biología Tropical "Los Tuxtlos"
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Universidad Nacional Autonoma de Mexico
Apart. Post 94
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Revisions in US tax law may eliminate the deduction allowance for dues to unions and professional societies. Persons who itemize their return are encouraged to pre-pay annual dues in 1986 for up to the next three years, allowing the entire deduction to be taken on 1986 returns. ●

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Tax law revisions may eliminate deductions for dues to unions and professional societies. The SSAR Board has reinstituted the Life Member category, and persons who join as life members may take the full deduction in 1986.

Life membership cost is $550.00. While this amount may seem high, bear in mind that the cost of life memberships has always SEEMED high, but over the years life members have saved money and time. Life members are on record as life-time supporters of the Society.

Under 1986 tax law, payment of $550.00 will generate a refund of $148.50 for taxpayers in the 27% bracket. This may be the only way to realize this sort of return for years to come.

Rid yourself of the worries of dues increases, annual renewals, and possible loss of future deductions by selecting the Life Member category now. Your action now helps SSAR and gives you deductible expenses this year. ●

SSAR Grants-In-Herpetology, 1986

The Society for the Study of Amphibians and Reptiles is pleased to announce the awards made by the Grants-In-Herpetology Program for 1986.

GRADUATE STUDENT RESEARCH

Barry Sinervo, Department of Zoology, University of Washington, Seattle, Washington 98195, $430. "Thermal physiology of growth in field populations of Sceloporus lizards: genetic and environmental aspects."

John L. Carr, Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, $354. "Phylogenetic analysis of the Neotropical emydid genus *Rhinoclemmys.*"

HERPETOLOGY-ORIENTED CONSERVATION

Franz J. Kutka, Department of Animal Ecology, Iowa State University, Ames, Iowa 50011, $430. "The threat of habitat acidification to the Ambystomatid salamanders of Michigan."

FIELD WORK

Byron Wilson, Department of Zoology, University of Washington, Seattle, Washington 98195, $430. "A study of latitudinal patterns of mortality in ***Uta stansburiana.***"

No proposals were received from Regional Herpetological Societies and no award was made in the category of Herpetological Research in Zoos.

THOMAS H. FRITTS, CHAIR
SSAR Grants-In-Herpetology Committee ●

ANNUAL MEETING ABSTRACTS AVAILABLE

Several copies of the abstracts of papers presented at the 1986 SSAR/HL Annual Meeting are available for sale. Price to a US address is $5.00, postpaid. For non-US orders, add $1.75 (surface) or $4.50 (air). US funds only, please. Make checks payable to SSAR.

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SPONSORSHIP OF NON-U.S. MEMBERS

SSAR is expanding its sponsorship of non-U.S. members by requesting contributions to a fund established to defray the membership dueś of herpetologists in countries that face difficulties with exchange of foreign currency. We encourage your participation in this program. Please contact our Treasurer, Dr. Henri C. Seibert, if you can assist in the identification of colleagues who can benefit from this program. All contributions are tax deductible. ●

NEWSNOTES

ONTARIO HERPETOFAUNAL SUMMARY

The Ontario Herpetofaunal Summary is a volunteer project designed to gather and publish distributional and ecological data on Ontario amphibians and reptiles. Initiated in

1984, the Summary is now in its third year, with funding support from the World Wildlife Fund and Essex Region Conservation Authority. Contributors to the Summary are asked to fill in cards on sightings of amphibians and reptiles; these cards are available from the compilers. Plans are underway for a 5-year herpetofaunal atlas beginning in 1987. Such an atlas would map the distribution of the province's amphibians and reptiles by 10 km^2 squares for southern Ontario and 100 km^2 squares for northern Ontario.

Copies of sightings cards and the 1984 Ontario Herpetofaunal Summary are now available. The Summary is 214 pp. long, with 51 species accounts. Each account contains a distribution map, comments on the current and historic distributions, a list of sightings in each county, and a bibliography. The Summary may be ordered for $15 Canadian ($13 US) from:

Michael J. Oldham
Essex Region Conservation Authority
360 Fairview Avenue West
Essex, Ontario N8M 1Y6, Canada ●

CALL FOR PAPERS

All professional and amateur herpetologists are invited to submit for consideration the titles of papers they wish to present at the 11th Annual International Herpetological Symposium on Captive Propagation and Husbandry. The meeting will be held in Chicago, Illinois during June, 1987. Paper lengths should be 20-30 minutes. A brief Abstract of the proposed talk should be submitted to Sean McKeown within 30 days after receiving this issue of *Herpetological Review*.

Sean McKeown, IHS Program Chairman
Curator of Reptiles
Fresno Zoo
894 W. Belmont Avenue
Fresno, California 93728, USA
(209) 488-1096

Ray Pawley, IHS Program Co-chairman
Curator of Reptiles
Brookfield Zoological Park
3300 Golf Road
Brookfield, Illinois 60513, USA
(312) 242-2630 ●

HERPETOLOGICAL REPRINTS WANTED

The Alfonso L. Herrera Museum of the Faculty of Sciences at the Universidad Nacional Autónoma de México started a herpetological collection in 1979. We currently have some three thousand specimens. We are asking our colleagues to send us any publications they may have on herps, particularly if they relate to México and Central América. Please contact:

Oscar Flores Villela
Curator of Herpetology
Museo de Zoologia,
Facultad de Ciencias, UNAM
Apdo. Post. 70-399
México, D.F. 04516
México ●

INFORMATION REQUEST

We are seeking information regarding the biogeography of herpetofauna of Guerrero, Mexico, for our dissertations. We would appreciate hearing from private herpetologists or individuals at universities or museums who have collections from this area. Please contact:

Edmundo Perez Ramos
and
Lucía Saldaña De la Riva
Colección Herpetológica
Departamento de Zoología
Universidad Nacional Avtonoma
Apartado Postal 70-153
04510, México, D.F. ●

NON-RELEASABLE ANIMAL PLACEMENT PROGRAM

The Animal Rehabilitation Center, Inc. of Midlothian, Texas will be coordinating the mammal, reptile and amphibian sections of the San Francisco Zoological Society's Non-Releasable Animal Placement Program (NAPP). This program is a computer-based information system for non-releasable species of mammals, birds, reptiles and amphibians. Its purpose is to maintain a clearinghouse for wildlife professionals who deal with non-releasable, permanently injured or imprinted animals. It is designed for the placement of surplus animals into various programs throughout North America.

"Availability" or "Request" forms, or further information, may be obtained from:

Animal Rehabilitation Center, Inc.
449 Edgefield Lane
Midlothian, Texas 76065, USA ●

INDIAN TURTLE FIELD GUIDE

The World Wildlife Fund — India has available for sale "Indian Turtles — A Field Guide" by Indrancil Das. The volume is 119 pages, paperback, and has numerous b & w illustrations. It was printed in 1985. The cost is Rs. 35.00 plus postage from India. Write to:

World Wildlife Fund — India
Tata Centre
43 Chowringhee Road
Calcutta 700 071 INDIA

Edward Moll has several copies available in the US at $6 postpaid. Write to:

Edward Moll
Department of Zoology
Eastern Illinois University
Charleston, Illinois 61920, USA ●

WILDLIFE REHABILITATION GRANTS AND AWARDS

The National Wildlife Rehabilitators Association announces a small-grants program and the establishment of two awards. The grant makes funding available to support a single $1000 project or several smaller projects that total $1000 in the field of wildlife rehabilitation. Applicants must demonstrate financial need and submit a typewritten proposal that includes name(s) and resume of personnel involved, objectives of the project, a brief description of how the project will be carried out, a brief statement of the literature reviewed and an itemized budget. An annual report on progress is required.

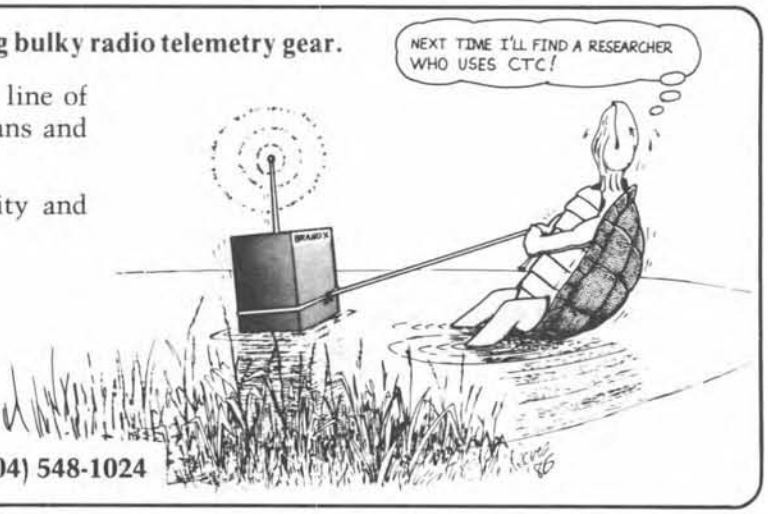
The awards include the Lifetime Achievement Award given to an individual whose primary identification is with rehabilitation of wildlife and who has contributed to this field in a major way for many years. The Signifi-

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cant Achievement Award is for a person who has contributed something of merit to the field in the last two years. The contribution may be a research finding, publication, organization of a program, etc., with a major theme in wildlife rehabilitation. Both awards consist of a plaque, $100, and free registration at the NWRA conference where the award will be presented. The deadline for submittal of proposals for the grant or nominations for the awards is December 1 of each year. They should be sent to:

Daniel R. Ludwig, Ph.D.
Awards and Grants Committee
Willowbrook Wildlife Haven
Willowbrook Forest Preserve
P.O. Box 2339
Glen Ellyn, Illinois 60138, USA
(312) 790-4900 Ext. 283 ●

JOINT ICHTHYOLOGY/ HERPETOLOGY TRIP TO THE AMAZON

Dr. Bob Stiles, ichthyologist at Samford University, and Dr. Ken Marion, herpetologist at the University of Alabama at Birmingham, will lead a joint seven-day ichthyology/herpetology field trip to the Peruvian Amazon. The departure date from Miami is January 11, 1987. A licensed 76-foot two-deck river boat, the M/V Margarita, will serve as the base of operations. The ship has bathroom facilities, a dining room and comfortable sleeping quarters.

Stops will be made at unique habitats on the River for the purposes of seining, observation, and herpetological journeys into the rain forest. The Margarita is equipped to hold fish. Appropriate arrangements for specimen collection can be made. The cost is $1695 all inclusive from Miami. For more information, contact Dr. Bob Stiles at (205) 870-2928 or Dr. Ken Marion at (205) 934-3582 as soon as possible. Other information can be provided by writing Ken Marion, Biology Department, UAB, Birmingham, Alabama 35294. ●

ASZ AND FIVE OTHER SOCIETIES TO MEET IN NASHVILLE, TENNESSEE

The 1986 Annual Meeting of the American Society of Zoologists with the American Microscopical Society, Animal Behavior Society, The Crustacean Society, International Association of Astacology, and the Society of Systematic Zoology will be held at the Opryland Hotel in Nashville, Tennessee during the traditional post-Christmas period, 27-30 December 1986.

Symposia presently scheduled are: (1) Energetics and Animal Behavior, (2) The Comparative Endocrinology of the Thyroid, (3) Phylogenetic Development of Self-Non-Self Recognition, (4) Cutaneous Exchange of Gases and Ions, (5) Nervous System Regeneration in the Invertebrates, (6) Habitat Selection and Evolution, (7) Philosophical and Theoretical Issues in Systematics, (8) Axial Movement Systems: Biomechanics and Neural Control, (9) Vertebrate Morphology: A Tribute to Milton Hildebrand, (10) History of American Marine Biology and Marine Biology Institutions, and (11) Science as a Way of Knowing—Developmental Biology.

The Division of Developmental and Cell Biology is presenting three special sessions: (1) Intercalation Mechanisms in Pattern Formation, (2) New Approaches to the Cell Biology of Limb Regeneration, and (3) The Role of Matrix in Development.

In addition, a workshop on *Applications of Histochemistry to Microscopy. II. Immunocytochemistry* will be offered by the American Microscopical Society.

The Genetics Association of America will sponsor the Wilhelmine E. Key Lecture by Dr. Bruce Wallace, titled, "Closing the Ring: Fifty Years of Genetic Load."

Meeting plans include several socials, special programs, commercial exhibits and a Job Placement Service. Housing and Registration deadlines are November 20. Forms are now available.

This meeting is hosted by Vanderbilt University, with Burton J. Bogitsh and Mafoi C. Bogitsh co-chairing the Local Arrangements Committee. For more information contact: Mary Adams-Wiley, Executive Officer, American Society of Zoologists, Box 2739 California Lutheran University, Thousand Oaks, California 91360, USA. (805) 492-3585. ●

IN MEMORIAM

COLEMAN J. GOIN, 1911 - 1986

Coleman Jett Goin was born in Gainesville, Florida on 25 February 1911. He received his academic training at the University of Florida (B.S., 1939; M.S., 1941; Ph.D., 1946), and joined the faculty of the Department of Biology there in 1942. In 1971 he retired as Emeritus Professor of Biological Science and moved to Flagstaff, Arizona, where he was associated with the Museum of Northern Arizona and Northern Arizona University. He remained in Flagstaff until his death on May 12, 1986.

Coleman Goin specialized in amphibians, and studied all aspects of amphibian biology, including behavior, systematics, and even fossils. He published prolifically on the amphibians of his native Florida, often in collaboration with his wife, Olive B. Goin, who is a trained biologist in her own right. The team of Goin and Goin is probably best known for their textbook "Introduction to Herpetology," now in its third edition (with co-author George R. Zug). Goin also worked on the amphibians of Jamaica and northern South America. His work on Neotropical frogs culminated in the massive "Frogs of Colombia" (1970), co-authored with Doris M. Cochran.

In addition to his herpetological research, and a full teaching schedule, Goin wrote a number of books, including the immensely popular textbook "Man and the Natural World" by Goin and Goin, the "New Field Book of Reptiles and Amphibians" (with Doris M. Cochran), and "Guide to the Reptiles, Amphibians, and Fresh-water Fishes of Florida" (with Archie Carr).

Coleman Goin, known to friends as "Coly," was a man of uncompromising personality. To those who, in his opinion, warranted criticism he was the most outspoken of critics. To those he befriended he was the most steadfast and loyal of friends. Herpetology is fortunate that his influence will continue to be felt through "Introduction to Herpetology."

C. J. McCOY
Carnegie Museum of Natural History
Pittsburgh, Pennsylvania 15213, USA ●

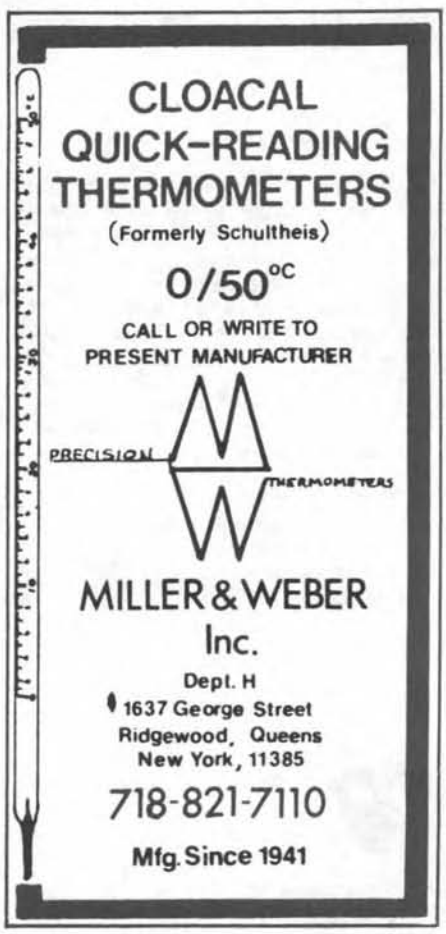
SOCIETIES

GAINESVILLE HERPETOLOGICAL SOCIETY

The Gainesville Herpetological Society was established in September 1985 and presents a forum of communication for anyone interested in herpetology. The Society promotes the scientific study and conservation of amphibians and reptiles worldwide. Regional education is emphasized but our activities address many herpetological subjects.

Dissemination of information is accomplished by monthly meetings and the Gainesville Herpetological Society Newsletter. The monthly meetings highlight guest speakers which have included Dr. W. Auffenberg, P. Moler, Dr. M. Crump, Dr. H. Lillywhite, Dr. E. Jacobson and Dr. L. H. S. Van Mierop. The Newsletter, published monthly, contains articles and comments on many herpetological subjects.

Activities during this first year have included public educational programs, excursions to state preserves, Silver Springs, Santa



Fe Community College Teaching Zoo and Jumbolair Ranch. The Society also acted as co-sponsor for the 9th Annual All Florida Herpetological Conference with the Florida State Museum.

The Society encourages liaison between members, the public and other herpetological societies to promote education for the welfare of amphibians and reptiles. With a current membership of over 100, combined with support from the distinguished herpetological community inherent in Gainesville, we fully expect to continue as a positive and productive Society.

Annual membership is $8 and correspondence may be directed to:

Gainesville Herpetological Society
P.O. Box 7104
Gainesville, Florida 32605, USA ●

ONTARIO HERPETOLOGICAL SOCIETY

The Ontario Herpetological Society is a non-profit organization dedicated to the education of its members and the general public in the conservation, captive husbandry and scientific knowledge of reptiles and amphibians. Membership is open to anyone with an interest in reptiles and amphibians whether or not they maintain a collection of these animals.

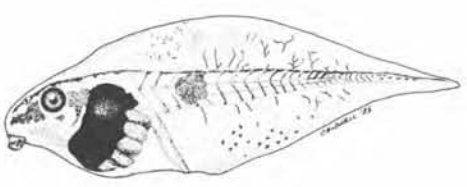
THE ONTARIO HERPETOLOGICAL SOCIETY NEWS is published quarterly. The newsletter contains original and reprinted articles in the field of herpetology as well as classified advertisements. THE JOURNAL OF THE ONTARIO HERPETOLOGICAL SOCIETY is published annually and contains longer and more specialized articles. Members are encouraged to submit articles for either publication.

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FEATURES

IN DEFENSE OF PRIVATE COLLECTIONS

Strongly negative viewpoints regarding private collections of preserved herpetological material have periodically been expressed in *Herpetological Review*. The Committee on Resources in Herpetology recommended unequivocally that "all specimens . . . should be deposited in institutional collections" (*HR* 6(2):34), and the Joint Herpetological Resource Committee, in the second list of museum acronyms (*HR* 11(4):93-102) omitted all private collections on the grounds that the important ones are ultimately deposited in recognized institutional collections, and because the Committee did not want to encourage the proliferation of non-institutional collections by affording recognition to those already in existence. Also, the preambular remarks to the Geographic Distribution section of *Herpetological Review* under the editorships of Joseph Collins and Ellen Censky include wording that *requires* identification of the place of deposition and catalog number of specimens on which range extensions are based, and *discourages* private collection depository records, although it is not entirely clear if it is the placement of specimens in private collections or the reporting of such placement — or both — that is being discouraged. However, exceptions have been made, e.g. the Ohio *Chelydra serpentina* or the California *Caretta caretta* (*HR* 12(1):15).

I largely share this philosophy, and would certainly not offer encouragement to the young, or to the less than dedicated, to start private collections of preserved reptiles and amphibians. However, private collections do exist. Some excellent ones were accumulated by some of the great names in herpetology (e.g. Arthur Loveridge and Laurence Klauber). Moreover, because collections of non-protected species cannot be outlawed in most countries, and because they sometimes include important specimens, nothing is gained by pretending that they do not exist. To argue that they need not be publicized because they will ultimately be incorporated into institutional collections is to condemn them to inaccessibility to other workers for decades, or even a lifetime. Moreover, I do not believe that private collections should be discouraged under all circumstances. I maintain a private collection within my own field of interest (turtles and tortoises) that currently includes 236 taxa and over 2000 specimens, and since the viewpoint in favor of such collections is not often heard, I would like to express some arguments giving qualified justification to the accumulation of private collections such as mine.

Common sense suggests that at least certain private collections are acceptable, or at least inoffensive. A young herpetologist may preserve and keep the remains of captive specimens that die, or a mature worker will often keep series of specimens he has collected and on which he is actually working, at least for the duration of his study. In the case of long-term or lifelong studies, such specimens will constitute an *ipso facto* private collection. Moreover, public collections have a finite capacity for specimens of common species, especially bulky or incomplete ones or those lacking collecting data, and they show an understandable lack of enthusiasm in accepting such material. An alternative to the discarding of such specimens is that they be kept by an individual who has an interest in them. So far so good.

Divergence of opinion starts when a private collection achieves a point of quantity or quality at which it has real scientific value and would be received gladly by an institution. It is perhaps harsh to expect owners of private collections to dispose of them just at the time the collection becomes significant, but objections to a collection remaining private are generally as follows:

a) Private collections may collectively constitute a demand for specimens of rare or local species that may threaten the population integrity or even survival of such forms.

b) Private collections may not be easily accessible, or even known, to other workers.

c) Private collections may be dispersed or discarded after the owner's death.

d) Holders of private collections may lack the time or resources to curate them properly.

These are legitimate concerns, but all are answerable.

a) It is not appropriate for holders of private collections to collect or sacrifice live specimens of rare species for their collections. My own philosophy, even more conservative, dictates that I only incorporate specimens that have not been sacrificed for this purpose, but that were found dead in the wild or that died in captivity. Specimens found dead and prepared into skeletons may be of greater scientific value than complete and mounted museum specimens, which have many critical features inaccessible.

Neither holotypes nor paratypes of any organism should be kept in private collections. However, specimens listed in the "hypodigm" of a new species may be housed in private collections if they are not part of the type series. Authors such as Cagle (1954) included in the hypodigm of new species individuals that were dissected and discarded, and even those that were seen but not captured.

b) Once a private collection achieves signif-

icant value, its existence should be publicized through appropriate media and, if possible, a catalog of specimens published or made available to other workers. Specimens should be available on loan to qualified individuals.

The question of publication of catalogs of museum holdings is a critical one for both private and public collections. Major museums (especially the BMNH) have a tradition of periodic publication of catalogs of holdings within a particular Order of vertebrates. These catalogs also include much taxonomic insight and sometimes revision, as well as important illustrations, and have value long after the specimen lists included are outdated. Lesser or regional collections are less appropriate for publication in this form of a combined catalog and taxonomic overview, and generally the holdings of such institutions are not publicized. Moreover, with the current plethora of museum collections with large and constantly expanding herpetological holdings, it would probably occupy an excessive proportion of publication budgets to publish comprehensive and constantly updated catalogs. A substitute means of promulgation of this information is clearly needed, and the recent efforts of J. Iverson (pers. comm.) to prepare a worldwide catalog of turtle specimens is to be applauded. Obviously, modern techniques employing computer terminals in each institution and a centralized data base hold great promise for facilitating the task of preparing complete lists of museum holdings, and efforts towards this are under way by the Association of Systematics Collections. Owners of private collections could cooperate by providing specimen lists to the curator of the institutional collection closest to them, or which has been identified as the permanent repository for the private collection in the future.

In my experience, it is incorrect to assume that all private collections are less accessible than all public collections. Owners of some important private collections deny access to other workers altogether, whilst others will even admit visitors at weekends or evenings, when public institutions are likely to be closed. Some institutional collections, although theoretically public, are fraught with idiosyncratic opening hours or access policies. In the extreme case, such collections may be only minimally public, being guarded jealously by curator/researchers who maintain them essentially as private collections subsidized with public money.

Most museum specimens in foreign countries are effectively inaccessible to workers without generous travel budgets. Mail service to many countries is so appalling that the average specimen would be unlikely to get home safely after a round trip through international mails. Thoughtful workers would not insist upon such a loan even if the institution were willing.

c) Owners of private collections do not typically keep them until death do them part, unless the owner should die young. Numerous circumstances — an unsympathetic spouse, space needed for a growing family or other reasons, changing interests, lack of time, or moving to a smaller residence or no longer having office space upon retirement, prompt owners of private collections to seek an institutional depository for them. It makes obvious sense for the ultimate recipient to be identified in the owner's will, although this perhaps should not be done too early in life since the owner may later make a career move to an institution that expects to incorporate his collection, and changes in the ultimate beneficiary, while obviously possible, can be awkward. Meanwhile, the intelligent strategy for curators of institutional collections is to adopt a friendly and cooperative attitude towards local owners of important private collections, on occasion perhaps providing them with supplies of preserving fluids or labels, urging them to draw up catalogs of specimens that can be kept on file at public institutions, and providing other forms of encouragement. The institution will eventually get the whole accumulation, at minimal expense to itself or the public purse.

The permanence of even public or institutional collections, incidentally, while earnestly to be sought, is not absolute. The major national collections in developed countries will presumably have a permanent existence, although World War II resulted in destruction of much important material in European collections, as well as the levelling of the Valetta (Malta) Museum and the total destruction of its display specimens (Brongersma and Carr 1983), but lesser collections, or those in politically unstable countries, can easily be closed down or just disappear, as was noted by Patterson (1936).

d) The curation of both public and private collections runs the gamut from meticulous to inadequate. There are rich and dedicated individuals and poor or sloppy institutions, and the reverse. Some university collections are well curated only so long as the individual who contributed most of the specimens remains on the faculty. Curation may subsequently lapse and it would have been better had the collection remained with the individual who assembled it.

It is possible that my personal collection to a degree reflects the same instincts that prompted me to collect stamps twenty years ago. However, it is also a necessity for a herpetologist with systematic and osteological interests, such as myself, who needs access to specimens and who does not live close to a major systematic collection. Whilst Oviedo, Florida, is not the depths of the Amazon, it is over 100 miles from the nearest major collection (the Florida State Museum), and it is not always convenient to make the journey there to check on a single specimen or a minor point. Moreover, just as non-directed browsing through books in a library sometimes yields treasures of information that could not have been obtained in a more systematic fashion (despite what the computer index enthusiasts may insist), so contemplation and handling of preserved and skeletal specimens may well result in new ideas, inspirations, or observations. Yet few public institutions, however well-intentioned, are able to accommodate significant numbers of visitors who just wish to "browse" in the research collections.

Nevertheless, I recommend that tenured and "settled" members of universities not become owners of major personal collections, since they can have them curated by the local university museum, with mutual benefits. Museum employees themselves would be in a conflict of interest situation with a home collection, unless they put a moratorium on new acquisitions at least for the duration of their employment. But an untenured or junior faculty employee who requires ongoing access to his own specimens may be excused for holding on to them. His next post may be thousands of miles away and he would naturally like to take them with him.

One advantage of a private collection is that the owner may conduct or authorize certain procedures, such as dissections, that are in general not permitted or are inappropriate for specimens in public collections. These may include permanent transfer of specimens to other collections. For example, during a visit from Dr. L. D. Brongersma some years ago, I learned that no European collection included a carapace of a mature Kemp's ridley *(Lepidochelys kempi)*. I was able to donate one to the Leiden collections on the spot from my own holdings of this species.

A collection of biological specimens does not typically include many items that could be considered "unique," with the limited exception of record-sized specimens. By this, I mean that the possession of a specimen by a private collector does not normally prevent a public collection from acquiring specimens that are functionally similar and just as useful. This may not be true in palaeontology or in collections of recently extinct organisms, but generally a private collection of biological specimens could be essentially duplicated by a public institution wishing to do so. Curiously, few raise objections to private art collections, even though an original sculpture or painting is truly unique, and private butterfly or shell collections are not considered offensive by most people even though they require sacrifice of sometimes rare specimens.

It is important to recognize more than one possible motive for depositing a specimen in any collection. One of these motives is that of providing a "voucher specimen" so that later workers can satisfy themselves that a specimen about which a certain morphological or distributional point was made in the literature was accurately identified (although of course it must be realized that a voucher specimen only allows one to confirm the identification of the specimen; one is still dependent upon the collector's word for the locality). Still, such voucher specimens belong in public institutions and serve little purpose in private collections. On the other hand, specimens kept primarily for studies of geographic variation (which need collecting data) or anatomy or morphology unrelated to geographic variation (when collecting data are less important) may reasonably be retained by a researcher if he can benefit from ongoing access to them.

Finally, private collectors, whether of stamps, shells, art, or turtles, often exhibit extraordinary zeal. With live turtles too, by far the most varied accumulations are in private hands rather than in zoos. The existence of private collectors thus adds greatly to the sum total of available material and, as mentioned above, patient and helpful curators of public institutions can expect to get it all in the end anyway.

I would welcome responses or opposing viewpoints.

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TECHNIQUES

A COMBINED HOOK FOR HANDLING SMALL VENOMOUS SNAKES

There are many devices for handling venomous snakes and all have a double function: To prevent the handler from being bitten and to avoid injury to the snake. Several satisfactory instruments for handling adult venomous snakes have been reported (Gillingham et al. 1983; Freed and Freed 1983; King and Duvall 1984; Fuhrman 1975). However, devices for handling juvenile or smaller species of venomous snakes have not been reported. This paper describes a new, combined hook that was developed for handling newborn and/or small-bodied venomous snakes under laboratory conditions.

The tool (Fig. 1) is constructed by modifying a steel fencing foil and consists of three main parts:

1. The "hook end": This part is flattened and curved so that it is easy to insert under the body for elevation of the specimen.

2. The "body": Behind the hook is a straight cylindrical section, covered with rubber tubing. This portion is used to gently press the snake's head onto the substrate before grasping by hand.

3. The "oar end": This part is flattened and resembles a small oar having a double-angled neck. Its function is to lift the snake's neck up between the fingers during the grasping process (Fig. 2). This is important because it is often difficult to pick up a small snake with the fingers.

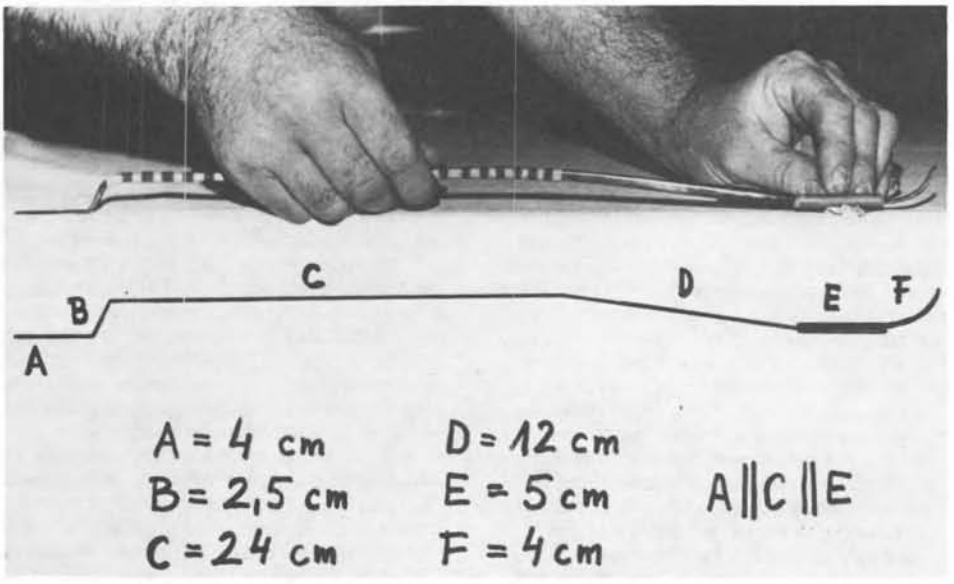


Figure 1. Overall view and dimensions of the snake hook. The snake's head is immobilized by pressing with part of the tool covered by rubber tubing.

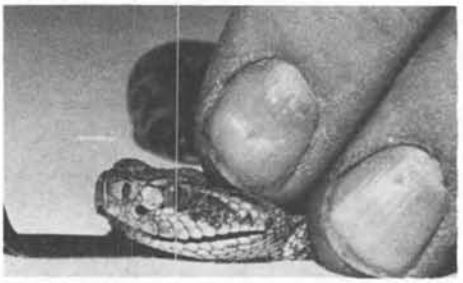


Figure 2. The oar end is slipped under the head-neck region of the snake, as the latter is pressed down between the fingers.

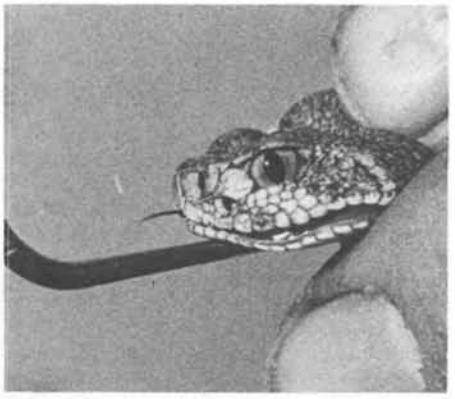


Figure 3. After slight release of pressure on the neck, the snake can be raised so a firmer grip can be applied on the neck and head.

After immobilizing the snake with the rubber-covered section, the "oar" is used to lift the head into a better position between the

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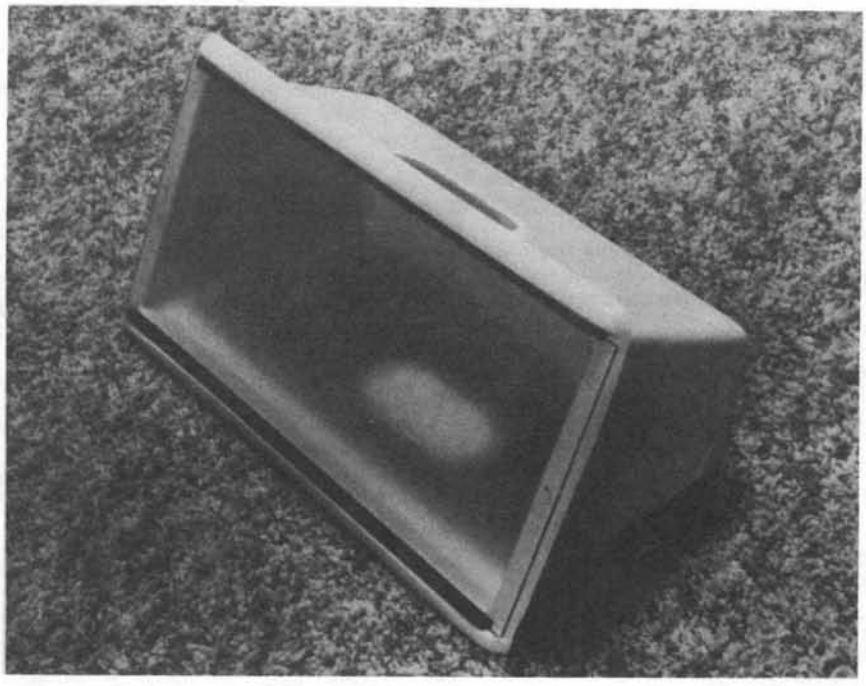
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fingers (Fig. 3). This makes it unnecessary to grasp the snake with fingernails or fingertips or having to exert too great a force in the process. Pressing the soft tissues of the neck against the vertebrae could easily result in trauma.

The various angles of the tool are important in providing comfort and balance. During the whole procedure, the longest section of the tool is gripped. While pressing down the snake's head or slipping the oar under the head, the end being used should be parallel to the substrate. At the same time, the articulations of the hook-grasping fingers should also contact the substrate, providing easier coordination of the tool and greater control over the degree of pressure being applied to the snake's head (Fig. 1).

ACKNOWLEDGMENTS

Special thanks go to my colleague Dr. Ernó Vértes for taking the photographs.

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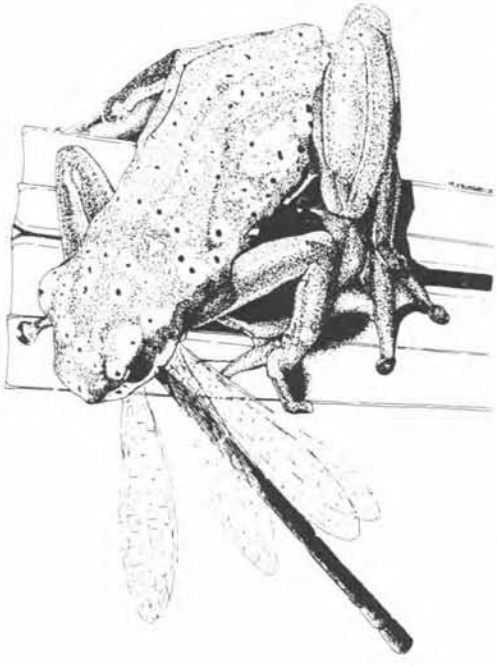
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A NEW METHOD FOR COLLECTING AQUATIC LARVAL SALAMANDERS

Aquatic larvae of many species of salamanders inhabit streams with rocky, irregular bottoms. Collecting larvae from these streams is often difficult and time consuming. Larvae have traditionally been collected from rocky streams by a combination of hand-grabs and small nets; however, larvae frequently are located in areas that prevent collecting by hand-grabs and the irregular bottom reduces the effectiveness of nets. During the last 25 years I have developed some degree of proficiency collecting salamander larvae by these methods, but I can rarely capture more than 60% of the larvae I locate. In the mountain streams of Virginia 1-2 hours is often required to obtain a sample of 25 *Eurycea* larvae. Because many larvae escape collection the possibility of a sample bias exists when using hand-grabs and nets as collection methods.

I have devised an apparatus that allows capture of over 90% of larvae sighted. The time required for collecting larvae is less than one-half of that required to collect them by traditional techniques. The apparatus consists of a 150 ml rubber pipetting bulb with a 40 cm length of 15 mm diameter clear flexible tubing inserted into the bulb opening.

After sighting a larva in the stream, I squeeze the bulb and place the open end of the tube near the larva and quickly release the pressure on the bulb. The larva is sucked into the tube. The larva may be observed and measured in the tube. It may then be released into the stream or squirted into a container by squeezing the bulb. I have collected over 600 individual larvae using this technique. Many of these have been recaptured several times, and I have not observed any trauma to the larvae. This technique is very successful not only in collecting larvae that are visible to the collector, but also for sucking larvae from under rocks and from crevices even if they can not be seen. Placing the clear tube near larvae does not cause them to move to another position in the stream. The size of the tube can be altered to meet the needs of the individual collector. Bulbs smaller than 150 ml do not suck sufficient water into the tube to be effective and bulbs larger than 200 ml are cumbersome and unnecessary. However, if the size of the tube is modified it may be necessary to alter the size of the bulb.

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LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. Reports of clutch or litter size should include snout-vent and total lengths of females. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1982. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

Please submit Life History Notes in the standard format directly to the ***SECTION EDITOR*** to avoid delays in publication: Peter J. Tolson, Toledo Zoological Gardens, 2700 Broadway, Toledo, Ohio 43609, USA.

ANURA

RANA CATESBEIANA (Bullfrog). **PREDATION.** Bullfrogs are known to be preyed upon by some birds (Chapin 1908. Proc. Staten Isl. Assoc. Arts Sci. 2:3-8; Jenni 1969. Ecol. Monogr. 39:245-270; Niethammer and Kaiser 1983. Colonial Waterbirds 6:148-153). Although infrequent reports exist of terns of the genus *Chlidonias* taking frogs (Craig 1974. Ostrich 45:142) or their life stages (Pandit 1982. Indian J. Ecol. 9:181-190), to our knowledge, the only report of any member of the tern genus *Sterna* taking frogs is that of Peabody (1896. Osprey 1:1-3, 21-23) of Forster's terns *(Sterna forsteri)* from Heron Lake, Minnesota consuming unidentified dead frogs and feeding unidentified live frogs to their young. Here we report predation by Caspian terns *(Sterna caspia)* on postmetamorphic *Rana catesbeiana.*

In the course of a study of a nesting colony of Elegant Terns *(Sterna elegans)* on dikes separating salt evaporating ponds at the south end of San Diego Bay, California during 1980 and 1981, one of us (FCS) made several observations that indicated predation on bullfrogs by *Sterna caspia.* On 9 June 1980, a dead *Sterna caspia* chick was found with a bullfrog missing a left hind leg in its throat. On 6 May 1981, an adult *Sterna caspia* was observed flying overhead with a subadult *Rana catesbeiana* (ca. 80-90 mm SVL) in its bill. Furthermore, on 20 May 1980, one pair of bullfrog legs severed just above the pelvis was found in a *Sterna caspia* nest.

These observations suggest non-incidental predation by *Sterna caspia* on postmetamorphic *Rana catesbeiana.* The observations indicate that bullfrogs were exploited as food during tern reproduction. It is also noteworthy that the *Sterna caspia* population at San Diego was not established until ca. 1940 (Gill and Mewaldt 1983. Auk 100:369-381) and that bullfrogs did not become well-established until about this time (Jennings and Hayes 1985. Herpetologica 41:94-103).

Submitted by **MARC P. HAYES and FRED C. SCHAFFNER,** Department of Biology, P.O. Box 249118, University of Miami, Coral Gables, Florida 33124, USA

SAURIA

AGAMA AGAMA (Common agama). **EGG LAYING.** Three female *Agama agama* were observed laying eggs at Niono (14° N, 6° W) in central Mali on 19 July 1980. This lizard is by far the commonest reptile in the area. The eggs were laid in sand two days after heavy rain had fallen. Activity started at 1300 h, in sunshine. The temperature was 35.3° C and humidity was 92%. Each female made a separate nest ca. 1-3 m apart. The female at nest 1 was active for 58 minutes during this time and laid 13 eggs. Female 2 was active for 84 minutes, was interrupted by and copulated with a male on several occasions during the period and laid 11 eggs. Female 3 was intermittently active over 38 minutes, was courted by the male, but did not lay any eggs. At nest 1 the female dug the nest with her front legs and evacuated the soil with her hind legs. She then laid her eggs from a rather upright stance with the head thrust upwards. Sand was dragged in with the fore legs and consolidated with both fore and hind legs. Further eggs were then laid and the covering and consolidation activities were repeated. The nest was finally smoothed over and considerable time was spent scarifying the sand surface about 30 cm away from the nest. The deepest egg was at 180 mm below ground level and the shallowest at 50 mm. Mean measurement of four eggs was 14.37 x 9.02 mm and mean mass was 0.94 g.

Submitted by **R. TREVOR WILSON,** 21 Westfield Grove, Wakefiled, WF1 3RS, UK

SERPENTES

AGKISTRODON CONTORTRIX PICTIGASTER (Trans-Pecos Copperhead). **FEEDING.** The feeding behavior and prey items of *Agkistrodon contortrix* are well documented in general, but little has been recorded for the westernmost subspecies. *Agkistrodon contortrix pictigaster* is known to consume small rodents, lizards, frogs, toads and insects (Tennant 1984. The Snakes of Texas, Texas Monthly Press, 561 pp). Tennant (ibid) also states that *pictigaster* probably eats birds and lists the only recorded instance of ophiophagy *(Crotalus lepidus).* Herein, we list a second instance of ophiophagy and verify Tennant's assumption of birds in the diet of *A. c. pictigaster.*

At 2145 h on 20 July 1983, an adult female *A. c. pictigaster* was found in the process of consuming a *Rhinocheilus lecontei tessellatus* (Texas long-nosed snake). The copperhead was approximately 60 cm off the pavement of highway 163, 78.9 km south of the town of Ozona, Crockett Co., Texas. All but the tail and posterior few cm of the long-nosed snake had been consumed. The copperhead completely ignored the observers' presence, even submitting to measurement without ceasing consumption of the *Rhinocheilus.* The copperhead measured 65 cm TL. It was estimated that the *Rhinocheilus* measured 42-47 cm TL. The ground was still damp from an afternoon thunderstorm and the air temperature at the time of observation was 26° C.

It was not known whether the *Rhinocheilus* had been hit by a car prior to consumption or if the copperhead had caught and killed it. There was blood on the road not far from where the snakes were discovered, and considerable blood around the vent of the *Rhinocheilus* and on the ground in the immediate vicinity of the snakes. We have often observed *R. l. tessellatus* to void blood from the cloaca when captured. The copperhead may have found and dragged the *Rhinocheilus* off the road.

At 2315 h on 11 June 1985, an adult male *A. c. pictigaster* was found under a shrub at the base of the canyon wall at Arch camp, on the U.S. side of the Rio Grande, several km inside Santa Elena Canyon, Brewster Co., Texas. Upon discovery, the copperhead started to flee, but it then momentarily paused before it turned and crawled back through the shrub for about 0.5 m to where it found and started eating a nestling cliff swallow *(Petrochelidon pyrrhonota).* The snake completely ignored the observers' presence, consumed the baby bird in a few minutes and then took refuge in a crevice in the canyon wall. The snake was approximately 50 cm TL.

Cliff swallows nest on the sheer 300-350 m high limestone walls along both sides of the canyon. Most of the nests visible in the immediate vicinity of Arch camp were, however, across the river on the Mexican side, and the nestling swallow that the copperhead had consumed was much too young to fly.

The following morning, Chihuahuan ravens *(Corvus cryptoleucus)* were observed raiding the swallow nests, pulling the nestlings out and flying off with them. Occasionally, they would drop the nestlings, apparently trying to kill them. Several were observed being dropped that were not recovered, some of which landed well up on the bank of the U.S. side of the river. We believe the copperhead consumed a nestling that had been dropped by one of the marauding ravens earlier in the day. This apparent opportunistic feeding is of special interest because competition for food at Arch camp must be high due to the isolation of the location and the large population of copperheads found there.

We thank Roger Conant for his thoughtful comments on the manuscript.

Submitted by **HUGH K. McCRYSTAL,** Arizona-Sonora Desert Museum, Rt. 9, Box 900, Tucson, Arizona 85743 and **RICK J. GREEN,** P.O. Box 146, Terlingua, Texas 79852, USA

NAJA MELANOLEUCA (African Forest Cobra). **CAUDAL USE.** A moderate number of snake species are known to possess a relatively sharp spine on the tip of the tail; suggested functions of such a caudal tip have been as an aid in burrowing, prey-handling, and in defense as a possible mechanism for facilitating escape from a predator. Carpenter and Ferguson (1977. pp. 335-554, *In*: C. Gans and D. W. Tinkle, eds. Biology of the Reptilia. Vol. 7) listed eleven species in four families (Typhlopidae, Aniliidae, Colubridae, Viperidae) that have been reported to use this caudal adaptation as a mechanism for defense. With the exception of a single venomous species, *Atractaspis bibroni,* all are considered inoffensive, fossorial, and in some cases nocturnal, forms. This note describes caudal use in a high-profile elapid species, *Naja melanoleuca.*

A sexual pair of newly hatched *N. melanoleuca* was received in April, 1984. Both specimens were restrained anteriorly in a clear plastic tube on 22 February 1985 and again on 14 May 1986 for sex determination. Once in the tube, the snakes were grasped at midbody with one hand and at the region of the vent with the other.

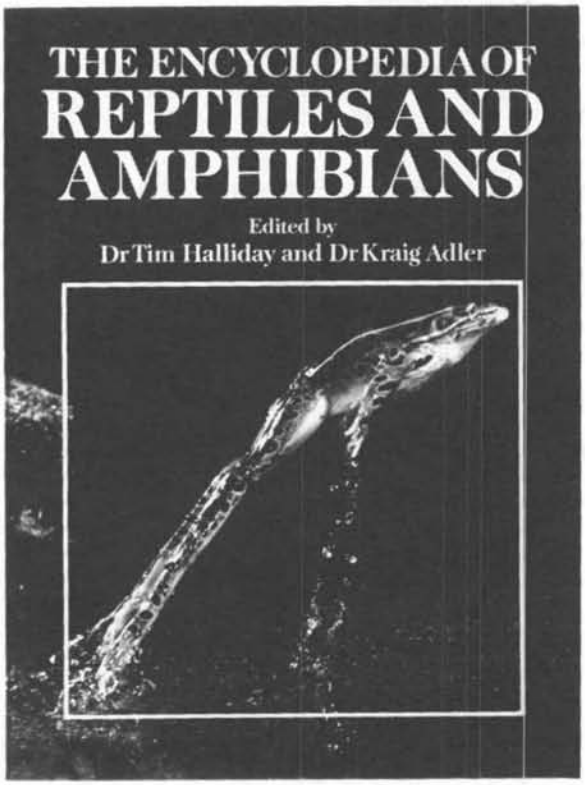
In all cases, both responded with a rapid side to side motion of the tail which was accompanied by repeated, vigorous jabbing of the caudal tip against the hand and wrist. This action was forceful enough to superficially scratch but not penetrate the skin. Jabbing behavior increased in intensity as the caudal grip on the snakes was slowly moved posterior to the vent region. During these sequences, both specimens attempted to maneuver backward using the entire tail, tip first, to encircle the hand and wrist. This latter behavior has been noted when specimens were suspended by the tail from handling equipment and exhibit props.

Naja melanoleuca, a large and dangerous elapid species, would not seem to "need" a sharp tail tip for defense, though it may be effective as such against some predators. Based upon this species' ability to gain a secure hold on objects using only a small portion of the entire tail, we feel that another function may be associated with its arboreal tendencies.

Submitted by **BERN W. TRYON** and **JON WHITEHEAD,** Department of Herpetology, Knoxville Zoological Park, P.O. Box 6040, Knoxville, Tennessee 37914, USA

NERODIA SIPEDON (Northern Water Snake). **FEEDING.** At ca. 1500 h on 26 April 1986 a small *Nerodia sipedon* (33.1 cm TL) was collected from a small limestone stream in Raven Run Nature Preserve in Fayette Co., Kentucky. The snake was collected to determine if it had been preying on *Ambystoma texanum* larvae which were abundant in the stream. Upon returning to the laboratory one hour later I examined the plastic bag and found the snake had regurgitated three partially digested *A. texanum* larvae (1.9, 1.8, 2.4 cm TL) and a live and apparently unhurt *Pseudotriton montanus* larva (7.8 cm TL). The significance of *A. texanum* larvae in the diet of *Nerodia sipedon* from this stream is unknown (J. Petranka, pers. comm.). Examination of the *P. montanus* larva under a dissecting scope revealed only a slight abrasion to the animal's tail. The larva transformed within two weeks of captivity. Although *N. sipedon* apparently commonly feed on *P. montanus* (Brown 1979. Brimleyana 1:113-124) this instance was unusual because of the regurgitation of a live animal and because records for *P. montanus* larvae are relatively rare in the Inner Bluegrass of Kentucky.

I would like to thank J. Holomuzki for commenting on the manuscript. Both the *N. sipedon* and the *P. montanus* will be depos-



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Submitted by **LEE B. KATS,** T. H. Morgan School of Biological Sciences, University of Kentucky, Lexington, Kentucky 40506-0225, USA ●

TESTUDINES

CLAUDIUS ANGUSTATUS (Chopontil). **COLORATION.** Albino turtles have been reported for several genera of turtles *(Chrysemys, Clemmys, Pseudemys, Terrapene, Gopherus,* and *Chelydra)* in the families Emydidae, Testudinidae, and Chelydridae. (Dyrkacz 1981. SSAR Herpetol. Circ. No. 11:1-31; Gilboa and Dowling 1974. HISS Publ. Herp. 6:1-11; Hensley 1959. Publ. Mus. Mich. State Univ. Biol. Serv. 1:133-159.) This is the first reported albino for this genus and for the family Staurotypidae.

On 29 November 1983, 80 female *Claudius* containing shelled eggs were collected in the pantanos 2.3 km north of Lerdo de Tejada, Veracruz, Mexico. They were injected on 12 December with oxytocin, 1 unit per 100 g body weight, to induce oviposition. A total of 229 eggs were laid; 1-5 ($\bar{X}$ = 2.8) eggs per clutch. Half of each clutch was incubated at 29° C and the other half at 25° C in a mixture of water-vermiculite at a ratio of 1:1 by weight in a sealed clear plastic bag. On 24 June 1984, after 194 days of incubation, the albino pipped from an egg incubated at 25° C. As hydric conditions often cause the eggs of Kinosternids and Staurotypid turtles to crack longitudinally months before the embryo is completely developed, pipping is defined as when the hatchling begins biting its way out of the egg. The egg measured 28.9 x 17.5 mm with a mass of 5.5 g. The other egg from this clutch died during the early stages of development, as did most other eggs incubated at 29° C. A total of 72 *Claudius* hatched from this series of eggs, but no others had abnormal color patterns. The albino lived in captivity for 7 months, and now has been deposited in the collection here (3019 UNAM-LT).

Submitted by **RICHARD C. VOGT,** Estacion de Biologia Tropical "Los Tuxtlas," Instituto de Biologia, Universidad Nacional Autonoma de Mexico, Apt. Post 94, San Andres Tuxtla, Veracruz, Mexico. ●

GOPHERUS POLYPHEMUS (Gopher Tortoise). **BURROW COMMENSALS.** A survey of amphibians and reptiles associated with burrows of *Gopherus polyphemus* was conducted on a 14-hectare section of the Smith Lake Sandhill Site on the Katharine Ordway Preserve-Carl S. Swisher Memorial Sanctuary, 4 km SE of Melrose, Putnam Co., Florida. The study area included approximately 45 active, inactive and old tortoise burrows in a high pine-scrub oak forest environment.

Animals were captured in single-opening screen funnel traps set flush with the burrow opening. Traps were installed ca. 1-2 hours before sunset and retrieved the next morning 1-2 hours after sunrise. As tortoises are primarily diurnal, I felt that this schedule would reduce injury to trapped animals by the movements of resident tortoises. Traps were set on 62 days between September 1983 and October 1985 for a total of 2551 trap nights (=one trap/burrow/night).

The following amphibians and reptiles were captured: 313 *Rana areolata aesopus,* 24 *Cnemidophorus s. sexlineatus,* 16 *Eumeces inexpectatus,* 12 *Sceloporus u. undulatus,* 8 *Anolis c. carolinensis,* 4 *Scincella laterale,* 3 *Crotalus adamanteus,* 3 *Gastrophryne carolinensis,* 2 *Masticophis f. flagellum,* 2 *Pituophis melanoleucus mugitus,* 2 *Heterodon platyrhinos,* 2 *Cemophora c. coccinea,* 2 *Elaphe g. guttata,* 2 *Thamnophis s. sirtalis,* 2 *Micrurus f. fulvius,* 2 *Eumeces egregius onocrepis,* 2 *Bufo terrestris,* 1 *Drymarchon corais couperi,* 1 *Acris gryllus dorsalis.* This computation includes trapping data for 582 trap nights presented in Table 7 of Humphrey, Eisenberg, and Franz (1985. Wildl. Soc. Bull. 13:487-496).

A total of 403 individuals representing 19 amphibian and reptile species were captured. These data suggest that burrows are not just residences for tortoises, but are also important retreats for a variety of other upland amphibians and reptiles. Thus, we could expect that with the continued decline in the number of gopher tortoises in the southeastern United States we might also see changes in populations of other sandhill amphibians, reptiles, and other wildlife which frequent their burrows.

Submitted by **RICHARD FRANZ,** Florida State Museum, University of Florida, Gainesville, Florida 32611, USA ●

PSEUDEMYS FLORIDANA PENINSULARIS (Peninsula Cooter). **EGG PREDATION.** Sixteen viable nests and 102 predated nests of *Pseudemys floridana peninsularis* were investigated between November 1983 and March 1986 on the Katharine Ordway Preserve-Carl S. Swisher Memorial Sanctuary, 4 km SE of Melrose, Putnam Co., Florida. Nests were found in xeric live oak forests (=hammocks) and longleaf pine-scrub oak forests, 50 to 200 m from ponds and lakes. Nest sites were typically constructed in open patches of sand, particularly along sand roads. One hundred and eight nests were found from November-May.

Viable nests were discovered while females were still at nest sites. Fourteen of these nests were constructed in the manner described by Carr (1952. Handbook of Turtles, Cornell Univ. Press, Ithaca, p. 294) with a deep central chamber and two shallow satellite pockets (with 1-3 eggs per hole, but not exceeding 4 eggs in total). Two nests had only one satellite chamber each.

Depth of central chambers $\bar{X}$=12.5 cm; side pockets, $\bar{X}$=6.0 cm. Eggs in central chambers were covered with $\bar{X}$=5.0 cm of soil; eggs in satellites had 2.0 cm of covering. At one nest site, the shell of an egg in a satellite pocket was covered with only a thin layer of sand, allowing it to be visible from above.

Destroyed nests were obvious from the excavations left by egg predators and from scattered egg shells. Footprints and the nature of the excavation suggested that raccoons *(Procyon lotor)* were responsible for all of the destruction.

Ninety-nine of the predated nests were constructed as described above. The three other nests were aberrant (two with a central chamber and one satellite hole, and the third with apparently no side holes). Only two predated nests contained eggs after the egg predator had left the site, but, in each case, we suspect that we may have frightened away the raccoon before it had a chance to finish. The overlooked eggs occurred in only the central chambers.

Carr (op. cit.) speculated over whether this nesting behavior may reduce predation by

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drawing the attention of would-be egg predators toward eggs in satellite holes and away from the larger cache of eggs in the central chamber, or acted as a beacon to attract potential egg predators. Data from the Ordway Preserve seem to corroborate the latter.

Submitted by **RICHARD FRANZ,** Florida State Museum, University of Florida, Gainesville, Florida 32611, USA ●

TRIONYX SPINIFERUS (Spiny Softshell Turtle). **SIZE.** A possible record size for an undetermined subspecies of *Trionyx spiniferus* was exhibited by a female specimen captured 4 October 1985 in Ouachita Parish, Louisiana. The specimen, possessing a deep camouflage pattern on the carapace typical of old females, had an impressive mass of 11.7 kg and possessed the following morphometry: carapace length = 54.0 cm, carapace width at widest point = 40.6 cm, plastron length = 36.2 cm, and tail length = 22.2 cm. The female was taken in 1.5 m of water by a 0.91 m diameter hoop net in a paper plant impoundment, Wham Brake, located approximately 16 km NE of Monroe, Louisiana off the south shoreline about 1.6 km W of the spillway. Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston) listed the upper limit in carapace length for *T. spiniferus* as 18 in (46 cm) and Lagler (1943 Amer. Mid. Nat. 29:257-312) mentioned "more than 16 in (40.6 cm)" as maximum size.

Subspecies designation was not assigned to the large female *Trionyx* because of physical changes associated with age, sex, and intergradation. In Mississippi, Arkansas, and Louisiana there are intergraded populations of *T. spiniferus* that have characteristics of the three subspecies, *harwegi, spiniferus,* and *aspera* (Carr 1952. Handbook of Turtles, Comstock, Ithaca.).

Submitted by **JOHN H. HALK,** Department of Biology, Northeast Louisiana University, Monroe, Louisiana 71209, USA ●

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Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

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Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

ANURA

BUFO MICROSCAPHUS (Southwestern Toad). USA: NEW MEXICO: Sierra Co: 35 km E Beaverhead on NM 59, T10S R10W S 11. 12 July 1969. W. G. Degenhardt. Museum of Southwestern Biology, University of New Mexico (MSB 20240, 22355). Socorro Co: 5 km S, 5 km E Dusty, Alamosa Warm Springs, T8S R 7W S 31. 6 March 1985. L. A. Fitzgerald, V. L. Fitzgerald. (MSB 43382). Verified by L. A. Fitzgerald and W. G. Degenhardt. New county records and first report within the Rio Grande drainage. Extends range 43 km E and 24 km N of Wall Lake, Catron Co. (Findley 1964. The Southwestern Naturalist 9:107).

Submitted by **LEE A. FITZGERALD** and **WILLIAM G. DEGENHARDT,** Museum of Southwestern Biology, Department of Biology, University of New Mexico, Albuquerque, New Mexico 87131, USA ●

PSEUDACRIS STRECKERI ILLINOENSIS (Illinois Chorus Frog). USA: ILLINOIS: Monroe Co: about 4 mi W and 1 mi S Columbia on Levee Road. 1 November 1983. H. R. Gilbert. Verified by R. W. Axtell. Southern Illinois University, Edwardsville (photo voucher 101-102). First county record (Smith 1961. The Amphibians and Reptiles of Illinois. Illinois Natur. Hist. Surv. Bull. 28, 1-298 pp.).

Submitted by **HUGH R. GILBERT,** 203 W. Main St., Valmeyer, Illinois 62295, USA ●

SAURIA

CNEMIDOPHORUS UNIPARENS (Desert Grassland Whiptail). USA: NEW MEXICO: Bernalillo Co: Albuquerque, N side of Old Town. 5 July 1982. J. Gottfried. Museum of Southwestern Biology, University of New Mexico (MSB 45881). 7-8 July 1983. P. J. Heise and J. N. Stuart. (MSB 39699, 39702). 23 May 1984. P. J. Heise and R. Dettmer. (MSB 41421). 17 July 1984. P. J. Heise et al. (MSB 41938-39). 28 August 1984. J. N. Stuart. (MSB 43701-02). Verified by W. G. Degenhardt and J. N. Stuart. Extends northern limit ca. 90 km up Rio Grande Valley from Rio Salado, Socorro Co. (Stebbins 1985. Field Guide to Western Reptiles and Amphibians, 2nd ed. Houghton Mifflin Co.). Population probably represents an introduction.

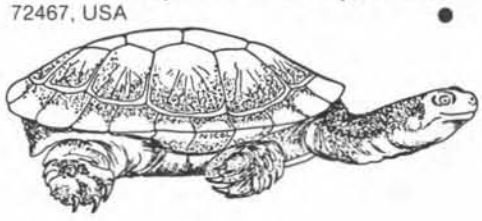
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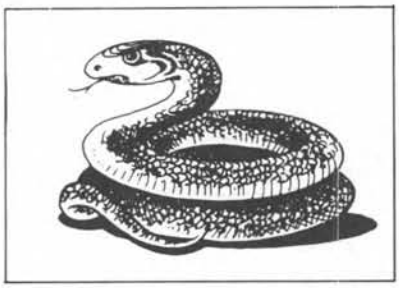
EUMECES ANTHRACINUS PLUVIALIS (Southern Coal Skink). USA: ARKANSAS: Independence Co: 1.6 km W Cushman (T14N R7W S7). 16 March 1986. S. R. Moulton and B. M. Blakely. Arkansas State University Museum of Zoology (ASUMZ 5438). Crawford Co: 8.2 km N Mulberry (T10N R29W S1). 20 April 1986. S. E. Trauth (ASUMZ 5792). All verified by S. E. Trauth. New county records (Dellinger and Black. 1938. Occ. Pap. Univ. Arkansas Mus. 1:1-47; Dowling. 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

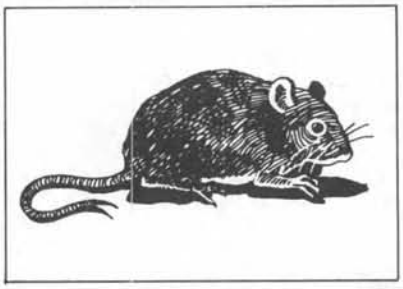
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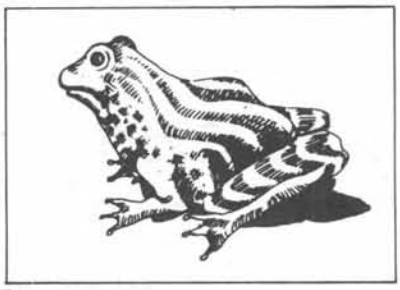
OPHISAURUS ATTENUATUS ATTENUATUS (Western Slender Glass Lizard). USA: ARKANSAS: Dallas Co: 7.2 km S Princeton (T9S, R15W, S24). 18 October 1974; 6.4 km S Dalark (T9S, R17W, S6). 7 May 1975; 9.6 km S Dalark (T9S, R17W, S8). 7 May 1975; 3.2 km N Sparkman (T9S, R17W, S17). 9 May 1975; 5.6 km N Holly Springs (T10S, R15W, S7). 10 May 1975; 3.2 km N Holly Springs (T10S, R16W, S24). 10 May 1975; Princeton (T8S, R15W, S34). 12 May 1975; 1.6 km W Carthage (T7S, R15W, S36). 12 May 1975. S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 5595, 5603-5604, 5606-5608, 5610-5611 respectively). Hot Spring Co: 6.4 km S Bismarck (T5S, R20W, S27). 29 April 1975; 9.6 km S Donaldson (T6S, R18W, S35). 29 April 1975; Lono (T6S, R16W, S11). 3 May 1975. S. E. Trauth. (ASUMZ 5600-5602 respectively). Nevada Co: 10.4 km S Prescott (T12S, R22W, S10). 2 November 1974; 7.4 km N Pleasant Hill (T9S, R23W, S27). 10 May 1975. S. E. Trauth (ASUMZ 5596, 5609). Pike Co: 0.4 km E Glenwood (T5S, R24W, S1). 15 May 1975. S. E. Trauth (ASUMZ 5612). Van Buren Co: 6.5 km N Damascus (T19N, R13W, S8). 24 May 1975. S. E. Trauth. (ASUMZ 5613). All verified by S. E. Trauth. New county records (Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51).

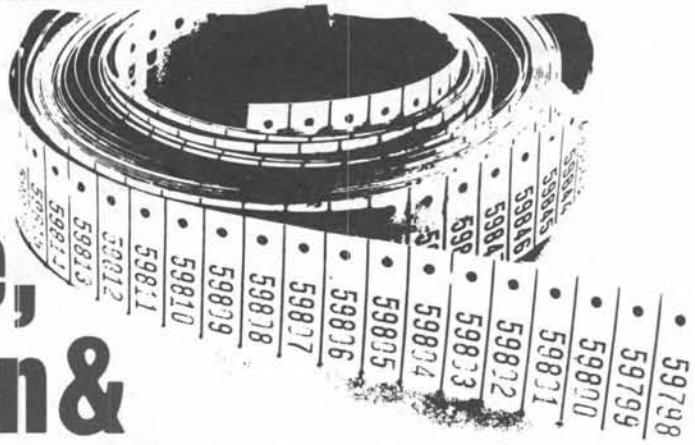
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SERPENTES

CROTALUS ATROX (Western Diamondback Rattlesnake). USA: ARKANSAS: Garland Co: near Mountain Pine (T2S, R20W, S6). 12 June 1982. M. McKinney. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 5593). New county record (Dellinger and Black 1938. Occ. Pap. Univ. Arkansas Mus. 1:1-47; Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51; Schwardt 1938. Univ. Arkansas Agri. Exp. Sta. Bull No. 357. 47 p.).

I thank J. T. Collins for drawing my attention to the lack of *C. atrox* records from Arkansas.

Submitted by **STANLEY E. TRAUTH,** Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, USA ●

DIPSAS BREVIFACIES. BELIZE: COROZAL DIST: Santa Elena. 9 July 1979. R. E. Olson. Verified by L. D. Wilson. R. E. Olson Collection (REO 5169). To be deposited in St. John's College, Belize City. Third specimen from Belize. New district record, about 100 km N of previous record (Neill & Allen 1960. Herpetologica 16(3):145-162).

Submitted by **R. EARL OLSON,** 133 So. Cleveland, Cambridge, Minnesota 55008, USA ●

REGINA RIGIDA SINICOLA (Gulf Crayfish Snake). USA: ARKANSAS: Hot Spring Co: 1.6 km W Donaldson (T6S R18W S4). 4 April 1986. S. E. Trauth and P. Chaffin. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 5704). New county record (Huheey 1959. Copeia 1959:303-311).

Submitted by **STANLEY E. TRAUTH** and **PHYLLIS CHAFFIN,** Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, USA ●

RHADINAEA MONTANA. MEXICO: NUEVO LEON: Ojo de Agua at Pablillo, 2134 m. 18 July 1972. E. A. Liner, R. M. Johnson and A. H. Chaney. Verified by E. A. Liner. E. A. Liner Collection (EAL 3095). Extends range southward from La Huasteca, Monterrey and the type-locality (Ojo de Agua near Galeana) (Myers 1974. Bull. Amer. Mus. Nat. Hist. 153(1):89-91). This is the fifth known specimen of the species.

Submitted by **ALLAN H. CHANEY,** Department of Biology, Texas A & I University, Kingsville, Texas 78363, USA and **ERNEST A. LINER,** 310 Malibou Blvd., Houma, Louisiana 70364-2598, USA ●

SIBON SANNIOLA. BELIZE: CAYO DIST: 8 km SSE Belmopan. 10 July 1980. R. E. Olson. Verified by L. D. Wilson. R. E. Olson Collection (REO 5559). To be deposited in St. John's College, Belize City. Extends range 55 km NE Augustine (McCoy 1986. Ann. Carnegie Mus. 55(6):117-123).

Submitted by **R. EARL OLSON,** 133 So. Cleveland, Cambridge, Minnesota 55008, USA ●

THAMNOPHIS EQUES (Mexican Garter Snake). USA: ARIZONA: Yavapai Co: Confluence of Agua Fria River with Big Bug Creek (SW¼, Sec. 20, T11N, R3E), ca. 1060 m. 19 August 1980. G. L. Bradley and F. C. Baptista. Yavapai Community College Vertebrate Museum (Herp. 155). Bloody Basin Road at Agua Fria River crossing (NE¼, Sec. 8, T10N, R3E), ca. 1000 m. 25 July 1981. G. L. Bradley and J. G. Higgs. (Herp. 257 and 349). Fort Verde. 1884. E. A. Mearns. American Museum of Natural History (AMNH 4200-4201). All verified by C. H. Lowe. These central Arizona populations extend the range ca. 260 km (Stebbins 1985. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., 336 p.).

Submitted by **GEORGE L. BRADLEY,** Department of Ecology and Evolutionary Biology, University of Arizona, Tucson, Arizona 85721, USA ●

TROPIDOCLONION LINEATUM TEXANUM (Texas Lined Snake). USA: TEXAS: Johnson Co: 14.5 km NE Glen Rose on Co. Rd. 1234 at Ken Fry Ranch. 4 May 1986. C. T. McAllister. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 5898). First record for the county filling a distributional gap between Hill (Vance 1980. Bull. Chicago Herp. Soc. 15:70-76) and Tarrant counties (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, USA ●

TESTUDINES

STERNOTHERUS MINOR PELTIFER (Stripeneck Musk Turtle). USA: NORTH CAROLINA: Cherokee Co: 6.9 km WSW Violet, in Shuler Creek. 20 & 21 July 1984. North Carolina State Museum of Natural History (NCSM 25113, partial skeleton; 25124). 7.1 km WSW Violet, in backwater of Hiwassee River. 21 July 1984. (NCSM 25126-25127). Madison Co: 4.7 km NW Hot Springs, in French Broad River. 24 September 1984. (NCSM 25319-25320). All collected by A. L. Braswell and J. E. Cooper and verified by A. L. Braswell and William M. Palmer. First record in North Carolina. The closest previous record appears to be Citico Creek on the Tennessee side of the Great Smoky Mountains National Park (William Redmond, personal communication).

Submitted by **ALVIN L. BRASWELL,** N. C. State Museum of Natural History, Box 27647, Raleigh, North Carolina 27611, USA ●

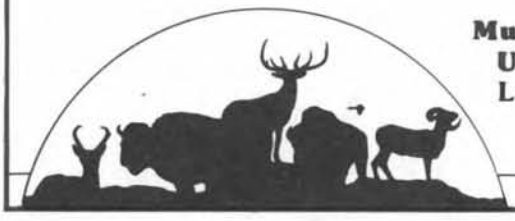
ERRATUM

The genus for *Blancus cinereus (sic)* in Geographic Distribution, *Herp. Review* 17(2):49 should have read *Blanus,* and the account should have appeared under Amphisbaenia. Apologies to the author for this editorial error. ●



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BOOK REVIEWS

Anfibios de los Alrededores de Buenos Aires, by J. M. Gallardo, EUDEBA (Ed. Universitaria Buenos Aires), 229 pp., 3 fig., 16 pls., 1974.

Reptiles de los Alrededores de Buenos Aires, by J. M. Gallardo, EUDEBA (Ed. Universitaria Buenos Aires), 213 pp., 3 fig., 16 pls., 1977. (EUDEBA, Rivadavia 1571/73, Cap. Fed., Buenos Aires, Argentina).

Qué Sabe Usted de Víboras?, by J. W. Abalos, Ed. Losada, B. Aires, 174 pp., 91 figs., 1977. (Ed. Losada, Alsina 1131, Cap. Fed., Buenos Aires, Argentina).

Interest in the South American herpetofauna is certainly increasing and new books have been published in the last few years, among them Duellman's THE SOUTH AMERICAN HERPETOFAUNA, 1979, and Cei's AMPHIBIANS OF ARGENTINA, 1980. Three additional books dealing with the temperate Neotropical herps, although published several years ago, seem to have been overlooked by many herpetologists. The three are popular accounts but differ in their format.

The first two books describe the herpetofauna of the Buenos Aires Province, Argentina. Although this area is commonly associated with the large Pampas plains, the landscape varies, ranging from hilly systems in the south to subtropical gallery forests bordering the Paraná River mouth in the north. They were written by the well known Argentinian herpetologist, Dr. J. M. Gallardo, for many years Director of the Argentinian Museum of Natural Sciences.

AMPHIBIANS OF BUENOS AIRES is divided into 8 chapters. The first two are an introduction to morphology, biology and landscapes of the area. The remaining chapters cover 19 species in five families (Bufonidae, Leptodactylidae, Pseudidae, Hylidae and Microhylidae). In some cases the descriptions are very detailed while in others some aspects of reproduction or ecology are stressed, following Gallardo's extensive work on these subjects. Some interesting chapters include one devoted to the Pseudidae frogs, of which the author still continues to be the latest reviewer, and a reprint of his study on *Bufo granulosus* complex distribution and hydrographic basins (but see Cei 1980 for nomenclature). The book is softcover, it includes 3 diagrams in text and 16 central black and white plates with photos of 15 species.

REPTILES OF BUENOS AIRES follows the same pattern, including introductory chapters, and consideration of the principal groups in subsequent chapters (Turtles, Crocodiles, Lizards, Amphisbaenian and Snakes). About 44 species are described and/or commented on in eight chapters, ranging from their description to diverse information on natural history. The main focus is on amphisbaenians, lizards (families Gekkonidae, Iguanidae, Teiidae, Scincidae and Anguidae) and snakes (families Leptotyphlopidae, Boidae, Colubridae, Elapidae and Viperidae). The descriptions of some Iguanid species are very detailed following the author's research on the group. The book is softcover, with three diagrams in the text and 16 black and white plates with photos of 16 species.

Both books are very similar in that they resemble collections of papers from journals, most of them Latin American. Introductory notes to each chapter (i.e. paper) are very short. As papers come from diverse sources with different purposes, not all species are considered with the same detail (in some accounts the morphological description is stressed, in others the biology) and reading does not go smoothly from chapter to chapter. Also, nomenclature has not been revised since publication of the original paper. In a number of instances the experimental results of some herpetologists, particularly North American, were not cited. Although I do not support this, I must say that the reverse also occurs, and more frequently: North American reviewers ignoring papers in Spanish and published in Latin America.

Gallardo's books contain much information that will be of great interest to herpetologists interested in the Argentinian herpetofauna. Although they were prepared for the public at large, they would be difficult for the beginner. But I would recommend these books for those who have difficulty obtaining the original papers or for those with research interests in the herps of the area.

The third book, by the late J. W. Abalos, is completely different. Abalos was a biologist at the Universities of Tucumán and Córdoba, Argentina, and his interest ranged from venomous spiders to snakes. On the other hand, he was also a popular writer and author of several fictional works.

Abalos' WHAT DO YOU KNOW ABOUT SNAKES? is restricted to Argentinian snakes. It has 15 chapters, covering basic information on morphology (particularly dentition) and biology (particularly reproduction, feeding and defensive behavior, etc.), with short stories and tales intercalated. The biological information stresses boids (particularly *Boa constrictor*), some colubrids and venomous snakes (*Micrurus, Bothrops* and *Crotalus*). Of particular interest is the description of *Clelia clelia* ("terciopelo") feeding on rattlesnakes. South American crotaline response to the "terciopelo" resembles North American rattlesnakes' behavioral response to kingsnakes. Abalos also published a note on this behavior (Abalos and Náder 1968) but this was not cited in the latest description of this behavior (Carpenter and Gillingham 1975; Weldon and Burghardt 1979). There are many black and white photos and diagrams, most of them of poor quality. An Appendix includes a list of Argentinian snakes (with common and scientific names) after Abalos and Mischis (1975). There are nomenclatural errors and many old names are retained in the main text.

In spite of these limitations this is a very good popular book on snakes in a strict sense: it was written for readers with almost no knowledge of snakes, avoiding an overabundance of information, and with many nice tales and anecdotes. It follows Abalos' literary works, containing delicious field stories (most notably TERCIOPELO, THE BLACK HUNTER, SHUNKO, SHALACOS, etc.). I would recommend this book for those that may read Spanish fluently.

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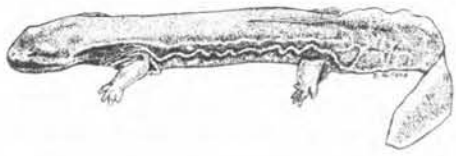
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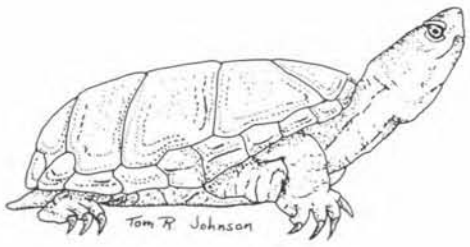
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Herpetological Review

Volume 17 June 1986 Number 2

SSAR BUSINESS

SSAR TRANSLATIONS PROJECT

The object of this project is to make available to SSAR members accurate translations of foreign language research articles. Since SSAR has not budgeted money for translation of articles, we must rely on contributions from members. If you have an article that has been translated, please send a copy (or reprint) of the original and the translation to the coordinator. A few people have volunteered to translate articles and we are interested in hearing from any others who are willing to contribute their time.

If you have an article for translation that you feel would appeal to a large segment of the herpetological community, send a copy or reprint and we will try to have it translated. We now have a total of 99 translations available through the Translations Project. The titles of 31 are listed below. Previous titles appeared in *Herpetological Review* 10(3):82-83, 1979; 13(4):111-112, 1982; and 16(1):2-3, 1985. Copies of these are available (.06/page plus postage) from the Translations Project Coordinator, Robert D. Aldridge, Department of Biology, Saint Louis University, 3507 Laclede Ave., St. Louis, Missouri 63103, U.S.A.

I would like to thank Paul Gritis, Field Museum of Natural History, Chicago, IL and Margaret Berson, California Academy of Sciences, San Francisco, CA for their help in translating and providing articles for this Project.

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NEWSNOTES

NIXON GRIFFIS FUND FOR ZOOLOGICAL RESEARCH AWARDS GRANTS

The Nixon Griffis Fund for Zoological Research (NGFZR), established in 1984 by New York Zoological Society Trustee Nixon Griffis, awarded ten research grants on 17 March 1986. One recipient was R. Andrew Odum, Houston Zoological Gardens for the "Aruba Island rattlesnake Species Survival Plan Conservation program."

Nixon Griffis Fund for Zoological Research grants are available to members of the zoo and aquarium community. Fund recipients may be keepers, curators, veterinarians, or research and consulting biologists. Grants, not to exceed $3000, are awarded semi-annually. Closing periods are January 1st and July 1st. For information about the Fund and grant application procedures, contact:

John Behler, Coordinator
Nixon Griffis Fund
for Zoological Research
c/o New York Zoological Society
Bronx Zoo, Bronx, New York 10460 ●

SLIDE PROGRAM ON NEVADA'S HERPS AVAILABLE

A high quality color slide program depicting the herpetofauna of the Silver State is available from the Nevada Chapter of The Wildlife Society. The program, entitled *Silver Amphibians and Reptiles*, is assembled in a binder containing: written narrative, 80 color 35 mm slides, and a cassette tape with narration and music. It can serve as an educational medium for public schools, or an enjoyable resource program for youth organizations, conservation clubs, etc.

The Nevada Chapter produced the program. The Chapter is composed of professional wildlife biologists and managers representing various Federal and State wildlife agencies, universities, and private organizations.

Orders should be sent to the Nevada Chapter of The Wildlife Society, University of Nevada, Department of Range, Wildlife and Forestry, 1000 Valley Road, Reno, Nevada 89512. The cost of the program is $65.00 plus $4.50 for mailing. Include your name, address, and check or money order. ●

FILE SNAKE SURVEY

The Reptile Department at the Royal Melbourne Zoo is conducting a survey on husbandry and propagation techniques for Arafuran file snakes *(Acrochordus arafurae)*. They request the following information from institutions or individuals which currently maintain (or have previously maintained) this species or other fully aquatic species of snake:

- Species maintained and duration in the collection
- Disease or husbandry problems encountered
- Techniques for treating problem(s) mentioned above, and success rate
- Comments and suggestions

Please reply to:

Roy Dunn (Curator)
or
Chris Banks (Keeper-in-Charge)
Reptile Department
Royal Melbourne Zoo
P.O. Box 74
Parkville, Victoria, 3052
AUSTRALIA ●

MOSSY-BACKED TURTLES SOUGHT

Dr. L. C. Colt, Jr., of the Biology Department of Southeastern Massachusetts University, is seeking samples of the green alga *Basicladia*. This alga grows as a mossy-green coating primarily on the backs of turtles.

If any reader has turtles with this type of coating on the carapace, or knows of institutions with such turtles in captivity, or might be in a position to collect such turtles, please contact Dr. Colt at:

Biology Department
Southeastern Massachusetts University
North Dartmouth, Massachusetts 02747
U.S.A.
(617) 999-8230 or (617) 359-6013

Sample bottles, preservative, and collecting instructions will be sent to any investigator who can provide the samples. Wild-type samples are sought primarily, but any samples will be useful. ●

HL NOTICE

It has been brought to our attention that the reprinted copies of *Herpetologica* Volume 10(2) are incomplete (pp. 103-106 are missing). If your copy is missing these pages please write to the Publications Secretary for an insert.

Ellen J. Censky, Publications Secretary
Section of Amphibians and Reptiles
Carnegie Museum of Natural History
Pittsburg, Pennsylvania 15213, U.S.A. ●

CORDYLID PUBLICATION

The Museum National d'Historie Naturelle has recently published "Les Gerrhosaurinae de Madagascar" by E. -R. Brygoo, as Memoires du Museum, Ser. A Zool., Volume 134. This is a revision of the two genera of Madagascan cordylids, *Tracheoloptychus* and *Zonosaurus*. For each species, the taxonomic status and diagnostic characters are examined. A key to the species of *Zonosaurus* is provided, as well as distribution maps and numerous line drawings. Price is 108F (+ 4% for shipping and handling). This Memoir and others are available from:

Service de Vente des Publications
38, rue Geoffrey-Saint-Hilaire
75005 Paris ●

NYZS TORTUGUERO TURTLE-TAGGING PROGRAM

Volunteer field assistants cataloged 2,427 green and 10 hawksbill turtles during the 1985 season. Sponsored by the New York Zoological Society and the Caribbean Conservation Corporation, 19 men and 19 women recruits, assembled into 5 teams, patrolled a five-mile section of beach each night from 13 July through 21 September. Program participants thoroughly monitored the activities of all turtles that emerged from the sea and tagged all unmarked individuals before they returned to the Caribbean.

In 1986, NYZS-CCC will repeat the turtle-tagging mission to Tortuguero. The project, now in its third year, is designed to support and augment the green turtle research that has been directed by Professor Archie Carr of the University of Florida for the past 30 years. The New York Zoological Society is now gearing up for the 1986 season. Five teams of dedicated people will be assembled to patrol the Tortuguero beach during July-September 1986. Additional information and applications are available from John Behler, Curator, Department of Herpetology, Bronx Zoo, Bronx, New York, 10460, U.S.A. ●

KANSAS HAS STATE REPTILE

The governor of Kansas has recently signed a bill which designates the ornate box turtle *(Terrapene ornata ornata)* as the state reptile of Kansas. Through the efforts of Mr. Larry Miller and his sixth grade class at Caldwell Elementary School in Caldwell, Kansas, a well-researched proposal was provided to wildlife, environmental and educational organizations, to colleges and universities, to the media, and to the lawmakers in Topeka.

Further information may be obtained from:

Mr. Larry Miller
Caldwell Elementary School
One North Osage Street
Caldwell, Kansas 67022, U.S.A. ●



SOCIETIES

OKLAHOMA HERPETOLOGICAL SOCIETY

Founded April 1976, the Oklahoma Herpetological Society's purpose is threefold:

1) To encourage education and dissemination of scientific information through the facilities of the society;

2) To encourage conservation of wildlife in general and of amphibians and reptiles in Oklahoma in particular;

3) To achieve closer cooperation and understanding between amateur and professional herpetologists, so that they may work together in the common cause of furthering science.

Membership numbers 75 and is open to all. Members receive the society's newsletter, bulletin and special publications.

Dues for the calendar year 1986 are as follows:

Regular member	$7.00
Family member	$9.00
Contributing member	$15.00

Make checks and money orders payable to OHS. Send subscription requests to:

Linda C. Putnam
Rt. 8, Box 580
Claremore, Oklahoma 74017, U.S.A. ●

WISCONSIN HERP SOCIETY PLANS SYMPOSIUM

The Wisconsin Herpetological Society is planning a 1986 Midwest Regional Herpetological Symposium on October 17, 18 and 19. The meeting will be held at the Milwaukee County Zoo's Aquarium Reptile Building. Individuals wishing to present papers should submit titles as soon as possible. For further information contact:

Dave Sorensen
Milwaukee County Zoo
10001 W. Bluemound Road
Milwaukee, Wisconsin 53226, U.S.A. ●

Amphibians of Argentina
by Jose M. Cei
(1980, Monitore Zool. Ital., NS, Monogr. 2)

Limited number of copies are available at the special price of: US $39.00
Order directly from:

Jose M. Cei
Rancho Somuncura
Rua Fausto de Figueiredo
Birre 2750 Cascais, Portugal

Price includes shipping by registered surface mail from Portugal. Checks should be made payable to Jose M. Cei

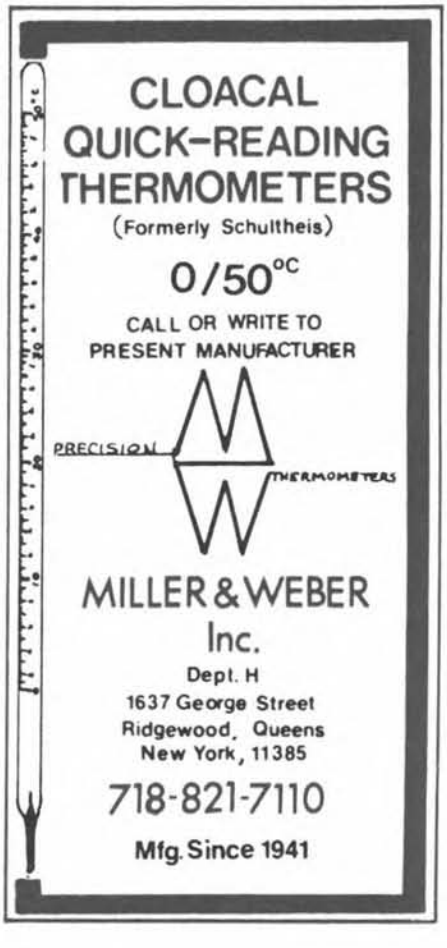
THE GREATER CINCINNATI HERPETOLOGICAL SOCIETY

The Greater Cincinnati Herpetological Society, founded in 1977, provides a vehicle for information and resources exchange between its members. Through education, responsible research, and example the society zealously promotes the welfare of reptiles and amphibians.

The GCHS provides information to its members regarding herpetologically related legislation and threatened and/or endangered species. Society members are available to community groups or educational facilities for lectures. Members are active in "white bag runs" on a year round basis, rescuing reptiles from the homes and yards of frightened or concerned citizens. These animals are released into more appropriate locations. The society sponsors periodic trips to observe the animals in the field and also behind the scenes at various zoos.

The highlight of the year is the annual GCHS sponsored "Herp Show" at the Cincinnati Museum of Natural History. Live animal displays, demonstrations and lectures draw large crowds to the museum for this exciting event.

The GCHS newsletter, published monthly and distributed to 125 members, has grown from a one page "flyer" to a professional 10-12 page bulletin which includes an illustrated cover, pertinent articles, news items, a question and answer column and classified ads. Articles and papers submitted for publication are welcome.



Membership is open to anyone with an interest in herpetology. Dues for 1986 are:

Family	$15.00
Individual	10.00
Student	8.00
Corresponding	8.00

For further information please write to:

The Greater Cincinnati
Herpetological Society
c/o The Cincinnati Museum
of Natural History
1720 Gilbert Avenue
Cincinnati, Ohio 45202, U.S.A. ●

NORTHERN NEVADA HERPETOLOGICAL SOCIETY

The Northern Nevada Herpetological Society was formed in 1984 to educate its members and the public in the field of herpetology and wildlife conservation. The society has a membership of about 50 in the United States and Canada. Membership is open to anyone interested in the field of herpetology. Monthly meetings are held in Reno, Nevada the second Wednesday of every month, featuring films, guest speakers, and educational discussions. Membership includes a subscription to the society newsletter, published every other month. The price for membership is:

Regular Member	$7.00
Family Membership	$25.00
Contributing Member	$25.00

Please make checks and money orders payable in US funds to NNHS, and please include your address.

Send all correspondence and membership requests to NNSH c/o Reptiles of the West, P.O. Box 511, Virginia City, Nevada 89440, U.S.A., call (702) 847-0147. ●

MEETINGS

FALL ESHL MEETING

The Eastern Seaboard Herpetological League (ESHL) will hold its Fall meeting on Saturday, 18 October 1986 at the Peabody Museum, Yale University, New Haven, Connecticut. Presentations will be given on the following topics: Recognition and Prevention of Diseases in Reptiles, the Chemistry of Venoms, Defense Mechanisms of Amphibians and Reptiles, and Pathology of Reptiles. There will also be a workshop on Keeping Regional Herpetological Societies Healthy. A tour of the Peabody Museum may be scheduled. All individuals interested in herpetology are invited to attend. There is no admission fee. The meeting is being hosted by the Connecticut Herpetological Society. For further information contact:

Michael J. Urichek
77 Faber Avenue
Waterbury, Connecticut 06704, U.S.A. ●

SOCIETAS EUROPAEA HERPETOLOGICA

The Faculty of Natural Sciences, Catholic University, Nijmegen, will host the 4th Ordinary General Meeting of the SEH, 17-21 August 1987. The program will consist of oral and poster presentations, social gatherings, and a one-day field trip. Workshops will focus on "The Use of Telemetry in Herpetological Studies" and "Vocalization in Anura." All contributions will be presented in English.

A detailed program and call for papers will be delivered during or after September 1986 only to those who request them. For further information write to:

Dr. Jan J. van Gelder
Catholic University Nijmegen
Faculty of Sciences,
Department of Zoology
Toernooiveld
6525 ED Nijmegen, The Netherlands ●

INTERNATIONAL MEETING FOR BEHAVIORAL ECOLOGY

A meeting of behavioral ecologists will be held October 17-19, 1986 at the New York State Museum in Albany, New York, U.S.A. The program will include presentations by invited speakers, sessions for submitted posters, and workshops. Working committees will report at the meeting on the plausibility of a new scientific society, a new journal of behavioral ecology, and plans for future meetings.

For further information write:

Behavioral Ecology Group
Department of Biological Sciences
State University of New York at Albany
1400 Washington Avenue
Albany, New York 12222, U.S.A. ●

FEATURES

IDENTIFICATION CHARACTERISTICS OF ANURAN TADPOLES

Because of the small number of diagnostic traits that can be evaluated easily, subjective evaluations are commonly used in the identification of tadpoles. We point out additional traits or character states that might be considered in the identification of tadpoles. Characters do not have to be taxonomically universal to be of great help.

CHARACTERS

Color Patterns. Shapes and distributions of chromatophores can be distinctive, such as the chain-like patterns of melanophores in *Discoglossus* and *Pelodytes* (Boulenger 1891) and the abrupt switch from punctate to stellate melanophores in the tails of *Hyla gratiosa* tadpoles (Altig 1972). Some stream hylids and leptodactylids from Central and South America have bundles of parallel rodular melanophores arranged at right angles to each other. Pigmentation of the vent tube, spiracle tube, eyes, nostrils, pharyngeal walls, peritoneum, limb buds, and viscera often offer distinctive features but have never been systematically examined and are seldom used.

Nostril. More attention needs to be given to the aperture shape and size and detailed configurations of the opening (level with surface, countersunk, partial or complete surrounding rim, and presence, number, shape and distribution of papillae (see Inger 1983).

Spiracle. A primary concern involves those species that have the spiracle located well below the horizontal longitudinal axis so that neither sinistral (= laevogyrinid) nor mediogyrinid are entirely applicable. We suggest paragyrinid (e.g., phyllomedusine hylids, pelobatids) to describe a spiracle that lies between a point next to the midline and about 70 degrees counterclockwise as one imagines the animal in cross-section at the level of the spiracle. This term avoids excessive qualification of the term sinistral. Secondly, detailed configurations of the spiracle tube (medial wall absent or present as a partial or complete ridge versus a free medial wall) offers more information than is commonly presented.

Vent Tube. Cei (1980) noted a case in *Pleurodema* where the vent was "almost sinistral." If this is not a preservation artifact or a case of reversed symmetry (one *Mixophyes balbus*, UMMZ 154850, has reversed symmetry), it represents a new category.

The categories medial and sinistral should be evaluated solely on whether feces emerge in line with (medial) or anywhere to the right of the vertical plane of the ventral fin (dextral), regardless of the orientation of the tube proper or kind of association with the fin. There are several ways of being dextral: a circular tube (ignoring collapse) with walls attached at the same site to the fin; the same attached at the same site to a web between vent tube and fin; right wall displaced dorsally, anteriorly, or both (aperture no longer circular); or the attachment of both walls displaced to the right with or without a web. Several other types of dextral vents are not associated with the ventral fin or tail muscle (e.g., *Phyllomedusa guttata*, some myobatrachids). Medial vent tubes may have no association with the ventral fin, be within the ventral fin, or may be attached dorsally to the fin for part or all of their length with or without a web. The ventral wall may be shorter than (aperture a slit), equal to (aperture circular), or longer than the lateral walls. Contrast in these and other translucent features can be increased by histological stains or lyophilization (Altig 1974).

Jaw Sheaths and Labial Teeth. The buccal face of the upper jaw sheath (Altig 1973) may be diagnostic because of differential sloughing of cells. Shapes of cross-sections of jaw sheaths may be diagnostic or at least have ecological significance. The shape of the basal margin of keratinization on the buccal face of the sheath is often distinctive. Serration density (number/mm), depth, shape and orientation should be noted in more detail. The density of labial teeth seems to be stable

once the oral features are entirely formed, and more data are needed on the occurrence, number and configuration of cusps.

Lateral-line Pores. Patterns of lateral line pores (Boulenger 1891) are seldom used diagnostically because they are difficult to see; Lannoo (1985) solved this problem and indicated the presence of taxonomic traits. Many stream tadpoles in several families have the last posterolateral pore on the body greatly enlarged.

Buccal Papillae. Wassersug (1976, 1980), Inger (1985) and others have used these structures in the context of systematics and ecology. Configurations of these papillae aid identification in some cases.

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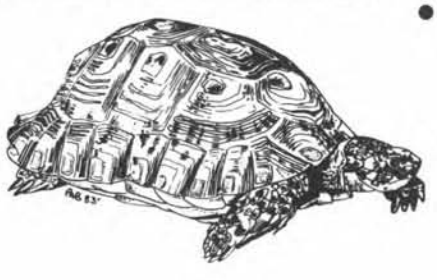
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EXPERIMENTS WITH GOPHER TORTOISE *(Gopherus polyphemus)* RELOCATION IN SOUTHERN MISSISSIPPI

Gopher tortoise *(Gopherus polyphemus)* populations in Louisiana and Mississippi have declined drastically since the arrival of European man and Louisiana populations are probably functionally extinct (Lohoefener and Lohmeier 1983). Throughout the gopher tortoise's range in the southeastern United States the conversion of pine (*Pinus* sp.) from natural open stands to planted dense stands has reduced gopher tortoise populations (Auffenberg and Franz 1982). The gopher tortoise is a colonial species and Lohoefener and Lohmeier (1981) believed that many pine forest management practices caused fragmentation of tortoise colonies. Lohoefener (1982) believed such fragmentation decreased the tortoises' reproductive potential and increased human predation. In Mississippi the gopher tortoise population consists mostly of isolated tortoises and there are many areas of suitable soils and topography from which gopher tortoises have presumably been extirpated. Any long-term gopher tortoise recovery plan in Mississippi will probably have to include relocation of isolated tortoises to re-establish colonies.

Little information is available on gopher tortoise relocation. This paper reports our attempts to relocate gopher tortoises in southern Mississippi.

METHODS

Relocation efforts were conducted during the spring and early summers of 1980, 1981, and 1982. Forty mature or nearly mature tortoises were used. Five tortoises were acquired from the Louisiana Nature Center. Four tortoises (probably released captives) were found wandering in a floodplain devoid of gopher tortoise habitat. Six tortoises (probably wandering feral tortoises) were found on southern Mississippi roads in areas lacking resident tortoises. Eleven tortoises were trapped at their burrows in southern Mississippi road ditches. Nine isolated tortoises were trapped at their burrows in forest habitats and five tortoises were trapped in areas that had recently been clear-cut.

Only five of the tortoises were less than 23 cm carapace length (CL). Sex determination was not inclusive for all tortoises. All relocated tortoises were marked by drilling one or more 0.32 cm diameter hole(s) in a marginal scute(s).

Five relocation sites were used: an area with seven mature tortoises resident in an open canopy stand of young slash pine *(P. elliotti)* on Eustis soils of 8-17% slope; an area with four mature tortoises resident in a semi-closed canopy stand of 20-30 year old slash pine on Poarch soils of 2-5% slope; an area known to have four mature tortoises resident in an open canopy stand of mature longleaf pine *(P. palustris)* on Poarch soils of 5-12% slope; and two areas of open canopy stands of 15-20 year old slash pine on Eustis soils of 8-17% slope where no tortoises occurred.

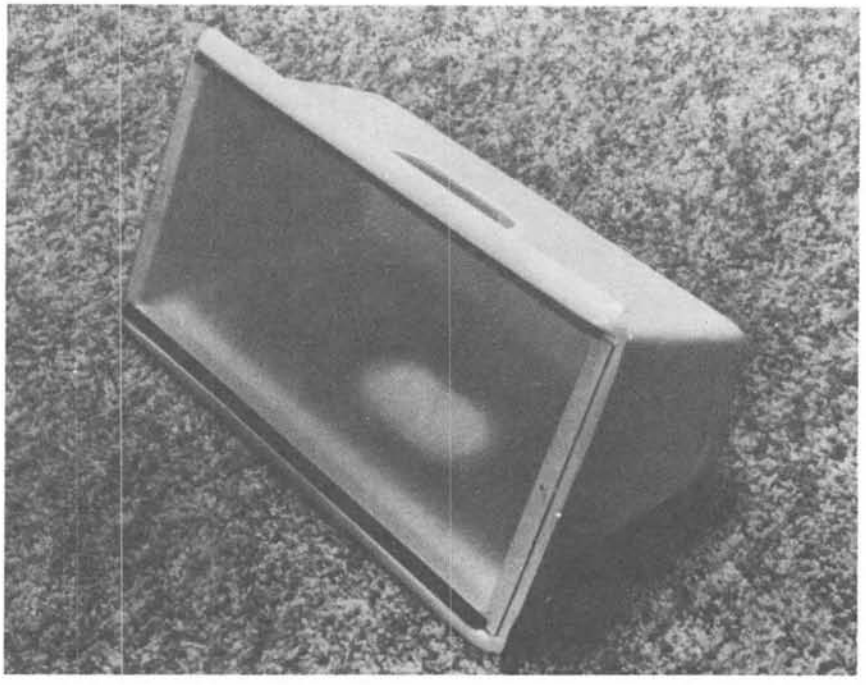
In 11 of the 30 trials (11/40 of the tortoises) the relocated tortoises were simply released at the relocation site (Table 1). In 5/30 (5/40 of the tortoises) the relocated tortoises were placed in existing tortoise burrows judged to be of the right size and not currently in use by a resident tortoise. In 3/30 of the trials (3/40 of the tortoises) the relocated tortoises were placed in "started" burrows. The remainder (11/30 of trials, 21/40 of tortoises) were placed in started burrows in pens.

Table 1. Results of experiments with relocation of gopher tortoises *(Gopherus polyphemus)* in southern Mississippi.

Release Method	No. of Trials	No. of Tortoises	Percent Success
Individual tortoises:			
In an area with feral tortoises.	11	11	0
In a started burrow in an area with feral tortoises.	3	3	0
In an abandoned burrow in an area with feral tortoises.	5	5	20
In a started burrow and penned in an area with feral tortoises.	5	5	80
Grouped Tortoises:			
Groups of 3, 3, 3, and 2 placed in started burrows and pens in an area with feral tortoises.	4	11	73
Groups of 3 and 2 placed in started burrows and pens in areas without feral tortoises.	2	5	100

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A "started" burrow consisted of a hole being dug with post-hole diggers to a depth of about 1 m and at an angle of about 45 degrees to the ground's surface. An attempt was made to ensure that the width and height of the hole exceeded the tortoise's carapace length and height. A shovel was used to shape the hole into the typical "half-circle" shape of a real tortoise burrow. All soil excavated was mounded and packed in front of the started burrow.

Of the penned tortoises, 5/11 of the trials used individual tortoises and the other six trials used groups of two or three tortoises (Table 1). The pen was constructed using 61 cm wide pieces of heavy translucent vinyl sheeting of varying lengths. The sheeting was arranged in the form of a circle and held erect by stapling to wooden stakes. About 10 cm of the sheeting's width was buried. When only single tortoises were enclosed the diameter of the circle was about 4 m, otherwise the diameter was about 7 m. Usually the pens were left erect for two to four weeks. However, in 4/11 of the trials, including both "new area" releases, the pens were knocked down by animals before two weeks had elapsed.

Where feral tortoises already existed a successful relocation was judged to have occurred when a new burrow became active in the area and subsequent trapping caught the marked tortoise. A relocation was judged as unsuccessful if no new burrows occurred in the study area and the marked tortoise was never again captured. In the two areas where no feral tortoises existed, success was judged by presence of new tortoise burrows. Because of human predation in the study areas no study period was longer than one season and successful relocation is based on whether the relocated tortoise was still present in late summer or early fall.

RESULTS

Only one relocation was successful among the 19 unpenned tortoises placed in areas where feral tortoises occurred (Table 1). All 21 tortoises placed in pens were also placed in started burrows and seventeen (81%) of these relocation attempts were successful.

Following the initial placement, many tortoises were never again observed to be in the started burrow. Following release in the pen, only 6/21 of the tortoises were observed to have excavated the started burrow. Once the pens were removed none of the relocated tortoises stayed in the artificial burrows. Of the tortoises that remained in the study area, all excavated burrows elsewhere.

Of the 18 unpenned tortoises that left the study area, three are known to have returned to near the place of capture. These three tortoises had been removed from clearcut areas and relocated to areas about 1.5 km distant. One tortoise returned to within 3 m of its original burrow. The other two dug new burrows within 100 m of their old burrows.

DISCUSSION

MacFarland et al. (1974) reported the results of releasing 71 captive raised, five year old Galapagos tortoises *(Geochelone elephantopus)* in an area of feral tortoises. They reported the behaviors of the released tortoises and young feral Galapagos tortoises were similar. Ten months after release the overall dispersal of the toroises was not great and the survival and health of the released tortoises was encouraging.

Berry (unpublished 1972-75 contract reports, see Hohman et al. [1980] for an annotated listing) experimented with relocation of desert tortoises *(Scaptochelys agassizii)*. She relocated desert tortoises to areas where feral desert tortoises already existed. The tortoises were not penned nor provided refugia. Berry believed her efforts to be generally successful, with relocated feral tortoises probably having a greater chance of survival than relocated captive tortoises.

Cook et al. (1978) and Weber et al. (1979) reported on the reloction of former "pet" desert tortoises to areas lacking feral tortoises. All tortoises were held for a period of time (to ensure they were not diseased) and then released. No pens or refugia were provided. Based on the number of tortoises found dead after one year the survival rate was estimated to exceed 70 percent.

Our study would have been improved by penning some tortoises without started holes and penning where abandoned real burrows were present. However, we were concerned with feral dog predation and felt obligated to provide refugia.

All five tortoises we relocated to areas lacking feral tortoises were captive tortoises from New Orleans, Louisiana. We were concerned with possible disease transmissions and these tortoises were placed on small "islands" of upland soils that were completely surrounded by creeks or extensive wet areas. The high rate of success (100%) for these tortoises may have been attributable to this isolation.

Our results indicate that simple release of relocated tortoises in areas where feral tortoises occur may not be worthwhile. Except for perhaps providing shelter, the artificial starting of burrows, at least by our methods, did not seem to enhance the success rate of tortoise relocation. Our results indicate that the penning of the tortoises in the release area increases the relocation success.

However, our results are at odds with those of other gopher tortoise relocation studies. Landers (unpubl. ms., see Diemer [1984]) placed 79 adult tortoises among four sites, each about 5 ha in size, on which low numbers of feral tortoises were already present. None of the relocated tortoises was penned but some were placed in existing burrows and others placed in started burrows. Overall, Landers reported that about 40% of the tortoises remained in the area of release.

Contrary to our results, Landers found nine of the 12 tortoises that were placed in started burrows converted these starts into burrows and became resident. Landers reported that on at least five occasions the relocated tortoises initially left the release site but returned during "the next few months."

N. Mills (pers. comm.) has relocated four tortoises from Louisiana to Mississippi. In each instance the relocated tortoise was placed in an existing colony of feral tortoises but not in a pen. He believes his success rate has been 100%.

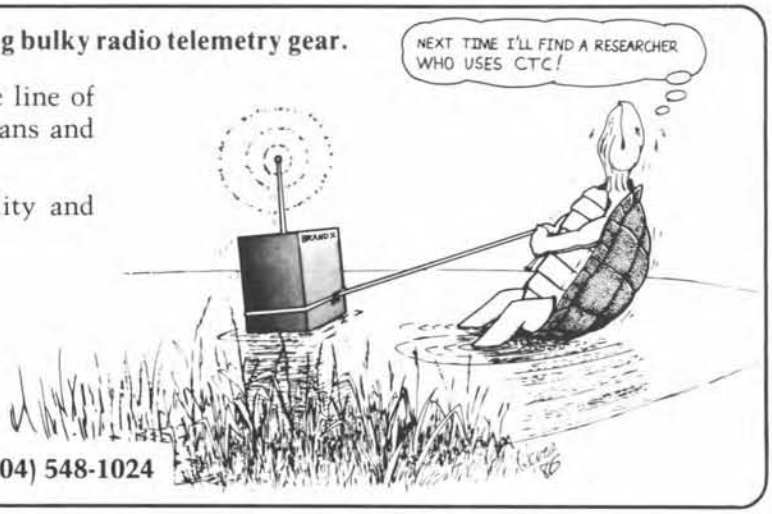
Diemer (1984) recently addressed the ethical and ecological problems associated with tortoise relocation in Florida and presented preliminary results for one relocation project. In 1978 twenty-nine (24 marked) gopher tortoises were penned and later released in an area where feral tortoises occurred. In 1983 seven of 12 tortoises recaptured were of the original 24 marked.

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CONCLUSIONS

There is a great need for comprehensive and well-planned gopher tortoise relocation studies. If the gopher tortoise is to remain part of Mississippi's naturally occurring fauna a relocation of isolated tortoises to areas where colonies can be protected will be necessary. To save the gopher tortoise from extinction in Louisiana such work would have to be done immediately.

In Mississippi, where suitable gopher tortoise habitat is usually found as small widely separated upland areas, preliminary recommendations might include the following. Only isolated feral tortoises should be used in relocations. If at all possible the relocation site should have supported tortoises in the past. When possible the sex ratio of relocated tortoises should be approximately 1:1. Based solely on our results, relocated tortoises should be penned at the release site for at least one week. Some measures should be taken to ensure that the penned tortoises are protected from human and animal predation.

Relocating gopher tortoises is very labor intensive and time consuming, thus expensive. The results can be obliterated by one human predator. It is highly desirable that the other southeastern states with gopher tortoise populations do not allow the populations to decline to the point where survival of the species in the wild is dependent upon relocation efforts.

We thank R. Thomas and the Louisiana Nature Center for tortoises. We thank the editor and reviewers for assistance with the manuscript.

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ARCHAEOLOGICAL EVIDENCE OF *Emydoidea blandingii* IN MAINE

In 1966, 651 bone fragments were recovered from an Indian site on Hog Island, Lincoln County, Muscongus Bay, Maine. The site is an Indian shell midden composed mostly of soft-shell clams, *Mya arenaria.* An examination of ceramic sherd fragments and two stone projectile points leads to an estimated period of occupation between 500 BC and 1500 AD. Among the bones collected were fragments of two turtles: a 9th right marginal, probably from a painted turtle, *Chrysemys picta,* and 10 fragments representing a single section of an adult Blanding's turtle shell. The Blanding's turtle fragments consist of nearly complete 2nd, 3rd, and 4th neural bones and the attached proximal ends of the left 2nd and 3rd pleural bones. The 3rd neural measures 35 X 23 mm, suggesting a specimen of approximately 225 mm total carapace length. These shell fragments are stored at the Department of Archaeology, University of Maine, Orono as site number 17.22 in the Maine Archaeological Survey System. This Blanding's turtle specimen represents the first record of the species from an archaeological site in New England and is evidence that the species was indigenous to New England in pre-colonial times.

Recent Blanding's turtle specimens found in Maine include those reported by Packard (1960) and Graham and Doyle (1973). A specimen reported from Hampden Highlands (Barden 1952) was a misidentified wood turtle, *Clemmys insculpta,* (McCoy 1973; Graham and Doyle 1973) and an animal found in the 1950s on Mt. Desert Island (Coman 1981) was most likely an escape. McCoy (1973) summarized the range of the species.

Appreciation is extended to Peter Meylan of the Florida State Museum, University of Florida, for verifying the identification of the shell fragments. Art Spiess of the Maine Historic Preservation Commission and Russell Barber, former director of the Institute of Conservation Archaeology, Peabody Museum of Archaeology, Harvard University, examined cultural artifacts from the site and estimated the period of occupation. Appreciation is also extended to Duryea Morton and Stephen Kress, past and present directors of the National Audubon Society's Ecology Workshop on Hog Island, for permission to examine the material and publish this report.

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PSEUDOCOPULATION IN *Eumeces laticeps*

The first observation of pseudocopulation in female lizards under natural conditions was made on a parthenogenetic geckonid, *Lepidodactylus lugubris* (Werner 1980). Male-like courting and mounting has been observed under laboratory conditions in both unisexual and bisexual *Cnemidophorus,* Teiidae, in a scincid, *Eumeces egregius* and occasionally in an iguanid, *Anolis carolinensis* (Cole and Townsend 1983; Crews and Fitzgerald 1980; Cuellar 1981; Mount 1963). Here I report on an instance of pseudocopulation during a staged encounter under natural conditions between two female scincids, *Eumeces laticeps.*

On 8 June 1984 at a study site in Scott Co., Illinois I presented a tethered female *laticeps* (107 mm SVL, collected on 4 June 1984) at the end of a bamboo fishing pole to a resident female *laticeps* (115 mm SVL). This is a technique that has been used at the study site to study male-male interactions. Portions of the pseudocopulation were filmed with a Beaulieu Super 8 movie camera. Film analyses were made with a Lafayette Super 8 film analyzer. Gender identification in this species was determined by the obvious sexual dimorphism during the breeding season.

The resident female was observed at 1105 h. She lay on the ground with her head and body in the sun while her pelvic region and tail were hidden under the floor of a small building. Upon presentation of the tethered female at 1107 h the resident ran back under the building. At 1109 h the resident, assumed to be the same female, reemerged, approached the tethered female and tongue-flicked the base of her tail. At 1110 h the two females were lying side by side. At 1111 h the resident moved close and secured a neck bite hold on the tethered female. She then arched

her body over the tethered female and twisted the base of her tail under the tail of the tethered female to appose the cloacae (Fig. 1). Pelvic thrusting by the resident occurred ca. every 2 s. The resident released the neck bite hold at 1116 h and moved under the building. Shortly thereafter she reemerged and was captured.



Figure 1. Pseudocopulation in female *Eumeces laticeps*.

Interpretation of this behavior is difficult. Several variables, e.g., social, spatial, physiological, (or some combination of these) may explain the behavioral sequence. Since the resident was larger than the intruding female, this may have been an expression of social dominance. However, in male *laticeps* dominance is achieved through a ritualized assessment strategy involving biting of the occipital region (Moehn, in prep). Neck bite hold, cloacal apposition and pelvic thrusting have not been observed in numerous male-male interactions.

Spatial relationships may have been important. The resident female had previously been observed in the same area on 4 June 1984 and on 6 June 1984. Her home range was located ca. 75 m from three different foci of male activity. No males had been observed in her home range prior to 8 June during 1984. Her relative spatial isolation may have produced "ersatz," i.e., mating with one's own sex in the absence of the appropiate sex.

A more satisfying explanation is a physiological one. Because neither female was dissected, their ovarian conditions are unknown. However, reproduction in the Scott Co. population was delayed in 1984 because of the cool spring. Reproductive activities normally peak before the end of May. In 1984 the first instance of female tending by a male was observed on 4 June. The resident may have been preovulatory on 8 June and perhaps her preovulatory state produced the pseudocopulatory response. In parthenogenetic *Cnemidophorus* male-like behavior is more often associated with the postovulatory condition (Crews and Fitzgerald 1980), but I simply suggest that the resident female's ovarian/hormonal state, whatever it may have been, provides the most heuristic explanation for this behavior. Regardless of the social, spatial or physiological factors involved, the observation does suggest that pseudocopulation between females may occasionally occur under field conditions in sexually reproducing lizards.

In captivity the resident female copulated with a male on 14 June 1984 and on 22 June 1984 she deposited a clutch of 11 eggs. Both females had been toe-clipped and they were returned to their respective capture sites on 16 July 1984.

I thank Illinois College for financial support.

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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Knoxville Zoological Park, Box 6040, Knoxville, Tennessee 37914, U.S.A.

COURTSHIP AND REPRODUCTION IN CAPTIVE CRETAN VIPERS, *Vipera lebetina schweizeri*

The Cretan viper, *Vipera lebetina schweizeri* is an oviparous, dwarf form (to 80 cm) of the leventine viper occurring on islands in the West Cyclades, Greece. The Greek Department of Agriculture presently offers a bounty of 10 Drachme per snake which results in an annual harvest of about 600-1000 vipers by inhabitants of Milos. In addition several hundred are taken annually by collectors (Honegger 1977). Honegger (1977) considers the subspecies to be endangered with a total population estimated at 3000-5000 specimens. Currently in need of protection, the future survival of the Cretan viper may depend upon captive management programs.

Information regarding the Cretan viper's reproductive biology in captivity is scanty. Schweizer (1957) reported on the artificial incubation and hatching of eggs laid by a wild-caught female. Stemmler (1967) observed combat between males as did Schweiger (1981), who further recorded copulation. The most inclusive account of the snake's reproductive biology in captivity is by Westrin (1983), who reported combat between males, copulation, egg laying, incubation and hatching.

This paper presents information on the successful reproduction of a pair of *Vipera lebetina schweizeri* at the Dallas Zoo for three successive years, 1980-1982.

MATERIALS AND METHODS

An adult sexual pair of *Vipera lebetina schweizeri*, from an unknown locality, arrived at the Dallas Zoo on 28 November 1977. The snakes were initially maintained at a relatively constant year round temperature (26-29° C).

From early March to early December the snakes were housed together on exhibit in a fiberglass enclosure measuring 77.5(l) x 60.2(w) x 38.0(h) cm. Rocks, plastic plants and a water bowl were provided on a sand and gravel substrate. Lighting was provided by two 20 watt Sylvania cool white fluorescent tubes (F20T12/CW). For the 1980 season only, one of the fluorescent tubes was replaced with a blacklight (Sylvania, F20T12/BL). A 50 watt infrared spotlight (Sylvania Corp.) created a basking spot in one corner of the exhibit. The artificial lights provided a photoperiod of 12L:12D. Skylights provided a natural photoperiod for the Dallas, Texas area. Ambient temperature varied from 26-32° C. The snakes were fed 1-3 freshly killed laboratory mice every three weeks.

Every year during hibernation, the snakes were housed in a 15 gallon, screen-topped glass aquarium. A hide box, rocks and a water bowl were provided on a newsprint substrate. Cooling took place in a converted convection freezer with a Honeywell thermostat (type T6021A). Beginning in early December the ambient temperature (26° C) was lowered approximately 2° C daily until 13° C was reached. The temperature remained constant until the last week of February, at which time the temperature was elevated 2° C daily until the ambient temperature reached 26° C. The snakes were not fed during hibernation. The pair was placed back on exhibit during the first week of March. After hibernation the female was provided with a container filled

with moist sphagnum moss for egg deposition.

In 1980-1981, eggs and hatchlings were weighed to the nearest 0.1 gram using an Ohaus triple beam balance. In 1980-1981, eggs were measured to the nearest 1.0 mm using a vernier caliper. Hatchlings were measured using the technique of Quinn and Jones (1974). In all three years the eggs were incubated using the method of Tryon (1975) and kept at an ambient temperature of 27-31° C.

Each hatchling was housed individually in a one gallon jar filled with ca. four inches of pea gravel. A small water dish was sunk into the gravel. A rock, plastic plant and a piece of bark were provided for shelter.

OBSERVATIONS AND DISCUSSION

Courtship was noted for the first time on the morning of 30 March 1980 and continued throughout the next day. The female's tail was elevated to the vent with the posterior half of her tail looping over her body. The cloaca was held agape at the time. Periodically the female would elevate her tail to an even greater angle and then gradually let it back down while simultaneously moving her head from side to side. The combined action would usually elicit rapid tongue flicks and head bobs from the male along the female's dorsum. Tail-search copulatory attempt, as described by Gillingham et al. (1977), was frequently misdirected with the male's caudal region in line with the female's cephalic region. Copulation was never observed.

The female first appeared gravid approximately two to three weeks after courtship. The posterior portion of her body had noticeable swelling with discernable masses. Five eggs and two infertile egg masses were laid on 20 May 1980; the latter were discarded. The clutch consisted of four adherent eggs (total mass = 53.5 g) and one nonadhesive egg (mass = 15.0 g). The mean egg mass (n = 5) was 13.7 g. Measurements were: length 39-48 mm, X = 32.2 mm. All eggs hatched 41-43 days later. Hatchling masses and lengths were: mass 7.0-9.3 g, X 8.26 g; total length 188-192 mm, X = 185.8 mm; tail length 19-27 mm, X = 24.5 mm.

In 1981, courtship was observed on 7 April. Copulation was not observed. Ten eggs were laid on 13 June. One egg proved to be infertile and was discarded. Two of the remaining eggs were infertile and were disposed of four days later. Two of the nine eggs were adherent, the rest nonadhesive. Egg mass for the adherent eggs was 28.9 g, for the nonadhesive eggs 13.8-16.9 g, X = 14.5 g. Egg measurements (n = 9) were: length 37-43 mm, X = 39.6 mm; width 23-27 mm, X = 25.2 mm. Seven snakes hatched 37-39 days after egg deposition. Hatchling masses and lengths (n = 7) were: mass 9.0-9.4 g, X = 9.3 g; total length 195-218 mm, X = 202.2 mm; tail length 27-31 mm, X = 28.7 mm. In 1981, even though the clutch size was larger than in 1980, the snakes hatched earlier and were also larger than the 1980 individuals. In the 1981 brood, the first ecdysis occurred 9-10 days after birth; newborn laboratory mice were accepted 19-20 days after the first ecdysis.

In 1982, the adult pair was observed copulating on 7 April. Eleven eggs were laid on 23 June. Three eggs proved to be infertile and were disposed of 31 days later. The remaining eight eggs hatched 48 days after egg deposition. Egg and hatchling measurements were not recorded.

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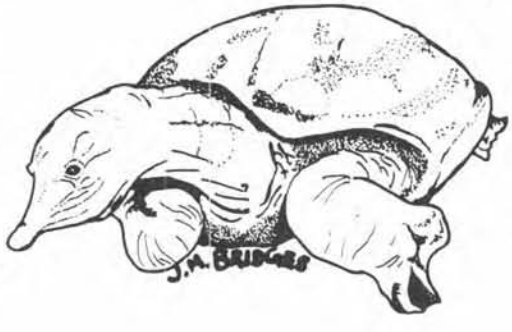
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TECHNIQUES

A WARNING AGAINST THE USE OF PETERSEN DISC TAGS IN TURTLE STUDIES

In all of my field studies of freshwater turtles dating back to 1966 I have marked individuals by a notching method modified after Cagle (1939). While the pros and cons of this technique have been discussed elsewhere (Plummer 1979) an additional failing of the method is that anyone picking up a notched turtle usually overlooks the marks, and even if the notches are noticed the sequence (i.e. unique number) they represent is not recorded.

During the course of my studies on the status of the redbelly turtle, *Pseudemys rubriventris*, in Plymouth County, Massachusetts I recognized a need for a marking system which could be employed in addition to the shell notching scheme; a system which would alert the finder to report the turtle's number, location, and the date of the find to myself or the Massachusetts Division of Fisheries and Wildlife. In particular I was interested in getting data on the overland movements of individuals which were occasionally witnessed by passing motorists, cyclists, or hikers. After learning of the application of printed Petersen disc tags to marking Blanding's turtles, *Emydoidea blandingi*, in the field (Erik Kiviat, personal communication) I ordered a set of 1.5 cm round, serially numbered Petersen disc tags, blank backing tags, and pure nickel fish pins from a west coast supplier in the spring of 1981. I affixed these tags to all redbellies considered big enough to carry them, generally those greater than 15 cm carapace length. The tags were attached via a small hole drilled in the center of one of the rear marginals. A nickel fish pin was first inserted through a blank backing tag and then up through the hole in the shell margin. A numbered printed disc was placed over the top of the pin to form a "sandwich" of two discs with the shell in between them. The protruding nickel pin was cut off ca. 1 cm above the top disc, folded (loop-like) back on itself, and then crimped tightly against the top disc by pliers pressed against the pin head on the underside of the shell. The attachments were always very tight and were in fact checked carefully to be sure that they did not move at all when grasped between my thumb and forefinger. This check was done routinely to insure against premature tag loss. Over a period of approximately two years I applied more than 150 Petersen tags to redbellies without incident. Subsequent recaptures of tagged animals indicated that the tags and their attachment were holding up quite nicely. In the summer of 1983 however, I began to notice that the tag attachment on many animals showed signs of loosening.

Although tag retention has been very high through 1985, the loosening of the conventional pin attachments has proven disastrous. From 9 to 24 September 1983, four adult (3♀, 1♂) redbellies became entangled in the one inch, stretched mesh, knitted nylon New Hampshire fyke nets I had been using since

1979. It seems that during their confinement in the body of this trap these turtles have a habit of backing into the side walls and the loosened Petersen tags catch in the mesh. Entangled animals, unable to surface for air, drown. Since this alarming discovery I have discontinued the use of Petersen tags and have religiously removed them from previous tagged turtles. In addition, although I continue to use fyke nets for turtle capture, in waters still containing tagged turtles the fyke nets must be checked three or four times daily to insure that tagged captives don't suffer a similar fate.

Another disturbing occurrence in 1985 was the discovery that Petersen-tagged turtles can also get fouled in snagged or discarded monofilament fishing line. While I have previously freed birds found entangled in monofilament which was apparently discarded onshore, I never envisioned that abandoned fishing line could pose such an insidious threat to tagged turtles. It could be argued that a safer method of attaching the discs might be found, e.g. adhesives or even the monofilament suggested by Randall (1956). Nonetheless, I strongly urge anyone considering the use of Petersen tags in field studies to carefully weigh the hazard these devices pose if they are attached in conventional fashion.

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A METHOD FOR SAMPLING BLOOD FROM HATCHLING LOGGERHEAD TURTLES

Blood collection from hatchling marine turtles (or turtles of comparable size, 4-5 cm straight carapace length) has been accomplished previously by cardiac puncture (Owens & Ruiz 1980) or decapitation (Dunson & Moll 1980). These two methods are unsatisfactory for studies on small turtles requiring repetitive blood sampling. In the case of cardiac puncture, the sample is likely to be contaminated with pericardial fluid, there may be problems in locating the heart through the plastron, and there is always some degree of trauma to the myocardium, depending on the skill of the operator. The disdvantages of decapitation are obvious.

Blood samples have been collected from the bilateral dorsal cervical sinuses of larger turtles (Kooistra & Evans 1976; Limpus pers. comm.; Owens & Ruiz 1980) although this was found to be too difficult in hatchling green turtles (Owens & Ruiz 1980). However, during a study carried out on hatchling loggerhead turtles *(Caretta caretta),* I found the dorsal cervical sinuses to be a very simple and atraumatic site for repetitive blood collection. Other sites for collection from large turtles include the heart (Stephens & Creekmore 1983) and the scapular vein (Avery & Vitt 1984).

Disposable insulin syringes with integrated needles are ideal for collection of small volumes of blood, ensuring minimum loss of sample in the syringe deadspace. If these are not available, a small syringe with a short, narrow gauge needle is adequate (26G, 0.5"). Hold the turtle in the left hand (if you are right-handed) with the carapace towards you and the plastron resting on the fingers. The turtle is restrained by pressing the thumb on the carapace and holding the head between the index finger and middle finger (or between the third and fourth fingers, using the index finger to steady the needle). The neck should be partially (not fully) extended and lightly flexed ventrally. Entry to the cervical sinus should be perpendicular to the skin and just lateral to the midline (Figure 1). The needle should draw blood at a depth of 0.5-1 cm depending on the size of the animal. It is helpful to apply gentle suction to the syringe during entry if unsure about the depth of the sinus.

Blood samples of up to 0.5 ml were taken from 20 g hatchlings when only a single sample was needed, and 0.2 ml samples could be collected daily for up to a week. More than one hundred hatchling loggerheads were sampled in this way and none showed adverse effects attributable to blood collection.

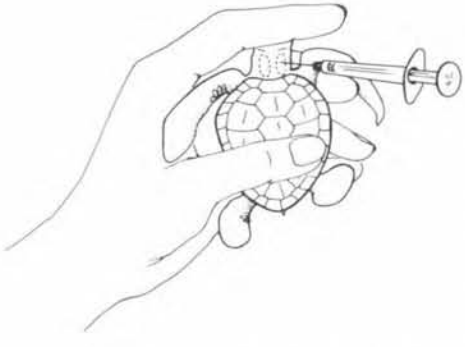


Figure 1. Collection of blood from the dorsal cervical sinus of a hatchling loggerhead turtle. The extent of the sinuses is marked with a dotted line.

ACKNOWLEDGMENTS

This method derives from a study on hatchling loggerhead sea turtles carried out in cooperation with the Queensland Turtle Research Group of the Queensland National Parks and Wildlife Service and the Physiological Ecology laboratory at the University of Sydney.

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CANDLING TURTLE EGGS

Turtle and tortoise eggs are slow to hatch. Candling allows an early determination of viability.

Candling is a noninvasive means of looking inside the eggs. It has been done for many years with avian eggs but works with chelonian eggs as well. Although candlers can be bought which are designed specifically for this purpose, an effective substitute can be constructed from items readily available or inexpensively purchased. The procedure takes only a few minutes.

Components needed to construct a candler consist of a large clay flower pot, an extension cord with a bulb socket on the end, a 100-watt light bulb, and a room which can be totally darkened. Fasten the socket to a board in an upright position (Figure 1) and place the flower pot upside down over the bulb. Place the egg to be candled on the drainage hole in the bottom of the pot. Turn on the bulb and darken the room completely. View the egg at right angles to the beam of light coming through the drainage hole (Figure 1) Do not look straight down on the egg from above. If done properly, the entire egg will glow and appear as if it were lit from within.

The eggs of some species afford better views of their contents than others. Many tortoises produce heavy-shelled eggs which are difficult to candle, while smaller turtles tend to produce less calcareous eggs, permitting a better view of their contents. All eggs reveal only a shadowy, blurry, image with no detail,

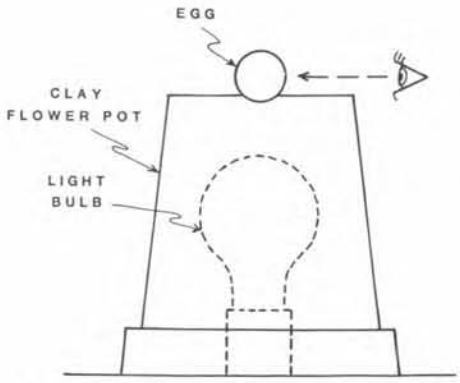


Figure 1. A simple apparatus for candling turtle eggs utilizing a light bulb and a clay flower pot.

requiring some experience for proper interpretation.

A total of 40 eggs of six species were examined by candling after 10 days of incubation at 80° F. At this time, a penny-sized pink membrane could be seen, usually near the top of the egg. Variations in embryo size were observed within clutches as well a interspecifically. The six species observed were *Clemmys guttata, C. insculpta, Cuora flavomarginata, Emydoidea blandingii, Graptemys kohnii,* and *Trionyx ferox*. Arteries, heads, eyes, shells, feet, and yolk became progressively visible with time. The yolk is always on the bottom and glows yellow to orange when candled. Fertile eggs with soft shells usually turn chalky white after a few days, while infertile eggs tend to turn yellow and develop dents.

Figures 2 and 3 are of an egg almost half way through a 60 day incubation period. These figures demonstrate how to interpret the candled image.

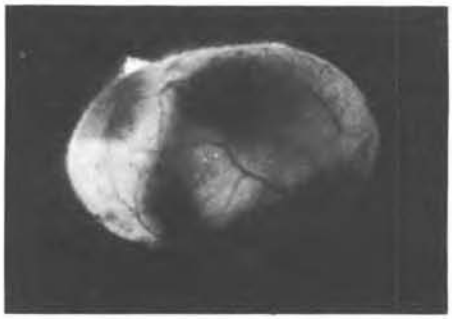


Figure 2. Photograph of a candled *Pelomedusa subrufra subrufra* egg on the 27th day of the 60-day incubation period. Compare with Figure 3. (Photograph by Ted Colvin and Ann B. Bryan).

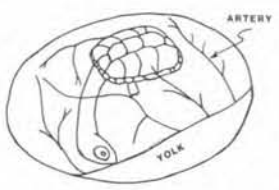


Figure 3. A sketch of the candled egg shown in Figure 2 showing the location and position of the embryo and the location of the yolk and arteries.

It is not uncommon for hard-shelled eggs to develop permanent air pockets which increase in size during incubation. They can occupy up to one-third of the volume of the egg with no adverse effects on the embryo. Eggs with free-floating air bubbles or cracked shells never hatch. The senior author had one instance of an egg which was punctured from within. It oozed a drop of blood, which was wiped off, and the puncture was sealed with Elmer's® glue. The turtle hatched a month later.

Late in the incubation period the shell, four legs, and head are evident. The head end contains the smallest and fewest blood vessels.

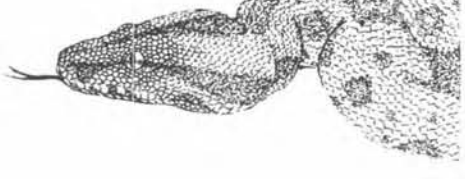
Since turtle eggs develop best when the embryo is at the top of the egg, candling allows one to determine when eggs are not properly oriented and rotate them if necessary. There is currently disagreement on whether or not rotation during incubation is harmful to turtle eggs. Except for this initial reorientation of the egg, the authors do not recommend rotation. Candling also minimizes a disorder that the senior author has termed "full term egg death." This is a condition in which individuals attain full hatching size but fail to hatch. We believe the cause of full term egg death to be related to the membrane enclosing the turtle within the egg. This membrane, through which the turtle respires while in the egg, is withdrawn into the turtle's abdomen at hatching time. If the turtle cannot break out soon after this happens, it will drown. If eggs are opened slightly just before hatching, they will usually survive.

To open an egg, one must candle it daily during the last week of incubation. When an area clear of blood vessels appears at the head end, mark it with a pencil. Then, using a sterilized pin, carefully make a small puncture and wipe away as much liquid as possible, leaving an air pocket in which the turtle may breathe. Return the egg to the incubator and it should hatch by itself.

The following species were hatched in 1985 using the above technique: 50 *Clemmys insculpta,* 8 *C. guttata,* 12 *C. muhlenbergii,* 20 *Terrapene carolina,* 12 *Cuora amboinensis,* 6 *C. flavomarginata,* 2 *Chrysemys picta,* 3 *Cyclemys dentata,* 5 *Chelodina longicollis,* 3 *Graptemys kohnii,* and 18 *Pseudemys scripta elegans.* Three of the *P. s. elegans* had no legs and would not have been able to hatch on their own. They were euthanized two weeks after hatching.

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LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. Reports of clutch or litter size should include snout-vent and total lengths of females. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1982. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

Please submit Life History Notes in the standard format directly to the ***SECTION EDITOR*** to avoid delays in publication: Peter J. Tolson, Toledo Zoological Gardens, 2700 Broadway, Toledo, Ohio 43609, U.S.A.

ANURA

HYLA REGILLA (Pacific Treefrog). **PREDATION.** An adult Male *Hyla regilla* (2.4 g, 33 mm snout-urostyle length) was observed struggling in the jaws of an adult male red-leg frog *Rana aurora* (45 g, 80 mm SUL). The incident occurred at Blumpond, a stock pond (15 m in diameter, less than 1 m deep) in oak woodland, immediately adjacent to the NW border of Hastings Natural History Reservation, elev. 518 m, Carmel Valley, Monterey Co., CA on 19 January 1986, 2035 h, during a light rain. The *Rana aurora* rested on a mat of aquatic vegetation in the center of the pond. The *Rana* released the *Hyla* during capture but later ingested him in the collecting bag. Approximately 100 male *Hyla regilla* were chorusing in the pond and several male-female pairs were observed in amplexus. Only the one *Rana aurora* was observed.

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RANA CATESBEIANA (Bullfrog). **PREDATION.** Bullfrogs are known to be preyed upon by birds (Chapin 1908. Proc. Staten Is. Assoc. Arts Sci. 2:3-8; Jenni 1969, Ecol. Monogr. 39:245-270; Niethammer and Kaiser 1983.

Colonial Waterbirds 6:148-153). Although infrequent reports exist of terns of the genus *Chlidonias* taking frogs (Craig 1974. Ostrich 45:142) or their life stages (Pandit 1982. Indian J. Ecol. 9:181-190), to our knowledge, the only report of any member of the tern genus *Sterna* taking frogs is that of Peabody (1896. Osprey 1:1-3, 21-23) of Forster's terns *(Sterna forsteri)* from Heron Lake, Minnesota consuming dead frogs that had been trapped by ice and feeding live frogs to their young, none of which were identified. Here, we report predation by Caspian terns *(Sterna caspia)* on postmetamorphic *Rana catesbeiana*.

In the course of a study of a nesting colony of elegant terns *(Sterna elegans)* on dikes separating salt evaporating ponds at the south end of San Diego Bay, California during 1980 and 1981, one of us (FCS) made several observations that indicated predation on bullfrogs by *Sterna caspia*. On 9 June 1980, a dead *Sterna caspia* chick was found with a bullfrog. The frog was in its throat; missing a left hind leg. On 6 May 1981, an adult *Sterna caspia* was observed flying overhead with a subadult *Rana catesbeiana* (ca. 80-90 mm SVL) in its bill. On 20 May 1980, one pair of bullfrog legs severed just above the pelvis was found in a *Sterna caspia* nest.

These observations suggest non-incidental predation by *Sterna caspia* on postmetamorphic *Rana catesbeiana* and indicate that bullfrogs were exploited as food during tern reproduction. It is noteworthy that the *Sterna caspia* population at San Diego was not established until ca. 1940 (Gill and Mewaldt 1983. Auk 100:369-381) and that bullfrogs did not become well-established until about this time (Jennings and Hayes 1985. Herpetologica 41:94-103). *Sterna caspia* is known to be more plastic than other Sterninae in its nesting habits (Gill and Mewaldt op. cit); our observations suggest plasticity in its choice of prey.

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RANA SYLVATICA (Wood frog). **REPRODUCTION.** Wood frogs are explosive breeders, and the earliest anuran to breed in Maryland (late February to early March). Females tend to oviposit their eggs in central egg masses. Colonial egg deposition in wood frogs is thought to function as an insulating mechanism against cold temperatures (Seale 1982. Copeia 1982:627-635; Waldman 1982. Behav. Ecol. Sociobio. 10:169-174; Waldman and Ryan 1983. J. Herpetol. 17:70-72). We report that colonial egg deposition may also function to increase survival, by reducing desiccation.

On 13 March 1985, a mass of wood frog eggs (mass D=0.75m) was noted in a shallow, ephemeral pond in Baltimore Co., Maryland. by 19 March the pond had receded significantly, stranding the eggs on moist leaf litter, 4 meters from the water. After a few hours exposure to the air, the outer-most layers of eggs desiccated, forming a thin (apparently protective) covering around the visible surface of the mass. The inner eggs were observed nightly; they appeared hydrated and developed normally (compared to other eggs still in the pond). On 23 March, after four days of exposure, a heavy rain refilled the pond, inundating the stranded egg mass. Many of the eggs continued to develop and eventually hatched. No change in the size of the egg mass was noted during the four days it was exposed.

These observations represent the first published report of woodfrog eggs surviving prolonged exposure to a terrestrial environment. We suggest that this capability represents a significant advantage to a temperate anuran selected to exploit temporary vernal ponds; and it corroborates previous reports ascribing improved fitness to the practice of communal oviposition.

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CAUDATA

LEUROGNATHUS MARMORATUS (Shovelnose Salamander). **CLIMBING.** Since the species was described (Moore 1899. Proc. Acad. Nat. Sci. Phil. 1899:316-324), no investigator has attributed anything other than a purely aquatic existence to *Leurognathus marmoratus* (Martof 1962. Amer. Midl. Natur. 67:1-35). All of Martof's (1962) several thousand specimens, as well as those collected earlier (Pope and Hairston 1947. Fieldiana-Zool. 31:155-162), were found in trout streams in the southern Appalachians. In addition, the unique morphological features of *L. marmoratus*, such as the fin-like tail, the slit-like choanae, and the rudimentary internasal glands, are considered specializations for an aquatic existence.

During the summer of 1982, I conducted experiments that required the construction of rectangular 5-m^2 pens placed perpendicular to a mountain stream. The long dimension of the pen was arranged so that it spanned 1 m of stream and 2 m of the adjacent streambank and forest floor. I sank 40 cm of 3.2-mm-mesh hardware cloth into and underneath the substrate to prevent salamanders from burrowing into or out of the pens. During construction the substrate was thoroughly searched and all resident salamanders removed. Salamanders from the surrounding area, however, could enter the pens if they successfully climbed the 50-cm sides. Over the course of the summer, 340 salamanders were found, 263 of which were *Desmognathus*. Surprisingly, eight of the salamanders found in two of the four pens were adult *Leurognathus marmoratus*. I am convinced that these salamanders did not enter the pens from beneath the substrate, because no new salamanders were found in the pens when tape was added to the top of the pens to prevent climbing over the sides.

The pens into which the *L. marmoratus* climbed were located on a small second-order stream at elevations of 1200 m and 1220 m on Sugar Mountain, Avery County, North Carolina. I believe this stream to be considerably smaller than those in which *L. marmoratus* is usually found, and had not previously collected *L. marmoratus* here. During the summer months, the stretch of stream between these two pens averages a width of 2 m and a depth of only 6 cm. I have, however, collected *L. marmoratus* from the West Fork of the Linville River at the point (elevation 1185 m) where this small stream flows into it.

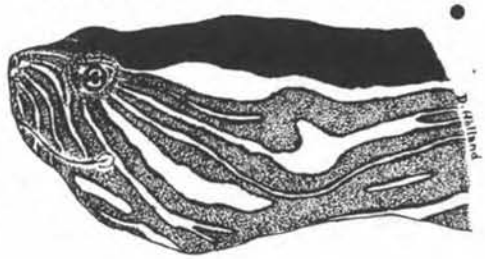
Each of the eight *L. marmoratus* discovered in these pens was an adult of undetermined sex, ranging in SVL from 58 to 72 mm ($\bar{X}$ SVL = 65 mm). All eight observations were made during periods of rainy or misty weather between 27 June and 17 September 1982. Two individuals observed at night were climbing above the stream along the top inner edge of the pen. The other six salamanders were found in the stream with none closer than 0.3 m to the streambank. The two nocturnal observations were the only times I have seen *L. marmoratus* outside of a stream pool or riffle. Movement by *L. marmoratus* along the stream current would not have required climbing over the pen sides.

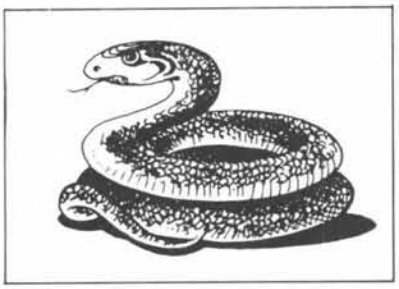
These results are not consistent with the concept of *L. marmoratus* as a completely aquatic salamander. Although this species is generally restricted to areas of moderately deep water, I have presented evidence that individual *L. marmoratus* will leave the stream habitat temporarily. Their ability to traverse vertical walls of fine-mesh hardware cloth reveals a previously unrecognized ability to climb. I believe that short movements out of water and between pools or riffle zones can occur in these salamanders.

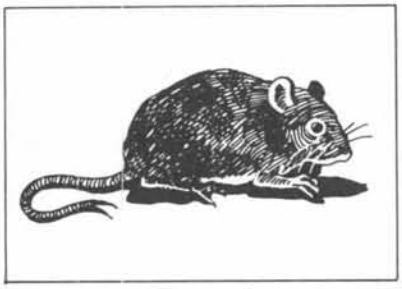
Submitted by **MARK T. SOUTHERLAND,** Department of Biology, University of North Carolina at Chapel Hill, North Carolina 27514, U.S.A. ●

PSEUDOBRANCHUS STRIATUS STRIATUS (Broad-striped Dwarf Siren). **MAXIMUM SIZE.** Published accounts suggest that this form reaches a maximum size of 150-152 mm (Martof 1972. Cat. Amer. Amphib. Rept. 118.1-118.4; Conant 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston). During 1984-1985 we collected a total of eight adult specimens from Long Co., Georgia, and Jasper Co., South Carolina. Two of these specimens far exceed 152 mm as follows: UF56694, Jasper Co., South Carolina - 175 mm; UF 62657, Long Co., Georgia -203 mm. Specimens are deposited in the Florida State Museum.

Submitted by **PAUL E. MOLER,** Florida Game and Fresh Water Fish Commission, 4005 S. Main Street, Gainesville, Florida 32601 and **BARRY W. MANSELL,** 2826 Rosselle Street, Jacksonville, Florida 32205, U.S.A. ●

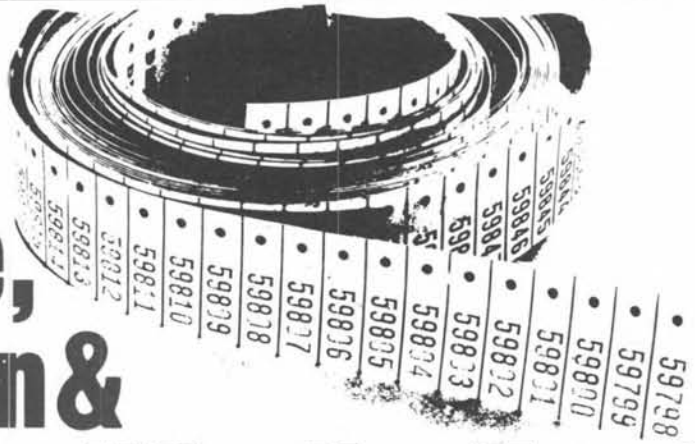








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SAURIA

CALLISAURUS DRACONOIDES (Zebra-tailed Lizard). **BEHAVIOR.** *Callisaurus draconoides* is typically considered to be a principally insectivorous terrestrial forager, occupying washes and desert pavements where plant growth is scant and there are ample open areas for running (Stebbins, R. C., A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston, MA 336 pp.)

On 24 March 1982 I witnessed arboreal foraging by an adult *C. draconoides* in an area of windblown sand and scattered low shrubs a few miles northwest of El Centro, Imperial Co., CA. The specimen observed was situated ca. 5 m above the ground in the branches of a rush-pea *(Hoffmannseggia microphylla)* shrub. It was watched from a distance of 5 m for about 10 min, apparently unaware of my presence. The lizard appeared to be attracted by the activity of flying insects feeding on nectar in the blossoms. It made numerous lunges about in the foliage in the direction of these insects and was, in fact, able to capture successfully this prey at least twice during the time it was watched.

Submitted by **VINCENT N. SCHEIDT,** 3158 Occidental Street, San Diego, California 92122, U.S.A. ●

GAMBELIA WISLIZENII (Leopard Lizard). **FOOD.** On 18 April 1982 a female *Gambelia wislizenii* (SVL = 90 mm, TL = 276 mm) was collected in San Bernardino Co., California by Dr. David Morafka. Inspection showed that the individual had ingested an *Uma scorparia* (SVL = 88 mm). *Uma scorparia* has not been a recorded food item although *G. wislizenii* is a known consumer of other lizards (Parker and Pianka 1976. Herpetologica 32(1):95-114). The lizards (ROM 13750) are deposited in the herpetological collections of the Royal Ontario Museum.

Submitted by **ANN E. GRACIE** and **ROBERT W. MURPHY,** Department of Ichthyology and Herpetology, Royal Ontario Museum, 100 Queen's Park, Toronto, M5S 2C6, Canada. ●

SERPENTES

ALSOPHIS CANTHERIGERUS (Cuban Racer). **DIET.** Predation on hatchling sea turtles by crabs, fish, birds, and mammals is widely acknowledged, but accounts of reptiles as hatchling sea turtle predators are few. Stancyk (1982. Biology and Conservation of Sea Turtles. Bjorndel, K. A. (ed.). Smithsonian Inst. Press, Washington D.C.) in a review of non-human hatchling sea turtle predators, listed two snakes, *Boiga dendrophila* and *Python reticulatus*, as well as varanid lizards in general as hatchling predators. However, Stancyk's (op. cit.) primary source (Hendrickson 1958. Proc. Zool. Soc. London 130: 455-535) noted the records of snake and varanid predation were anecdotal, based on reports from local people.

Brattstrom (1955. Am. Midl. Natur. 54:219-229) presented the only documented data of predation by a snake on neonate sea turtles. During his work on the Revillagigedo Islands south of Baja California, he found a hatchling *Caretta caretta gigas* in the stomach of a *Masticophis anthonyi*. This has been confirmed several times for this snake species (Brattstrom, pers. comm. to Frazier 1985. J. Herpetol. 19(1):1-11). The present report provides an additional record of neonate sea turtle predation by a snake.

On 8 October 1985 at 0920 h, at Cuzco Beach, U.S. Naval Base, Guantanamo Bay, Cuba, I collected an *Alsophis cantherigerus* (SVL 83.0 cm, mass 242.0 g) about 15 m above the high water mark. While in the collection bag, the snake regurgitated a partially digested hatchling sea turtle, later identified as *Eretmochelys imbricata*.

Snakes of the genus *Alsophis* are active foragers and have opportunistic feeding habits (frogs, lizards, snakes, birds and mammals have been recorded) based on unpublished stomach content data, *Alsophis* (*N* = 466, R. W. Henderson, pers. comm.). With regard to these diet data, predation on *Eretmochelys* by *Alsophis* is not unlikely, but probably uncommon. Both the *Alsophis cantherigerus* (UMRC 86-1) and the *Eretmochelys imbricata* (UMRC 86-2) are deposited in the University of Miami herpetology collection.

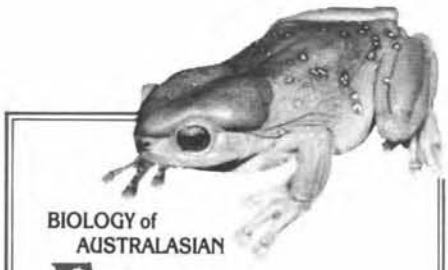
L. White is thanked for arrangements at Guantanamo and A. Schwartz, N. J. Whitcher, and J. M. Savage are thanked for providing funding. P. Meylan, H. Greene, and J. Frazier are thanked for responding to my inquiries. J. M. Savage and P. N. Lahanas helped positively identify the *Eretmochelys*. M. P. Hayes, and S. D. Werman are thanked for their comments.

Submitted by **BRIAN I. CROTHER,** Department of Biology, P.O. Box 249118, University of Miami, Coral Gables, Florida 33124, U.S.A. ●

ATHERIS CHLOROECHIS (West African Bush Viper). **REPRODUCTION.** Information in the literature regarding reproduction in the West African bush viper is scant. Cansdale (1961. West African Snakes. Longman Group Ltd., London, 74 pp.) reported that one East African female contained 11 embryos; however, no measurements of the female or embryos were given.

In February, 1984, I received a wild-caught, gravid *A. chloroechis* (Female A) that measured ca. 700 mm SVL. The snake was housed in a 41 cm X 35 cm X 21 cm glass enclosure with a hardware cloth top. A heat plate was placed under one end of the enclosure to allow thermoregulation prior to parturition. The snake was never observed using this heat source; instead, she spent most of her time on the branch in the opposite end from the heat plate.

On 12 March 1984, Female A gave birth to six living young, ranging from 131-142 mm SVL/161-172mm TL, $\bar{X}$svl= 137.6 mm, $\bar{X}$tl= 166.8 mm, $\bar{X}$ mass = 3.0 g. In addition to the living young, she also passed nine infertile masses. One neonate, born with no tail and severe body kinks, died several hours after birth. The remaining neonates showed no apparent abnormalities.



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In March 1985, the Houston Zoological Gardens received a wild-caught female *A. chloroechis* (Female B) that measured ca. 600 mm SVL. The snake was set up in an enclosure similar to that of Female A except that the snake was not provided with a heat plate.

On 4 April 1985, Female B gave birth to nine living young, ranging from 138-155 mm SVL / 170-189 mm TL, $\bar{X}$svl= 146.9mm, $\bar{X}$tl= 179.4 mm, $\bar{X}$ mass = 2.4 g. In addition to the living young she also passed four infertile masses.

All the young from both females shed shortly after birth. Body color after shedding was a light-brown or tan. Within 24 h, however, their body color had changed to a light green. The tail tips of the neonates were sulphur yellow (Fig. 1) much like those of juvenile *Agkistrodon contortrix*.

All the young from both broods were sexed and found to be females.

One week after birth, the young from Female A fed upon small *Acris*. They were fed small *Acris* weekly for one month before their diet was changed to newborn mice. The young from Female B were initially offered and ate newborn mice.



Figure 1. Newborn *Atheris chloroechis*

Submitted by **PAUL FREED,** Department of Herpetology, Houston Zoological Gardens, 1513 Outer Belt Drive, Houston, Texas 77030, U.S.A. ●

CARPHOPHIS AMOENUS AMOENUS (Eastern Worm Snake). **COLORATION.** Perhaps due to the diminutive size and secretive habits of the worm snake *Carphophis amoenus* (Ditmars 1936. The Reptiles of North America. Doubleday, Garden City), individuals that are abnormally colored are almost unknown. Exceptions include an entirely pink specimen from Virginia (Allard 1945. Copeia 1945:42), a xanthic specimen from Maryland (Simmons and Stine 1961. Herpetologica 17:206-208), and an albino specimen from Maryland (Harrison 1968. Bull. Maryland Herp. Soc. 4:88-89). The following account is, to our knowledge, the first documentation of an amelanistic partial albino worm snake from Georgia.

The amelanistic *Carphophis a. amoenus* was found in the metropolitan Atlanta area and brought to the Fernbank Science Center, Atlanta (Dekalb Co.), Georgia. Unfortunately, the particulars of collector, collection locality and ultimate disposition of the specimen are unknown; a photograph in the possession of the junior author remains the only record. Instead of the light brown dorsum and pinkish venter typical of *Carphophis* from this area, the entire snake had a creamy yellowish aspect. The eyes were pink. That the snake was 8-10 inches in length indicates that it was probably at least two years of age (Clark 1970. Univ. Kansas Publ., Mus. Nat. Hist. 19:85-194). It is compelling to suggest that albinism presents less of a handicap to the survival of small, semi-fossorial reptiles like *Carphophis*, since their coloration should be under less selective pressure by visually oriented predators than that of larger, more terrestrial forms.

We thank H. B. Bechtel and H. S. Harris, Jr. for their assistance in the preparation of this note.

Submitted by **DAVID G. COOK,** Department of Herpetology, Zoo Atlanta, 800 Cherokee Ave., SE, Atlanta, Georgia 30315, and **DAVID O. FUNDERBURK,** Fernbank Science Center, Atlanta, Georgia 30307, U.S.A. ●

TESTUDINES

CLEMMYS INSCULPTA (Wood Turtle). **ECTOPARASITISM.** Not all accounts of leech *(Placobdella parasitica)* infestations in wood turtles agree on seasonal abundance of these ectoparasites. Harding and Bloomer (1980. Bull. N.Y. Herp Soc. 15(1):9-26) reported that leeches were present during the entire active season in wood turtles in northern Michigan. However, in New York and New Jersey, Koffler et al. (1978. J. Herpetol. 12(4):571-572) reported that leech infestations were highest on wood turtles in the fall and spring, when tightly-packed masses of young leeches were evident on the soft tissues of several areas of the body. These authors noted a marked decrease in the amount of leeches found on turtles soon after emergence from aquatic hibernation (April) and an increase prior to hibernation in October and November. Hulse and Routman (1982. Herp. Review 13(4):116-117) reported leech infestations in wood turtles in April and October, but did not observe the turtles during the intervening months. No accounts of changes in leech loads over time observed in re-captured individual wood turtles are known.

From 21 April to 30 September 1985, we observed leech infestation in wood turtles sampled from a 200 m linear stretch of the Wisconsin River in Vilas County, Wisconsin. The area within 30 m of the river channel was patrolled on foot or observed from a canoe. All wood turtles found were captured by hand, examined for ectoparasites, and marked by notching their marginal scutes and released. One adult female wood turtle was fitted with a radio transmitter and radiotracked throughout the active season. It was examined for leeches upon each re-location. All of the turtles captured (N=18) were adults ($\bar{X}$ CL=19.6 cm, range=17.1-22.6 cm). Of the total captures (N=29), 37.9% (N=11) were recaptures. All of the turtles were located in at least partial sunlight, generally partially concealed by dead vegetation or grasses, and were dry when captured.

Masses of young leeches (1.0 to 1.5 cm diam.) were found on most of the turtles in April, immediately after emergence from hibernation, but became less prevalent later in the season (Table 1). The masses were located in the inguinal cavity, posterior to the hind legs, on the ventral surface of the neck or in the adjacent axillary cavity. None of these areas could be easily exposed to direct sunlight.

Table 1. Monthly variation in leech infestation on wood turtles from Wisconsin River study site in 1985.

Month	No. of turtles	No. with leeches (%)
April	7	6 (85.7)
May	5	2 (40.0)
June	15	0 (0)
July	1	0 (0)
August	1	0 (0)
September	0	—

A heavily infested specimen was captured on 22 April, but was without leeches when re-captured on 27 May. Another infested individual was found on 5 May but was free of leeches when re-captured on 27 May. A third individual was found carrying masses of small leeches (< 1.0 cm diameter) on 27 May, and re-captured leech-free on 2, 4, and 23 June. The reduction in parasite loads corresponded with the movement of the turtles away from the river for nesting (June) and dispersal into surrounding wooded areas. A female wood turtle (18.1 cm CL), radio-tracked from 5 July to 27 September, was re-located 34 times. No leeches were present when it was captured or on any re-capture, even though it was relocated several times in or near the river channel. Koffler et al. (op. cit.) postulated that increased terrestrial activity in wood turtles in the spring reduced leech infestations through desiccation. Our observations support this idea.

We wish to thank Walter Auffenberg for helpful comments on this manuscript. These observations are part of a study conducted under Endangered and Threatened Species Permit #95, issued by the Wisconsin Department of Natural Resources, Bureau of Endangered Resources. The staff of the Demmer Memorial Library, Three Lakes, Wisconsin, was most helpful in gathering background literature for the study.

Submitted by **KEVIN N. BREWSTER** and **CATHERINE M. BREWSTER,** Northwoods Wildlife Center, Minocqua, Wisconsin 54548, U.S.A. ●

PHRYNOPS GEOFFROANUS (Geoffroy's Sideneck). **MATURATION.** Captive reproduction in *Phrynops geoffroanus* was reported by Kardon (Inter. Zoo Yearbook, 1981, 21:71-72), while information concerning reproduction in nature was summarized by Pritchard and Trebbau (Turtles of Venezuela, 1984, SSAR). Three of the hatchlings reported by Kardon were acquired by the Columbus Zoo 14 October 1981. These were hatched at the San Antonio, Texas, Zoo in the period 16 June through 3 July 1979. The largest of these, a female, died from undetermined causes 8 February 1986, and was found upon necropsy to contain 11 shelled eggs. At this time the specimen was ca. 6 years and 7 months of age and had a CL of 25.1 cm. Egg size and shape agree well with data presented by Kardon and Pritchard and Trebbau, being

roughly spherical with the largest axis varying from 29 to 31 mm.

Submitted by **MIKE GOODE,** Columbus Zoo, Columbus, Ohio 43065, U.S.A. ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

ANURA

CENTROLENELLA ALBOMACULATA. HONDURAS: Depto. de Colón: 4 km ESE Tulito. 25 May 1985. M. T. O'Shea and J. Eves. Verified by J. M. Savage. British Museum (Natural History) (BMNH 1985-1231). First record for country. Extends range 500 km Northward. (Frost. (ed). 1985. *Amphibian Species of the World.* Allen Press and Assoc. Syst. Collections. Lawrence, Kansas v + 732 p.).

Submitted by **MARK T. O'SHEA,** 46 Buckingham Road, Penn, Wolverhampton, WV4 5TJ, England. ●

CAUDATA

AMBYSTOMA TEXANUM (Smallmouth Salamander). USA: ARKANSAS: Garland Co: T2S-R21W-S28. 14 October 1984. Arkansas State University Museum of Zoology (ASUMZ 4068). T3S-R21W-S04. 18 October 1985. (ASUMZ 4822, 4920). Montgomery Co: T3S-R25W-S09. 19 April 1964. Northeast Louisiana University (NLU 2014-2017). H. Stegall. Verified by N. H. Douglas. Perry Co: T4N-R20W-S35. T4N-R20W-S36. T4N-R19W-S30. T4N-R19W-S29. T4N-R19W-S28. T4N-R19W-S26. T4N-R19W-S25. T4N-R19W-S24. T4N-R18W-S19. T4N-R18W-S20. T4N-R17W-S18. T4N-R17W-S22. 26 November 1985. (ASUMZ 5200-5220). Polk Co: T2S-R28W-S13. T2S-R28W-S10. T2S-R29W-S07. T2S-R28W-S07. 17 November 1985. (ASUMZ 4983-4985, 4990-4991). Yell Co: T3N-R23W-S03. 28 October 1985. (ASUMZ 4194-4199). T3N-R23W-S12. T3N-R23W-S01. T4N-R23W-S36. T4N-R23W-S25. T4N-R22W-S30. T3N-R23W-S02. 22 February 1985. (ASUMZ 4188-4193). Specimens deposited in the Arkansas State University Museum of Zoology were collected by D. A. Saugey and D. G. Saugey and verified by S. E. Trauth. First record from these counties in the Ouachita Mountain Region of Arkansas, filling a gap in the distribution (Conant. 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America).

Submitted by **DAVID A. SAUGEY** and **DIANNE G. SAUGEY,** United States Forest Service, P.O. Box 255, Mt. Ida, Arkansas 71957, U.S.A. and **NEIL H. DOUGLAS,** Department of Biology, Northeast Louisiana University, Monroe, Louisiana 71209, U.S.A. ●

NOTOPHTHALMUS VIRIDESCENS LOUISIANENSIS (Central Newt). USA: ARKANSAS: Garland Co: T3S-R21W-S08. 18 October 1985. Arkansas State University Museum of Zoology (ASUMZ 4879-4885). Howard Co: T5S-R28W-S08. 18 October 1985. (ASUMZ 4886). Montgomery Co: T2S-R27W-S08. 14 October 1984. (ASUMZ 4071, 4858-4860). T3S-R26W-S25. 11 November 1985. (ASUMZ 4962, 4963). T1S-R26W-S25. 17 November 1985. (ASUMZ 4986). T2S-R27W-S07. 17 November 1985. (ASUMZ 4987). Perry Co: T4N-R17W-S22. 26 November 1985. (ASUMZ 5222). Pike Co: T5S-R25W-S17. 18 October 1985. (ASUMZ 4887). Polk Co: T2S-R28W-S09. 14 October 1984. (ASUMZ 4072, 4842-4845). T2S-R29W-S09. 14 October 1984. (ASUMZ 4073). Scott Co: T2N-R28W-S20. T2N-R28W-S28. T2N-R27W-S33. T2N—R27W-S36. 28 October 1985. (ASUMZ 4894-4903). Yell Co: T2N-R23W-S01. 6 October 1984. Collected by D. A. Saugey and D. G. Saugey. Verified by S. E. Trauth. First records from these counties in the Ouachita Mountain Region of Arkansas. Fills gap between published localities (Dellinger and Black 1938. Occas. Papers Univ. Arkansas Mus. 1, 47 p; Dowling 1957. Occas. Papers Univ. Arkansas Mus. 3, 51 p.).

Submitted by **DAVID A. SAUGEY** and **DIANNE G. SAUGEY,** United States Forest Service, P.O. Box 255, Mt. Ida, Arkansas 71957, U.S.A. ●

SIREN INTERMEDIA (Lesser Siren). USA: VIRGINIA: City of Suffolk: St. Rt. 759, 2 km NW Cypress Chapel. 20 August 1985. T. M. Padgett and W. M. Lane. Verified by C. A. Pague. Carnegie Museum of Natural History (CM 113139-113145). First record from Virginia. Extends range 65 km NE of nearest locality (Bertie County, North Carolina; North Carolina State Museum of Natural History 14736).

Submitted by **THOMAS M. PADGETT,** Old Dominion University, Norfolk, Virginia 23508 and **WILLIAM M. LANE,** Great Dismal Swamp National Wildlife Refuge, Suffolk, Virginia 23434, U.S.A. ●

SERPENTES

BLANCUS CINEREUS. SPAIN: Zaragoza Province: Carenas, 15 km WSW Calatayud. 24 August 1985. D. Bauwens and M. Honnay. Verified by C. Gans. Photos deposited at the Field Biological Station, University of Antwerp, Belgium (#s 493-498). This confirms the occurrence NW of Madrid, previously known from a single record (Salvador. 1981. *Blanus cinereus* (Vandelli 1797) - Metzwühle. Pp. 277-289, *In:* Böhme, W. (ed). Handbuch der Reptilien und Amphibien Europas. Band 1. Akademische Verlagsgesellschaft Wiesbaden.). Record fills gap at the northern range limit between Madrid (ca. 185 km WSW) and Maria (ca. 75 km ENE) (Salvador. op. cit.).

Submitted by **DIRK BAUWENS,** Field Biological Station, University of Antwerp (U.I.A.), Verbindingsweg, B-2180 Kalmthout, Belgium. ●

HELICOPS HAGMANNI (Mapanare de Agua). VENEZUELA: TERRITORIO FEDERAL AMAZONAS: Caño Pavones, 40 km NE Puerto Ayacucho (via El Burro) 5°57'N, 67°22'W). 2 February 1981. E. Armas. Museo de Biologia Universidad Central de Venezuela (MBUCV 7039). Puerto Ayacucho (5°41'N, 67°37'W). 10 January 1981. P. Piñate. Estación Biológica de Rancho Grande (EBRG 1909). Las Queseras, 20 km S Puerto Ayacucho, 135 m. (05°30'N, 67°37'W). 21 September 1967. National Museum of Natural History (USNM 217186). All verified by A. Paolillo O. First records for Venezuela. These specimens differ from others (Rossman. 1975. Herpetologica (4):414-418) in having more dorsal scales (29-23, 30-22, MBUCV 7039 and USNM 217186, respectively; ventral scales (136 MBUCV 7039); and subcaudal pairs (60, 63, USNM 217186 and ERBRG 1909. They also have a maximum of 3 temporal scales and 13 infralabials (USNM 217186 and EBRG 1909). The ventral coloration in alcohol is considerably darker, a generally blackish background with a few cream-colored spots arranged irregularly. I thank J. O'Neill, D. Rossman, C. Myers and R. McDiarmid for letting me examine material. Louisiana State University, American Museum of Natural History and the Smithsonian Institution gave financial support and Zona 10 MARNR (Venezuela) provided facilities for studying two of the specimens.

Submitted by **ALFREDO PAOLILLO O.,** Instituto de Zoologia Tropical, Universidad Central de Venezuela, Apartado 47599, Chaguaramos 1041-A, Caracas, Venezuela. ●

TESTUDINES

CLEMMYS MUHLENBERGI (Bog Turtle). USA: NORTH CAROLINA: Alexander Co: 11.3 km NE Taylorsville. 1 June 1985. D. W. Herman. Verified by D. W. Herman. North Carolina State Museum of Natural History (NCSM 26082). Yancey Co: 16 km SE Burnsville. 6 June 1985. D. W. Herman. Verified by D. W. Herman. (marked and released). Photograph deposited in the North Carolina State Museum of Natural History (DWH 85.47).

New county records. NCSM 26082 fills a gap in the N.C. piedmont between records from Iredell Co. (Dunn. 1917. Bull. Amer. Mus. Natur. Hist. 37(23):593-634) and Watauga Co. (Nemuras. 1974. Wildlife N.C. 39(2):13-15). DWH 85.47 fills a gap between Buncombe Co. (Ernst. and Bury. 1977. Cat. Amer. Amphib. Rept. 204.1-204.2) and Avery Co. (Dunn. op. cit.).

The North Carolina Nature Conservancy supported field work, and the North Carolina Natural Heritage Program provided assistance.

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Zoo Atlanta, 800 Cherokee Ave. SE, Atlanta, Georgia 30315, U.S.A.

●

CLEMMYS MUHLENBERGI (Bog Turtle). USA: NORTH CAROLINA: Wilkes Co: 16 km SE North Wilkesboro. 6 May 1985. D. W. Herman and A. S. Weakley. Verified by D. W. Herman. (marked and released). Photograph deposited in North Carolina State Museum of Natural History (DWH 85.16). Additional record for Wilkes Co. and the N.C. piedmont. Fills gap between piedmont and mountain populations shown by Ernst and Bury (1977. Cat. Amer. Amphib. Rept. 204.1-204.2), Bury (1979. USDI. Fish & Wildl. Ser. Spec. Sci. Report-Wildl. No. 219:1-9), and Martof, et al. (1979. Amphibians and Reptiles of the Carolinas and Virginia. Univ. North Carolina Press. Chapel Hill. 264 pp.).

The North Carolina Nature Conservancy supported field work and the North Carolina Natural Heritage Program provided assistance.

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Zoo Atlanta, 800 Cherokee Ave. SE, Atlanta, Georgia 30315 and **ALAN S. WEAKLEY,** North Carolina Natural Heritage Program, Department of Natural Resources & Community Development, P.O. Box 27687, Raleigh, North Carolina 27611, U.S.A.

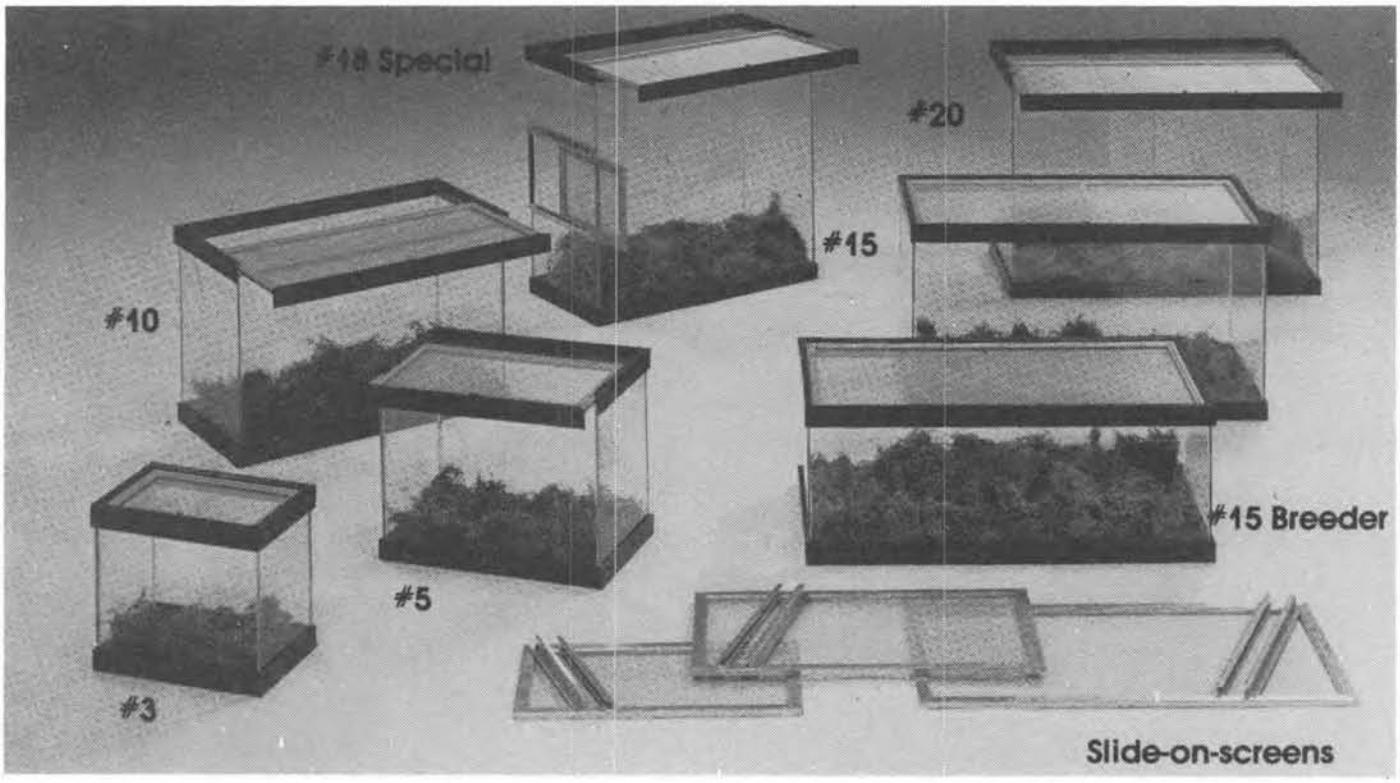
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EMYDOIDEA BLANDINGII (Blanding's Turtle). USA: MASSACHUSETTS: Bristol Co: Hockomock Swamp, Easton, 3.3 km SW Algers Corner, Jct. MA 106 and MA 138. August 1974. S. Higginbotham. Verified by T. E. Graham. Slide deposited in Museum of Comparative Zoology Kodachrome Collection (K900). First substantiated record for county.

Submitted by **TERRY E. GRAHAM,** Department of Natural & Earth Sciences, Worcester State College, Worcester, Massachusetts 01602, U.S.A.

●

KINOSTERNON LEUCOSTOMUM (White Lipped Mud Turtle). MEXICO: YUCATAN: cenote 25.6 km N Tizimin (town square) on Federal Hwy 295. 21 August 1985. P. E. Dixon, S. T. Hooper, P. J. Ode, D. P. Young, Jr. Verified by J. B. Iverson. University of Florida, Florida State Museum (UF 62923). First state record and third record for Peninsula. Extends range ca. 195 km N and 186 km NNE from previous two records [(4 km NNE Felipe Carrillo Puerto (University of Kansas 70941), 14.5 km SSE Dziuche (University of Utah 95201)].



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Submitted by **SARAH T. HOOPER** and **DAVID P. YOUNG, JR.**, Biology Department and Joseph Moore Museum, Earlham College, Richmond, Indiana 47374, U.S.A. ●

LEPIDOCHELYS OLIVACEA (Pacific Ridley). USA: HAWAII: Maui: Lower Paia, Kahului Dist. 30 September 1985. S. Hau and R. Sylva. Verified by G. H. Balazs. Bernice P. Bishop Museum (BPBM 11095-11100). First record of nesting in Hawaii. Previous records have been ocean sightings or strandings, usually of specimens entangled in synthetic debris (Balazs. 1985. Impact of ocean debris on marine turtles: Entanglement and ingestion. *In:* R. S. Shomura and H. O. Yoshida (ed.), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, Hawaii, p. 387-429. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54).

Submitted by **GEORGE H. BALAZS,** Southwest Fisheries Center Honolulu Laboratory, National Marine Fisheries Serivce, NOAA, P.O. Box 3830, Honolulu, Hawaii 96812, U.S.A. and **SKIPPY HAU,** Division of Aquatic Resources, State of Hawaii, P.O. Box 1015, Kahului, Hawaii 96793, U.S.A. ●

NEW HERPETOLOGICAL RECORDS FOR CUMBERLAND ISLAND, GEORGIA

Cumberland Island, Georgia, is a relatively new National Seashore with a large area designated as Wilderness. Past agricultural and forestry practices, along with feral animals, greatly modified many habitats on the island and likely reduced some of the herpetofauna. Management as a Wilderness area is resulting in marked ecological changes and modifications in relative abundance of some species. Since the surveys of Hillestad et al. (1975. The ecology of the Cumberland Island National Seashore, Camden County, Georgia. Technical Report Series Number 75-5, Georgia Marine Science Center, Univ. System of Georgia, Skidaway Island, Georgia, 299 pp.), several additional species have been discovered and others listed by them have not been confirmed. This paper is the second in a series to define current status of the Cumberland Island biota.

Hillestad et al. (1975) presented an annotated list of 52 amphibians and reptiles. Some of their records were based on observations without specimens, and comments on the introduction of some species lack documentation. Nevertheless, their work is the best comprehensive herpetological report available for the island. We present additions to the Hillestad et al. (1975) list including some species heretofore unreported for the other Georgia barrier islands. Unconfirmed species from their list are also indicated. All specimens are deposited in the U.S. National Museum of Natural history (USNM) and were verified by G. R. Zug.

AMPHIUMA MEANS (Two-toed Amphiuma). Sweetwater Slough Outlet, S of Lake Whitney. 3 April 1984. C. Robert Shoop and Carol Ruckdeschel. USNM 252432. Additional specimens collected from Lake Whitney, Brickhill Pond, North Fraser Road Pond 1, Duckhouse Sloughs, and beach at Sweetwater Slough Outlet. Known also from Sapelo Island (Martof 1963. Herpetologica 19(1):70-72) and St. Catherines Island (Zweifel and Cole, unpublished).

HYLA CRUCIFER BARTRAMIANA (Southern Spring Peeper). Candler Pond. 11 January 1975. Carol Ruckdeschel. USNM 252433. New record for the Georgia barrier islands.

PSEUDEMYS NELSONI (Florida Redbelly Turtle). Beach near Retta Outlet. 4 May 1979. Carol Ruckdeschel. USNM 252439. An additional specimen collected on the beach the same day (both alive) and several have been observed basking in the Sweetwater Slough system. This is the second locality record for the state (Vitt and Johnson 1980. Herp. Review 11(3):80), and the only record for the Georgia islands.

DEIROCHELYS RETICULARIA RETICULARIA (Eastern Chicken Turtle). Candler Beach Road. 14 March 1984. C. Robert Shoop and Carol Ruckdeschel. USNM 252438. This species is known for several Georgia barrier islands (Johnson et al. 1974). Milanich (1973. Florida Anthropoligist 26(3):105-118) found bones of this species in an Indian midden at Table Point, Cumberland Island, but the source of the specimens could have been from another locality.

CHELONIA MYDAS MYDAS (Atlantic Green Sea Turtle). Beach at Dungeness Road. 2 August 1984. David Casey. USNM 252440. Another specimen found dead on the beach 14 July 1984 is in the Cumberland Island Museum. Green turtles probably forage throughout the Georgia coastal region, and one has nested on Jekyll Island (Litwin 1981. Herp. Review 12(3):81).

DERMOCHELYS CORIACEA CORIACEA (Leatherback). Reported previously by Ruckdeschel, Ellis and Shoop (1982. Herp. Review 13(4):126).

EUMECES EGREGIUS SIMILIS (Northern Mole Skink). The Settlement. 19 January 1982. Carol Ruckdeschel. USNM 252434. First record for the Georgia barrier islands.

STORERIA OCCIPITOMACULATA OBSCURA (Florida Redbelly Snake). Near Greyfield, on Main Road. 20 July 1984. S. Theberge. USNM 252437. New record for the Georgia barrier islands.

DIADOPHIS PUNCTATUS PUNCTATUS (Southern Ringneck Snake). Edge of Ashley Pond. 14 August 1983. C. Robert Shoop and Carol Ruckdeschel. USNM 252435. New record for the Georgia barrier islands.

FARANCIA ABACURA ABACURA (Eastern Mud Snake). Plum Orchard mansion. First half of May, 1975. M. Roberts. USNM 252436. First record for the Georgia Barrier islands.

The following species listed by Hillestad et al. (1975) lack voucher specimens, and their occurrence on Cumberland Island is unsubstantiated:

Bufo guercicus, Oak Toad.
Hyla chrysoscelis (= *versicolor* of Hillestad et al.), Gray Treefrog.
Pseudacris nigrita nigrita, Southern Chorus Frog.
Eumeces fasciatus, Five-lined Skink.
Ophisaurus compressus, Island Glass Lizard.
Pituophis melanoleucus mugistus, Florida Pine Snake. A juvenile *Elaphe obsoleta* from Cumberland Island in the Georgia State University collection (GSU 1004, now UGAMNH 6272) was misidentified as this species (C. W. Seyle, pers. comm.).

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RECENT POPULATION CHANGES

RECENT POPULATION CHANGES provides an outlet for anecdotal or minimally documented information on local extinctions or regional population changes. These reports could be valuable historic indications that might enhance our understanding of very long term population trends (in excess of 20 years) and changes in distribution patterns.

Manuscripts should be submitted directly to the editor of this subsection: Ralph W. Axtell, Department of Biological Sciences, Southern Illinois University, Edwardsville, Illinois 62026, U.S.A.

ATLANTIC LOGGERHEAD TURTLE NESTING STATUS IN SOUTHWEST FLORIDA

The status of the loggerhead turtle *(Caretta caretta)* is precarious along many of its nesting beaches in North America. The southernmost nesting population in the continental U.S.A. apparently has been something of an exception. Davis and Whiting (1977) concluded that the Atlantic loggerhead turtles nesting on the beaches of Cape Sable and other nesting sites in southwestern Florida were increasing through the time of their study in the early 1970s. They estimated that nesting effort had doubled from the early 1960s to the early 1970s, despite raccoon *(Procyon lotor)* depredations on 49-87% of the eggs laid. To evaluate whether this increasing trend, unusual among sea turtle rookeries, did indeed characterize the status of this population, the censuses of Davis and Whiting were repeated after a lapse of eight years.

To obtain comparable data, Davis and Whiting's (1977) methods were followed. Aerial censuses of fresh crawls were conducted once per week in May and August and twice per week in June and July, 1980. All nesting beaches were censused 23 times during this period. Twenty-five crawls were

examined on the ground to determine if raccoon predation was still occurring. A "total nesting effort" was calculated by interpolating between census dates, following David and Whiting, and summing all dates. This method has an unevaluated error because it assumes uniform change in nesting numbers between spot censuses.

We calculated that during 1980 1,362 nests were excavated. Of these, 90% occurred on the primary nesting beach on Cape Sable. Nineteen of the crawls investigated led to nests, and 69% of these eventually suffered depredation.

Davis and Whiting (1977) calculated 1,644 nests were constructed in 1972 and 1,069 nests in 1973. The present estimate is midway between these. They found that 89% of the nests in southwest Florida occurred on Cape Sable and that predation destroyed 85% of the nests in 1972 and 75% in 1973. Comparison of these figures with our findings fails to reveal notable changes in the number of loggerhead turtles nesting in southwest Florida over the 1970s.

Raccoon predation is a principal cause of nest mortality among loggerhead turtles (Hopkins et al. 1978). Work by R. Klukas (pers. comm.) demonstrated predation could be reduced by removal of raccoons. Stancyk et al. (1980) reported that transplanting partially depredated nests was also effective. Davis and Whiting argued reasonably that such interference was inappropriate in a National Park where a policy of nonintervention holds, especially if nesting numbers were increasing. Others have questioned such a policy for a threatened species (A. Carr pers. comm. to G. E. Davis). A primary management concern should be whether raccoon numbers along the nesting beaches are artificially elevated above a natural level. This question cannot be resolved because there has been no study of raccoon population density on Cape Sable.

Although there is no evidence of decreased loggerhead turtle nesting in the study area, there is also no suggestion of the population increase predicted by Davis and Whiting. It should be noted too that the total population figure reported by Davis and Whiting depended on one very large count, which influenced the interpolations. The precision of the survey method is not known, and it is not possible to know what sort of change in nesting numbers would be detectable statistically. The use of airplane surveys for monitoring this population of turtles should involve the determination of its precision, and its accuracy. Institution of an accurate monitoring program and evaluation of the natural role of raccoon predation are essential for the conservation of this nesting population of sea turtles.

I would like to acknowledge the efforts of Richard Klukas and Gary Davis for providing the base line studies of Cape Sable sea turtles, which made the present comparison possible, and for their encouragement of our follow-up study. I especially acknowledge the efforts of my assistants Oron Bass and Todd Steiner in carrying out the field work, and Richard Dawson for his advice. The censuses were sponsored by the National Park Service, in cooperation with the National Marine Fisheries Service.

LITERATURE CITED

Davis, G. E. and M. C. Whiting. 1977. Loggerhead sea turtle nesting in Everglades National Park, Florida, USA. Herpetologica 33:18-28.

Hopkins, S. R., T. R. Murphy, Jr., K. B. Stansell, and P. M. Wilkinson. 1978. Biotic and abiotic factors affecting nest mortality in the Atlantic loggerhead turtle. Proc. Ann. Conf. SE Ass. Fish and Wildl. Agencies 32:213-223.

Stancyk, S. E., O. R. Talbert, and J. M. Dean. 1980. Nesting activity of the loggerhead turtle Caretta caretta in South Carolina, II. Protection of nests from raccoon predation by transplantation. Biol. Conserv. 18:289-298.

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BOOK REVIEWS

The Bacterial Diseases of Reptiles, by Richard Ross and Gerald Marzec. 1984. 114 pp. 23 color photos. Publ. Institute for Herpetological Research, P.O. Box 2227, Stanford, California 94305. Paper, $22.00.

This book represents a major advance in herpetological husbandry techniques. Although the works of Reichenbach-Klinke, Frye, and Marcus are admirable and broad in their scope, they leave much to be desired in terms of practical diagnosis and day-to-day husbandry. Contrary to the opinion of some, these works are not *the end* in herpetological husbandry, nor, given the state of art, can they be. Ross and Marzec, however, have filled the gap admirably, at least as far as one disease syndrome is concerned.

Much of this work had its basis in field studies by the authors and in subsequent work in their laboratory. Some of their findings and recommendations will surprise some workers but I find little to argue with regarding their methodology and reasoning. Their finding that Gram-negative bacteria are the major causes of bacterial disease in reptiles is of particular interest and confirms my experience and that of many others. Their arguments for the use of aminoglycoside drugs in the treatment of these diseases are clear and forceful. These recommendations run counter to some current veterinary practices, but it would behoove all veterinarians to take them to heart.

There are other benefits to the book, though. The authors' recommendation that thermotherapy be used in conjunction with chemotherapy is to be applauded. There is evidence that allowing reptiles to raise their body temperature through "hot spots" serves the same purpose as a fever in homeothermic animals: initiation of an immune response by the ill animal (E. Jacobson, pers. comm.).

I was surprised to find that the authors recommend use of phenolic compound disinfectants, a practice largely discontinued upon the recommendation of Karl Kauffeld many years ago. That certain Gram-negative bacteria may actually grow in certain quaternary ammonium disinfectants, the type of disinfectant now most commonly used, is cause enough to make one consider reverting to phenolic disinfectants, in which Gram-negatives cannot grow.

Ross and Marzec's destruction of the theory that the snake mite is a major bacterial vector is gratifying. This role as a vector has never been proven to anyone's satisfaction, being based on one paper by Camin in 1948; yet the theory persists to this day. Ross and Marzec's laboratory work on snake mites taken from snakes with known infections of Gram-negative bacterial produced no evidence of those bacteria in the mites.

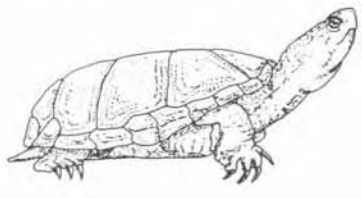
As we all know, with the good must come the bad, but my quibbles are minor. For instance, the authors state that, since the effects of aminoglycoside drugs are additive, half dosages of two different aminoglycosides cannot be administered. Why not? To the best of my knowledge, all injectable aminoglycosides have the same dosage: 2.5 mg/kg. Unless they are trying to say that different aminoglycosides act upon different bacteria (which may well be true), Ross and Marzec's statement makes no sense.

The authors give short shrift to gastroenteritis, a major disease syndrome in reptiles. In addition, contrary to their previous recommendations concerning Gram-negative bacteria and aminoglycoside drugs, the authors list a variety of non-aminoglycoside drugs to be used in treatment of this disease, which is normally caused by Gram-negative bacteria. The aminoglycosides, neomycin and spectinomycin, have been found to be very effective in treating this ailment. I also disagree with the authors' statements against the use of lincomycin, a non-aminoglycoside drug. I have found this drug to be particularly effective against cutaneous and subcutaneous staphylococcal infections.

I disagree with some of the authors' taxonomic designations. For example, the authors raise lampropeltine colubrids to familial level: Lampropeltidae. Although there may be merit in this, I have yet to see any definitive paper supporting this notion. Lastly, the authors commit a nomenclatural *non sequitor* almost equal to Ross' *Bothrochilus boa nardoana* of **The Python Breeding Manual**; this time it is *Liasis morelia spilotes!!*

All in all, though, the book is well worth its $22.00 purchase price. That may seem steep but perhaps this is justified by the several excellent color plates in the appendix. This book belongs in the library of anyone (particularly veterinarians) concerned with herpetological husbandry.

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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (four issues per year), **Herpetological Review** (four issues per year), and occasional issues of **Facsimile Reprints in Herpetology.** Members may purchase other Society publications at reduced rates.

ANNUAL DUES 1986

Student member	$17.00*	Sustaining member	$35.00
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*All memberships and subscriptions *outside of the U.S.* require either a $5 surcharge to defray additional surface mailing costs or $25 for air mail delivery.

Subscriptions to **Herpetological Review** only are available for $10 per year. Subscriptions *outside of the U.S.* require a surcharge of $2.50 (surface) or $12.50 (air mail). Subscribers to **HR** only are not members of the Society.

Individuals are encouraged to join at the higher membership categories. Money from such support substantially helps promote the publications and services of the SSAR. For information about SSAR membership, write to:

Henri C. Seibert
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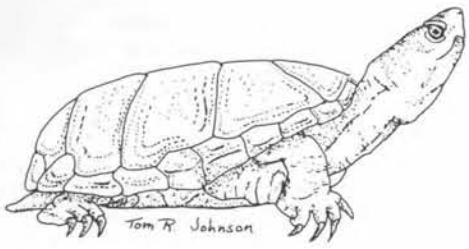
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Herpetological Review

Volume 17 March 1986 Number 1

1986 JOINT ANNUAL MEETING

The 34th Annual Meeting of

HERPETOLOGISTS' LEAGUE

and

The 29th Annual Meeting of

SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Commemorating the 50th Anniversary of *Herpetologica*

at

SOUTHWEST MISSOURI STATE UNIVERSITY

Springfield, Missouri

10-15 August 1986

Meeting Site

Southwest Missouri State University is a state supported, multipurpose institution with an enrollment of approximately 16,000. Students are drawn from throughout Missouri, from 45 other states, and from 25 other countries. Over 1,200 graduate students are enrolled in Master's and Specialist programs. The university is located in Springfield, Missouri's third largest city, with a population over 140,000. Springfield is located on the Ozark Plateau within easy driving distance of the most popular vacation and resort areas in the Midwest.

Technical Presentations

Research reports will be given in two formats: Oral presentations and poster sessions.

Special Herpetological Events

Distinguished Herpetologist Lecture (HL), 11 August.
A D. Dennis - J. E. Juterbock slide presentation (SSAR), 12 August.
A Regional Herpetological Societies' symposium-workshop on "The Role of Regional Societies in Public Education" (SSAR).
A Zoo Liaison Committee symposium-workshop on "Snake Venom Poisoning" (SSAR).
A symposium and workshop on "The Behavioral Ecology of Salamanders" chaired by R. Jaeger and K. Nishikawa (HL, SSAR).
Live herpetofaunal exhibits (SSAR).
Herpetology Examination coordinated by Marty Crump (SSAR).

Social Events

Sunday night social.
Monday evening graduate student social.
Tuesday evening Dennis-Juterbock slide show.
Wednesday evening BBQ and Auction.
Thursday evening banquet.

Displays (SSAR)

Numerous artists and exhibitors will display their work. For an exhibit application or further information contact:

Ruth Zantzinger
2108 Cherry Street
Philadelphia, Pennsylvania 19103, U.S.A.
(215) 557-0182

Field Trip

An all day float trip on the Niangua River, 15 August.

Collecting

Collecting is discouraged. Unless otherwise specifically exempted in the Wildlife Code of Missouri, all wildlife (including amphibians and reptiles) are protected by State law. Collection of wildlife (including herptiles) requires possession of a Wildlife Collector's Permit. For information write:

Missouri Department of Conservation
Wildlife Division
P.O. Box 180
Jefferson City, Missouri 65102, U.S.A.

Awards

Best student paper (HL).
Best student poster (HL).
Herp Examination prizes (SSAR).

Business Meetings

Inter-Society Liaison Committee Meeting 1930 h, 9 August.
SSAR Board Meeting, 1000 h, 10 August.
HL Board Meeting, 1300 h, 10 August.
Inter-Society Liaison Committee, 1200 h, 11 August.
SSAR Business Meeting, 1630 h, 12 August.
HL Business Meeting, 1600 h, 13 August.

Auction (SSAR)

This popular and traditional event will be repeated this year. Joseph T. Collins will be the auctioneer again. Proceeds will help support the meeting. Attendees are encouraged to donate books, art objects and other herpetological materials. Receipts will be given for all items sold (tax-deductible). Materials may be shipped to one of the meeting co-chairmen or brought to the meeting.

Accommodations and Meals

Dormitory apartments with linens and towels will be available at $10.00 per person per day. Each apartment has two or three individually locked bedrooms, a living room, kitchen, and bathroom. Needed floors will be designated for families and quiet areas. Blocks of rooms at discount rates have been reserved at two

motels within walking distance of campus. Reservations for these rooms will be made through the Local Committee. The rates for these motels are: University Inn, $26.00 per room per day; University Plaza, $50.00 per room per day. (Several of the social events will be held at the University Plaza. The University Inn is located on an adjoining property.) Numerous other motels are available but not within walking distance. Three campgrounds are located just outside the city limits within 20-25 minutes driving time from SMSU.

Registrants may eat in the cafeteria at the Campus Union. The package rate is approximately $35.00 for all meals. Individual meals cannot be purchased. Several eating establishments are within easy walking distance of campus. A list of these (and others) will be provided in the Program. Alcoholic beverages are served at several places within staggering distance of SMSU.

Family Meeting

Trip to Silver Dollar City
Luncheon and tour of Springfield
Trip to Dickerson Park Zoo
Trip to Wilson's Creek National Battlefield

Meeting Announcement

The official meeting announcement, call for papers, and preregistration forms will be mailed to all members in March. Those planning on attending are strongly urged to preregister since there will be a greater difference between preregistration and registration fees than in past years.

Transportation

Springfield, Missouri is accessible via several airlines, Interstate Highway 44, U.S. Highways 65, 160, and 60 and several state highways.

Meeting Co-Chairmen

Don Moll and Robert Wilkinson, Jr., Department of Biology, Southwest Missouri State University, Springfield, Missouri, 65804, U.S.A.

All interested persons are welcome to attend. Non-members may obtain programs and registration material by writing to the co-chairmen. ●

SSAR BUSINESS

SSAR ELECTION RESULTS

The results of the 1985 SSAR Election are as follows:
President-elect: Norman J. Scott, Jr.
Secretary: James S. Jacob
Treasurer: Henri Seibert
Board-Regular: Victor H. Hutchison
Board-Zoological Parks: William W. Lamar
A total of 531 members voted in the election.

The Society extends its gratitude to the Nominating Committee (Douglas H. Taylor, Chair), and to the SSAR Elector (David Grow) for their hard work, and to the outgoing President and Board Members for their service during their terms. ●

NEW SECTION EDITOR FOR LIFE HISTORY NOTES

We are pleased to welcome Dr. Peter J. Tolson as the new Section Editor for *Herpetological Review's* Life History Notes. Dr. Tolson is Curator of Reptiles at the Toledo Zoo, has previous editing experience, and has a broad knowledge of amphibian and reptile biology. Beginning immediately, all manuscripts for this section should be sent to Dr. Tolson at the Toledo Zoo (see inside front cover for address).

The Society extends its thanks to Bern Tryon for his many years of outstanding service as LHN Section Editor. Bern will continue as Section Editor for Herpetological Husbandry. ●

SSAR CONTRIBUTORS

Once again we are pleased to recognize those individuals who have financially aided the Society by becoming Contributing or Sustaining members for the year 1985 and also those who have supported the Grants-in-Herpetology fund. A statistical analysis would reveal a very high positive correlation between those who have contributed in 1985 and those who have contributed in previous years. To all of you, new or old, we offer our thank you. H.C. Seibert, Treas.

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Whiting, C.

●

SPONSORSHIP OF NON-U.S. MEMBERS

SSAR is expanding its sponsorship of non-U.S. members by requesting contributions to a fund established to defray the membership dues of herpetologists in countries that face difficulties with exchange of foreign currency. We encourage your participation in this program. Please contact our Treasurer, Dr. Henri C. Seibert, if you can assist in the identification of colleagues who can benefit from this program. All contributions are tax deductible. ●

NEWSNOTES

ASIH SOLICITS WORKSHOP PROPOSALS FOR ANNUAL MEETINGS

At the 1985 annual meeting of the American Society of Ichthyologists and Herpetologists (ASIH) the Board of Governors of that Society approved a plan to have teaching workshops at future meetings. The Time, Place and Program Committee (TPPC) of the ASIH has been charged with soliciting workshop proposals. Proposals for the 1987 meetings are invited at this time.

Workshops, as defined here, are distinct from symposia in that they involve *hands-on experience*. A workshop should provide a more thorough and complete treatment of a method or topic than one would expect from a platform presentation. Participants in an ASIH workshop should be able to leave the workshop with the ability to carry out procedures learned there or to teach what they learned to others. Workshops may involve field and laboratory exercises in ichthyology and herpetology. They could be of a systematic nature and constitute a review — with specimens available for examination — of a major taxonomic group. The ASIH—TPPC is open to proposals in *all* areas of ichthyology and herpetology.

Each workshop should include a handout or syllabus. A typical workshop might run from 2 to 3 h and have 20 to 24 participants, although the ASIH—TPPC will consider applications for longer and larger workshops.

The ASIH Board of Governors has approved cash advances of up to $300 to cover expenses (e.g., syllabus preparation; shipping workshop materials to the meeting site) in setting up each workshop approved by the TPPC. It is hoped that these funds can be recovered in full or in part from registration fees for each workshop.

Those interested in organizing workshops for the 1987 (and future) meeting should submit their proposals to:

Workshop Program, ASIH—TPPC
c/o Richard Wassersug
Department of Anatomy
Dalhousie University
Halifax, Nova Scotia
CANADA, B3H 4H7

Workshop proposals should be no longer than three typed pages and must include brief statements on: the qualifications of the organizer(s), the size and length of the work-

shop, and the budget, if any set-up funds are requested. Proposals will be considered on a first come first serve basis. Students as well as senior members of the community are invited to submit proposals.

In order to assure a time slot in the program and funding, prospective workshop organizers should have their proposals submitted at least three weeks before the annual meeting of the year preceding the proposed workshops. All those interested in organizing workshops for 1987 should get their proposals to The Workshop Program, ASIH—TPPC, as soon as possible, preferably before 1 June 1986. ●

NIXON GRIFFIS FUND FOR ZOOLOGICAL RESEARCH

New York Zoological Society trustee Nixon Griffis has established a unique fund for zoological research. Open to zoo and aquarium scientific staff members across the nation, fund recipients may be curators, keepers, veterinarians, and research and consulting biologists. Programs to be considered for support include those in: animal behavior, veterinary medicine, reproductive biology, genetics, exhibition design and other research areas that address the care, management and propagation of wildlife in captivity.

Grants, not to exceed $3000, will be awarded biannually. For information about the Fund and grant applications, interested biologists are urged to write to:

The Nixon Griffis Fund
for Zoological Research
c/o New York Zoological Society
185th Street and Southern Blvd.
Bronx, New York 10460, U.S.A. ●

ALL FLORIDA CONFERENCE

The ALL FLORIDA HERPETOLOGICAL CONFERENCE AND SHOW will be held April 12-13 at the Florida State Museum, University of Florida, Gainesville, Florida. Registration and session information is available from Rhoda Bryant, (904) 392-1721. ●

ECOLOGY RESEARCH FELLOWSHIP

The **MORTON B. RYERSON FELLOWSHIP** has been established through funds contributed by the Chicago Community Trust. Applications are being solicited for fellowships-in-residence to begin in May 1986 or thereafter.

Open to any student, with preference to graduate students, the fellowship awards a monthly stipend of $800, plus room, for any period from two to nine months. Fellows are granted full and private use of a comfortable four-room log cabin with kitchen, spectacularly situated amidst floodplain, hardwood forest on the banks of the Des Plaines River in the Edward L. Ryerson Conservation Area, managed by the Lake County Illinois Forest Preserve District.

Fellows will be expected to conduct independent field research on any topic relating to ecology and/or conservation in northern Illinois forests. Cooperation with a local interpretive nature center is encouraged, but the research project is paramount.

Applicants should send a two to three page proposal, a resume or CV, two letters of recommendation, and a proposed schedule of residency at the Ryerson Conservation Area.

Address application or requests for complete fellowship description to:

DR. JOHN W. FITZPATRICK
Chairman
Morton B. Ryerson Fellowship Committee
Department of Zoology
Field Museum of Natural History
Roosevelt Road at Lake Shore Drive
Chicago, Illinois 60605, U.S.A.

Deadline for receipt of applications for the 1986 program was 15 February. Applications for next year's program are now being considered. ●

VOLUNTEER PROGRAM AT AMNH SOUTHWESTERN RESEARCH STATION

Approximately 20 volunteer positions are open this summer (1986) at the Southwestern Research Station of the American Museum of Natural History in Portal, Arizona. The volunteer program is run annually and offers students in the biological sciences outstanding opportunities to observe and become involved with scientists doing field research. Food and lodging at the Station are provided to volunteers in exchange for four hours per day of routine work chores, with the remaining time available for research activities.

Volunteers are needed each year between 10 March and 1 December and are appointed for part of this period, with a minimum appointment of four to six weeks. Faculty knowing of promising students should alert them to this opportunity for professional experience toward, development of, and evaluation of their career goals.

Applicants for positions from March through May should submit forms by 15 February, summer volunteers, June through September, by 1 April. The program is open to both undergraduate and graduate students.

For application forms, write:

Resident Director
Southwestern Research Station of
The American Museum of Natural History
Portal, Arizona 85632, U.S.A.
(602) 558-2396 ●

SNAKE RESEARCH PROJECTS

The Irula Snake Catcher's Cooperative is a tribal self-help project based on catching snakes, extracting their venoms, marking and releasing them back to the wild. Last year about 22,000 snakes were caught and released, the majority *Echis carinatus*.

The Irula Cooperative is committed by its stated objectives to carrying out research pertinent to its activities of "passive exploitation" of snakes. Present data collection on distribution and abundance of snakes, scat analysis, sex ratios etc. are just some of the areas to be worked on.

The Cooperative is interested in collaborative research projects. As it is a tribal project it could provide basic facilities; funding would have to be provided by the collaborator.

For further information please write to:

Romulus Whitaker
Irula Snake Catchers Industrial
Cooperative Society
c/o Madras Crocodile Bank Trust
Vadanemmeli Village, Perur Post
Mahabalipuram Road
Chingleput Dist, Tamil Nadu
SOUTH INDIA 603104 ●

LEGISLATIVE ALERT

Recent CITES Actions. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates trade in certain wild animal and plant species. At the Fifth Meeting of the Conference of the Parties to CITES (COP 5) held 22 April-3 May 1985 in Buenos Aires, Argentina, several species amendments to Appendices I and II were adopted and, effective 22 November 1985 (Federal Register), became incorporated into the U.S. Fish and Wildlife Service's regulations implementing CITES. Amendments of interest to herpetologists are:

1. Additions to Appendix II of the CITES list:

Nile crocodile *(Crocodylus niloticus)* populations in Cameroon, Congo, Kenya, Madagascar, Malawi, Mozambique, Sudan, Tanzania, and Zambia subject to export quotas described by the Secretariat.

Broad-headed snake *(Hoplocephalus bungaroides)*

Asian bullfrog *(Rana hexadactyla)*

Indian bullfrog *(Rana tigerina)*

Platypus frog *(Rheobatrachus* spp.)

2. Revisions of the CITES list:

Appendix I: **Nile crocodile** *(Crocodylus niloticus)*, except those populations in Appendix II (cf. above)

Appendix I: **Salt-water crocodile** *(Crocodylus porosus)*, except the population of Papua New Guinea, the Australian population subject to ranching, and the Indonesian population subject to export quotas. These three are, as of COP 5, now included in Appendix II.

Appendix III: **Monteverde toad** *(Bufo periglenes)*

A majority of the 66 countries attending COP 5 rejected all proposals to allow increased trade in world sea turtle products. As noted by the "Tortuga Gazette" reporting on the Center for Environmental Education's (CEE) Sea Turtle Rescue Fund (STRF), despite this display of concern for sea turtles, one of the major problems with the treaty still was not adequately addressed. This is Japan's continuing importation of large amounts of sea turtles and sea turtle products (40 to 70% of Japan's tortoise-shell each year has been provided by Indonesian hawksbills to supply the luxury market in Japan) without complying with Conference Resolution 4.25 requiring an importing country to obtain a certificate from an exporting country attesting that the shipment of wildlife products meets CITES standards. CEE and STRF urge concerned supporters to write to the Japanese embassy urging that Japan withdraw its res-

ervations to CITES and to comply with C.R. 4.25. The U.S. address is: Embassy of Japan, 2020 Massachusetts Ave., N.W., Washington, D.C. 20008, U.S.A.

Ban on Commercial Taking of ***Caiman crocodilus.*** Dr. Stefan Gorzula has forwarded an official notice from the Ministry of the Environment and Renewable Natural Resources of the Republic of Venezuela concerning *Caiman crocodilus*. Effective 23 October 1985, all commercial hunting of *C. crocodilus* is suspended in Venezuela for a period of one year in order to evaluate programs of commercial exploitation of this species that have been in effect.

Listing of ***Sternotherus depressus*** *as a Threatened Species.* United States Fish and Wildlife Service proposes to list the flattened musk turtle, *Sternotherus depressus* Tinkle and Webb (1955), as a threatened species (Federal Register 1 November 1985). Deadline for receipt of comments was 31 December 1985. The proposed action, if made final, would implement full protection of *S. depressus* under the Endangered Species Act of 1973 as amended. Federal agencies would be required to conserve the species, state agencies could enter into Cooperative Agreements, and, without a permit, it would be illegal for any person to take *S. depressus*, or to import, export, ship in interstate commerce, or sell or offer it for sale in interstate or foreign commerce.

The flattened musk turtle is found only in Alabama in the upper Black Warrior River system above the fall line. The U.S. Fish & Wildlife Service included *S. depressus* in a notice of review of the status of 12 species of turtles (FR 6 June 1977) and received information from a number of herpetologists who suggested that the flattened musk turtle should be listed as threatened. Detailed status surveys were conducted by Dr. Robert H. Mount in 1981 and by Drs. Carl H. Ernst, W. A. Cox, and Ken R. Marion in 1983. These studies have shown that only about 15% of the turtle's habitat contains healthy, reproducing, viable populations.

Chief factors threatening *S. depressus* are: (1) Siltation and water pollution from surface mining, forestry, agriculture, and industrial and residential sewage effluents. These factors extirpate or reduce the turtle's mollusk prey populations, physically alter its rocky habitats, and provide a substrate in which heavy metals or chemicals toxic to the turtles accumulate; and (2) Overcollecting. Because it favors clean, shallow water, *S. depressus* is highly vulnerable to overcollecting. The species has been listed for sale on several dealer price lists at prices above $80 each and large collections from particular streams or pools have been documented. Most of the formerly good populations have been considerably reduced in this way in recent years.

Application for Permit re. ***Uma inornata.*** Notice is provided persuant to the Endangered Species Act of 1973 as amended (Federal Register 18 November 1985) regarding an application from Riverside County, California, and nine cities therein, requesting a permit to take Coachella Valley fringe-toed lizards *(Uma inornata)*, a species listed as threatened, incidental to certain development and conservation activities proposed to be conducted in the area persuant to a multi-party agreement implementing the Coachella Valley fringe-toed lizard Habitat Conservation Plan (HCP). Copies of the application, its supporting documents, HCP, and implementing Agreement are on file at several locations including: U.S. F & W S Sacramento Office of Endangered Species, 2800 Cottage Way, Room 1823, Sacramento, California 95825, U.S.A. (916/484-4935); and Riverside County Planning Department, 4080 Lemon Street, 9th Floor, Riverside, California 92501, U.S.A. (714/787-6181). Comment period ended 30 days following date of publication (18 November 1985).

WILLIAM S. BROWN
Chairperson, Conservation Committee
Department of Biology
Skidmore College
Saratoga Springs, New York 12866, U.S.A. ●

SOCIETIES

GOPHER TORTOISE COUNCIL

The Gopher Tortoise Council is a nonprofit, conservation organization dedicated to the perpetuation of the gopher tortoise *(Gopherus polyphemus)* and its many associates in their native habitat. *G. polyphemus* is the only land tortoise in eastern North America. The Council was formed in 1978 by a group of scientists, students, and environmentalists who shared similar concerns about the decline of gopher tortoise populations throughout the southeastern United States. The Council's efforts, while focusing on the gopher tortoise as a "keystone species," follow an ecosystem approach. Thus, the conservation of the tortoise in its native habitats (longleaf pine forest and related xeric habitats) is considered the key to protecting more than 100 other animals that depend upon the tortoise's burrow for shelter — e.g., the eastern indigo snake, gopher frog, and Florida mouse.

The Council maintains a representative in each of the six states in the tortoise's range (AL, FL, GA, LA, MS, SC) as well as having several active committees (e.g., education, conservation, management, research, publications). Annually the Council provides funds of ca. $400 to assist one or two students conducting pertinent research.

The Council meets yearly in Oct-Nov to share ideas, present research papers and reports, and to develop and instigate further means to achieve its goals. Members receive a quarterly newsletter as well as the *Proceedings* of the annual meeting.

Interested persons may learn more about the Council anc the tortoise by requesting a free brochure and sample newsletter from GTC secretary-editor, Mrs. Ellen B. Nicol, Route 1, Box 1367, Anthony, FL 32617. Those wishing to join the Council may do so by mailing a check (payable to the Gopher Tortoise Council) to that address for 1986 dues. Membership categories are: Regular, $10; Student, $5; Organization, $25; Contributor, $25; and Sustaining Member, $100+.

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RAÎNNE-SOCIÉTÉ WALLONNE D'HERPÉTOLOGIE

The Society was formed on 9 September 1984. The Society's objective is to promote the study and principally the protection of Walloon herpetofauna (Walloon is the southern, French-speaking part of Belgium). The double aim will be pursued by:

- Enquiry into the vulnerability of the population
- Action based on public opinion
- Promotion of scientific research to develop a better knowledge of the herpetofauna
- Protection of species and their habitats

To these ends, the Society will take over land and equipment, exploit every resource, have useful regulations passed with the help of public opinion and of individuals and cooperate with organizations having objectives compatible with theirs.

Publication: A tri-annual revue, *Rainne.*
Chairman: Marcel Brialmont
(Rue D. Belleflamme 23,
B-4610 Beyne-Heusay, Belgium).
Administration: Christian Vansteenwegen,
Parc Naturelle de la Burdinale, Rue Onu 8,
B-5080 Burdinne, Belgium. ●

BRITISH HERPETOLOGICAL SOCIETY MEETINGS 1986

Meetings are held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1, and start at 7:00 pm, ending at 9:00 pm, unless indicated otherwise. As always, *SSAR members* and other North American herpetologists visiting or on stop-overs in London *are most welcome.* For further details, please write to BHS, c/o Zoological Society of London, Regent's Park, London NW1 4RY, England.

26 February

Dr. Andrew Gardner (Department of Zoology, University of Aberdeen, now Department of Genetics & Biometry, University College London): Herpetofauna of the Seychelles (Indian Ocean).

18 March

A.G.M. (see separate Agenda), followed by Dr. M.R.K. Lambert (Chairman, BHS): Some more herpetofauna of the Commonwealth. II. Ethiopian Zone *(as time allows).*

24 April

Dr. Paul Verrell (Department of Biology, Open University, Milton Keynes): Sexual cycles and breeding dynamics of smooth newts in southern England.

28 May

Conservation of rare herpetofauna and their habitats. Prof. G.A.D. Haslewood (Chairman, BHS Conservation Committee), with an Intro-

duction, and other members, including Keith Corbett (Chairman, Conservation Committee of Societas Europaea Herpetologica) and Tom Langton (Staff Herpetologist, Fauna & Flora Preservation Society, London), will describe current work of the BHS Conservation Committee.

19 June

**Amphibia and reptiles worldwide: their care and breeding.* A discussion organized by the Captive Breeding Committee (Chairman: Dr. Simon Townson).

July

Meeting and date to be arranged (see announcement in *BHS Bulletin*).

23 September

Topic to be arranged by the Captive Breeding Committee.

23 October

Conservation and ecology of Mediterranean tortoises. Dr. Ian Swingland (School of Continuing Education, University of Kent, Canterbury, and Chairman, IUCN/SSC Tortoise Group) and David Stubbs (Founder, Station d'Observation et de Protection des Tortues des Maures, France): Movement patterns in *Testudo hermanni* and implications for management. David Stubbs and Dr. Ian Swingland: Conservation efforts on *T. hermanni* in S France. Dr. M.R.K. Lambert: The pluviothermic range of Mediterranean *Testudo* and growth of captive bred hatchlings in the climate of N Europe in relation to conservation farming.

18 November

John Buckley (Member, BHS Conservation Committee): Natterjack conservation, including reintroductions, in East Anglia.

*Members are encouraged to bring live animals, preserved specimens and 35mm slides for display and to illustrate discussions. ●

SAN DIEGO TURTLE AND TORTOISE SOCIETY

The San Diego Turtle and Tortoise Society is a registered non-profit California corporation comprised of individuals sharing a common interest in Chelonians and is dedicated to the preservation of existing wild populations along with a better understanding and knowledge of care for those animals already in captivity.

The Society began in 1971 with a small group of people sharing a like interest in turtles and tortoises and has since grown to a membership of over 3000 individuals, both in the U.S. and many foreign countries. Monthly meetings take place on the 2nd Friday of each month at 7:30 p.m. in Room 101 of the Casa del Prado in Balboa Park, San Diego, California, at which time a formal guest speaker or presentation is offered, followed by an informal exchange of ideas and information on the "shelled" charges of our many members.

The Society has many committees and educational programs available and several of our local members are recognized authorities in their fields of turtle and tortoise care and research. A monthly news bulletin is published and mailed to the membership. It contains practical, up-to-date information on turtles and tortoises in the wild and in captivity.

The greatest emphasis of the Society is placed on the continuation and preservation of declining wild populations and many of its activities are directed toward organized conservation and education programs.

For further information, write to:

San Diego Turtle and Tortoise Society
40 13963 Lyons Valley Road
Jamul, California 92035, U.S.A. ●

MEETINGS

SINO-JAPANESE HERPETOLOGICAL SYMPOSIUM

From 25 August to 5 September 1985, 90 herpetologists from four countries (China, Japan, U.S.A. and Switzerland) met at the Sino-Japanese Herpetological Symposium held in Guangzhou, China. It was the first time that the Chinese Society of Herpetology and the Herpetological Society of Japan cosponsored an international meeting for academic exchanges. Some 70 papers and reports were presented at the symposium, covering a wide range of topics, including taxonomy and fauna, ecology and evolution, physiology, morphology and ultrastructure, embryology, karyology, and snake venom and toxicology. To some extent, they showed results of current research and advances in these four countries.

The atmosphere that pervaded the host institution, the South China Normal University, was lively and cheerful throughout the symposium. Participants were active in exchanging information and ideas in their specialties. Many of them felt that such an informative meeting provided opportunities to discuss problems and observe developments in their research fields. It was also helpful for them to enhance academic ties and friendships through this symposium. Besides lectures and discussions, participants enjoyed a five-day survey tour to Hainan Island during the symposium period.

The Sino-Japanese Herpetological Symposium was a great success. It was a significant beginning for further communications among herpetologists of China and Japan, as well as other countries. This symposium will, as the sponsors believe, have a positive influence on promoting herpetological studies in China and Japan.

Abstracts of papers presented by Chinese herpetologists have been published in Acta Herpetologica Sinica, Vol 4(2), 4(3) and 4(4) 1985. Other proceedings will be published later.

PROFESSOR PAN JIONGHUA, PRESIDENT
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EUROPEAN HERPETOLOGICAL MEETING

The 3rd Ordinary General Meeting of the Societas Europaea Herpetologica was held in Prague, Czechoslovakia, 19-23 August 1985, and was hosted by the Faculty of Natural Sciences, Charles University, Prague. It was attended by 261 herpetologists from 29 countries (Australia, Austria, Belgium, Brasil, Canada, Czechoslovakia, Cuba, Denmark, France, GDR, FR Germany, Greece, Hungary, India, Israel, Italy, Netherlands, Nigeria, Norway, Pakistan, Poland, Romania, Spain, Sweden, Switzerland, United Kingdom, USA, USSR, Yugoslavia). This seems to be the first herpetological meeting where so many countries were represented. Nearly 240 contributions were presented, either talks or poster presentations.

After an "ice-breaking" social held Sunday evening, the meeting began officially at 0900 h on Monday, 19 August. Zbyněk Roček welcomed participants on behalf of the local organizing committee, and Josef Eiselt gave his Presidential Address. After these brief opening ceremonies the meeting began with the lecture "The Origin of the Amphibia" given by Erik Jarvik from Stockholm. The first day was devoted to the problems of the origin and evolution of the Amphibia and Reptilia, from the viewpoints of both paleoherpetology and neoherpetology.

On Tuesday 20 August, the morning business session dealt with affairs of the SEH. The scientific programme of the meeting consisted of 12 sessions on Systematics, Ecology, Physiology, Genetics, Morphology and Ontogeny, Behaviour, Distribution, and Conservation, and a "mini-symposium" on *Podarcis*.

Besides the scientific programme, one of the goals of the organizers was to provide an opportunity for informal meetings among the people from different countries.

All participants and their guests were invited into the Aula Magna of the Carolinum, the oldest university building preserved on the European continent, to listen to the concert of old Czech music. The programme "Music in the Reign of Czech Kings" was performed by musicians playing medieval musical instruments. This music, composed in 14th to 17th centuries, is appreciated even by herpetologists living in 20th century, as shown by the hearty ovations. During the evening, the participants were welcomed by Prof. František Fabian, Dean of the Faculty, and by Prof. Vladimír Pokorný, Vice-president of the Czechoslovak Academy of Sciences. They were followed by Dr. Josef Eiselt, former SEH President, and Prof. Benedetto Lanza, new president of the Society. The evening was appreciated as one of the social highlights of the meeting.

On Wednesday, two excursions were organized to see some herpetological localities, as well as some historically interesting sites. The first led to south Bohemia, a pond area where an historic municipal reservation and several localities of local herpetofauna were visited. The itinerary of the second excursion included an excavation site of Palaeozoic amphibians, a walking tour of the



Participants in the 3rd Ordinary General Meeting of the Societas Europaea Herpetologica

subterranean karst labyrinth, a trip to the famous battlefield Slavkov (Austerlitz) known from Napoleonic history, and finally dinner in a wine cellar, with live folk music.

The social programme of the meeting was concluded Thursday evening in the famous Prague beer restaurant "U Fleku." The meeting was officially closed on Friday evening, 23 August by Benedetto Lanza, SEH President, and by some representatives of national herpetological societies.

It was decided to publish proceedings of this meeting in which most of the contributions (nearly 160) will be printed in full. The volume should appear in 1986 under the title "Studies in Herpetology," and can be ordered from:

Faculty of Natural Science
Library (knihovna)
Albertov 6
CS-128 43 Praha 2
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The meeting was generally appreciated as an opportunity to make personal contacts with those colleagues who are unable to participate in herpetological meetings in western countries. It also served as a basis for future cooperation with them.

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FEATURES

ENVENOMATION BY A BLUESTRIPE GARTER SNAKE, *Thamnophis sirtalis similis*

Envenomation in humans has not been reported for *Thamnophis sirtalis similis*. Gans (1978) and Vest (1981) reported envenomation from the bite of *Thamnophis elegans terrestris* (originally misidentified as *T. couchi*) and *Thamnophis elegans vagrans* respectively. This phenomenon has also been reported from *Rhabdophis tigrinus* (Minton 1978) and *R. subminiatus* (Mather et al. 1978).

A large female specimen of *Thamnophis sirtalis similis* (64 cm total length) was given to me in the summer of 1982. Collection locale was unknown but was probably Pasco Co., Florida. The snake was removed by hand from its container. When restrained, it immediately bit the lateral surface of my right hand and chewed. To prevent damaging the snake by forceful removal, I permitted it to disengage spontaneously, which occurred after three min.

The finger displayed four distinct rows of punctures from the maxillary and pterygoid dentition. The wounds bled profusely for several min. The blood then coagulated normally. Thirty min after the bite, however, the finger was markedly edemetous (far more than could be attributed to the action of the teeth). Cyanosis around the wound progressed until, by the end of one h, the entire finger was discolored. Additional symptoms experienced were: moderate arthralgia, peripheral numbness in the digit, and lymphadentitis of the axillary nodes.

Fifteen h after the bite the edema had subsided considerably, the cyanosis and lymphadentitis persisted for an additional 72 h. The symptoms appeared and progressed far too rapidly to be attributed to bacterial or fungal infection, and no secondary infection developed.

Minton (1978) pointed out the possibility of acquired anaphylaxis to snake saliva. However, no urticaria developed in this case, nor were there any symptoms from previous or subsequent bites by natricine snakes. It is possible that the bite was a feeding rather than defensive response, as I had been handling mice earlier in the day. Residual odor may have precipitated the unusually lengthy bite response. This and other reported cases of natricine envenomation suggest the need for further biochemical analysis of saliva.

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OVERWINTERING OF AN AMBYSTOMATID SALAMANDER IN A PRAIRIE RATTLESNAKE HIBERNACULUM

The tiger salamander, *Ambystoma tigrinum* (Green) is widely distributed over southern parts of western Canada and most of the United States. Currently, seven subspecies are recognized (Hassinger et al. 1970). There have been numerous studies of this salamander, principally from the United States, major ones being Powers 1907; Prosser 1911; Bishop 1943; Glass 1951; Murphy 1953; Gehlbach 1965, 1967; Tihen 1969; and Rose and Armentrout 1976. In western Canada however, little information exists on this salamander. It is known that very dry areas have populations that breed without transforming from larva to adult where there are suitable ponds or lakes for overwintering. But even in some arid areas they do transform, using heavy rains to migrate from ponds in late summer or fall, and spring rains to migrate to and from breeding ponds (Sprules 1974). There are advantages to each of these two strategies: the salamander can live where water sources dry up during summers and can also live where land is too dry to traverse in others. This may partially explain why *A. tigrinum* are the only salamander found between the foothills of Alberta and Manitoba.

Adult salamanders are known to spend considerable time during dry seasons in burrows of mammals (Seton 1918; Stebbins 1951). Stebbins (op. cit.) stated that use of underground retreats probably has been important in making it possible for this species to inhabit semi-arid regions. This note is the first report of use of a rattlesnake hibernaculum for overwintering by *A. tigrinum* in Canada or the United States.

On the morning of 25 April 1983, 2.7 km south of Lethbridge, Alberta, Canada, I caught a 17 cm (total length), 25.2 g blotched tiger salamander, *A. t. melanostictum* in a trap designed to catch prairie rattlesnakes *(Crotalus viridis viridis)* as they emerged from a hibernaculum. The length is within the size range considered by Smith (1949) and Preston (1982) as mature.

The hibernaculum entrance opened on a south-facing slope, 550 m from the closest surface water, the Oldman River. The adjacent land lies at an average altitude of 900 m and is open, dry and very hilly (slopes average 43° incline). Soils are sandy-clay and vegetation consists of drought-resistant herbs such as pasture sage *(Artemisia frigida)*, cushion cactus *(Coryphantha vivipara)*, prickly pear cactus *(Opuntia polyacantha)* and moss phlox *(Phlox hoodii)*.

Spring emergence by tiger salamanders from subterranean retreats usually occurs at night for feeding and migration to water for breeding (Goin and Goin 1971; Conant 1975). The tiger salamander left the rattlesnake hibernaculum sometime during the night of 24-25 April (the trap had been checked the evening of the 24th). The morning of the 25th was cloudy and 14° C. The trap had been set 6 March while there was still snowfall on the ground making it unlikely the salamander had already emerged for mating prior to its capture. Also, the cloacal region was strongly protuberant at the time of capture which is characteristic of a breeding male (Stebbins 1951). When the salamander was released 5 hours after capture, it immediately crawled back down the den and was not seen again. Two prairie rattlesnakes were captured from the same hibernaculum three days later.

Lewin (1963) stated that 141 of this subspecies were captured in the spring within 90 m of the shores of Pakowki Lake, southeast Alberta and were common in temporary and permanent lakes, ponds and roadside ditches. However, Lethbridge lies in one of the sunniest and windiest areas in Canada and similar water sources are very limited or non-existent due to rapid evaporation. Average annual precipitation ranges from 30-40 cm but only 22 cm falls during the growing season. As a result, tiger salamanders are not common in the Lethbridge area.

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Oxybelis brevirostris (COPE): AN ADDITION TO THE SNAKE FAUNA OF HONDURAS

Wilson (1983) listed two species of *Oxybelis*, *aeneus* and *fulgidus*, as occurring in Honduras. In May of 1977, the senior author collected a specimen of *Oxybelis brevirostris* (Cope), 1860, on Cerro El Viejo, near the Río Platano in the department of Gracias a Dios, Honduras. This specimen represents the first record for the species in Honduras.

Peters and Orejas-Miranda (1970) gave the range of *Oxybelis brevirostris* as "Caribbean lowlands of Central America from Nicaragua through Panama to Pacific lowlands of Colombia and Ecuador." Boulenger (1896) listed a specimen from Chontalez (= Chontales), Nicaragua. This locality must refer to the department of Chontales; there is no city by that name in the country. Another Nicaraguan specimen (AMNH 75429), heretofore unreported, was collected at Musawas, on the Huaspac River in the northern portion of the department of Zelaya (George Foley, pers. comm.). Actually, Musawas is on the Haspuc River, a tributary of the Huaspac River.

The Honduran locality is approximately 175 km north of the Musawas locality. These two localities provide confirmation for the extension of the range of this rainforest species across the Nicaraguan depression into Nuclear Middle America.

The specimen (KU 195564) is a female exhibiting the following characteristics: 175 ventrals; 170 subcaudals; anal plate single; dorsal scale reduction pattern,

$$15\ \frac{3+4(135)}{3+4(134)}\ 13;$$

6-6 supralabials, 3rd and 4th entering orbit; 8-8 infralabials, 5th largest, four touching anterior chinshields; loreal absent; 1-1 preoculars; 1-1 postoculars; 1+2/1+2 temporals. In preservative the dorsum is purplish brown and the venter pale purple. The lower edges of the temporals are dark, giving the impression of a narrow, diffuse postocular stripe. These data are in agreement with those presented for this species by Boulenger (1896).

ACKNOWLEDGMENTS

My sincere thanks go to Jaime Villa, for informing me of the existence of the AMNH specimen, and to George Foley, for kindly sending me information on this specimen.

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SKIN INFECTION IN HATCHLING RIDLEYS, *Lepidochelys olivacea* (ESCHSCHOLTZ), IN CAPTIVITY

While we were rearing the olive ridleys, *Lepidochelys olivacea* (Eschscholtz) at Bhagabatpur Crocodile Rearing Centre, Sunderbans, West Bengal, an outbreak of skin infection among infant olive ridleys was observed. The infection first appeared on 19 June 1983 as small yellowish patches on the neck and flippers of a month-old hatchling. It was found that almost all the 13 hatchlings were severely infected within three days. The infected areas increased in size while the disease was invading other sites, viz., eyelids and the carapace. The usual feeding schedule with fish, prawn and molluscan flesh (Banerjee 1984) was continued during the period of infection though the turtles showed a loss of appetite.

The affected areas were bathed once a day with aqueous 0.4% potassium permanganate solution after which the sites were cleaned with a soft brush. Most of the patches diminished within 4 days. Application of potassium permanganate solution was continued for another 3 days but no further improvement was noted. Following the advice of a local veterinarian the hatchlings were dipped in 0.08% aqueous solution of Terramycin antigerm-77 (Pfizer Limited, Thane, India) for 15 min, following the potassium permanganate applications. These treatments were repeated on every alternate day during the course of infection. In addition to the above treatment, the turtles were fed Electral® powder [The Fairdeal Corporation (Pvt.) Limited, Secunderabad, India] dissolved in water (5%) twice daily to revitalise them and to induce food intake. Electral® powder is a mixture of calcium lactate, potassium chloride, magnesium sulphate, sodium chloride, sodium acid phosphate, sodium citrate, permitted colour tartrazine, and dextrose.

The hatchlings responded to the treatment well. The skin infection disappeared completely by 6 July 1983. But about a week later, a hatchling without any sign of skin infection showed retarded growth in comparison to others and died on 16 August 1983. It had stopped feeding for 24 hours before its death. Postmortem study could not assign the cause of death. Another hatchling with stunted growth and bifurcated fore-flippers was again infected on 3 March 1984. Since the symptoms were similar to those described above, the same treatment was followed. The skin infection disappeared within a fortnight but soon the turtle stopped feeding and died on 12 April 1984. The postmortem study revealed enlargement of liver.

Whitaker (1978) reported a similar type of skin infection caused by fungus at the Madras Snake Park Trust when hatchling ridleys were 7 weeks old. He held that the disease had posed the biggest problem for turtle farming as it could cause death in serious cases of infection around the eyes and cloaca. In the present study, though the skin disease was successfully treated twice within a period of a year, the death of two hatchlings due to liver enlargement or other reason soon after the disappearance of the skin infection is still a problem. The literature shows that skin infection in reptiles may be due to attack by fungi, viruses, bacteria and helminths (Cooper and Jackson 1981). However, the role of bacteria in initiating skin infection in sea turtles is not clear. Though the causative agents were not isolated in the present study we believe they were bacteria, possibly more than one strain, some sensitive to potassium permanganate solution and others to terramycin.

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Plectrohyla glandulosa (BOULENGER): AN ADDITION TO THE ANURAN FAUNA OF HONDURAS

The number of species of the hylid frog genus *Plectrohyla* known from Honduras has increased markedly since Meyer and Wilson (1971) listed *P. guatemalensis* as the sole species. The current total is four species (McCranie and Wilson 1981, 1985; the present paper) and two others remain to be reported, including an undescribed form.

On 26-27 April 1982 we collected several specimens of *Plectrohyla glandulosa* (Boulenger), 1883 (KU 195455-62) at an elevation of 2490 m on the east slope of Cerro Celaque (14°32'30"N, 88°40'W), Honduras' second-highest mountain (2827 m), in the department of Lempira. Adults were collected on low vegetation along a small stream in cloud forest vegetation.

The adults had the following color in life: lime green dorsum; pale maroon side; dark stripe from nostril to eye to above tympanum.

Duellman (1970) gave the range of *P. glandulosa* as "elevations from 2400 to 3500 meters in the highlands of Guatemala and adjacent El Salvador." The Honduran locality is ca. 60 km ENE of the nearest locality in El Salvador.

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COMBAT BEHAVIOR IN THE GILA MONSTER *(Heloderma suspectum cinctum)*

Although reproductive behavior in *Heloderma* is well-documented (Peterson 1982) no description of combat behavior is found in the literature. On the morning of 6 January 1984 in an exhibit at the Reptile House of the National Zoological Park, two male *Heloderma suspectum cinctum* were observed in ritualized combat behavior. Both animals had been housed in the same exhibit with three male and one female *H. s. suspectum* for approximately two years. The exhibit is constructed of two 1.2 m x 1.2 m x 2.7 m glass-fronted enclosures joined at ground level by a tunnel constructed of rock and cement with a sunken pool on one side and several rock planters for shelter. Sand serves as a substrate. In addition to daylight from overhead skylights, supplemental lighting is provided by two 4-bulb banks of 40 W Chroma-50 fluorescent bulbs (G.E.) and a 400 W mercury vapor lamp (Sylvania) over one cage. Each cage also has a 150 W Plant Light (G.E.) placed 1.4 m over the floor to provide additional heat and light for basking. The animals are maintained at a year-round ambient temperature of 28° C, although it is warmer directly under the Plant Lights.

We rely upon a combination of three characteristics to determine sex of these lizards: The head at the widest point is generally smaller in females (46.4-51.0 mm in our sample of ten) than in males (52.0-57.3 mm), cloacal probes penetrate less deeply in females (12-23 mm) than in males (15-32 mm), and the presence of a 10-12 mm long bulge just posterior to the vent of females, particularly noticeable in side view. The bulge appears to be absent in males. Three of our *Heloderma* have laid eggs and fall well within these parameters. One of the ten animals was questionable due to a shallow probe depth, however a large head width and lack of a post-anal bulge leads us to think it is a male.

All observations were made in the exhibit cage. The animals were first seen interacting at 0800 h and continued throughout the day until about 2000 h when note taking ceased although the animals continued to interact. Observations were intermittent with spot checks at least every hour. The next morning the combat had stopped and all animals were acting normally. The combat consisted of almost continual "bouts" described in this paper. A bout refers to an interaction between the two males from the time of approach to when they disengaged. The larger lizard (900 g, 350 mm SVL) appeared to dominate the smaller (750 g, 330 mm SVL), although there were several dominance shifts. The lizard in the superior body position at the end of the bout was considered to be dominant. The other lizards in the cage did not participate in the combat and showed no outward signs of interest or disturbance. One of the three non-participating males was, however, with no apparent provocation bitten on the leg, held, and shaken for about two minutes by the largest combatant. When the aggressor released his grip, the other lizard retreated into a corner and offered no resistance or rebuttal.

Ten major behavioral acts were identified:

FRONTAL HEAD NUDGE - Pushing the snout against another lizard's body or head.

LATERAL HEAD SHOVE - Pushing another lizard's head or body with a lateral movement of the head.

DORSAL HEAD PIN - Forcing an opponent's head downward with the chin from a lateral or head on position.

DORSAL STRADDLE - Mounting the back of an opponent. Usually involves gripping the inferior lizard on both sides of the body with the front and rear legs.

NECK ARCH - Upward arching of the neck by the inferior lizard. Performed when a combatant has effected a DORSAL HEAD PIN.

TAIL WRAP - Intertwining of both combatants' tails while in a DORSAL STRADDLE position.

LATERAL TAIL THRASH - Vigorous sideways movement of the tail by the superior lizard in the DORSAL STRADDLE position.

TAIL WAVE - Lateral movement of tail by inferior lizard while PINNED or in a partial DORSAL STRADDLE.

LATERAL HEAD BITE - Vigorous open-mouthed swipe by the superior lizard in a DORSAL STRADDLE position. Performed simultaneously with a LATERAL TAIL THRASH, in the same direction as the BITE.

ROLL - Turning over the inferior lizard from a DORSAL STRADDLE position by the superior lizard.

TYPICAL SEQUENCE OF COMBAT ACTS

A typical sequence of combat acts was determined qualitatively. The aggressor, usually the same animal, would often instigate the bout by nudging the other lizard, sometimes coming under the body to lift the opponent off the ground. HEAD NUDGING could be preceded, but was usually followed, by LATERAL HEAD SHOVING. This was done when the animals were laterally oriented toward each other. LATERAL HEAD SHOVES were performed by either lizard, often in response to a previous SHOVE.

These initial acts were often followed by a DORSAL HEAD PIN by one of the lizards, which elicited a NECK ARCH (Figure 1) from the opponent. A DORSAL HEAD PIN was often broken by a NECK ARCH; if not, the aggressor could move into a DORSAL STRADDLE position (Figure 2). DORSAL HEAD PINS were usually executed from a lateral position whereas a STRADDLE was more often associated with a rear approach. Some circling occurred during these encounters but usually the aggressor would simply approach and STRADDLE his opponent.

NECK ARCHES did not seem to be very effective against a fully-executed DORSAL STRADDLE hold which included a tight grip with both legs and a TAIL WRAP. In this position the inferior animal's tail was slightly raised and the aggressor's tail firmly pressed against it. If the tails were not tightly entwined during the DORSAL STRADDLE a TAIL WAVE was often performed by the inferior lizard. The inferior animal also TAIL WAVED when under a DORSAL HEAD PIN.

From the DORSAL STRADDLE position with tails locked the superior lizard would often attempt a LATERAL HEAD BITE, simultaneously THRASHING the tail in the direction of the BITE. Although no attempt was made to hold on, both lizards had bruised areas around the head and labials as a result of this behavior. The vigorous LATERAL HEAD BITING and TAIL THRASHING served to bend the inferior lizard into a crescent shape. The aggressor might do this several times before the action either dislodged him or effected a ROLL. A ROLL occurred as the inferior lizard reached the limit of his lateral bend. The aggressor then would pull on the inner side of the other's body with his legs and manage to flip both of them over on their backs. The reason for this behavior is unclear



Figure 1. Two male *Heloderma* in combat ritual. Superior animal has a DORSAL HEAD PIN on opponent which is responding with a NECK ARCH. Other lizards in picture are non-participants in the combat.

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Figure 2. Two male *Heloderma* in combat ritual. Superior animal is in a DORSAL STRADDLE position over opponent.

since it resulted in the dominant animal ending up underneath. At this point both animals would disengage and a similar sequence would commence, beginning with an approach by one of the lizards followed by either LATERAL HEAD SHOVING or HEAD NUDGING.

DISCUSSION

This was the first indication of combat in these animals during the three years they have been housed together. *Heloderma* combat had been observed at the Houston Zoo in 1983 (Karl Peterson, pers. comm.). In one instance, a larger male bit another so forcefully as to lift him off the ground, whereupon they were separated.

Several behaviors were exhibited primarily by the dominant lizard (HEAD PIN, STRADDLE, TAIL THRASH, HEAD BITE, and TAIL WRAP) while others (NECK ARCH and TAIL WAVE) were observed only in the subordinate lizard. The latter were usually performed in response to acts by the dominant lizard. The main objective seemed to be to push the opponent to the substrate and keep him pinned there. In this respect, the behavior is strikingly similar to the ritual male-male combat of varanids in which the primary features are centered around a test of strength in which the opponents wrestle or grapple and attempt to force the other to the substrate (Auffenberg 1981). The *Heloderma* combat is different from varanid combat in that the grappling is dorso-ventral rather than ventro-ventral and the general *Heloderma* orientation is horizontal instead of bipedal. With the exception of *Varanus gilleni* (Carpenter et al. 1976b) ritual varanid combat does not include biting, whereas the *Heloderma* combat did.

Some aspects of the *Heloderma* combat such as the DORSAL HEAD PIN, DORSAL STRADDLE, LATERAL HEAD SHOVE, TAIL WRAP and NECK ARCH seem to be similar to behaviors noted for some snakes, such as topping, pushing, and entwining for crotalids (Carpenter et al. 1976a) and dorsal pin and head raise for *Elaphe obsoleta* (Gillingham 1980). A predominant feature of the *Heloderma* combat is the strongly ritualistic nature of the behavior as noted for varanids (Carpenter et al.1976b) and crotalids (Carpenter et al. 1976a). Achieving a PIN or ROLL did not terminate the combat; the two males repeatedly and consistently re-engaged each other. During the entire combat they did not seem (to the observer) to be aware of or distracted by any outside activity or disturbance.

This highly ritualistic and tactile behavior is remarkably different from that of other lizards, notably agamids and iguanids in which no grappling occurs and most agonistic behavior consists of posturing and head bob displays (conspicuously absent in helodermatids and varanids). This would seem to lend behavioral support to morphological evidence (Camp 1923) that helodermatids and varanids do indeed belong to the same group that gave rise to the snakes.

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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

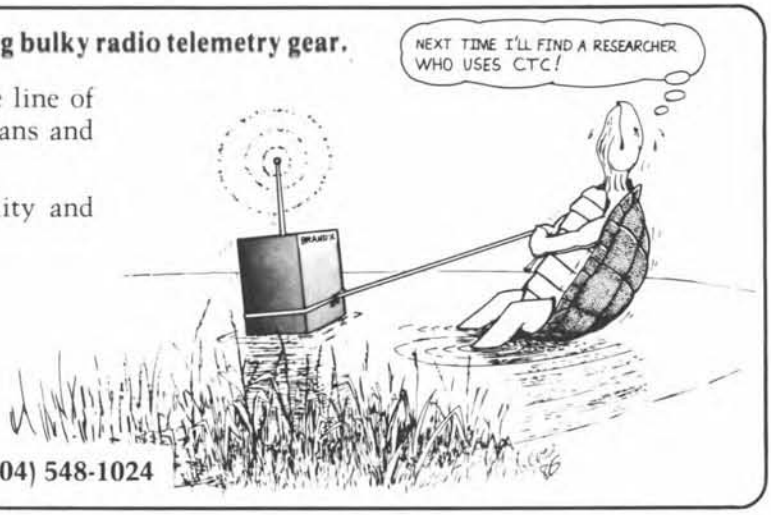
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CAPTIVE REPRODUCTION OF THE MUSSURANA, *Clelia clelia* (DAUDIN) FROM COSTA RICA

Little information about the reproductive cycle of the neotropical snake *Clelia clelia* has appeared in the literature.In his reviews, Fitch (1970, 1982) did not include information about reproduction in this species. Recently, Nickerson (1979) reported a female *C. clelia* that died before completing oviposition; the eggs were exposed to adverse conditions, and none hatched. Here we describe some aspects of the reproductive cycle of *C. clelia* from Costa Rica.

At the serpentarium of the Instituto Clodomiro Picado, a 200 cm long male and a 266 cm long female were put in a wooden cage measuring 1.22 m X 62 cm X 60 cm on 25 November 1982 at 0845 h. The temperature was 25° C and the relative humidity was 60 percent. Both individuals were collected in Salitrales, Puriscal, at an altitude of 1090 m in the province of San José. The male arrived at the serpentarium in May 1979 and the female in June 1980. Upon introduction, it was observed that the female was more aggressive toward the male, however, several minutes later the male was very active, crawling over the female's back and lying parallel to her body. An increase of tongue flicking was observed in both specimens. The male lifted his tail several times, pressing his cloaca against her body.

On two occasions the male everted one hemipenis, and copulation occurred at 0958 h, lasting 18 min. Several days after copulation, the female began to refuse food. A progressive increase in the size of the posterior part of her body was noted. Shedding occurred on 31 December 1982. Oviposition of ten eggs (some adherent) took place on 10 January 1983, 47 days after copulation. Nine eggs appeared in good condition; one was abnormal, with a yellowish color and a hard shell. They were weighed, measured and numbered. The length of the eggs ranged from 5.5 to 6.6 cm ($\bar{X}$ = 6.08 cm; SD = 0.37); the width ranged from 3.2 to 3.9 cm ($\bar{X}$ = 3.48 cm; SD = 0.20); and the mass ranged from 24.35 to 40.20 g ($\bar{X}$ = 36.73 g; SD = 5.85). The eggs were incubated in a fiberglass case 21 X 21 cm with dampened cotton on the bottom. The case was kept inside a plastic bag, and was opened daily for ventilation. Temperature was maintained in a range of 26-28° C in the incubator. The eggs hatched between 6-9 May 1983 after 117-120 days of incubation (Table 1). Two eggs did not hatch; when these eggs were opened, it was noted that the snakes were totally developed and dead, both possessing teratogenic malformations dorsally in the posterior part of the body.

Data on the young are given in Table 1. Coloration was transparent white ventrally and bright red dorsally except for neck and head. A black irregular spot was found on the neck followed by a well defined white ring that extended to varying parts of the parietal scales while totally covering the temporal scales. A black hood covered the anterior part of the head. Coloration was almost identical in all of the snakes. The ontogenetic changes that occur in the coloration pattern are under study and will be reported in another communication.

ACKNOWLEDGMENTS

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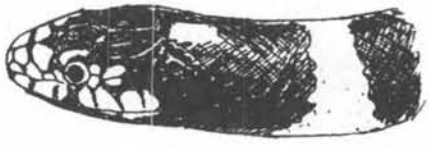
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A CAPTIVE BREEDING OF THE GREAT BASIN GOPHER SNAKE, *Pituophis melanoleucus deserticola*

On 15 October 1981, a pair (male-SVL 113 cm, mass 482 g; female-SVL 110 cm, mass 300 g) of *Pituophis melanoleucus deserticola* was received at the Cheyenne Mountain Zoo. Both snakes were long term captives that had been housed together, and had exhibited no previous reproductive behavior. Upon arrival at the zoo they were housed separately at an average temperature of 23° C. Skylights provided a natural photoperiod.

The snakes were moved to a hibernation chamber on 10 November 1981. The temperature in this room fluctuated with outdoor temperatures, but averaged 9° C (range 5°-16° C). While in hibernation, the glass fronted cages faced large windows with an eastern exposure. After 83 days in hibernation (2 Feb 1982), both snakes were returned to a warm environment (19°-23° C).

On 25 February 1982, the snakes were placed together in an all glass aquarium (L-73, W-31, H-28 cm). This cage was fitted with a 15 watt fluorescent light fixture attached to the wooden top. The light was controlled by an automatic and self-adjusting natural photoperiod duplicating device (Llewellyn 1972). The sides of the aquarium were covered with paper to minimize the influence of other building lights, and also to eliminate the potential disturbances caused by keepers working in the area. Gravel was used as a substrate. The snakes consumed both live and pre-killed rats and mice on a weekly basis.

Courtship behavior by the male was first observed on 26 February 1982, and continued intermittently through 28 February, but the female was unreceptive. Courtship recommenced on 8 March, but the female remained unreceptive. She often retreated into one of the hide boxes provided. Finally on 13 March, copulation was witnessed several times between 1400 and 1530 h. During copulation the pair was very calm. They were undisturbed when the cage lid was lifted for photographic purposes. Further copulation attempts were not witnessed.

The female fed twice after copulation, the last time on 1 April. A plastic container, partially filled with damp vermiculite was placed

Table 1. Length, mass, sex, date of hatching and number of ventral and subcaudal scales of neonate *Clelia clelia*.

Young #	Total length (cm)	Tail length (cm)	Mass (g)	Sex	Date of hatching	Number of ventral scales	Number of subcaudal scales
2	47.0	8.5	20.1	Male	9-5-83	225	95
3	35.5	6.5	17.3	Male	Unhatched	219	92
4	48.0	10.4	29.9	Female	6-5-83	242	85
5	42.0	9.2	22.4	Male	7-5-83	225	90
6	49.0	11.0	31.8	Male	7-5-83	227	79
7	44.0	10.0	32.0	Male	6-5-83	226	92
8	46.0	10.0	25.8	Male	Unhatched	223	91
9	48.0	9.3	22.7	Female	6-5-83	233	Unavailable
10	48.0	10.5	24.6	Female	9-5-83	Unavailable	Unavailable
	$\bar{X}$ = 45.3	$\bar{X}$ = 9.5	$\bar{X}$ = 25.2				
	SD = 4.3	SD = 1.4	SD = 5.2				

in the cage to provide a suitable site for oviposition. Seven eggs were laid in a damp corner of the cage on 28 April 1982. The container holding vermiculite was totally ignored. Wright and Wright (1957) mention a captive breeding of *deserticola* in which the gestation was 49 days, compared to the 41 day period observed in the present study.

The adherent eggs had a mass of 196 gms. All eggs were of similar size and shape (ca. 6 cm in length by 2.5 cm in diameter). Accessible surfaces of the clutch were wiped clean with zephiran chloride (1:750 solution). The clutch was covered with damp vermiculite, and placed in a closed (not airtight) stainless steel container. A still-air poultry incubator set at 29.5° C was used for incubation.

The first egg slit after 55 days of incubation, and by day 58 all seven eggs had hatched. The hatchlings were weighed ($\bar{X}$ = 19.8, range = 17.8-22.4 g), and measured to the nearest mm by gentle stretching (SVL $\bar{X}$ = 34.7, range = 32.2-35.9 cm; TL $\bar{X}$ = 40.2, range = 38.0-41.6 cm). The young snakes appeared to be in excellent condition. A large amount of yolk was visible through the ventral skin of each snake. Fifteen days after hatching all had completed their first shed, and the hatchlings fed readily on newborn mice soon afterward.

Fitch (1970) describes *Pituophis* as spring breeders with early summer oviposition, and autumn hatching. This captive breeding fits that pattern fairly well. The results of this study indicate that a lengthy (i.e. natural) hibernation period is unnecessary for successful captive propagation of *Pituophis melanoleucus deserticola*.

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A CAPTIVE BREEDING OF THE AUSTRALIAN DEATH ADDER, *Acanthophis antarcticus*

Death adders are popular zoo exhibits but reports of captive breeding are rare (Hay 1972; Hudson 1979; Mirtschin 1976, 1982). We report the captive propagation of 12 litters of death adders over a seven year period. The parents of at least six of the litters had been conceived and born in captivity.

MATERIAL AND METHODS

The origins of the parents and the first successful breeding have been reported elsewhere (Hay 1972). Briefly, the female was 29 cm (all measurements in this paper are of total length) when captured in January 1964. The male was 57 cm when captured in November 1966. Copulation was observed January-March and October-November 1968 and October-December 1969. No copulation was observed in 1970 and the first brood was produced 11 March 1971. The female was 77.5 cm and the male 66.0 cm in December 1970. They were maintained in a 60 X 60 cm glass aquarium with leaf litter and gravel on the floor.

The death adders were kept in various aquariums, ranging from 60 X 30 cm to 150 X 45 cm from then until 1978. They were exposed to the natural photoperiod of Sydney, Australia, and the temperature regime was natural except for the slight "glasshouse" effect of the shed in which the aquariums were maintained. All of the first litter and representatives of subsequent litters were maintained in 60 X 30 cm glass aquariums with gravel and leaf litter on the floors under natural photoperiod and without artificial heat.

RESULTS AND DISCUSSION

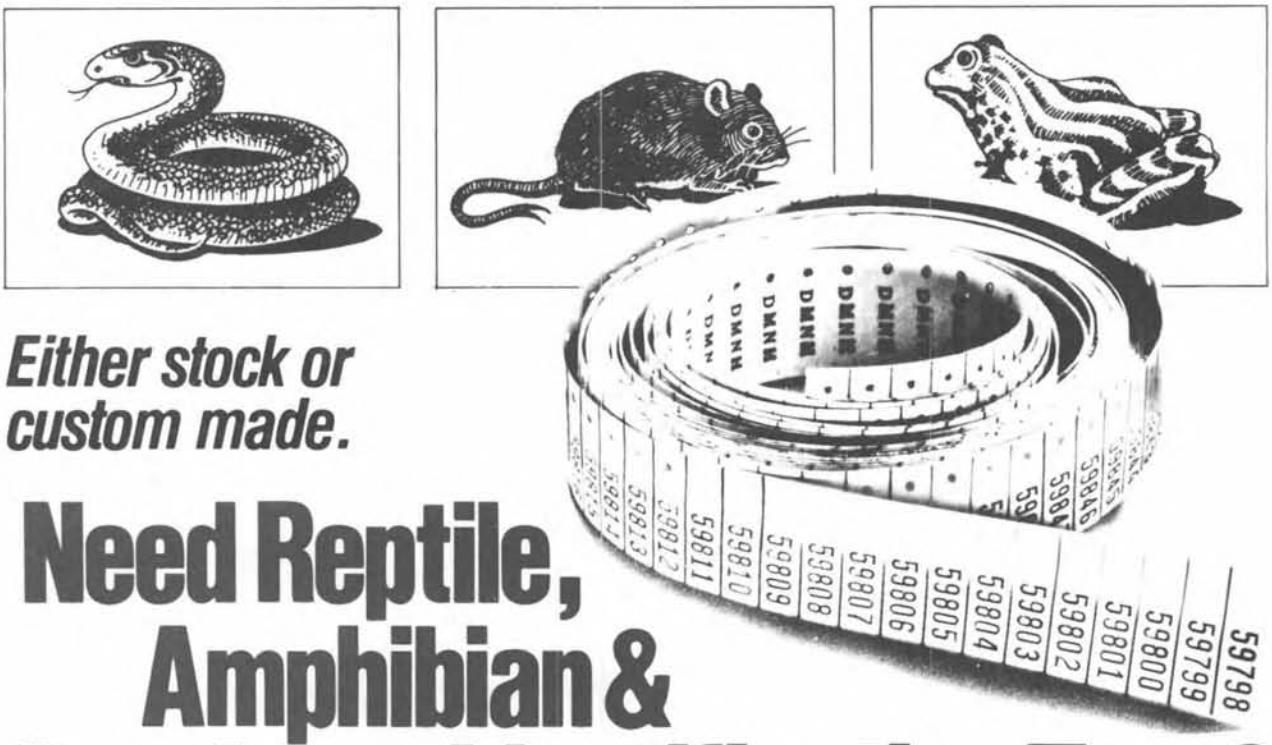
A second litter was produced 10 March 1972. The original male died before the production of the second litter and the female had no opportunity to mate until 7 November 1971 when another male was introduced into the cage. The male repeatedly attempted to copulate but was ignored by the female until he gave up and coiled under the leaves. He was removed from the cage 10 November 1971 when inspection of the female indicated that she was already gravid. Although it cannot be proven that copulation did not occur in 1971 these observations suggest that insemination was by the original male and that the female stored sperm (see also Hay 1972). A third litter was produced 4 March 1973, but no litters were produced in 1974.

By 1 June 1973 females of the first brood were considerably larger ($\bar{X}$ = 324 g, range = 271.4-367.6 g) than the males ($\bar{X}$ = 239 g, range = 174.5-332 g) despite having had access to similar quantities of food. On 20 November 1973, three males of the first litter were observed copulating with their sisters (same litter). They were then 32 months old, about one year older than the age at sexual maturity predicted by Shine (1980) from sizes of specimens in museum collections, and also about one year older than males when they first mated in captivity under constant temperature (29° C) conditions (Mirtschin 1982). Females of that litter did not produce young until March 1975 when they were 48 months old. This agrees with Shine's (1980) estimate of 42 months at first ovulation for death adders in the wild. Progeny of the original female after 1975 were sired by one of her sons (unless, more doubtfully, she was using stored sperm).

From 1975 on records were less precise. Dates of parturition, clutch sizes and sex ratios at birth for all broods are summarized in Table 1. Parturition always occurred in March, but the timing varied between years. The first three litters of the original female (1971-1973) were produced between 4 and 10 March. The five litters in 1975, including that of the original female were produced between 24 and 29 March. Litters in 1976 were produced between 5 and 11 March. It appears that parturition is relatively synchronous among captive females but that the stimulus producing synchrony varies between years. In the wild, female death adders apparently breed only in alternate years (Shine 1980). Shine presented three hypotheses regarding the selective pressures that lead to biannual reproduction, two of which related to mortality rates, and one to food availability. As at least one of the death adders reported here reproduced in three consecutive years, it appears that death adders can respond to the

Table 1. Dates of birth, clutch sizes and sex ratios of death adder litters. Generation 1 indicates young of parents captured from the wild. Generation 2 indicates young of parents born in captivity. ? indicates that the parents were not recorded. One brood in any year may have been from the original female, the rest were generation 2. * One neonate of this brood, dead at birth and apparently immature, could not be sexed. [A] 16 dead at birth. [B] 4 dead at birth.

Generation	Date of Birth	Clutch size	Sex ratio ♂ : ♀	Undeveloped eggs
1	10 March 1971	20	9:11	0
1	10 March 1972	19	8:11	0
1	4 March 1973	19	9:10	0
1	27 March 1975	25	12:12*	0
2	24 March 1975	20	8:12	0
2	26 March 1975	21	10:11	1
2	28 March 1975	23	10:13	0
2	29 March 1975	17	8:9	0
?	5 March 1976	24	—	0
?	11 March 1976	42[A]	—	0
?	11 March 1976			4
?	12 March 1977	19[B]	—	



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extra food available in captivity and that the reproductive interval is not fixed genetically.

The sex ratios of seven of eight litters that were sexed at birth were slightly skewed towards females. This result is significantly different from random ($\chi^2 = 4.5$, $p < 0.05$). However, it may not reflect a population characteristic as at least four of the litters were from one female and the rest were from her progeny. In any case, the overall bias towards females (55%) was slight.

Clutch size was fairly constant among and within females, and the data from the original female offer little evidence of a large increase in clutch size with age, consistent with the lack of correlation between clutch size and female size in wild death adders (Shine 1980).

The mean ($\pm$ SD) masses and lengths of young produced in 1972 and and 1973 were 6.69 ± 0.42 g, 16.6 ± 1.2 cm and 8.65 ± 0.62 g, 15.6 ± 0.33 cm, respectively. Lengths and masses were not determined for other litters. The young did not eat until they sloughed their skins 14-17 days after birth. During that time the second litter lost 3.8-16.7% ($\overline{X}$ = 11.3%) of their mass, but increased 6.3-14.4% ($\overline{X}$ = 9.7%) in length. Neither adults nor juveniles ate during the Sydney winter. Weight loss of a sample of eight juveniles from the first litter during their first brumation (1 June-1 September) was 7.7 ± 2.3%.

The death adders were fed lizards, small birds and mice. The snakes readily took lizards, but one species, *Ctenotus taeniolatus*, from the Sydney region may not be a suitable food. Two juveniles from the first litter died in 1972 and were infested with pentastome lung worms. Those snakes had been fed only *C. taeniolatus* since birth. Another snake died in 1973 of the same cause. A single *C. taeniolatus*, recently captured from the wild, which showed similar symptoms (spasms and mouth gaping apparently associated with attempts to dislodge worms from the trachea) had a large pentastome in its lung. Apparently, *C. taeniolatus* can act both as a primary and as an intermediate host for the pentastomes. Giving only other species of lizards when the death adders were small, and feeding them only on mice when larger, avoided further problems with pentastomes.

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TECHNIQUES

"TAPPING": A TECHNIQUE FOR CAPTURING TORTOISES

Capturing and recapturing tortoises without excavating or disturbing the burrow system has been considered important. Woodbury and Hardy (1948) describe using a half-inch metal pipe with a hook to pull desert tortoises from their burrows. Carpenter (1955) used sticks and blunt rods made of aluminum tubing to locate turtles under leaves, debris, or soil by sounding. Carpenter stated that a stick striking the carapace made a hollow sound easily distinguishable from that of a piece of wood or stone. R. C. Stebbins (pers. comm.) stated that naturalists have used the tapping technique to get desert tortoises out of burrows. One of us (Medica) first tried tapping in Coahuila, Mexico, in June 1959. Using a flashlight, he observed a Texas tortoise *(Gopherus berlandieri)* about 2 m within a burrow under a large boulder. He tapped on the carapace of the tortoise with a 2 m bamboo pole to see if the tortoise would move. Within a few minutes, two tortoises (male and female) emerged from the burrow.

We have used the tapping technique with desert tortoises *(Gopherus agassizii)* since 1967 in southern Nevada and in southeastern California. In Ivanpah Valley, San Bernardino Co., California, we recaptured and weighed tortoises with radiotransmitters regularly during 1980 and 1981 (Turner et al. 1984). The tapping technique enhanced this effort significantly. Of 440 captures and recaptures of tortoises in Ivanpah Valley in 1980, 103 (23%) were the result of successfully tapping and capturing animals in burrows. Of 1,111 captures and recaptures in 1981, 219 (19.7%) were recaptured by tapping.

A tortoise deep in its burrow should be tapped 3-4 times on the carapace with a stick (we used surveyor's laths). The observer should then remove the stick and move away from the burrow entrance. If the burrow is too deep (or turns) and the tortoise cannot be tapped directly, striking the roof or the floor of the burrow, or pounding on the mound at the entrance to the burrow may produce results. If the tapping is successful the tortoise will turn in its burrow and emerge rapidly, usually to the burrow entrance. If tapping does not result in an immediate reac-

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tion, it should be repeated several times. Unless movement is heard from within the burrow within a few minutes, further tapping is fruitless. The above procedure is particularly useful after normal aboveground activity of tortoises has ceased (ca. 0930 h in June and 0830-0900 h in July).

Male and female tortoises responded similarly to tapping. During two seasons in Ivanpah Valley, 119 of 144 males tapped (82.6%) and 203 of 249 females (81.5%) emerged from burrows. Chi-squared totals computed for 1980, 1981 and both years combined were statistically insignificant. Response increased as the season progressed and the weather became warmer and drier (Table 1). The significant seasonal effect may have been associated with higher tortoise body temperatures. Tortoises with high body temperatures may respond more readily to stimulation. Chi-squared tests showed that tortoises were significantly more responsive to tapping in 1981 than in 1980. March-April results were from 1981 only, and 1981 was the year in which tortoises were apparently more prone to emerge. Hence, there is an apparent reluctance to emerge early in the season.

Many tortoises were tapped and captured more than once (Table 2). The χ^2 0.05 value (with 3 d.f.) is 7.82 indicating a significant difference in emergence due to frequency of tapping.

Why do tortoises react to tapping and emerge from burrows? Emergence may be an aggressive response to presumed interference by another tortoise. The response may be associated with courtship or mating behavior (e.g., see Harless 1979). The more frequent response in 1981 and the data in Table 2 suggest that some type of conditioning may result from tapping. However, no "reward" was ever given to captured individuals. Tortoises were simply weighed, measured, and released at burrow entrances.

Tapping is a simple, practical method of increasing the number of captures and recaptures of desert tortoises. The technique may also be successful with other burrow-inhabiting tortoises.

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Table 1. Tortoise tapping success during spring and summer of 1980 and 1981 in Ivanpah Valley, California.

Month	Number tapped		Number captured		Percent success	
	1980	1981	1980	1981	1980	1981
March	—	11	—	5	—	45.5
April	—	35	—	25	—	71.4
May	14	60	5	53	35.7	88.3
June	74	143	47	136	63.5	95.1
July	56	—	51	—	91.1	—
Totals	144	249	103	219	71.5	88.0

Table 2. Response to tapping and frequencies with which individual tortoises were tapped in Ivanpah Valley in 1981. Figures in parentheses are expected values assuming an equal response at all frequencies.

Number of times tapped	Number emerged	Number that did not emerge	Total cases	Percent emergence
1-2	36 (39.2)	9 (5.8)	45	80.0
3-4	84 (86.3)	15 (12.7)	99	84.9
5-6	61 (60.1)	8 (8.9)	69	88.4
7-8	36 (31.4)	0 (4.6)	36	100.0

A TECHNIQUE FOR MARKING TEIID LIZARDS IN THE FIELD

Marking with unique colors and patterns of paint is a commonly used field technique for identifying lizards (Ferner 1979). This technique is not practical for field studies of teiid lizards because the paint tends to come off in a short time (1 to 5 days; Carpenter 1959). This is partly because it does not adhere well to a teiid lizard's small dorsal scales and partly because teiids often live in sandy areas where activities such as burrowing cause the paint to flake off. I have developed a technique for marking teiid lizards by gluing colored plastic bird bands to their tails. This technique was tested during a field study of the six-lined racerunner, *Cnemidophorus sexlineatus*, in Oklahoma.

Plastic leg bands were obtained from National Band and Tag Co., Newport, Kentucky, U.S.A. I used size 3 coiled leg bands (internal diameter 3/16 in) for *C. sexlineatus*. The bands were cut so only a single complete ring was used with no gap between the ends. Bands were rolled betwen the thumb and forefinger to reduce the diameter for use on small lizards (sometimes I also cut the width of the band in half with scissors). The band was slid up the tail until its leading edge was just tight against the skin and glued in place with two drops of Duro® superglue applied to the inside of the distal end of the band. It is best to glue the band about two-thirds of the way up the tail, which reduces the possibility of losing the band by autotomy and does not interfere with leg movement, defecation, or copulation. Two or three bands may be used on one lizard allowing a large number of unique color combinations. If multiple bands are used, it is best to leave a space between bands so the tail can move freely.

Plastic bands are no encumbrance to adult racerunners and do not alter normal behavior. However juveniles may be hindered by their bands when they climb into small bushes especially if more than one band is used (I never used more than two bands on lizards with a SVL of less than 40 mm). The bands are typically lost when the skin is shed, however if the lizard is growing rapidly, the diameter of the tail distal to the band may increase so the band can not come off. In this case, the band is essentially permanent although the tail becomes constricted at the band. In extreme cases the old band should be removed and a new band put on to prevent severe deformity. Based on records of banded lizards I have resighted more than once, average "band life" is 26.4 ± 14.1 days (range 4 to 63 days, N=23).

I found this technique to be a convenient way to identify individual racerunners in the field. It allowed observation of movements, activity cycles, and behaviors of individuals over several weeks without subjecting lizards (and investigators) to the stress of repeated captures. In combination with standard toe-clipping, this technique can be a useful tool in field studies.

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IMPLANTING LONG-RANGE TRANSMITTERS IN PRAIRIE RATTLESNAKES, *Crotalus v. viridis*

External attachment of radio transmission equipment obviously is not possible on snakes. Most researchers using telemetry (e.g. Osgood 1970; Fitch and Shirer 1971; Parker and Brown 1972; Kroll et al. 1973; Jacob and Painter 1980; Sanders and Jacob 1981) have force-fed transmitters to snakes, a procedure which often results in short tracking periods due to regurgitation of the transmitter. Speake et al. (1979) tested several designs for transmitters and implantation techniques in indigo snakes, *Drymarchon corais*. Brown and Parker (1976) and Reinert and Cundall (1982) described surgical techniques for the intraperitoneal implantation of transmitters with external loop and whip antennae respectively. Weatherhead and Anderka (1984) implanted transmitters and antennae subcutaneously. In this paper, I present the procedures utilized and results obtained from surgically implanting new, long-range, commercially available transmitters into peritoneal cavities of prairie rattlesnakes *(Crotalus v. viridis)*. The encapsulation procedures used here greatly reduced the degree of permeability, and the anaesthetic, ketamine HCl, was easily and quickly administered, making it safer for the investigator and the snake.

VHF transmitters (Model KG80, Austec Electronics Ltd., Edmonton, Alberta, Canada), pulsed by a CMOS with a Fenwall GA62JI (2 MEG) thermistor (paralleled with 3.9 MEG resistor), were powered by TADIRAN 3.4 V high energy lithium batteries, TL-2100 (size AA). The life of the transmitters was at least 400 days at 23 C° (one pulse every .66 sec.), with a range of approximately 1.6 km (direct line of sight). Frequencies were in the 150.800-151.375 MHz range and pulse rates were positively correlated with body temperature. Actual body temperatures were calculated from pre-determined calibration curves: pulse interval (sec) vs temperature (ranging from 40° to -40° C). Pulse rates were accurate to 0.3° C. The receiving equipment used consisted of an AVM portable receiver (Model LA 12, AVM Instrument Co., Illinois) and an RA-3A hand-held antenna (Telonics Inc., Mesa, Arizona).

The first transmitter measured 16.5 cm in total length (9 cm was teflon coated, solid stainless steel whip antenna), 1.4 cm in diameter and had a mass of 21 g. The transmitter was encapsulated in 0.6 cm thick silicone cementing compound (Dow-Corning 3145) and had a mass of 30.5 g.

Eighty-eight milligrams (88 mg) of ketamine HCl were injected intramuscularly into the tail of the first rattlesnake with a mass of 618 g (142 mg/kg). Wallach and Boever (1983) reported that 66-88 mg ketamine HCl are required for major surgery, and doses greater than 132 mg/kg body mass required respiratory support. Complete immobilization (the rattlesnake could not right itself when laid on its back) took 5 min. The transmitter was sterilized in antiseptic and inserted through a ventral 3 cm transverse incision (the width of the snake's ventral surface) between the ventral scutes, 19 cm anterior to the cloaca. The whip antenna pointed posteriorly and ran parallel to the intestinal tract. The body cavity was flushed with 10^6 IU (3 cc) of penicillin squirted into the body cavity and the incision was closed using 7 self-absorbing sutures. The operation took a total of 42 min and no respiratory support was needed. Full recovery (rattlesnake alert and rattling with normal movement) took 3 h 20 min.

The transmitter stopped transmitting 3 days after implantation. X-rays showed that the transmitter shifted anteriorly 2 cm, and the whip antenna was being severely bent, allowing body fluids to penetrate the protective silicone cementing compound and short-out the battery. Donaldson (1980) discusses problems associated with encapsulation and packaging implanted components.

Subsequent transmitters differed from the first by using teflon coated (18.2 kg (40 lb) test), stainless steel fishing leader antenna encircling (or looping) the battery. Each of 5 transmitters was individually sealed inside a pre-formed dental acrylic capsule. The capsule was made in two half sections, sealed together with a quick-drying resin and hardened under a pressure of 9070 g/6.5 cm (20 psi) and a temperature of 30° C while immersed in a water bath in a pressure cooker. It was imperative that the dental acrylic harden under pressure and high temperature while immersed in a water bath. This removed any air bubbles which may have formed in the acrylic as it was mixed. Although dental acrylic is permeable over long periods, permeability is greatly reduced when this procedure is used. To prevent internal movement of subsequent transmitters, a small stainless steel loop was affixed with acrylic to the capsule and the capsule was "rounded off" using a fine electric grinding stone. The average thickness of the acrylic was 0.7 mm. Each transmitter measured 5.7 cm in total length, 2 cm in width and averaged 27 g mass. Encapsulation averaged 1 hr 10 min per transmitter.

The rattlesnake implanted with the first transmitter was anaesthetized after 8 days using the previous dose of ketamine HCl. The non-functional transmitter was removed through a second incision made 2 cm anterior to the first (which had healed well). A non-dissolving suture was threaded through the small stainless steel loop and sewn to the musculature of the body wall at the place of incision. The operation took 36 min and full recovery time was 1 hr 50 min. This animal was released 4 days later at the site of capture. The incision healed extremely well after one week and no apparent problems were encountered with ecdysis.

Four additional rattlesnakes (ranging in mass from 441-609 g) were anaesthetized with 40 mg ketamine HCl (a smaller dose was used to shorten recovery times). Insertion, internal suturing and flushing the body cavities were carried out as described above. Each operation was completed within 25 min at which time the snakes attempted to right themselves. Each snake started crawling within 48 min and was alert and rattling within 55 min. Five days after implanting, the rattlesnakes were released at the sites of capture.

In all four snakes the incisions healed completely after one week. There were no apparent problems with ecdysis. Four transmitters functioned for more than 400 days (range 431-472) without problems (after 400 days pulse rate accuracy deteriorates). One transmitter functioned without problems for 288 days but was then lost. Golden eagles *(Aquila chrysaetos)*, great-horned owls *(Bubo v. virginianus)* and red-tailed hawks *(Buteo jamaicensis)* frequented the study area and may have carried the snake beyond the receiver's range. Predation by badgers *(Taxidea taxus)* may also have destroyed the transmitter.

Prairie rattlesnakes can overwinter at great depths and up to 8 months in temperate climates. For these extended studies it was necessary that the transmitters be powered by large batteries: transmission range and longevity can only be increased by increasing battery size (and thus the bulk of the transmitter package). Weatherhead and Anderka (1984) used small Lithium-Thionyl Chloride batteries (290 mAh capacities at 3.5 V) to power their transmitters, with a longevity of 423 days, but maximum transmission range was 150-300 m.

The transmitter system described here greatly reduces time spent searching for snakes in the field, particularly in rough or hilly terrain. Although full, transverse incisions for implantation may appear drastic, no adverse effects on the snakes were evident since all recovered quickly and resumed normal movement. Although the size of the transmitter package restricts its use in thin-bodied snakes, the transmitters can be powered by smaller batteries.

Austec Electronics Ltd. supplies and services radio transmission equipment outside Canada (presently New Zealand, Australia, England, and the United States). Because of patent rights, the transmitter circuit board was not described in this paper.

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ANURA

ASCAPHUS TRUEI (Tailed Frog). **BEHAVIOR.** Nussbaum et al. (1983. Univ. Press, Idaho) indicate that *A. truei* occur in close proximity to fast-flowing, permanent streams, occasionally venturing into nearby woods following rains. Bury and Corn (pers. com., Denver Wildlife Research Center, USFWS) have evidence that juvenile frogs in a western Washington population leave the stream after metamorphosis and move overland.

On the morning of 22 May 1984 an adult female (50 mm TL) was found under bark on a downed, partially decomposed, Tan Oak log *(Lithocarpus densiflora)*, 40 m from the nearest stream. The frog was 15 cm above ground. The air temperature was 10° C, and there had been no rainfall in the area since 15 May. The site was at 1350 m near Brush Creek in the Illinois River drainage of southwestern Oregon (T40S, R7E, Sec. 23). The specimen is deposited at the Redwood Sciences Laboratory (RSL 21093). Contribution No. 32 of the Old-growth Forest Wildlife Habitats Program, USDA Forest Service.

Submitted by **HARTWELL H. WELSH, JR.** and **RICHARD J. REYNOLDS,** Redwood Sciences Laboratory, Pacific Southwest Forest and Range Experiment Station, USDA Forest Service, 1700 Bayview Drive, Arcata, California, U.S.A. ●

CAUDATA

AMBYSTOMA TIGRINUM TIGRINUM (Eastern Tiger Salamander). **FEEDING.** On 25 September 1982 a female *Ambystoma t. tigrinum*, (79.5 mm SVL, 20.8 mm head width) was collected in a limestone quarry in southwestern Iowa. This specimen contained a hatchling *Cnemidophorus sexlineatus viridis* in its stomach. The lizard was swallowed tail first and the tail was bent anteriorly at its base. The bolus, made up of only the lizard, measured 32.3 mm in length by 12.0 mm wide.

The salamander was found in a shallow hole near several small gravel piles where young and adult *Cnemidophorus* were observed. It was speculated that the salamander captured the lizard underground while the lizard was inactive.

Few reports of metamorphosed *A. tigrinum* feeding on vertebrates exist. Ditmars (1905 Amer. Mus. Jour. 5:161-208, figs. 1-28) reported that adults ate young field mice and Hay (1892. The Reptiles and Batrachians of the State of Indiana. 17th Ann. Report Geol. and Nat. Res., Ind. pp. 409-602, pls. 1-3.) reported that captive adults ate *Acris* and *Hyla versicolor*. I observed captive adult *A. tigrinum* from Illinois feeding on an adult *Storeria dekayi* and attempting to swallow an adult *Rana sylvatica*.

This note further documents the opportunistic feeding habits of *A. tigrinum*. *Cnemidophorus* are probably infrequent in the diet of *A. tigrinum*.

I thank J. L. Christiansen and J. R. Dixon for reviewing and commenting on the manuscript. The specimen (JDC-5) and stomach contents were deposited in the Drake University Research Collection.

Submitted by **JEFFREY D. CAMPER,** Department of Biology, Drake University, Des Moines, Iowa 50311, U.S.A.

Present address: Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843, U.S.A. ●

DICAMPTODON ENSATUS (Pacific Giant Salamander). **BEHAVIOR.** Documented habitat affinities for neotenic *D. ensatus* indicate a strictly aquatic usage (Nussbaum et al. 1983. Univ. Press, Idaho; Stebbins 1966. Houghton Mifflin Co.). On 19 November 1984, a neotenic male, 221 mm TL, 7 mm gill length, was captured in a pitfall trap 3 m from a small stream. The terrestrial habitat between the stream and the trap consisted of moss covered ground and a dense cover of low (0.2 m), shrubby vegetation, predominantly *Berberis nervosa*, Forest Barberry. The area had received five days of intermittent rainfall between trap checks; both the ground and the vegetation were wet, and the trap had collected 2 cm of water. The site was in old growth Douglas Fir forest in the Butte Creek drainage at 1070 m, Humboldt Co., California. The specimen is deposited at the Redwood Sciences Laboratory (RSL 1022). Contribution No. 31 of the Old-growth Forest Wildlife Habitats Program, USDA Forest Service.

Submitted by **HARTWELL H. WELSH, JR.,** Redwood Sciences Laboratory, Pacific Southwest Forest and Range Experiment Station, USDA Forest Service, 1700 Bayview Drive, Arcata, California 95521, U.S.A. ●

SAURIA

BASILISCUS PLUMIFRONS (Crested Green Basilisk Lizard). **FOOD.** Hirth (1962. Herpetologica 18(4):276-277) reported food items of *Basiliscus plumifrons*, from Costa Rica, included vegetation, insects, crustaceans (shrimp and crabs), and a mammal (a free-tailed bat).

On 8 August 1980, a young adult male *Basiliscus plumifrons* (ca. 70 cm TL) was captured soon after nightfall ca. 6 km N.E. of Bri Bri, Limon province, Costa Rica. The lizard was captured while sleeping on vegetation overhanging a small hillside stream of the Rio Sixaola drainage. While biting the hand of its captor, the hind legs of a frog were observed in the lizard's throat. The frog was removed and identified as an adult *Rana warschewitschii* (ca. 5 cm TL). The frog appeared to have been recently ingested as very minimal digestion had occurred. Unfortunately, neither specimen could be preserved due to lack of preservation equipment.

Although frogs have not previously been reported in the diet of *Basiliscus plumifrons*, Barden (1943. Copeia 2:118-121) reported frogs (species not identified) in the diet of *Basiliscus basiliscus* in Panama.

Submitted by **JOHN F. COVER, JR.,** Department of Herpetology, Fort Worth Zoological Park, 272 Zoological Park Drive, Fort Worth, Texas 76110, U.S.A. ●



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GERRHONOTUS KINGI (Arizona Alligator Lizard) **REPRODUCTION.** On 11 October 1982, at 1304 h, I introduced a recently captured male *G. kingi* (8.9 g; 85 mm SVL) into a 310 l plexiglass terrarium (1.52 m X 0.46 m X 0.46 m) with a shallow bottom of fine gravel and scattered leaf litter. Four conspecifics were already present. The male moved slowly over the substrate, extruded his tongue approximately once every 2-3 sec, and exhibited a *slow* side-to-side head motion. After several minutes a large female (31.0 g; 109 mm SVL) moved in the litter. The male immediately oriented toward the female (a distance of approximately 50 cm). As the female continued to move, the male approached to within 30 cm, halted momentarily, vibrated the posterior third of his tail, and continued his approach with a *rapid* side-to-side head motion. (While no exact time measurement was recorded for the side-to-side head motions, the difference in cadence between the first movement and the second was easily discernible.) Head movement, in the pattern of a flattened ellipse, appeared to be clockwise for several revolutions and then counterclockwise for a similar period. Tongue flicking continued throughout these preliminary movements by the male and occasionally by the female.

When within 5 cm, the male oriented toward the female's vent, tilted his head down at a 40-60° angle from the horizontal, and arched his body. The female, in response, tilted her head down at a 30-40° angle and pulled her body slightly away from the male in an S-shaped figure. The male moved toward the female's nape, opened his mouth, and gripped one-half of her neck region. The male slowly worked his tail under the female's tail, elevating her vent region. After several seconds, vent alignment was achieved. The copulatory position (Figure 1) was held intermittently for the next 32-43 h. Intromission could not be seen, but is assumed to have occurred.

Intervals between pulse times (the male pushing his vent against the female's vent in a rhythmic fashion for 2-3 sec periods) were erratic. Mean interval between pulses was 9 minutes (coefficient of variation = 40%). During the 25 hours of observations (1304, 11 Oct. to 0500, 12 Oct.; 0952-1330, 1540-2100, 12 Oct.), lizards were in the vent alignment position for 12.4 hours. The remainder of the time the male struggled to maintain his grip on the moving female or they sat motionless. Vent alignment was broken by the female at least 12 times and total displacement from the site of first copulation was 1.4 m. I believe holding and copulation continued for the 43 hour period because the female was found (at 0800, 13 Oct.; 43 hour mark) in the same position and area of the terrarium as when last observed (2100, 12 Oct.; 32 hour mark).

On 18 October, at 1313 h, the pair was again observed copulating. This mating sequence lasted until 0745 (19 Oct.), but was interrupted so that intromission could be confirmed.

Length of mating time may be an artifact of conditions under which it was observed. However, other anecdotal information supports long mating times in the gerrhonotine lizards. Stebbins (1959. Reptiles and Amphibians of the San Francisco Bay Region, University of California Press, Berkeley and Los Angeles, California.) suggested a mating time of 24 h and similar copulatory position for *G. multicarinatus*, while Fitch (1935. Trans. Acad. Sci. St. Louis 29:1-38) observed mating in *G. coeruleus* for 4¾ hours. Smith (1946. Handbook of Lizards, Comstock Publishing Associates. Ithaca, New York) suggested that mating may take from 12 to 26 hours for *G. multicarinatus*. Long copulatory periods seem characteristic of the genus.



Figure 1. Copulatory position of *Gerrhonotus kingi*.

I thank J. Fouquette, B. Sullivan, and E. Bowker for their editorial comments. I also appreciate observations made in my absence by E. Bowker and B. Sullivan and loan of a mature female *G. kingi* by C. Levy.

Submitted by **ROBERT W. BOWKER,** Arizona State University, Tempe, Arizona 85287, U.S.A. ●

SERPENTES

BUNGARUS FASCIATUS (Banded Krait). **REPRODUCTION.** A female *Bungarus fasciatus* was received at the Sedgwick County Zoo on 5 April 1985 from a commercial dealer. The specimen did not appear to be gravid at that time.

This individual was introduced to a long-term captive male on 19 May 1985 for a breeding attempt. The female was removed from contact with the male the following day, after brief courtship behavior by the male was observed. No further breeding efforts were made.

On 20 June 1985 a clutch of seven adherent eggs was found in the female's holding unit. The eggs were somewhat desiccated and had probably been laid the previous day. The clutch was placed in a one gallon glass jar and completely covered with moist vermiculite (water to vermiculite ratio 3:1 by weight). The jar was sealed with plastic sandwich wrapping and placed in an incubator. The clutch had a mass of 127.2 g ($\bar{X}$ = 18.1 g). The eggs ranged in length from 49-59 mm, ($\bar{X}$ = 53 mm), and were thin-shelled, smooth, and somewhat banded with oblique vermiculations.

On 3 August 1985, all eggs hatched after a 44 day incubation period with an average temperature of 84.5° F (range 81°-93° F). Masses for the neonates were 11.4 g-17.3 g ($\bar{X}$ = 14.8 g). The young appeared to be physically normal, except for pattern anomalies in two individuals. One neonate was marked with paired lateral blotches rather than bands. The other individual was partially banded, partially blotched. The young differed from the parents in that the ground color was pale lavender rather than yellow.

We believe this event to be the second captive hatching of this species in the United States. It is possible that it is the result of a captive breeding but, given an unusually short incubation period and what would have been an unusually short gestation period, we feel a wild breeding is more likely.

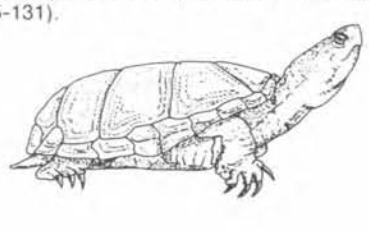
The pattern anomalies in the two neonates can probably be explained by two factors: an incubator malfunction wherein incubation temperatures reached 93° F for 14 h, and desiccation of the eggs at laying. The female parent showed no signs of abnormal patterning.

In contrast to previous reports, the female showed no sign of brooding or egg-guarding behavior.

ERIC M RUNDQUIST
Department of Herpetology
Sedgwick County Zoo
Wichita, Kansas 67204, U.S.A. ●

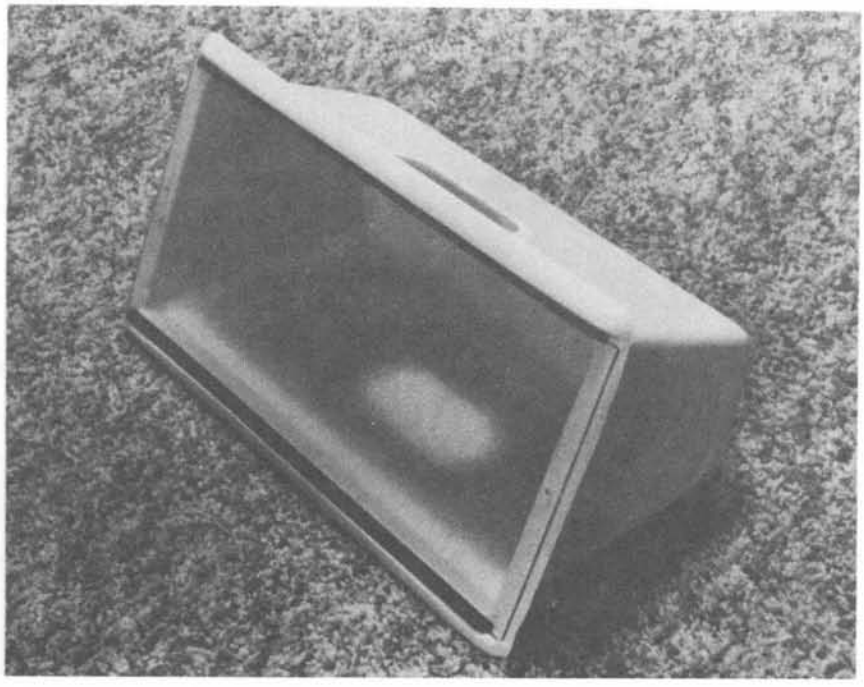
CROTALUS ATROX (Western Diamondback Rattlesnake). **PATTERN.** A gravid *Crotalus ktrox* (total length = 800 mm; postpartum mass = 205 g) with normal pattern and coloration was collected 18 July 1984, about 8 road miles south of Stanfield, Pinal Co., Arizona. Sometime between 28 September and 1 October 1984 this snake produced seven young, all with aberrant patterns but normal coloration. Three offspring appeared healthy, but four were either stillborn or crushed, and partially decayed. Surviving young lived for two, six, and 11 weeks respectively; one offspring never fed while two fed poorly on dead baby mice. Two of these offspring are in the reptile collection of the Department of Zoology, Arizona State University (# 23481, 23482).

All seven young showed abnormal longitudinal striping in the caudal and precaudal regions. Five showed striping in the neck region, and four showed merging of dorsal blotches midbody (Fig. 1). One young showed reduced scalation in the interorbital region. An adult *C. atrox* (length = 750 mm) with similar aberrations was reported from the Tucson Mountains, Pima Co., Arizona, about 60 air miles SE of the present locality (Nickerson and Mays 1968. Wasmann J. Biol. 26(1): 125-131).



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Figure 1. Aberrant *Crotalus atrox* with striped pattern.

Striping is common among aberrations reported in crotalid snakes, and is often attributed to recessive genetic traits (Antonio and Barker 1983. Herp. Review 14(4):108-110; Bechtel 1978. J. Herp., 12(4):521-532); Gloyd 1935. Pap. Mich. Acad. Sci. 82(4):205-208). The probability of seven out of seven young inheriting a simple recessive allele, however, is unlikely. Assuming the normal female is heterozygous and the unknown male is homozygous recessive, this probability is only one in 128 ($.5^7$). More likely these aberrations result from a shared environmental stress during development. Suboptimal temperatures, for example, have caused similar aberrations in *Python molurus* (Vinegar 1974. J. Herp., 30(1):72-74). The gravid female which produced these young may have experienced some environmental stress, including suboptimal temperature, before or after capture. The evolutionary significance of these aberrations remains unknown. I thank Larry Nienaber, Greg Hendricks, and the Department of Zoology at Arizona State University for support.

Submitted by **LEE H. SIMONS,** Department of Zoology, Arizona State University, Tempe, Arizona 85287, U.S.A. ●

ELAPHE GUTTATA GUTTATA (Corn Snake). **REPRODUCTION.** The largest clutch reported for *E. g. guttata* was 28 eggs for a specimen from Alachua Co., Florida (Iverson 1978. Florida Sci. 41:201-207). Ashton (1981. Handbook of Reptiles and Amphibians of Florida. Part One: The Snakes. Windward Publishing, Inc., Miami) gave an upper figure of 30 eggs for *E. g. guttata*. Larger clutches probably have been laid but not reported, especially considering the extensive captive propagation of this species.

On 11 April 1983 a female measuring 1500 mm TL (1290 mm SVL) with a mass of 891.5 g was captured 7.2 km W of Bunnell, Flagler Co., Florida. From 1400-0200 h on 9-10 June, 37 eggs (total mass = 334.1 g) were laid in a single adherent mass. Average egg mass was 9.0 g, and the female had a mass of 538.1 g after oviposition. Seven of the eggs averaged 32.3 mm long (range 29.8-33.8) and 21.8 mm wide (range 21.1-22.3). On 4-6 August 36 eggs hatched, and the remaining egg was opened on 7 August and found to contain a yolked embryo (296 mm TL) that subsequently died. On 9 August the 36 young averaged 318 mm TL (range 297-342) and 7.7 g (range 7.2-8.4).

A second female measuring 1380 mm TL (1190 mm SVL) with a mass of 588.9 g was captured on the same day at the same locality. After laying 30 fertile eggs and 2 small, yellow, misshapen eggs on 6 June, the female had a mass of 452.2 g. The 30 fertile eggs averaged 7.9 g, and 11 of the eggs averaged 30.7 mm long (range 29.2-32.1) and 21.7 mm wide (range 20.8-22.6). The eggs hatched on 1-2 August, and on 9 August the young averaged 300 mm TL (range 283-321) and 6.4 g (range 5.8-7.2).

Both females died in a viral epidemic in the author's collection; 60 of the offspring were released and 6 were maintained in several private collections.

Submitted by **KEVIN M. ENGE,** 1416 NW 21 Avenue, Gainesville, Florida 32605, U.S.A. ●

REGINA SEPTEMVITTATA (Queen Snake). **DICEPHALISM.** A dicephalic *Regina septemvittata* was found on 4 August 1985 in eastern Cobb County, Georgia by a Cobb County Water Department worker as it rested in a meter vault box. The neonate snake measured approximately 169 mm total length (121 mm S-V) with a well-formed umbilical scar indicating a recent birth. The two heads were joined near the right and left eyes of the left and right heads respectively. The lower jaw of the right head was unable to close properly due to the bifurcation and debris partially filled the mouth. The snake died shortly after being received by one of us (NJ) and was preserved.

Dicephalism is not uncommon in snakes. Clark and Tytle (1983. Herp. Review. 14(1):9) reported a dicephalic python. A dicephalic kingsnake was reported by Belfit and Nienaber (1983. Herp. Review. 14(4):121) who reviewed the literature on other cases of dicephaly. This is the first instance known to us of dicephalism in *R. septemvittata*. The specimen will be deposited in the University of Georgia Museum of Natural History. We wish to thank Mr. Ron McDaniel, Cobb County Water Department, for making this snake available to us.

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Atlanta Zoo, 800 Cherokee Avenue SE, Atlanta, Georgia 30315 and **NANETTE JOHNSON,** Chattahoochee Nature Center, 9135 Willeo Road, Roswell, Georgia 30075, U.S.A. ●

STORERIA OCCIPITOMACULATA (Redbelly Snake). **PREDATION.** During a study of largemouth bass *(Micropterus salmoides)* trophic ecology from 1980-1985 in lakes Peter, Paul and Tuesday in Michigan's Upper Peninsula (Gogebic County), a *Storeria occipitomaculata* was recovered from the stomach of a bass collected 31 July 1981 (bass total length = 248 mm; mass = 218 g). The percent frequency of occurrence (F.O.) of *S. occipitomaculata* in the diet of largemouth bass was 0.06 (1724 bass stomachs were examined).

It was unusual to observe this species in the stomach of bass since the snakes are commonly associated with woodland habitats. (Vogt, R.C. 1981. Natural history of amphibians and reptiles of Wisconsin. Milwaukee Public Museum, Milwaukee. 205 pp.). However, *S. occipitomaculata* have been observed beneath cover objects near the dike separating lakes Peter and Paul and in close proximity to other lakes in the general vicinity. Likelihood of contact between this species and aquatic predators may be greater in northern areas where lake shorelines are often forested and where numerous small lakes are characterized by a relatively high ratio of shoreline to surface area.

Other reptiles and amphibians found in bass stomachs during this study include *Thamnophis sirtalis* (4 individuals, F.O. = 0.23) *Notophthalmus viridescens* (1 individual, F.O. = 0.06) and several ranids (38 individuals, F.O. = 2.20, seven of which are tadpoles). Ranids commonly observed in the general study area include *R. clamitans, R. pipiens,* and *R. sylvatica*. Cochran (1982. Herp. Review 13:45-46) discussed predation on *R. pipiens* by largemouth bass.

The National Science Foundation provided funding for the project. We thank Philip Cochran for his suggested improvements to the manuscript.

Submitted by **PAUL G. KNAPIK** and **JAMES R. HODGSON,** Division of Natural Sciences, St. Norbert College, DePere, Wisconsin 54115, U.S.A. ●

THAMNOPHIS COUCHI HAMMONDI (Two-striped Garter Snake). **BEHAVIOR.** Head hiding in snakes is a distinctive defensive display in which the head is protected by concealing it under coils of the body. This behavioral strategy is widespread in snakes, and has been documented in at least 48 species (Carpenter and Ferguson 1977, *In:* Gans and Tinkle, Biology of the Reptilia, Vol. 7, pp. 335-554). In the genus *Thamnophis*, head hiding is known only in the plains garter snake, *T. radix* (Arnold and Bennett 1984, Anim. Behav. 32:1108-1118). In this note we report head hiding and other defensive behaviors observed in the two-striped garter snake, *T. c. hammondi*.

During three trips in April and May 1985 to the Santa Rosa Plateau Preserve in Riverside County, California, we captured eight individuals of *T. c. hammondi* along the edges of several vernal pools. To see if head hiding occurred in these snakes, we placed each individual on the ground and prodded the body with fingers. Six snakes attempted to flee, one tried to bite, and only two responded by hiding their heads under disorganized coils of the body. Defecation, dorso-ventral flattening, and flight into water were also observed. Most of the snakes, under continued molestation, raised the lateral coils of their bodies 0-2 cm above the substrate in a manner similar to but less exaggerated than that of crotaline snakes in response to ophiophagous snakes (Carpenter and Gillingham 1975, Herpetologica 31:293-302). Arnold and Bennett (1984) did not record defensive postures in *T. radix* in which the coils were raised above the substrate (except when biting).

That only 25% of the snakes responded by head hiding is not surprising since antipredator displays in garter snakes are highly variable within populations (Arnold and Bennett 1984). Arnold and Bennett (1984) have also shown that head hiding and other defensive displays in garter snakes are consistent in individuals and are in part heritable. Head hiding appears to be a common defensive mechanism in *T. c. hammondi*, and is probably widespread in the genus *Thamnophis*.

Submitted by **FLOYD E. HAYES** and **WILLIAM S. BAKER,** Department of Biology, Loma Linda University, Riverside, California 92515, U.S.A. Present addresses: Division of Biological Sciences, University of Michigan, Ann Arbor, Michigan 48109, U.S.A. (FEH); 270 White Cottage Road, Angwin, California 94506, U.S.A. (WSB). ●

THAMNOPHIS SIRTALIS SIRTALIS (Eastern Garter Snake). **COLORATION.** Albino common garter snakes (*Thamnophis sirtalis*) have been reported from British Columbia, Ontario, Connecticut, Indiana, Maryland, Michigan, Missouri, New York, Ohio, Pennsylvania, Washington, and West Virginia (Dyrkacz 1981. SSAR Herpetol. Circ. No. 11:1-31; Hensley 1959. Publ. Mus., Mich. State Univ. Biol. Ser. 1:133-159). To my knowledge, the following is the first documentation of albino garter snakes from Georgia.

In late April 1985 an amelanistic partial albino *Thamnophis s. sirtalis* (female, 43 cm SVL) was discovered by Mr. James Petty at his residence ¼ mi outside the city limits of Dalton, Whitfield Co., Georgia. The snake is entirely lacking dark pigmentation, but retains the characteristic yellow striping and lateral checkerboard of yellow/reddish spots. The background tissue where the dark pigment is missing has a bluish-pink aspect, and might best be described as lavender. The venter has the typical yellowish coloration. The eyes are pink and the tongue is red with white tips (the tongue tips would be black in a normally pigmented garter snake). The central portions of the frontal and parietal head scales, the temporal scales, and dorsolateral areas of the neck are slightly reddish. This snake was donated to the Atlanta Zoo where it is currently being maintained on a diet of earthworms and newborn mice.

Records of two other amelanistic partial albino *Thamnophis s. sirtalis* from Georgia were given to me by Mr. David Funderburk of the Fernbank Science Center, Decatur, Georgia. In July 1974 Cathie Brown of the Shoal Creek area of Dekalb County found a one foot amelanistic garter snake in her back yard. It was donated to Fernbank, where it was kept for several months until it died. In August 1976 another amelanistic garter snake caught in Dekalb County (no further information) was brought to Fernbank. It was ca. 18 inches long and lived only a few weeks in captivity. The ultimate disposition of these two specimens is unknown. However, the photos available (D.O. Funderburk, pers. comm.) show them to be identical in coloration to the Whitfield County specimen.

I thank James Petty and his family for caring for the snake and donating it. I thank David Funderburk for providing me with the information on the additional specimens, and Dr. H.B. Bechtel for providing literature references.

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Submitted by **DAVID G. COOK,** Department of Herpetology, Atlanta Zoological Park, 800 Cherokee Ave., SE, Atlanta, Georgia 30315, U.S.A. ●

TESTUDINES

CHELYDRA SERPENTINA (Snapping Turtle). **FORAGING.** In May 1985, 2 hatchling *C. serpentina* (carapace 3.7 and 3.4 cm) were collected at the same site from the Hillsborough River in Hillsborough Co., Florida. Once in captivity, the turtles were handfed assorted livebearing fish (with use of forceps) living in their 10 gallon aquarium.

At ca. 2200 h, 8 June 1985, I observed what appeared to be a common foraging behavior. The larger hatchling, while bottom crawling, stopped ca. 60 mm directly in front of a small (ca. 20 mm) *Xiphophorus helleri* hovering just over the substrate. The turtle withdrew its head aiming downwards and fully extended its forefeet upward and outward with palms outward. Vibrating its forefeet, it slowly approached the *X. helleri* using its hindlegs for locomotion. At ca. 30 mm from the turtle's head, the *X. helleri* oriented itself close to the turtle's right forefoot. At ca. 20 mm, the turtle lunged upward catching the fish by the peduncle and ate it tail first.

This has been repeated many times by both turtles using one or both forefeet seemingly to distract the fish. It is observed most frequently at night and when fewer than 20 fish are present. Any attempts by the turtles to extend or point their heads upward before a strike usually frighten the fish. Capturing the fish near the peduncle and eating it tail first occurred in each instance noted.

Submitted by **WALTER E. MESHAKA, JR.,** 8500 S.W. 87 Terrace, Miami, Florida 33143, U.S.A. ●

CLEMMYS MUHLENBERGI (Bog Turtle). **ELEVATION.** The elevation range of *Clemmys muhlenbergi* was summarized by Bury (1979. USDI. Fish & Wildlife Serv. Spec. Sci. Report No. 219, 9 pp.) as occurring from sea level to 1280 m (4200 ft). Nemuras (1974. Wildlife N.C. 38(2):13-15) gave the altitude range in North Carolina from 215 m (610 ft) in the piedmont to 1280 m (4200 ft) in the mountains. This 1280 m figure often cited by authors came from a male *C. muhlenbergi* collected 15 August 1916 in Avery Co., North Carolina by E. R. Dunn (1917. Bull. Nat. Mus. Natur. Hist. 37(23):593-634).

An adult female *C. muhlenbergi* (CL = 97.2 mm) was found in the fen on Bluff Mountain (N.C. Nature Conservancy Preserve), 3.2 km W West Jefferson, Ashe Co., North Carolina on 3 June 1985 at 1340 h at an elevation of 1373 m (4500 ft). The turtle was observed digging in the mud next to a small rivulet. The air temperature was 30.0° C and the cloacal temperature was 27.0° C.

This elevation (1373 m) surpasses the old record by nearly 100 m and the turtle confirms past sightings of *C. muhlenbergi* at this locality. Several other high elevation bogs presently under survey may also support populations of bog turtles.

A Kodachrome 35 mm slide (#DWH 85.42) has been deposited in the North Carolina State Museum. A grant from the North Carolina Nature Conservancy supported field work, and the North Carolina Natural Heritage Program provided assistance.

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Atlanta Zoological Park, 800 Cherokee Avenue SE, Atlanta, Georgia 30315 and **RUBY D. PHARR,** Department of Biology, Western Piedmont Community College, Morganton, North Carolina 28655, U.S.A. ●

CLEMMYS MUHLENBERGI (Bog Turtle). **NEST PREDATION.** Raccoons, skunks, foxes, dogs, and other large predators have been reported as predators on nests, young, and adults of *C. muhlenbergi* by Ernst and Barbour (1972. Turtles of the United States. The Univ. Press of Kentucky. Lexington. 347 pp.) and Nemuras (1974. Wildl. N.C. 38(2):13-15 and 1976. Defenders Wildl. 51(1):38-39).

On 31 July 1985, seven eggs in a bog turtle nest disappeared from a naturalistic bog setup at Zoo Atlanta. No disturbance to the nest itself was observed. A second *C. muhlenbergi* nest in a separate bog setup was checked and its one egg was found intact.

In an attempt to determine the source of predation, an infertile spotted turtle *(Clemmys guttata)* egg and the shell of a recently hatched spotted turtle were placed in the original *C. muhlenbergi* nest and covered with sphagnum moss. The following morning (0910 h) both the infertile egg and the bog turtle egg from the second nest were missing. Neither nest was noticeably disturbed; the moss cover was intact. A search of the immediate area yielded tracks of an oppossum, *Didelphis marsupialis*, on an ant mound (R.H. Hunt identification). This observation and the fact that a population of oppossums is known to exist on the zoo grounds suggested that we had solved the mystery.

This occurrence of nest predation adds the oppossum to the list of potential predators of *C. muhlenbergi* and *C. guttata*.

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Zoo Atlanta, 800 Cherokee Avenue SE, Atlanta, Georgia 30315, U.S.A. ●

CLEMMYS MUHLENBERGI (Bog Turtle). **REPRODUCTION.** Reproduction in the bog turtle was summarized by Bury (1979. USDI. Fish & Wildlife Service. Spec. Sci. Report-Wildl. No. 219:1-9) with no records then known of multiple clutches in *C. muhlenbergi*. Carr (1952. Handbook of Turtles. Cornell Univ. Press. Ithaca, N.Y. 542 pp.) stated (p. 132) "a captive specimen kept by Wright that laid 2 eggs, one on June 5 and another a month later; a third was found in the oviduct." This was probably a result of the stress of capture, as I have observed for wild-caught gravid *C. muhlenbergi* (unpub. obs.), and not a true case of multiple clutching. The maximum clutch size for the bog turtle was commented on by Herman (1983. SSAR Herp. Review 14(4):122) when a turtle housed at Zoo Atlanta deposited six eggs in May 1983. An additional clutch of six eggs was deposited by the same turtle in May 1984.

On 30 May 1985 this female bog turtle deposited two eggs in a shallow nest at the base of a sedge clump in an outdoor bog setup. A triple beam balance and vernier calipers were used to determine the following data for the eggs:

Length (mm)	31.8 and 32.3	($\bar{X}$ = 32.1)
Width (mm)	15.8 and 16.1	($\bar{X}$ = 16.0)
Mass (g)	5.1 and 5.2	($\bar{X}$ = 5.2)

The progress of the incubating eggs was checked three times weekly. On 30 June 1985 a second, freshly deposited clutch containing five eggs was discovered in the same nest cavity. The five eggs were noticeably smaller than those of clutch #1. Measurements were as follows (middle column = range):

Length (mm)	21.8-25.7	($\bar{X}$ = 23.5)
Width (mm)	13.6-14.4	($\bar{X}$ = 13.9)
Mass (g)	2.5-3.1	($\bar{X}$ = 2.8)

This is the first reported case of multiple clutching in *C. muhlenbergi* and the seasonal total of seven eggs is probably a record for the species. Contributing factors to this multiple clutching are not known.

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Zoo Atlanta, 800 Cherokee Avenue SE, Atlanta, Georgia 30315, U.S.A. ●

DERMOCHELYS CORIACEA (Leatherback sea turtle). **COPULATION.** On 5 April 1985 at 1630 h, while conducting a turtle and manatee survey in the Culebra Island Archipelago, Puerto Rico, we encountered a pair of mating leatherback sea turtles *(D. coriacea)* approximately 200 m northeast of Cayo Geniqui. The pair remained intermittently in view for ca. 20 min. When first sighted, in 44 m of water, the two turtles were coming to the surface about five m apart. The female remained stationary at the surface and the male moved rapidly toward her, with his head held high above the water. When he reached a point one m behind her, he lunged forward, lodging the center of his plastron on the posterior dorsal area of her carapace. The female immediately sounded, leaving the male at the surface. The male then took a quick audible breath and rapidly sounded along the same path of descent taken by the female. When the two emerged a second time they were only two meters apart. The male immediately lunged onto the back of the female, just as before. Again the female sounded, but this time with less zeal than before. When the turtles appeared at the surface a third time they were very close to each other and the female showed little reaction when the male lunged up onto her back, positioning the center of his plastron just posterior to the center of her carapace. His weight forced her body below the surface, and at that point both animals began to list, and then to roll laterally back and forth. Each time the male rolled, his tail and semi-erect penis, which had been angled down toward the trailing edge of the female's shell, lifted out of the water and was clearly

visible. The two then separated, sounded, and after a few minutes came to the surface for a fourth time, within two m of each other. Both appeared to be less agitated than on previous surfacings. Just as before, the male shoved himself up on top of the female, this time his movements appearing more coordinated. His tail curved under the female's shell and beneath the base of her tail. Her fore-flippers became rigid and were elevated slightly above the surface of the water, and the fore-flippers and neck of the male became rigid. At this point the two turtles quivered slightly, and then together, slowly submerged. They were lost from view at a depth of ca. four m and were together at that time.

We have not been able to locate previously published information on mating in *Dermochelys*. There are minor nesting colonies on several islands of this area, and no way of knowing the source of this pair or the subsequent nesting site of the female.

Submitted by **THOMAS CARR** and **NICOLE CARR,** Florida State Museum, Gainesville, Florida 32611, U.S.A. ●

STERNOTHERUS MINOR MINOR (Loggerhead Musk Turtle). **SIZE.** Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton-Mifflin Co., Boston. 429 pp.) gave a maximum size of 135 mm CL for *S. m. minor*. Iverson (1977. Copeia 1977:502-517) reported that females grow significantly larger than males and that of 1072 turtles examined, the largest female (Aucilla River, Florida) measured 132.9 mm CL and the largest male (Rainbow Run, Florida) measured 124.25 mm CL.

On 21 March 1985, a female *S. m. minor* with a straight-line CL of 145 mm was collected in Rainbow Run ca. 4 km north of Dunnellon, Marion Co., Florida. Carapace width and height at the juncture of the sixth and seventh marginals were 90 mm and 52 mm, respectively. The specimen had a mass of 401.3 g three weeks after capture. A male *S. m. minor* collected on the same day had a CL of 137 mm, despite missing ca. 5 mm of its pygal bone. Carapace width and height were 92 mm and 49 mm, respectively, and its mass was 379.3 g. These two specimens represent the largest individuals in a series of 1942 *S. m. minor* collected by the junior author in North Florida spring runs.

Submitted by **KEVIN M. ENGE,** 1416 NW 21 Avenue, Gainesville, Florida 32605, and **DOUGLAS R. FOSTER,** 3131 NW 11 Street, Gainesville, Florida 32609, U.S.A. ●

TERRAPENE CAROLINA CAROLINA (Eastern box turtle) **TWINNING.** Twinning in oviparous reptiles is well known in snakes. It is however, infrequently reported in turtles. Plymale et al. (1980. Flor. Scientist 43(2):97-102) reported chelonian twinning known from 62 specimens in five families, nine genera and 10 species, the highest instance of which was discussed by Yntema (1970. Anat. Record 166(3):491-498) in *Chelydra serpentina* (23 out of 2228 eggs).

Twinning in *Terrapene carolina* was described previously for *T. c. major* by Tucker and Funk (1976. Flor. Scientist 39(4):238-239) and for *T. c. triunquis* by Crooks and Smith (1958. Herpetologica 14:170-171).

On 19 August 1984 the author opened an obviously bad egg laid by a captive *T. c. carolina* (exact date of deposition unknown) and removed dead twin embryos joined at the yolk sack. The well-advanced embryos measured 19.0 and 20.0 mm in length.

Submitted by **HENRY COHEN,** 24 St. Johns Pl., Buffalo, New York 14201, U.S.A. ●

TRACHEMYS SCRIPTA CATASPILA (Huastecan Slider). **REPRODUCTION.** A gravid female *Trachemys scripta cataspila* was captured southeast of Rancho Nuevo, Municipio de Aldama, Tamaulipas, Mexico (23° 11' N, 97° 47' W) on 24 June 1981. The female had straight, mid-line lengths of 224 mm (carapace) and 205 mm (plastron), and a mass of approximately 1800 g. On 1 July, oxytocin injections totalling 1.4 cc (20 I.U./cc) were administered over a three hour period according to procedures modified from those of Ewert and Legler (1978. Herpetologica 34: 314-318). A parchment-shelled, ovoid egg was deposited after three hours and 40 minutes, followed by a second egg 12 minutes later. Repeated palpation between injections indicated that both eggs had originated in the left oviduct, and that at least one more egg was low in the right oviduct. However, a final injection of 0.2 cc oxytocin 13 minutes later failed to induce further oviposition. Measurements for these eggs were 41.7 X 26.5 mm, 16.92 g, and 43.6 X 27.3 mm, 18.85 g. Due to desiccation during incubation, the eggs did not develop. The female was subsequently released.

On 9 July 1981, a hatchling *T. s. cataspila* was found freshly killed less than 300 meters east of the site where the aforementioned gravid female was captured. The hatchling was in good condition, with the following dimensions: straight, mid-line carapace length = 39.6 mm, straight, mid-line plastron length = 35.2 mm, carapace width at marginals 5-6 = 35.9 mm, minimum bridge length = 11.5 mm, and maximum shell depth = 15.7 mm. The specimen retained unabsorbed yolk and was presumed to have recently hatched. It was found ca. 50 m from a permanent stream where adults had often been seen basking and surfacing. Hatchling turtles were observed in this same stream on 9, 11, and 12 July, 1981.

These observations provide natural emergence data. Assuming an incubation period of two to three months (similar to other subspecies of *T. scripta*) the eggs from which these hatchlings emerged were likely deposited in April or May. Together with the gravid female, this suggests a nesting season which lasts from April until late June. This estimated nesting season falls within the range given by Rosado (1967. Intl. Turt. and Tort. Soc. J. 1(3):16-19,42) for *T. s. venusta*, the closest occurring subspecies of *T. scripta* to the south.

We have used the vernacular name Huastecan slider in recognition of the coincidental range of *T. s. cataspila* with the pre-Columbian Huastec Indian culture. The hatchling will be deposited in the National Museum of Natural History (USNM). We gratefully acknowledge the assistance of Pat Burchfield, and also thank the U.S. Fish and Wildlife Service and Mexico's Instituto Nacional de Pesca for the opportunity to have worked at Rancho Nuevo.

Submitted by **RODERIC B. MAST,** World Wildlife Fund, 1601 Connecticut Avenue NW, Washington, DC 20009, and **JOHN L. CARR,** Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901, U.S.A. ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

ANURA

HAMPTOPHRYNE BOLIVIANA. VENEZUELA: ESTADO BOLIVAR: Reserva Forestal Rio Grande, Rio Grande at road to El Palmar (8° 00'N, 61° 40'W), 266 m. 16 December 1980. J. Cadle. Verified by Alfredo Paolillo O. Museum of Vertebrate Zoology, Univ. of California, Berkeley (MVZ 176018). First record for Venezuela. Duellman (1981. Amphibia. *In:* Hurlbert, Rodríguez and Santos (eds.) Aqua-

tic Biota of Tropical South America, Part 2: Anarthropoda. San Diego State Univ.: 230-245.) included "Venezuela" in the range of the species, but no specimen was cited. This species was mentioned from all Amazonian and Guianan countries, excepting Colombia and Venezuela (D. Frost, (ed.) 1985. Amphibian Species of the World. Allen Press & Assoc. Syst. Coll., Lawrence, Kansas 732 p.).

Study financed by the Smithsonian Institution (Department of Vertebrate Zoology); I thank R. McDiarmid for help and H. Greene for the MVZ loan.

Submitted by **ALFREDO PAOLILLO O.** Instituto de Zoología Tropical, Universidad Central de Venezuela, Apartado 47599, Chaguaramos 1041-A, Caracas, Venezuela. ●

HYLA CRUCIFER (Spring Peeper). USA: Wisconsin: Shawano Co: along Red River upstream from County Road G crossing. 13 June 1971. J. R. Hodgson. Verified by P. A. Cochran. University of Wisconsin-Madison Zoology Museum (UWZM H22631). New county record (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum. 205 pp.).

Submitted by **JAMES R. HODGSON** and **PHILIP A. COCHRAN,** Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115, U.S.A. ●

HYLA EXIMIA (Mountain Treefrog). MEXICO: COLIMA: ca. 10 km ESE San Antonio, 1478 m elev. 12 and 14 July 1975. Charles W. Painter and Bruce G. Stewart. Verified by William E. Duellman. Museum of Vertebrate Zoology, Northeast Louisiana University (NLU 40705-40708 and 40709-40712). Smith and Smith (1976. Synopsis of the Herpetofauna of Mexico. Vol. IV. Source Analysis and Index for Mexican Amphibians) included this species in their Colima list, based on Terron 1930 (La HYLA EXIMIA BAIRD. An. Inst. Biol. Univ. Mex. 1(1):47-50.). Smith (per. comm. 1985) states Terron's (1930) record may be conjecture and adds he knows of no "authentic" records of this species from Colima. These specimens reported here represent the first *H. eximia* from Colima, Mexico.

Submitted by **CHARLES W. PAINTER,** Endangered Species Program, New Mexico Department of Game and Fish, Santa Fe, New Mexico 87503, U.S.A. ●

RANA CATESBEIANA (Bullfrog). USA: TEXAS: Hill Co: 5.0 km N Whitney, Lazy SB Ranch. 1 June 1985. S. P. Tabor. Verified by W. Hathaway. Fort Worth Museum of Science and History (FWM 10744). New county record, fills gap between Bosque and Navarro counties (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **STEPHEN R. TABOR,** Route 3, 909 Stella Mae Drive, Burleson, Texas 76028, U.S.A. ●

RANA CATESBEIANA (Bullfrog). USA: TEXAS: Frio Co: Panther Hollow Ranch, 9.7 km NNW I-35 and FM 117 intersection. 29 April 1985. J. S. McCord, Jr. Verified by J. A. Campbell. University of Texas at Arlington Collection of Vertebrates (UTA A-17649). New county record. Fills gap between Uvalde and La Salle counties (Raun and Gehlbach 1972. Dallas Mus. Nat. Hist. Bull. No. 2).

I acknowledge help of the Texas Herpetological Society.

Submitted by **JOHN S. McCORD, JR.,** Box 19498, Department of Biology, The University of Texas at Arlington, Arlington, Texas 76019, U.S.A. ●

RANA PIPIENS (Northern Leopard Frog). USA: MISSOURI: Atchison Co: 9.6 km SW of Hamburg (Iowa) and SW of county highway V (T66N, R43W, Sec. 11). 30 May 1985. Tom R. Johnson. Verified by John B. Hess and Carl Gerhardt. Museum of Natural History, University of Kansas, (KU 204082-204086). New state record. Extends range into extreme northwest Missouri (Johnson 1977. Amphibians of Missouri. Univ. Kansas Mus. Nat. Hist., Publ. Educ. Ser. (6):1-142.

Submitted by **TOM R. JOHNSON,** Missouri Department of Conservation, P.O. Box 180, Jefferson City, Missouri 65102, U.S.A. ●

CAUDATA

AMBYSTOMA JEFFERSONIANUM (Jefferson Salamander). USA: NEW HAMPSHIRE: Chester Co: Winchester, 1.6 km E Scotland Rd on State Hwy 119. 3 May 1984. T. French and L. Master. Verified by J.P. Bogart. Museum of Comparative Zoology, Harvard University (MCZ 107955). First verified record for state. This specimen was identified by external morphology, erythrocyte nuclear volume, electrophoresis, and chromosome number.

Previous New Hampshire records refer to specimens taken before the recognition of *A. laterale* and triploid members of the complex. Examination of existing specimens (Univ. of Michigan Museum of Zoology (UMMZ) 84515-84516, MCZ 979) and printed descriptions (Oliver and Bailey 1939. Biological Survey of the Connecticut Watershed. Survey Report no. 4:195-217. New Hampshire Fish and Game Dept.; Stewart 1951. The Caudata of Durham, New Hampshire and Adjoining Localities. Unpublished master's thesis, Univ. of N.H.) suggest that all previous specimens from New Hampshire have been *A. laterale* and possibly the triploid, *A. tremblayi*. Twenty-one specimens collected in 1983 by the authors were identified by J. Bogart (by chromosome number) as 8 *A. laterale* (MCZ 107619-107621, 107623, 107632; UMMZ 176841-176842) from Hillsborough, Rockingham and Strafford counties and 13 *A. tremblayi* (MCZ 107622, 107624, 107626-107627, 107629-107631, 107952; UMMZ 176836-176840) from Hillsborough and Rockingham counties.

Submitted by **THOMAS W. FRENCH,** Massachusetts Division of Fisheries and Wildlife, 100 Cambridge Street, Boston, Massachusetts 02202 and **LAWRENCE L. MASTER,** The Nature Conservancy, 294 Washington Street, Boston, Massachusetts 02108, U.S.A. ●

AMBYSTOMA LATERALE (Blue-spotted Salamander). USA: WISCONSIN: Florence Co: near Pembine. 25 August 1985. D. Engels. Verified by P.A. Cochran. University of Wisconsin-Madison Zoology Museum (UWZM H22630). Langlade Co: In woods along Wolf River near Hollister (T-32N, R-14E, Sec. 19). 7 September 1985. P.A. Cochran. Verified by P. A. Cochran (UWZM H22629). New county records (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Publ. Mus. 205 pp.).

Submitted by **PHILIP A. COCHRAN** and **JAMES R. HODGSON,** Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115, U.S.A. ●

GYRINOPHILUS PORPHYRITICUS PORPHYRITICUS (Northern Spring Salamander). USA: RHODE ISLAND: Providence Co: North Foster, 225 m. 3 September 1985. James Lazell. Verified by J. Lazell. Museum of Comparative Zoology, Harvard University (MCZ 107821). New state record. Ca. 40 km ENE closest Connecticut locality (Storrs, Tolland Co: Brandon 1966. Illinois Biol. Monogr. 35:1-86). Ca. 55 km SE closest Massachusetts locality (Palmer, Hampden Co: MCZ 107866). Some published maps have anticipated this discovery: Brandon (ibid, Fig. 6, p. 20 and Fig. 15, p. 46) included part of Rhode Island, but examined no specimens. DeGraaf and Rudis (1983. Amphibians and Reptiles of New England, Univ. Mass. Press, Amherst) inform one of us (CR: pers. comm.) that the dot on their map, and other marks in Rhode Island, are printing errors.

Submitted by **J. D. LAZELL, JR.,** The Conservation Agency, 6 Swinburne Street, Jamestown, Rhode Island 02835 and **CHRISTOPHER RAITHEL,** Natural Heritage Program, RI-DEM, 22 Hayes Street, Providence, Rhode Island 02908, U.S.A. ●

SAURIA

CNEMIDOPHORUS LAREDOENSIS (Laredo Striped Whiptail). MEXICO: TAMAULIPAS: Nuevo Laredo, SE international bridge ca. 0.5 km from Rio Grande. 28 May 1985. J. M. Walker, S. E. Trauth, J. E. Cordes, J. M. Britton, and P. J. Polechla, Jr. Department of Zoology Collection, University of Arkansas (UADZ 1064-1075). Ciudad Miguel Aleman, N side of town near movie theater and baseball field. 26 May 1985. J. M. Walker, S. E. Trauth, J. E. Cordes, J. M. Britton, and P. J. Polechla, Jr. (UADZ 1076-1100). Reynosa, S international bridge in suburbs near canals. 27 May 1985. J. M. Walker, S. E. Trauth, J. E. Cordes, J. M. Britton, and P. J. Polechla, Jr. (UADZ 1112-1115). Nuevo Progreso, NW international bridge near Rio Grande. 22 July 1985. J. M. Walker, S. E. Trauth, J. E. Cordes, and J. M. Britton. (UADZ 1327-1328). All verified by J. M. Walker. First records in Mexico.

USA: TEXAS: LaSalle Co: Encinal. 8 September 1985. J. M. Walker, J. E. Cordes, and P. J. Polechla, Jr. (UADZ 1365). Webb Co: 4.5 km S Chacon Creek Arroyo, then 1.6 km W U. S. Highway 83 near Rio Grande. 16 June 1984. J. M. Walker, S. E. Trauth, J. E. Cordes, and B. Kuss. University of Kansas (KU 199854-199856). Zapata Co: Zapata, vacant lot several blocks S Dairy Queen and U. S. 83. 13 July 1984. J. M. Walker, J. E. Cordes, and J. M. Britton. (KU 199919-199920). Starr Co: 2.5 km from Falcon Lake Dam. 26 May 1985. J. M. Walker, S. E. Trauth, J. E. Cordes, J. M. Britton, and P. J. Polechla, Jr. (UADZ 1042-1045). Hidalgo Co: Los Ebanos, between town and Rio Grande. 28 May 1985. J. M. Walker, S. E. Trauth, J. E. Cordes, J. M. Britton, and P. J. Polechla, Jr. (UADZ 1054-1058). All verified by J. M. Walker. The LaSalle County record establishes the presence in the Nueces River drainage, a distance of 64 km from the Rio Grande. All other known records listed herein or published (McCrystal, Dean, and Dixon 1985. Texas Jour. Science 36(4):283-284, and Dryden 1985. SSAR Herp. Review 16(2):60) lie within a narrow riverine zone of about 10 km in width and 250 road km in length on both sides of the Rio Grande between Nuevo Laredo-Laredo and Nuevo Progreso-Progreso. Collections in Texas were made under authority of Texas Parks and Wildlife permit No. 61.

Submitted by **J. M. WALKER,** Department of Zoology, University of Arkansas, Fayetteville, Arkansas 72701, U.S.A. **S. E. TRAUTH,** Department of Biology, Arkansas State University, Jonesboro, Arkansas 72467, U.S.A. **J. E. CORDES** and **J. M. BRITTON,** Department of Zoology, University of Arkansas, Fayetteville, Arkansas 72701, U.S.A. ●

EUMECES FASCIATUS (Five-lined Skink). USA: MINNESOTA: Houston Co: Beaver Creek Valley State Park, 5 km W Caledonia (T102N R6W). 27 July 1985. J. J. Moriarty. James Ford Bell Museum of Natural History, University of Minnesota (JFBM 12646). Fillmore Co: Choice, South Fork of Root River. 14 September 1985. J. J. Moriarty. (JFBM 12674). Both verified by J. J. Moriarty and B. Oldfield. New county records, ca. 60 km N of Iowa records (Christiansen and Burken 1978. Endangered and uncommon reptiles and amphibians of Iowa. Iowa Sci. Teachers J., Spec. Issue).

Submitted by **JOHN J. MORIARTY,** 4085 Foss Road, St. Anthony, Minnesota 55421, U.S.A. ●

SPHAERODACTYLUS ELEGANS (Ashy Gecko). USA: FLORIDA: Monroe Co: Boot Key (near Marathon), along road 2 km south of bridge. 3 January 1985. J. H. Epler. Verified by Larry David Wilson. Museum of Natural History, University of Kansas (KU 204151). Three specimens observed at collection site 60 km (by air) NE of previous record at Big Coppitt Key.

Submitted by **J. H. EPLER,** Department of Biological Science, Florida State University, Tallahassee, Florida 32306, U.S.A. ●

SERPENTES

ARRHYTON TAENIATUM. CUBA: GUANTÁNAMO PROVINCE: Guantánamo Bay U.S. Naval Base, Cuzco Beach, west side of access road, 20 meters from splash zone. 8 October 1985. B. I. Crother. Verified by A. Schwartz. Albert Schwartz Collection (ASFS V50466). First record for Guantánamo Bay area (Lando and Williams 1969. Studies on the Fauna of Curacao and other Caribbean Islands. 116: 159-201), and extends range both south and west on Cuba. Although *A. taeniatum* is considered a mesic habitat dweller (Schwartz, pers. comm.), Guantánamo Bay is a xeric rain shadow habitat.

Submitted by **BRIAN I. CROTHER,** Department of Biology, University of Miami, P.O. Box 249118, Coral Gables, Florida 33124, U.S.A. ●

ERYTHROLAMPRUS PSEUDOCORALLUS (False Coral Snake). VENEZUELA: ESTADO MERIDA: Distrito Andrés Bello: El Amacao, 7 km SE La Azulita. 15 June 1985, Alfredo Lacroix. Verified by Juan Elías García. Colección de Vertebrados, Universidad de Los Andes. Mérida (ULAM IV-2819). First record for Mérida State and the southernmost locality, extending the known range approximately 220 km SE of Kunana, Zulia State (Marcuzzi 1950, Nov. Cient. La Salle, Caracas, Ser. Zool. (3):1-20). This species, previously considered endemic to the mountains of Zulia State, (Roze 1966. La Taxonomia y Zoogeografia de los Ofidios en Venezuela. Univ. Cent. Ven., Caracas) represents one of the few non-widespread species shared by the Sierra de Perijá and the Venezuelan Andes, and the only snake shared exclusively by these two mountain ranges. Contribution No. 1 of the Sierra de Perijá Herpetological Program.

Submitted by **ENRIQUE LA MARCA,** Apartado 116, Mérida 5101, Venezuela, and **JUAN ELIAS GARCIA,** Ecología Animal, Departamento de Biología, Facultad de Ciencias, Universidad de Los Andes, Mérida 5101, Venezuela. ●

MICRUROIDES EURYXANTHUS EURYXANTHUS (Arizona Coral Snake). USA: ARIZONA: LaPaz Co: Chocolate Mountains, 47 km SSW of Quartzsite. 450 m. 25 May 1984. Bruce K. Palmer. Verified by Cecil R. Schwalbe. University of Arizona (UAZ 45840). Extends known range 147 km SSW of nearest record (Fowlie 1965. The Snakes of Arizona. Azul Quinta Press, Fallbrook California) and fills gap in western Arizona.

Submitted by **BRUCE K. PALMER** and **JAMES C. DEVOS, JR.,** Arizona Game and Fish Department, 2222 West Greenway Road, Phoenix, Arizona 85023, U.S.A. ●

NOTHOPSIS RUGOSUS. HONDURAS: DEPT. DE COLON: 4 km ESE Tulito, at archeological site 20 m above Rio Tulito. 22 May 1985. Mark T. O'Shea and Roger Weatherby. Verified by A. F. Stimson, British Museum (Natural History) (BMNH 1985.1148). First specimen for Honduras. Extends range 500 km north (Dunn and Dowling 1957. Copeia (4):255-261).

Submitted by **MARK T. O'SHEA,** 46 Buckingham Road, Penn, Wolverhampton, WV4 5TJ, England. ●

TESTUDINES

KINOSTERNON SUBRUBRUM SUBRUBRUM (Eastern Mud Turtle). USA: NORTH CAROLINA: Burke Co: 2 km W Rhodhiss. 3 September 1985. D.W. Herman and T.M. Short. Verified by D.W. Herman. (1 female released). Photograph deposited in the North Carolina State Museum. New county record. Extends the range approximately 40 km N of present range (Martof et al. 1979. Amphibians and Reptiles of the Carolinas and Virginia. UNC Press, Chapel Hill. 264 pp.).

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Atlanta Zoological Park, 800 Cherokee Ave. SE, Atlanta, Georgia 30315 and **TOM M. SHORT,** 561 Moreland Ave. SE, Atlanta, Georgia 30316, U.S.A. ●

KINOSTERNON SUBRUBRUM SUBRUBRUM (Eastern Mud Turtle). USA: NORTH CAROLINA: Iredell Co: 4 km NE Olin. 6 May 1985. D.W. Herman and A.S. Weakley. Verified by D.W. Herman. (1 female released). Photograph deposited in the North Carolina State Museum. New county record. Extends range ca. 60 km N and 30 km W of known range (Martof et al. 1979. Amphibians and Reptiles of the Carolinas and Virginia. UNC Press, Chapel Hill. 264 pp.).

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Atlanta Zoological Park, 800 Cherokee Ave. SE, Atlanta, Georgia 30315 and **ALAN S. WEAKLEY,** North Carolina Natural Heritage Program, North Carolina Department of Natural Resources & Community Development, P.O. Box 27687, Raleigh, North Carolina 27611, U.S.A. ●

PSEUDEMYS SCRIPTA ELEGANS (Red-eared Slider). USA: TEXAS: Lampasas Co: 3.7 km N Adamsville off US 281. 28 September 1985. S.P. Tabor and C.T. McAllister. Verified by S.E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 4862). New county record. Extends range into a central hiatus near the Bosque, Lampasas and Leon River watersheds (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **STEPHEN P. TABOR,** 224 S.W. Thomas Street, Burleson, Texas 76028 and **CHRIS T. McALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, U.S.A. ●

TERRAPENE ORNATA ORNATA (Ornate Box Turtle). USA: TEXAS: Hill Co: 5.0 km S Huron along TX 933. 1 June 1985. S.P. Tabor. Verified by W. Hathaway. Fort Worth Museum of Science and History (FWM 10743). New

county record. Fills hiatus between Ellis and McLennon counties (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **STEPHEN P. TABOR,** Route 3, 909 Stella Mae Drive, Burleson, Texas 76028, U.S.A. ●

DISTRIBUTION RECORDS FOR AMPHIBIANS AND REPTILES IN BELIZE, CENTRAL AMERICA

Field work in Belize during 1984-1985 has yielded several new district records and range extensions, herein reported. The specimens (or voucher photographs) cited are deposited in the Carnegie Museum of Natural History (CM), Florida State Museum (UF), or Appalachian State University (ASU) collections. Identifications were verified by C. J. McCoy.

CENTROLENELLA FLEISCHMANNI. Toledo Dist: Blue Creek Village. August, 1984. R. W. Van Devender. (Photographs, CM Acc. 33025.27-33025.29). New district record. Extends range ca. 80.5 km S of previous Belize records in Cayo Dist (Henderson and Hoevers 1975. Milwaukee Publ. Mus. Contr. Biol. Geol. 5:13; Olson 1984. SSAR Herp. Review 15(3): 76).

GASTROPHRYNE ELEGANS. Belize Dist: Parrot's Wood, Mile 30.5 on Western Hwy. October, 1984. R. E. Ashton, Jr. (CM 109027). Toledo Dist: Blue Creek Village. 20 March 1984. R. W. Van Devender. (ASU 10177). New district records. Extend range about 97 km S and 217 km SSW, respectively, of the only previous Belize locality (Albion Island, Orange Walk Dist: Henderson and Hoevers 1975. op. cit.:16).

TRIPRION PETASATUS. Cayo Dist: 2.4-8.0 km S Belmopan on Hummingbird Hwy. 25 June 1985. C. J. McCoy, E. J. Censky, P. Freed and M. Freed. (CM 112160-112161, 112169-112170). New district record. Extends range ca. 97 km SSW Orange Walk Town, Orange Walk Dist (Hoevers and Henderson 1974. Milwaukee Publ. Mus. Contr. Biol. Geol. 2:1).

STAUROTYPUS TRIPORCATUS. Toledo Dist: The Dump, about 0.8 km W jct Southern Hwy and Punta Gorda-San Antonio Rd. 28 March 1984. C. J. McCoy, et al. (CM 105875-105878). Ca. 3.2 km SE Big Falls. 1 April 1984. C. J. McCoy et al. (CM 105898). New district record. Fills hiatus between records from central Belize (Neill and Allen 1959. Publ. Res. Div. Ross Allen's Reptile Inst. 2(1):28) and the northern coast of Honduras (Meyer and Wilson 1973. Los Angeles Co. Mus. Nat. Hist. Contr. Sci. (244):5).

CNEMIDOPHORUS COZUMELA. Toledo Dist: Las Lomitas, ca. 6.4 km S Swasey Branch on Southern Hwy. 8-9 April 1984. C. J. McCoy et al. (CM 105935). New district record. Extends range about 120 km S Manatee, Belize Dist (Henderson and Hoevers 1975. op. cit.:32).

EUMECES SCHWARTZEI. Cayo Dist: ca. 4.8 km S Belmopan on Hummingbird Hwy. E. J. Censky and C. J. McCoy. 26 June 1985. (CM 112183). New district record, second specimen from Belize. Extends range 58 km SE Gallon Jug, Orange Walk Dist (Henderson and Hoevers 1975. op. cit.:29).

LEPIDOPHYMA FLAVIMACULATA. Toledo Dist: Blue Creek Village. 9-11 August 1984. R. W. Van Devender. (Photograph, CM Acc. 33025.18). New district record. Extends range 72 km SW southernmost localities in Stann Creek Dist (Schmidt 1941. Zool. Ser. Field Mus. Nat. Hist. 22(8):495).

ADELPHICOS QUADRIVIRGATUS. Cayo Dist: Blancaneaux Lodge, 16.1 km N Augustine. 20 April 1972. J. F. Jackson. (UF 60685). New district record. Second locality (third specimen) for Belize (Smith 1942. Proc. Rochester Acad. Sci. 8:188-192), and the first from Mountain Pine Ridge.

DRYADOPHIS MELANOLOMUS. Toledo Dist: ca. 3.2 km SE Big Fall, Rio Grande. 1983. J. Chen. (CM 105886). New district record. Extends range about 80.5 km SSE Augustine, Cayo Dist (Neill 1956. Bull. Florida State Mus. 9(3):77-130).

CONIOPHANES SCHMIDTI. Cayo Dist: Macal River at Guacamallo Bridge. 22-25 June 1985. P. Freed, M. Freed, C. J. McCoy and E. J. Censky. (CM 112148). Second specimen from Belize. Extends range southward beyond Mountain Pine Ridge (Neill and Allen 1960. Herpetologica 16(3):145-146).

OXYRHOPUS PETOLA. Belize Dist: Parrot's Wood, Mile 30.5 on Western Hwy. October, 1984. D. Weyer. (CM 109026). New district record. Extends range 64 km ENE Augustine, Cayo Dist (Neill and Allen 1959. op. cit.: 55-56).

TANTILLA SCHISTOSA. Belize Dist: between Hattieville and Burrell Boom. 17 March 1984. C. J. McCoy et al. (CM 105923). New district record. Extends range ca. 88.5 km ENE Xunantunich, Cayo Dist (Neill and Allen 1962. Herpetologica 18(2):88-89).

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MORE DISTRIBUTIONAL RECORDS OF AMPHIBIANS AND REPTILES FROM TEXAS

The following presents new county records for 12 amphibian and 36 reptilian taxa from 48 counties of Texas. These records complement the distributional data in Raun and Gehlbach (1972), Karges (1978, 1979, 1981, 1982), McAllister et al. (1983), McAllister and Ward (in press) and others. The authors verified identifications. Specimens are deposited in the Dallas Museum of Natural History (DMNH). Appreciation is extended to Drs. Richard Fullington and William E. Wilson of the DMNH for allowing access to the collection.

CAUDATA

Ambystoma tigrinum mavortium (Barred Tiger Salamander). Winkler Co: 1.6 km NE of junction TX 18 and FM 1232. 2 May 1976. W. Seifert. (DMNH 4582).

Ambystoma tigrinum tigrinum (Eastern Tiger Salamander). Robertson Co: 3.2 km SW Franklin. 28 April 1969. T. L. Hibbitts. (DMNH 4274).

ANURA

Scaphiopus bombifrons (Plains Spadefoot). Garza Co: 8.9 km NE Post on FM 651. 17 May 1977. W. Seifert. (DMNH 4654). Wichita Co: 3.2 km E Burkburnett. 20 May 1967. W. Seifert. (DMNH 179).

Scaphiopus couchii (Couch's Spadefoot). Coleman Co: 17.7 km ENE Coleman. 30 April 1977. W. Seifert. (DMNH 4660). Crockett Co: 6.4 km W Ozona. 20 June 1957. D. C. Carter. (DMNH 3380). Sutton Co: 11.3 km WNW Sonora. 20 June 1957. D. C. Carter. (DMNH 3379).

Scaphiopus hammondii (Western Spadefoot). Randall Co: 12.9 km W Wayside on FM 285. 29 June 1973. T. L. Hibbitts. (DMNH 4415).

Scaphiopus holbrookii hurterii (Hurter's Spadefoot). Hidalgo Co: 24.1 km S McCook on FM 681. 10 April 1971. W. Seifert. (DMNH 764). Wood Co: 8.0 km NW Mineola. Collection date unknown. O. H. Sanders. (DMNH 2203).

Hyla versicolor/chrysoscelis (Gray Treefrog/Cope's Gray Treefrog). Waller Co: 16.1 km N Hempstead. 17 April 1958. D. C. Carter. (DMNH 3130). Due to the lack of recorded field calls or preparations of chromosomes, species discrimination between *H. versicolor* and *H. chrysoscelis* is not possible.

Bufo cognatus (Great Plains Toad). Culberson Co: 16.1 km N Van Horn. 10 September 1975. W. Seifert. (DMNH 2339).

Bufo punctatus (Red-spotted Toad). Crockett Co: 14.5 km E Sheffield. 21 June 1957. D. C. Carter. (DMNH 2680). Johnson Co: Cleburne State Recreation Area. 17 May 1959. W. B. Stallcup. (DMNH 3258).

Rana berlandieri (Rio Grande Leopard Frog). Winkler Co: 8.1 km NE Kermit. 1 May 1976. W. Seifert. (DMNH 4586). Extends the known range of this species north of a Ward County locality (Hillis 1981).

Rana blairi (Plains Leopard Frog). Garza Co: 7.0 km SE Poston on U.S. 84. 16 May 1977. W. Seifert. (DMNH 4650). Haskell Co: 4.8 km NE Haskell. 4 September 1966. Kimbrough and Van Nordstrand. (DMNH 3484).

Rana sphenocephala (Southern Leopard Frog). Hopkins Co: 6.0 km S Sulfur Bluff on FM 69. 18 September 1976. W. Seifert. (DMNH 4599).

TESTUDINES

Sternotherus carinatus (Razorback Musk Turtle). Anderson Co: 12.9 km S Palestine, N shore of Crystal Lake. 5 April 1966. T. D. Newsom. (DMNH 3850). Kaufman Co: 1.6 km S Kemp, King's Creek tributary. 8 June 1974. W. Seifert. (DMNH 2077).

Pseudemys scripta elegans (Red-eared Slider). Grayson Co: Eisenhower State Recreation Area, Lake Texoma. 11 April 1968. J. G. Rankin. (DMNH 3868).

Terrapene carolina triunguis (Three-toed Box Turtle). Ellis Co: 4.8 km SW Ellis. 31 March 1968. J. W. Skinner. (DMNH 3858). Hopkins Co: 30.4 km E Greenville. 7 May 1961. Kimbrough and McDonald. (DMNH 3908). San Jacinto Co: 8.0 km S Pointblank, Sam Houston National Forest. 24 April 1974. W. Seifert. (DMNH 1547).

Terrapene ornata ornata (Ornate Box Turtle). Crosby Co: 38.6 km NE Post. 19 May 1977. W. Seifert. (DMNH 4658).

SAURIA

Phrynosoma cornutum (Texas Horned Lizard). Glasscock Co: J. G. Carter Farm (precise locality not recorded). 9 May 1964. J. G. Carter. (DMNH 2020).

Phrynosoma modestum (Roundtail Horned Lizard). Ward Co: Pyote Air Force Base, Pyote. 1 May 1976. W. Seifert. (DMNH 4580).

Sceloporus olivaceous (Texas Spiny Lizard). Aransas Co: 1.6 km N entrance to Goose Island Recreation Area on Park Rd. 13. 1 June 1973. R. D. Specian. (DMNH 1247).

Sceloporus undulatus consobrinus (Southern Prairie Lizard). Runnels Co: 3.2 km N Wingate. 25 March 1967. C. L. Green. (DMNH 4148). Ward Co: Old Pyote Air Force Base, Pyote. 1 May 1976. T. L. Hibbitts. (DMNH 4457).

Sceloporus undulatus hyacinthinus (Northern Fence Lizard). Bee Co: 3.2 km N Beeville on U.S. 181. 2 April 1953. Collector unknown. (DMNH 3742). Van Zandt Co: 8.0 km S Grand Saline. 18 April 1976. W. Seifert. (DMNH 4683).

Eumeces laticeps (Broadhead Skink). Kaufman Co: 1.6 km E Kemp, Clark Farm. 24 July 1971. W. Seifert. (DMNH 884). Madison Co: vicinity Madisonville. 2 May 1969. J. Gent. (DMNH 4268).

Eumeces obsoletus (Great Plains Skink). Clay Co: 12.9 km S Jolly, Lake Arrowhead. 13 July 1972. W. Seifert. (DMNH 1074).

Cnemidophorus gularis gularis (Texas Spotted Whiptail). Garza Co: 7.2 km SE Post on U.S. 84. 18 May 1977. W. Seifert. (DMNH 4657).

Cnemidophorus sexlineatus sexlineatus (Six-lined Racerunner). Limestone Co: Fort Parker State Recreation Area. 16 April 1966. R. Davis. (DMNH 3004).

SERPENTES

Coluber constrictor priapus (Southern Black Racer). Upshur Co: 1.6 km N Gilmer on U.S. 271. 23 April 1950. J. Powell. (DMNH 1840).

Diadophis punctatus arnyi (Prairie Ringneck Snake). Freestone Co: 10.5 km W Cayuga, Trinity and Young Rivers. 27 November 1965. T. L. Hibbitts. (DMNH 4117). Grayson Co: 4.8 km NW Denison, Eisenhower State Recreation Area. 11 April 1968 and 3 March 1974. W. Seifert and J. G. Rankin. (DMNH 2867, 1467).

Diadophis punctatus stictogenys (Mississippi Ringneck Snake). Van Zandt Co: 16.0 km NW Brownsboro. 12 October 1976. J. Lanthum. (DMNH 4494).

Elaphe guttata emoryi (Great Plains Rat Snake). Collin Co: Joe G's Food Store, Wylie. 29 May 1980. T. L. Hibbitts. (DMNH 5257). Garza Co: 3.7 km S Post on U.S. 84. 17 May 1977. W. Seifert. (DMNH 4656). Nacogdoches Co: 0.5 km S Nacogdoches on TX Loop 224. 14 April 1977. A. Alexander. (DMNH 5276). Van Zandt Co: 16.0 km NW Brownsboro near Calendar Lake. 23 April 1975. T. L. Hibbitts. (DMNH 4482). Raymond and Hardy (1983) reported that "populations usually assigned to *E. g. emoryi* are in western and central Texas, eastward to a line from approximately Houston to Dallas." In addition, Conant (loc. cit.) noted that intergrade *E. g. emoryi* X *guttata* occur in extreme eastcentral Texas north to southern Arkansas. Based upon coloration and number of ventral plus subcaudal scales, the Nacogdoches County specimen appears to be an intergrade. Furthermore, the Van Zandt County specimen falls within a distributional gap (see Raymond and Hardy, loc. cit.) in eastern Texas.

Heterodon nasicus kennerlyi (Mexican Hognose Snake). Hudspeth Co: 8.0 km N Hueco Tanks Rd. near El Paso County line. 20 June 1973. J. Davis. (DMNH 1459).

Heterodon platyrhinos (Eastern Hognose Snake). Jones Co: 24.0 km SSE Hamlin on FM 126. 5 May 1968. J. E. Hawkins. (DMNH 4054). Taylor Co: 3.2 km NW Lake Abilene. 15 June 1968. T. L. Hibbitts. (DMNH 4254). Van Zandt Co: 4.8 km ENE Grand Saline. 20 April 1968. J. M. Adkins. (DMNH 4052).

Lampropeltis calligaster calligaster (Prairie Kingsnake). Collin Co: 8.0 km N Wylie on FM 154. 11 July 1979. T. L. Hibbitts. (DMNH 5099). Upshur Co: 4.8 km SE Rhonesboro on FM 49, Maxwell Ranch. 14 March 1971. O. Sanders. (DMNH 2083).

Lampropeltis getulus holbrooki (Speckled Kingsnake). Madison Co: 12.8 km N Madisonville on U.S. 75. 11 April 1976. J. Penner. (DMNH 5155).

Lampropeltis getulus splendida (Desert Kingsnake). Jeff Davis Co: Girl Scout Ranch Rd. 1837 (precise locality not recorded). Collection date unknown. T. L. Hibbitts. (DMNH 4218). Potter Co: Amarillo. 15 June 1971. W. Seifert. (DMNH 4553). Stephens Co: 1.0 km S U.S. 183 on Hubbard Creek Rd. 31 May 1980. T. L. Hibbitts. (DMNH 5256).

Masticophis flagellum testaceous (Western Coachwhip). Ector Co: 8.0 km ENE Penwell. 11 April 1966. L. Foster. (DMNH 3071).

Nerodia erythrogaster flavigaster (Yellowbelly Water Snake). Morris Co: 3.2 km SE Naples on U.S. 67. Collection date unknown. L. Curtis and D. Tinkle. (DMNH 3040). San Jacinto Co: 19.2 km NNW Cleveland, Sam Houston National Forest. 20 April 1974. W. Seifert. (DMNH 1536).

Nerodia rhombifera rhombifera (Diamondback Water Snake). Haskell Co: 8.0 km N Haskell on U.S. 277. 2 April 1966. Kimbrough. (DMNH 4034). Madison Co: Lake Normangee, Normangee. 14 April 1951. W. E. Fosberg and B. E. Hagee. (DMNH 4031-4032). The former record approaches the western limit of the continuous range of *N. r. rhombifera* in Texas (McAllister 1985. Cat. Amer. Aphib. Rept. 376.1-376.4).

Opheodrys aestivus (Rough Green Snake). Limestone Co: Fort Parker State Recreation Area. 16 April 1966. J. Rankin. (DMNH 3910).

Pituophis melanoleucus sayi (Bullsnake). Crockett Co: 16.0 km SSE Ozona on TX 163. 7 June 1965. T. L. Hibbitts. (DMNH 4112). Garza Co: 2.4 km NE Post on FM 651. 17 May 1977. W. Seifert. (DMNH 4653).

Sonora semiannulata (Ground Snake). Clay Co: Lake Arrowhead State Recreation Area. 27 July 1972 and 13 July 1973. W. Seifert. (DMNH 1080, 1076). Garza Co: 13.3 km NE Post on FM 651. 17 May 1977. W. Seifert. (DMNH 4655). Grayson Co: Eisenhower State Recreation Area, Lake Texoma. 11 April 1968. G. Rankin. (DMNH 2847). Starr Co: 4.8 km NW Roma on U.S. 83. 24 May 1971. T. L. Hibbitts. (DMNH 4328).

Tantilla gracilis (Flathead Snake). McCulloch Co: 16.0 km SW Brady on U.S. 190. 16 April 1971. W. Seifert. (DMNH 788).

Tantilla hobartsmithi (Southwestern Blackhead Snake). Reagan Co: 24.0 km SW Big Lake, Ted Harris Ranch. 2 May 1970. T. L. Hibbitts. (DMNH 4291).

Thamnophis marcianus marcianus (Checkered Garter Snake). King Co: 12.9 km S Guthrie on TX 114. 3 May 1980. T. L. Hibbitts. (DMNH 5252).

Thamnophis proximus proximus (Western Ribbon Snake). Hopkins Co: 6.4 km S Sulfur Bluff on FM 69. 18 September 1976. W. Seifert. (DMNH 4597).

Virginia valeriae elegans (Western Earth Snake). Henderson Co: Brownsboro. 15 October 1974. T. L. Hibbitts. (DMNH 4426).

Agkistrodon contortrix contortrix (Southern Copperhead). Limestone Co: 11.3 km SSW Mexia on TX 14, Fort Parker State Recreation Area. 20 April 1966. C. Morley. (DMNH 3889).

Agkistrodon contortrix laticinctus (Broad-banded Copperhead). Clay Co: 12.8 km S Bellevue. 10 September 1954. L. S. Roberts. (DMNH 3897).

Crotalus viridis viridis (Prairie Rattlesnake). Hardeman Co: Quanah on TX 6. 6 April 1972. W. Seifert. (DMNH 1100).

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RECENT POPULATION CHANGES

RECENT POPULATION CHANGES provides an outlet for anecdotal or minimally documented information on local extinctions or regional population changes. These reports could be valuable historic indications that might enhance our understanding of very long term population trends (in excess of 20 years) and changes in distribution patterns.

Manuscripts should be submitted directly to the editor of this subsection: Ralph W. Axtell, Department of Biological Sciences, Southern Illinois University, Edwardsville, Illinois 62026, U.S.A.

IMPACT OF EXPANDING HUMAN POPULATIONS ON THE HERPETOFAUNA OF THE VALLEY OF MEXICO

Mexico City and its adjacent urbanized areas now cover almost 2000 km², with some 16 million people seeking a livelihood (Bart 1984; Fernández 1984). The impact of the demographic changes that have taken place in this area over the past 20 years has been immense (Alanis 1978; Guzmán 1979; Bart 1984). Large areas of natural vegetation have been destroyed; soil erosion, regional pollution and drying aquatic habitats have gradually increased, causing profound changes in the local environment. These changes appear to have had a serious impact on the amphibians and reptiles of the Valley of México. In this report we indicate how we perceive the degree of impact these changes are having on the herpetofauna of the Mexico City region.

Based on our field collections, on citations, and on voucher material in scientific collections (Instituto de Biología; Facultad de Ciencias), we have prepared a checklist of the herpetofauna of the Valley of Mexico region. Using this checklist, we assigned each species occurring in the region to one of six categories established by the International Union for Conservation of Nature and Natural Resources (Table 1).

Historically there have been 21 amphibian and 34 reptile species known to have occurred in the Valley of Mexico. Twenty-six of these (47.27% of the total) appear to be adversely affected by human impact. In particular, more than 60% of the amphibians appear to be endangered (Table 2).

We believe that urbanization, regional pollution, and drying aquatic habitats are the main factors that have caused this negative impact on the majority of herpetozoa in the Valley of Mexico.

Indications of acid rain have been reported recently in the Ajusco mountains south of Mexico City (Krupa and Bauer 1982), and its effects on Ajusco plethodontid salamanders are unknown. In addition, we are not sure what influences commercialization and/or human intolerance might be having on various species, especially snakes.

There appear to be some populations that so far have been relatively unaffected by the

Table 1. Human impact on herpetozoan populations from the Valley of Mexico, according to IUCN categories.

PROBABLY EXTINCT

Rana berlandieri ssp., *Kinosternon h. hirtipes, Cnemidophorus gularis* ssp.

IN DANGER OF EXTINCTION

Ambystoma lacustris, Ambystoma mexicanum, Ambystoma tigrinum velascoi, Rhyacosiredon altamiranoi, Rhyacosiredon leorae, Bufo compactilis, Hylactophrine augusti cactorum, Diadophis punctatus dugesi, Rhadinaea laureata.

VULNERABLE

Chiropterotriton chiropterus, Pseudoeurycea leprosa, Pseudoeurycea altamontana, Pseudoeurycea b. belli, Pseudoeurycea c. cephalica, Hyla arenicolor, Hyla eximia, Thamnophis dorsalis cyclides, Thamnophis e. eques, Thamnophis m. melanogaster, Thamnophis scalaris scaliger, Phrynosoma o. orbiculare, Crotalus polystictus, Crotalus molossus nigrescens, Crotalus triseriatus aquilus.

RARE

Chiropterotriton dimidiatus, Hyla robertsorum, Abronia taeniata taeniata.

INDETERMINATE

Tomodactylus fuscus, Tomodactylus grandis, Rana montezumai, Crotalus t. triseriatus, Crotalus transversus, Sistrurus ravus, Salvadora bairdi, Toluca l. lineata, Conopsis biserialis, Conopsis n. nasus, Pituophis d. deppei, Eumeces l. lynxe.

OUT OF DANGER

Scaphiopus hammondi multiplicatus, Hyla plicata, Eumeces copei, Eumeces b. brevirostris, Barisia i. imbricata, Sceloporus a. aeneus, Sceloporus aeneus bicanthalis, Sceloporus t. torquatus, Sceloporus s. spinosus, Sceloporus grammicus microlepidotus, Sceloporus s. scalaris, Sceloporus m. mucronatur, Storeria storerioides.

Table 2. Species percentage (amphibians and reptiles) affected, in relation to total number of taxa

Taxa	Species Number	Percentage (%)				
		TOTESP	TOTEAF	TOTEAN	TOTURO	
Amphibia	14+	25.45	66.66+	—	—	
Anura	5	9.09	23.80+	45.45+	—	
Urodela	9	14.54+	38.09+	—	66.66+	
		TOTESP	**TOTREP**	**TOTECH**	**TOTELA**	**TOTESE**
Reptilia	12+	21.81+	35.29+	—	—	—
Chelonia	1	1.80	2.94	100+	—	—
Lacertilia	2	3.63	5.88	—	15.38	—
Serpentes	9	16.36+	26.47+	—	—	52.94+

+Taxa most affected

- TOTESP = in relation to total number of herpetological species
TOTEAF = in relation to total species number of Amphibia
TOTEAN = in relation to total species number of Anura
TOTURO = in relation to total species number of Urodela
TOTREP = in relation to total species number of Reptilia
TOTECH = in relation to total species number of Chelonia
TOTELA = in relation to total species number of Lacertilia
TOTESE = in relation to total species number of Serpentes

human population expansion. These are (with possible explanation for continued existence in parentheses): *Scaphiopus h. multiplicatus* (high reproductive capacity), *Sceloporus grammicus* (adaptation to urbanized areas), *Eumeces copei, E. brevirostris, Sceloporus aeneus, Storeria storerioides* and *Hyla plicata* (mainly found in mountainous terrain which is not yet heavily populated), and *Sceloporus scalaris* and *S. spinosus* (distributed in the northeastern Valley of Mexico, which is still unurbanized).

If the chaotic growth of Mexico City is not brought under some control, many more herpetological populations are doomed to decimation or extinction. We look to the Urban Reordination and Ecological Conservation Program and the Agricultural Development Coordination Commission, both within the Federal District, to begin to resolve some of these great problems.

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BOOK REVIEWS

A Guide to the Identification of Amphibians and Reptiles of the West Indies Exclusive of Hispaniola, by Albert Schwartz and Robert W. Henderson. 1985. Milwaukee Public Museum. 1-165 pp., 2 maps, 87 figures, 19 pls., wrappers. $29.95.

In his pioneering work on zoogeography, Alfred Russell Wallace (1876) wrote, "The West Indies have long been isolated . . . their separation from the continent took place at a remote period, and they have since broken up into numerous islands, which have probably undergone much submergence in recent times. This has led to that poverty of the higher forms of life, combined with the remarkable specialty, which now characterizes them . . . " Thomas Barbour's (1914) first checklist to the amphibians and reptiles of the West Indies listed 35 amphibian species and 250 reptile species. Twenty-three years later Barbour (1937) recognized 83 amphibian and 286 reptile species. Cochran (1941) reported 33 amphibian and 74 reptile species from Hispaniola. Forty-four years later Henderson and Schwartz (1984) listed 58 amphibian and 130 reptile species from Hispaniola, and since that publication several new taxa have been described from that island. In the volume under review, Schwartz and Henderson list 22 families holding 67 genera represented by 373 species of amphibians and reptiles. Thus, Wallace's impoverished islands have been shown to have a rich herpetofauna that rivals that of any on the South American mainland. A crude, but expedient, way to compare the faunas would be to look at the number of species per square mile. Considering Ecuador, Miyata (1982) lists 344 amphibian and 334 reptile species from that country of 109,483 square miles, or 0.0061 species/square mile. The West Indies, exclusive of Hispaniola, has a land surface of about 61,720 square miles and 0.0060 species/square mile. For comparison the states of Illinois and Florida have 0.001 and 0.002 species/square mile, respectively.

Now, thanks to Schwartz and Henderson, the zoologist traveling in the West Indies can carry two volumes (this one and Henderson and Schwartz, 1984) and identify most of the members of this diverse herpetofauna. The most useful part of this volume will be the 49 keys to orders, genera and species. To facilitate easy use there are separate keys to species in large genera by island; where species occur on more than one major island it is noted in the key; and wherever genera have less than 15 Antillean species they are all listed in a single key. The keys will be invaluable for those of us who have tried to identify an *Anolis* or *Eleutherodactylus* that a friend captured on a cruise, particularly when the friend can't remember if the specimen was found on St. Croix, St. Thomas or Guadeloupe.

Following the keys are checklists of species that include subspecific names applica-

ble to West Indian populations, a Key Literature section and a coded distribution for that species. The Key Literature sections may prove extremely useful for those who want more than a name; these sections are a guide to the non-taxonomic literature for each species. Key Literature sections have greatly increased the Literature Cited - Bibliography to more than 1000 items on 42 pages.The coded distributions are helpful, but they cannot match those in Schwartz and Thomas (1975) and Schwartz, Thomas and Ober (1978), nor are they meant to. The species lists and keys are exceptionally complete, including species that have been introduced by man or chance. For example, the key to *Crocodylus* includes *C. intermedius*. A single specimen was reported by Barbour (1914) to have reached Grenada in September of 1910 and no other sightings have been reported north of Trinidad since then (Medem 1983).

The watercolor plates of *Anolis, Chamaeleolis* and *Chamaelinorops* (pls. I-XI) by David C. Leber are magnificent and add considerable value to the volume, but they are undoubtedly responsible for the rather hefty price. Oddly, plates VI and VII are of Hispaniola taxa despite the fact that the volume is exclusive of that island. They would be more appropriately placed in the 1984 volume, but one of the authors (RWH) told this reviewer that the second volume was not planned until after the Hispaniolan volume was nearly completed. Nevertheless, it is worth the minor annoyance to have 104 taxa represented in such colorful detail. Following the anoline watercolors are eight color photographs of snakes and 36 black and white photographs of habitat and animals; the photographs are usually of good quality. Island species lists and a glossary precede the Literature Cited -Bibliography.

There are some problems, albeit minor ones. The keys are designed for live or freshly preserved material with patterns and colors intact, thus the identification of old, faded museum material becomes difficult. The key to the Lesser Antillean *Anolis* (p. 43) requires that specimens of both sexes be available to pass couplet number 5. Three items in the Literature Cited lack dates: Dixon and Huey, p. 128; Drewry and Jones, p. 129; and Lazell, p. 142. Also in the Literature Cited, Roughgarden (1979) lacks pagination. The Key Literature Section for *Anolis roosevelti* (p. 48) is given as, "Williams, 1962," however there are two papers by Williams 1962 in the Literature Cited (a and b), and which one refers to *A. roosevelti* is unclear based on titles alone. The use of *Rana utricularia* instead of *Rana sphenocephala* (p. 24) is questionable. Despite the fact that *utricularia* is an older name than *sphenocephala* the latter has received wider usage - see the comment by Hillis (p. 515) in Frost (1985). If the publisher reaches a point where this volume and Henderson and Schwartz (1984) need to be reissued, combining the two into one volume would be highly advantageous.

Professional and serious amateur herpetologists will want this book for its highly usable keys and extensive bibliography. However, the excellent artwork will be a major factor in making the volume more appealing to a wider audience.

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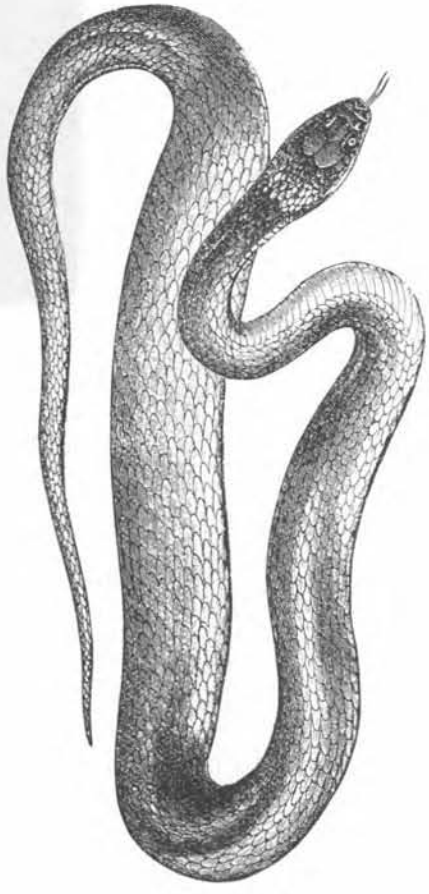
A Field Guide to the Lizards of Western Ghats, by T. S. N. Murthy. Records of the Zoological Survey of India, Miscellaneous Publ. Occas. Pap. no. 72, pp. 1-51, 1985. Rs. 40, $8.50.

This slim pamphlet appearing in the series of the Zoological Survey is intended to provide a review of the lizard fauna of the Western Ghats, the interesting mountain range that separates Kerala from Tamil Nadu and extends north parallel to the west coast of India. The montane fauna of Southern India is rich and remains poorly studied. The preface refers to the need for further study and the text provides brief descriptions relying upon the reports of Malcolm Smith, amplified by data from the scattering of papers which have appeared thereafter. The book is illustrated with photographs of assorted museum specimens, some deriving from the British Museum (N.H.). There is a general map, a key and a guide to scale characters. Sixty-three species are noted.

I am of two minds in evaluating this pamphlet. On the one hand, this brochure can serve to raise the consciousness of the local public. This is important and the aim is similar to, though not as extensive or as well produced as, that of Daniels' REPTILES OF INDIA, and somewhat more technical than Whitaker's guide to the snakes of India. However, the present pamphlet seems not to have been addressed to this audience but to a more technical one, and here, it fails. It fails because it does not provide even the minimum level of documentation required in science, namely that the observations and comments be repeatable and hence subject to test.

Neither the locality and ranges given in the individual accounts, nor the photographs at the back of the volume make reference to actual specimens or to museum numbers which might permit one to check attribution or locality. Consequently, there is no built-in mechanism of self correction. One must "accept the voice of authority," and cannot hope for progress by successive approximation. We need better collections, but also we need reports with adequate documentation. Reports about animals should tell us where these were collected and where (and under what numbers) they are deposited. This minimal addition permits other workers to check, and hopefully to improve, the state of our knowledge.

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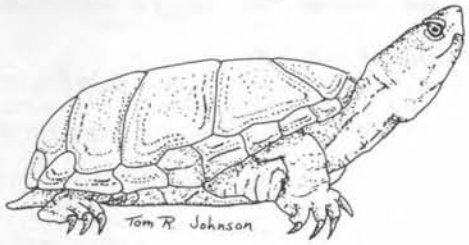
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SSAR BUSINESS

1986 HL-SSAR MEETING

The March issue of Herp. Review will contain a detailed outline of the events scheduled for the annual meeting of the Herpetologists' League and the Society for the Study of Amphibians and Reptiles on 10-15 August, 1986 at Southwest Missouri State University. Scheduled events include the HL Distinguished Speaker, paper and poster sessions, a symposium on "The Behavioral Ecology of Salamanders" chaired by Robert Jaeger and Kiisa Nishikawa, a workshop on "Regional Societies in Public Education" sponsored by the Regional Herpetological Society Liaison Committee, a symposium-workshop on snake venom poisoning sponsored by the Zoo Liaison Committee, the annual auction, another Dennis-Juterbock slide show, a herpetofaunal display, a banquet, a B-B-Q supper, a social (or two), and a float trip on the Niangua River.

Plans are being finalized by International Expeditions, Inc. for reduced air fares to Springfield.

For further information contact meeting co-chairmen:

Don Moll
Robert Wilkinson
Department of Biology
Southwest Missouri State University
Springfield, Missouri 65804, U.S.A. ●

EXHIBITORS WANTED FOR 1986 JOINT HL-SSAR MEETING

The local committee for the 1986 HL-SSAR meeting in Springfield, Missouri is in the process of contacting possible exhibitors for the meeting. Any individual or organization is welcome to display herpetologically-oriented material (except live animals). The following information may be useful to potential exhibitors.

Registrants: Biologists, college professors, zoo and museum personnel, state and federal wildlife officials, graduate students in biology and serious lay persons with interests in amphibians and reptiles.

Previous Exhibitors: Publishers, used-book companies, biological supply companies, manufacturers of animal collecting and housing equipment, artists (with animal themes), tee-shirt sellers, and travel services.

Cost: $125 for each table (approx. 4x6 feet). Artists who sell materials created by themselves will be charged $125 or the equivalent in donated art or crafts; such persons are expected to be engaged actively in their work at the exhibit area.

For exhibit application, or further information, contact:

Ruth Zantzinger
2108 Cherry Street
Philadelphia, Pennsylvania 19103, U.S.A.
(215) 557-0182

●

THANKS TO REVIEWERS

The editor would like to acknowledge the following individuals who reviewed manuscripts for *HR* during the past year. Their service to the Society is greatly appreciated.

Ralph W. Axtell
George H. Balazs
James Berry
Gordon M. Burghardt
R. Bruce Bury
R. Wayne Campbell
Charles C. Carpenter
Archie Carr
Stephen Cornelius
Orlando Cuellar
William E. Duellman
Richard L. Franz
J. Frazier
W. Gehlbach
Mike Goode
Terry E. Graham
John D. Groves
Harold F. Heatwole
Ronald Heyer
Jorge K. Leong
William P. Maclean
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Michael J. Miller
Ardell Mitchell
Jeanne Mortimer
James B. Murphy
David Owen
Ray Pawley
George Pisani
Peter C.H. Pritchard
Howard K. Reinert
Michael Seidel
Gordon W. Schuett
Norman J. Scott
Hobart M. Smith
Peter J. Tolson
Thomas M. Uzzell
Ernie Wagner
Richard Wassersug
Dagmar Werner
Andrew White
John W. Wright
Ermi Zhao
George Zug
Richard G. Zweifel ●

SSAR COMMITTEES FOR 1985-1986

Following the Tampa meeting, President Pisani appointed the following committees and coordinators for the current year to report to the Board at the Springfield meeting in 1986. Individuals with important matters pertaining to the activities of Society committees should contact the relevant committee chair. Addresses for committee chairs are included on the inside rear cover of each issue of *Herpetological Review*.

Conservation: William S. Brown (Ch), John L. Behler, M.R.K. Lambert, Paul E. Moler, and Patricia Riexinger.

Grants-in-Herpetology: Thomas H. Fritts (Ch), Robert Bader, C. Kenneth Dodd, Arthur C. Echternacht, Darrel Frost, Susan Schafer, and Michael V. Plummer.

Kennedy Student Award: J. Eric Juterbock (Ch), Robert E. Gatten, Ken R. Marion, John S. Mecham, and Laurie J. Vitt.

Long-range Planning: James L. Christiansen (Ch), Ralph Axtell, Carl Gans, James S. Jacob, Henri C. Seibert, and Douglas H. Taylor.

Meetings (SSAR/HL): Henry R. Mushinsky (Ch), Ray E. Ashton, Victor H. Hutchison, and James S. Jacob.

Nominating: Hugh R. Quinn (Ch), Kraig Adler, Douglas H. Taylor, Lynne D. Houck, and James S. Jacob.

Regional Society Liaison: Ray E. Ashton (Ch), Martin J. Rosenberg, Thomas Vermersch, John E. Simmons, Terry Hibbitts, Harold DeLisle, and Jeff Whipple.

Zoo Liaison: Richard A. Sajdak (Ch), Dale Belcher, Ronald Goellner, William Lamar, Joseph Laszlo, and Ruth Zantzinger.

Common and Scientific Names Coordinator: Joseph T. Collins.

Translations Coordinator: Robert D. Aldridge.

JAMES S. JACOB
SSAR Secretary ●

SSAR BALLOT FOUL-UP

All Society members should have received a ballot, ballot envelope and dues envelope in the September issue of *Herpetological Review*. Incorrect application of mailing labels after the issues were delivered to the mailing house, however, resulted in many members receiving copies of *HR* which lacked these important inserts. An attempt to remedy this situation by mailing separate ballots to all members was confounded by the failure to include the elector's name and address on the new ballot. Although a number of these secondary ballots were returned to the University of Kansas (the return address on the envelope), we assure members that their ballots have been forwarded to the elector and that their votes have been counted.

In the event that your September *HR* also lacked a dues envelope, we reprint the dues information here and ask that you submit your renewal dues as soon as possible.

We apologize for these inconveniences and assure you that steps are being taken to avoid similar occurrences in the future. ●

Send dues to:
The Society for the Study of
Amphibians and Reptiles
Dr. Henri C. Seibert, SSAR Treasurer
Department of Zoology
Ohio University
Athens, Ohio 45701, USA

***NOTE:* Prompt payment of dues and subscriptions saves your Society time and money. SSAR publications are sent only to active members and subscribers. Please pay by 31 December to guarantee uninterrupted benefits.**

***SSAR GRANTS-IN-HERPETOLOGY**

The Grants-In-Herpetology program is designed to provide financial support to deserving individuals or organizations engaged in research on or conservation of amphibians and reptiles. SSAR is establishing an endowment to help support the program and requests your support in this effort. All contributions are tax deductible.

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SSAR RENEWAL - 1986 / INDIVIDUALS (per calendar year)

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Cumulative Index to Vols., 1-10 of ***Journal of Herpetology***	7.00	☐
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[1]Non-U.S. members must remit in U.S. dollars by a draft on a U.S. bank, international money order, or credit card.

28TH ANNUAL MEETING HELD AT UNIVERSITY OF SOUTH FLORIDA

The 1985 Annual Meeting of the Society for the Study of Amphibians and Reptiles was held jointly with the Herpetologists' League in Tampa, Florida, during 3-9 August. Local Committee chairman Henry R. Mushinsky hosted an international gathering of herpetologists totaling 406 members and guests on the campus of the University of South Florida.

SSAR BOARD OF DIRECTORS MEETING

The annual meeting of the Board was held on Sunday, 3 August, under the chairmanship of SSAR President George Pisani. All Board members were present plus other officers, editors, committee chairs, and several visitors. The Board met for 5 hours and 43 minutes (a record for the shortest Board meeting) and discussed annual reports submitted by each Society officer, editor, committee, and coordinator plus a number of other items. In addition to the decisions announced at the business meeting on 5 August (see below), the Board took the following actions: (1) SSAR will play only a background role in the planning for the 1986 joint Annual Meeting since the Herpetologists' League will be celebrating the 50th anniversary of the publication of *Herpetologica*. (2) The Society will sponsor the auction, a conference organized by the Regional Society Liaison Committee, and a symposium organized by the Zoo Liaison Committee at the 1986 Annual Meeting and will cosponsor a symposium on "Behavioral Ecology of Salamanders" to be organized by Robert Jaeger. (3) The policy of assessing a late fee for failure to pay dues on time was rescinded. (4) The Board announced the availability of a pamphlet on "Herpetology as a Career." It is available from the Publications Secretary, at no charge for single copies.

CONFERENCES AND WORKSHOP

The SSAR Zoo Liaison Committee sponsored a conference on "Ecology and Reproduction of West Indian Herpetofauna." The conference, consisting of eight presentations, was organized and chaired by Peter J. Tolson.

The 9th Annual Regional Herpetological Society Conference was sponsored by the SSAR Regional Society Liaison Committee chaired by Terry Hibbitts. Eight papers were presented which dealt with the topic of the Conference, "Methods to Enhance the Regional Societies."

A workshop on the status of *Gopherus polyphemus* was also held during the Tampa meetings. Six presentations and a field trip to the University of South Florida Ecological Research Area dealt with the ecology, reproduction, management, and conservation of *Gopherus* in the southeastern United States. The workshop was organized by the Gopher Tortoise Council, Florida State Museum.

SPECIAL ACTIVITIES, EXHIBITS, AND SOCIAL EVENTS

The Local Committee organized an outstanding series of activities which enhanced the meeting tremendously. An opening night social provided an opportunity to greet old and new friends. A barbecue dinner and open house was held on Monday night at the Museum of Science and Industry. On Tuesday evening, there was an excellent tour of Busch Gardens which was attended by 130 people.

A well-attended slide presentation of "Herps of the Dallas Zoo" was given by Jim Murphy on Tuesday night using slides taken by David Barker. David Dennis and Eric Juterbock presented their magnificent multimedia show on "Amphibians of the Appalachians" on Wednesday night. They also showed an updated version of the SSAR sponsored multi-media slide show "Herpetologists: Past and Present." Following these acclaimed presentations, the traditional social and auction was held. Due to the generous support of our members, the auction was again successful and provided financial support for meeting expenses. A sold out closing-night dinner was held on Thursday which was attended by 200 people. The event was personally catered by Ernie Liner using his famous cajun recipes for alligator, turtle, frog, and catfish.

BUSINESS MEETING

A. Call to Order

President George Pisani called the 1985 business meeting of the Society to order at 1700 hr in room 1201 of the USF Busi-

ness Administration Building.

B. Report of the Secretary

Secretary James Jacob summarized actions taken by the SSAR Board of Directors since the 1984 annual meeting. The Board approved installing microcomputers in the offices of the Secretary, Treasurer, and Publications Secretary in order to more efficiently handle the business of the Society. The Board also approved a policy on bequests. The Internal Revenue Service recognizes SSAR as a publicly supported organization eligible to receive income-tax deductible donations. Members were encouraged to remember the Society in their wills.

The following resolution supporting the establishment of a national biological survey was approved by the Board and sent to the National Biological Survey Planning Committee:

Whereas faunal and floral surveys, and the production of species atlases, catalogues and identification manuals for the many economically important groups of organisms are needed in the United States of America to provide basic scientific information on diversity, distribution and the factors affecting these; and,

Whereas knowledge of the effects of habitat alteration on organismic diversity and distribution is increasingly critical; and,

Whereas the number of presently undescribed organisms globally has been estimated in excess of one million and the number of these in this country is felt to be significant; and,

Whereas there presently is no national direction or coordination of studies addressing these needs; and,

Whereas twenty-two professional societies and state biological surveys have endorsed in principle the establishment of a National Biological Survey;

Therefore, Be it Resolved that the Society for the Study of Amphibians and Reptiles join these organizations in the endorsement of the establishment of a National Biological Survey.

C. Report of the Treasurer

Treasurer Henri Seibert announced that the Society is in good financial shape. A dues increase will not be necessary in 1986. Our membership and subscribers appear to have stabilized at approximately 2,300. The Board approved a $98,000 budget for 1986, of which $50,480 is designated for publication of the *Journal of Herpetology*.

D. Editors' Reports

1. *Journal of Herpetology*

In the absence of Rodolfo Ruibal, Editor of the *Journal of Herpetology*, Associate Editor Paul Hertz announced that the Journal's editorial process had been restructured during 1985. The Editorial Board was appointed which consists of Paul Hertz, Samuel Sweet, Thomas Jenssen, and Lis Olesen Larsen. The responsibility for reviewing manuscripts is now shared by the Editor and Associate Editors. This procedure should speed the processing of manuscripts. Hertz noted that 190 manuscripts were received last year, of which approximately 50% were accepted. Fifty-three of the 190 manuscripts were from authors outside the United States.

2. *Herpetological Review*

Martin Rosenberg, Editor of *Herpetological Review*, announced that the Board had approved the establishment of a subscription category for *Herpetological Review* which will cost $10 per year. The availability of *Herpetological Review* on a subscription basis should have wide appeal among the individuals who belong to regional herpetological societies but who do not currently belong to the Society. Rosenberg noted that an extensive advertising campaign would be undertaken.

3. *Recent Herpetological Literature*

George Pisani, Editor of *Recent Herpetological Literature*, announced that the series had been discontinued due to loss of computer support previously arranged through Allen Press and the Association of Systematics Collections. Ways by which the series can be continued are being pursued. The possibility of associating with *Zoological Record* was discussed. Victor Hutchison commented that with the expansion of various on-line literature retrieval services, a hard copy format of *Recent Herpetological Literature* might become extinct within a few years.

4. *Herpetological Circulars*

President Pisani announced that Joseph Mitchell's manuscript entitled "Cannibalism and Related Behavior in Reptiles" will appear next year as a Circular. John Simmons' manuscript on "Herpetological Collecting and Collections Management" is being reviewed and will appear in the near future.

F. Committee Reports

1. Conservation

President Pisani announced that the Board of Directors approved two resolutions and a position paper presented by the Conservation Committee. In response to a request from Mary Anderson of the United States Humane Society, the following resolution was approved:

Whereas millions of hatchling turtles produced on breeding farms in the southeastern United States are being exported to Europe, the Far East and other parts of the world for the pet trade; and

Whereas these turtles are an important route for the transmission of salmonellosis; and

Whereas the trade requires the taking of an estimated 100,000 adult turtles out of the wild every year to replace breeding stock which has perished; and

Whereas the pet turtle industry is continuing efforts to get the existing domestic ban on the sale of hatchlings lifted, thereby opening up a market for many additional millions of hatchlings, thus necessitating severe exploitation of wild populations for breeding stock,

Therefore, Be it Resolved that SSAR goes on record as opposed to the commercial exploitation of chelonians for pet industry purposes.

In response to a request from Allan Puskar of Wellsboro, Pennsylvania, to the Conservation Committee, the Board of Directors approved the following resolution to address problems created by organized snake hunts and sacking contests in Pennsylvania:

Be it Resolved that SSAR is on record as being opposed to organized commercial snake hunts, sacking contests, and related activities that are judged by professional herpetologists to constitute inhumane treatment to the snakes involved and are detrimental to their populations.

The Conservation Committee received a request from Deputy Commissioner Dennis DeCarli of the Department of Environmental Protection of the State of Connecticut regarding conflicts between homeowners and timber rattlesnakes in Glastonbury, Connecticut. An area was developed on a timber rattlesnake den and the homeowners are now requesting that the snakes be either destroyed or moved. The State of Connecticut has requested recently passed legislation protecting *Crotalus horridus*. Mr. DeCarli asked for a statement from SSAR recommending how the situation should be handled. The Board approved a position paper prepared by the Committee which advises the State that "... total eradication is not warranted (nor legal) and relocation is not feasible on both biological and practical grounds. Problems between this species and humans could be best approached through the removal of offending snakes on an individual basis."

2. Grants-in-Herpetology

James Bacon, Chairman of the Grants-in-Herpetology Committee, announced that he received 37 applications, of which 28 met the criteria for review. The following grants were awarded for 1985:

Conservation Research: Lee A. Fitzgerald, Department of Biology, Museum of Southwestern Biology, University of New Mexico, "Reproductive Biology and Demography of *Caiman yacare* and *Caiman latirostris* in Paraguay," Awarded $400; **Graduate Student Research:** Frances J. Irish, Harvard University, "The Evolution of Tooth Replacement Patterns in Snakes: Mechanisms and Implications," Awarded $400, and George R. Cline, Oklahoma State University, "Gene Flow Between Two Forms of The Gray Treefrog, *Hyla chrysoscelis*, in Geographic Areas of Contact," Awarded $400; **Regional Society Research:** Harold F. DeLisle, The Southwestern Herpetologists Society, "The Present Status of the Herpetofauna of the Santa Monica Mountains," Awarded $350; **Field Work:** Douglas E. Ruby, Department of Biological Sciences, Drexel University, "Variation in Territorial Behavior in the Iguanid Lizard, *Sceloporus jarrovi*," Awarded $225, and Chris T. McAllister, Renal-Metabolic Laboratory, Veterans Administration Medical Center, Dallas, Texas, "The Role of Environmental Constancy on Oxygen Consumption and Thermal Sensitivity in Relict Population of

Hemidactyline Plethodontid Salamanders," Awarded $225; **Zoo Research:** Victoria A. Teubner, University of Toledo, "Endocrine and Behavioral Aspects of Reproduction in the Haitian Boa *(Epicrates striatus)*," Awarded $400.

Abstracts of these proposals were published in *Herpetological Review (16(3))*. Bacon also announced that the granting cycle will be changed so that awards can be made earlier in the year. Proposals sent to the Committee Chair will now have to be postmarked by 31 January. Awards will be announced by 15 March in order to make funds available for use during the summer. The new deadlines were advertised in the September issue *Herpetological Review*. A new form also will be prepared for applicants to use.

3. Kennedy Student Award

President Pisani announced that the Kennedy Student Award Committee, chaired by Eric Juterbock, judged that the best student paper published in volume 18 of the *Journal of Herpetology* was authored by Robert L. Seib of the University of California at Berkeley. The paper was entitled: "Prey Use in Three Syntopic Neotropical Racers" and appeared on pages 412-420.

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4. Nominating

President Pisani announced that the Board of Directors had approved the recommendation of the Nominating Committee, chaired by Douglas Taylor. The following members were nominated to stand for election to SSAR offices for 1986. **President:** Norman J. Scott (U.S. Fish and Wildlife Service, University of New Mexico) and Linda R. Maxson (University of Illinois); **Secretary:** James S. Jacob (Glendale College) unopposed; **Treasurer:** Henri C. Seibert (Ohio University) unopposed; **Director (General Membership):** Lynne D. Houck (University of Chicago) and Victor H. Hutchison (University of Oklahoma); **Director (Zoo Membership):** Dale Belcher (Rio Grande Zoo, Albuquerque, NM) and William W. Lamar (Caldwell Zoo, Tyler, TX).

President Pisani opened the floor for additional nominations. None was made and J. T. Collins moved that the nominations close. James Murphy seconded and the motion passed unanimously. Ballots were mailed with the September issue of *Herpetological Review*. David Grow (Oklahoma City Zoo) will serve as Elector. Ballots must be returned to him by 15 December 1985.

5. Meetings

President Pisani announced that the Board of Directors has received and approved an invitation from Southwest Missouri State University (SMSU) in Springfield to host the 1986 annual meeting.

6. 1986 Local Committee

President Pisani introduced Robert Wilkinson, Co-Chairman of the 1986 Local Committee. Wilkinson announced that Don Moll will serve as the other Co-Chairman. Wilkinson then showed slides of the SMSU campus, pointing out that the University has an enrollment of approximately 15,000 students, of which about 2,000 are graduate students, and occupies a 125 acre site in Springfield, Missouri. Springfield is a community of 150,000 people, the third largest city in the state, and is located on the western edge of the Ozark plateau. It is served by Ozark and Frontier Airlines. The Science Building will be used as the actual meeting site. Campus housing will be available at a rate of $11 per person per night. Facilities will consist of apartments which have two or three bedrooms and one bathroom. Preregistration will be no higher than it was for the 1985 Tampa meeting. The 1986 annual meeting will be held during 10-15 August.

7. Transfer of Society Gavel

President Pisani recognized President-elect Sherman Minton and presented him with the SSAR gavel.

H. Adjournment

President-elect Minton asked if anyone had any further business. There being none, James Murphy moved, and Victor Hutchison seconded, that the meeting be adjourned. The motion passed unanimously, and President-elect Minton declared the meeting closed at 1738 hr.

RESOLUTIONS

The following resolutions were presented at the closing night dinner by SSAR President George Pisani:

1. *Whereas* the following persons have generously contributed their time to the Society for the Study of Amphibians and Reptiles in their several capacities; and

   Whereas their appointments were relinquished during 1984; and

   Whereas SSAR hopes to entrap these and others to perform various functions in future years

   Therefore, Be it Resolved that the Society for the Study of Amphibians and Reptiles extends its sincerest thanks to the following persons: Carl Gans, President; Ralph W. Axtell, Immediate Past President; Thomas H. Fritts and Norman J. Scott, Jr., Directors; George R. Pisani, Managing Editor of *Herpetological Review;* Linda E. Maxson, Chair of Grants-in-Herpetology Committee; Diane M. Secoy, Chair of Nominating Committee; and Lynne D. Houck, Chair of Joint Meeting Committee.

2. *Whereas* the University of South Florida has most generously invited the Society for the Study of Amphibians and Reptiles and the Herpetologists' League to defile its campus; and

   Whereas more than the usual number of lithe, suntanned persons have been available for admiration all across campus; and

   Whereas the University of South Florida has been only the second host institution of an SSAR/HL meeting to have the good grace to schedule a concurrent cheerleader camp; and

   Whereas officials of the University have contributed generously to meeting finances

   Therefore, Be it Resolved that the Society for the Study of Amphibians and Reptiles and the Herpetologists' League extend its thanks to the University of South Florida for serving as meeting host.

3. *Whereas* Henry Mushinsky, ably assisted by Mary Ann Solic and numerous others pressed into temporary (we assume) servitude have worked their anal plates off to make certain that this meeting was well organized and executed; and

   Whereas they have succeeded admirably despite failing to feed Pisani to the lions at Busch Gardens

   Therefore, Be it Resolved that the Society for the Study of Amphibians and Reptiles and the Herpetologists' League extend sincerest thanks and appreciation to Henry Mushinsky, Mary Ann Solic and their unnamed band of stalwarts for their considerable effort.

4. *Whereas* the distances traversed by meeting participants have done much to stimulate good cardiovascular fitness; and

   Whereas the Tampa mosquito squadrons and chigger patrols have done their best to relieve participants of excess blood; and

Whereas the numbering system in the Village has done much to stimulate walking tours

Therefore, Be it Resolved that SSAR and HL recommend that future USF meetings be cosponsored by the American Medical Association's Council on Cardiovascular Fitness.

5. *Whereas* it is apparent that herpetologists have a consuming interest in their field; and

Whereas they may be the start of a meeting tradition to be superseded by such delights as python parmesan and anolis almondine; and

Whereas Ernie Liner has worked long and hard to prepare this dinner

Therefore, Be it Resolved that SSAR commends Ernie for his efforts and bestows upon him the title of Official SSAR Chef.

PAPERS AND POSTERS PRESENTED

One hundred and thirty-six oral papers were presented during the five-day meeting in three concurrent sessions. In addition to the oral presentations, 16 posters were displayed during the meeting. Titles are presented below.

JOINT OPENING SESSION

CARL GANS, University of Michigan. Herpetologists' League Distinguished Lecture:
Limbless locomotion: Status and prospects of our understanding.

STEVEN P. CHRISTMAN, U.S. Fish and Wildlife Service.
Florida focus: Natural diversity and progress — amphibians and reptiles in Florida.

CONTRIBUTED PAPER SESSIONS

SALAMANDER ECOLOGY

CHAIRS: ERIC J JUTERBOCK, RICHARD C. BRUCE

POLGAR, L. W., Southern Illinois University at Carbondale.
Brine shrimp nauplius bioassay for skin toxins of *Notophthalmus viridescens* efts.

LUE, K. Y., D. S. Chuang, S. H. Chen and Y. S Lue, National Taiwan Normal University. Republic Of China
The antipredator behavior of Formosan salamanders, *Hynobius formosanus.*

ETHERIDGE K., University of Florida.
The energetics of estivation in trenid salamanders *(Siren lacertina* and *Pseudobranchus striatus).*

HOLOMUZKI, J. R., Arizona State University.
Ontogenetic variation in diet of larval tiger salamanders, *Ambystoma tigrinum nebulosum.*

BRUCE, R. C., Western Carolina University and Highlands Biological Station.
Upstream and downstream movements of *Eurycea bislineata* and other salamanders.

CHEN, S. H. and K. Y. Lue, National Taiwan Normal University. Republic of China
The population study of *Hynobius formosanus.*

KERN, W. H., JR., Indiana State University.
The use of baited hoop nets to capture hellbenders, *Cryptobranchus alleganiensis,* and its effect on food habits analysis.

KEEN, W. H. and R. W. Reed, State University of New York, College at Cortland.
Differences in use of cover site types by sexes of *Desmognathus monticola.*

JUTERBOCK, J. E., The Ohio State University at Lima.
Nesting phenology of the dusky salamander *Desmognathus fuscus.*

BOGART, J. P. and L. E. Licht, University of Guelph York University.
Sex in parthenogenetic all-female salamanders of the genus *Ambystoma.*

SEVER, D. M., Saint Mary's College.
Disparate sexual variation in *Gyrinophilus, Pseudotriton,* and *Stereochilus.*

SALAMANDER GROWTH AND DEVELOPMENT

CHAIR: RICHARD SEIGEL

REILLY, S. M., Southern Illinois University at Carbondale.
The ecological morphology of neoteny in *Notophthalmus viridescens* and *Ambystoma talpoideum.*

ZALISKO, E. J., Washington State University.
Fate of unused sperm in post-breeding male *Ambystoma macrodactylum columbianum.*

HUTCHERSON, J. and R. Wilkinson, Southwest Missouri State University.
Growth and metamorphosis of ringed salamanders.

HALLIDAY, T. R., Open University, England.
Reproductive cycle and mating competition in the smooth newt, *Triturus vulgaris.*

REAGAN, N. L., Western Carolina University.
Larval life history studies of the *Eurycea bislineata wilderae* complex in Western North Carolina with especial reference to altitudinal variation.

SALAMANDER TAXONOMY

CHAIR: DAVID M. SEVER

JONES, T. R. and J. P. Collins, Arizona State University.
An electrophoretic analysis of Southeastern Arizona *Ambystoma tigrinum:* Hypothesized taxonomic affinities and biogeography.

HAAS, C. A., University of Maryland, College Park.
Geographic protein variation in *Plethodon cinereus* from the southern part of its range.

LOWCOCK, L.A., University of Guelph.
Electrophoretic evidence for multiple origins of triploid forms in the *Ambystoma jeffersonianum* complex.

KEZER, J. and P. Moler, University of Oregon and Florida Game and Fresh Water Fish Commission.
Chromosome variation in *Pseudobranchus.*

ANURAN ECOLOGY

CHAIRS: EDMUND D. BRODIE, CRAIG NELSON

PECHMANN, J.H.K. and R. D. Semlitsch, Savannah River Ecology Laboratory.
Diel activity patterns in the breeding migrations of four winter-breeding anurans.

LONDOS, P. L., University of Guelph.
Time course of locomotory adaptability in the toad, *Bufo woodhousei woodhousei,* as influenced by temperature and photoperiod.

NELSON, C. E., Indiana University.
Do tadpoles die for their siblings?

HEWS, D. K., Oregon State University.
Adaptive significance of larval toad alarm reaction.

VANDERBURGH, D. J., University of Guelph, Canada.
The effect of larval habitat desiccation on toad (*Bufo* spp.) reproductive effort.

HESS, J. B., Central Missouri State University.
A method of quantifying colors.

DONNELLY, M. A., University of Miami.
Feeding patterns of the strawberry poison-dart frog, *Dendrobates pumilio.*

BRODIE, E. D. JR. and D. R. Formanowicz, Jr., The University of Texas at Arlington.
Unpalatability in the evolution of aggregation: Protection of palatable individuals.

ZIMMERMAN, B. L. and J. P. Bogart, World Wildlife Fund — US, Washington, D. C.
Specificity of breeding habitat in four little known Central Amazonian forest frog species.

GODWIN, J. C., Department of Zoology-Entomology, Auburn University. **Extrinsic factors influencing the calling of *Hyla andersoni.***

ANURAN TAXONOMY

CHAIR: PAUL E. MOLER

HUTCHINSON, M. N. and L. R. Maxson, University of Illinois at Urbana-Champaign.
Albumin evolution, paraphyly and the relationships of the Australian frog *Megistolotis lignarius* (Anura: Limnodynastinae).

ANDERSON, K., New York University.
Effect of restriction enzymes on C-banding patterns in hylid chromosomes.

DRYSDALE, T. A., University of Guelph.
Eye specific isozyme effects in various Anura.

MAXSON, R. D. and L. R. Maxson, University of Illinois at Urbana-Champaign.
The phylogenetic basis of micro-complement fixation.

MAXSON, L. R. and R. Ruibal, University of Illinois-UC and University of California, Riverside.
Relationships of frogs in the Leptodactylid subfamily Ceratophryinae.

MOLER, P. E., Florida Game and Fresh Water Fish Commission.
An introduction to *Rana okaloosae,* a new species of Florida frog.

HAYES, M. P., University of Miami.
Vocal sac variation within *Rana aurora* (Ranidae): How many historical units?

LAMB, T., Savannah River Ecology Laboratory.
Directional introgression of mitochondrial DNA in a hybrid population of treefrogs: The influence of mating behavior.

RYAN, M. J., University of Texas, Austin.
Neuroanatomy influences speciation rates among anurans.

ANURAN VOCALIZATIONS

CHAIR: J. C. MITCHELL

KRUPA, J. J., University of Oklahoma.
The seasonal influence on the breeding behavior of the Great Plains toad *(Bufo cognatus).*

PAGUE, C. A., J. C. Mitchell and R. L. Hoffman, Old Dominion University, University of Richmond, Radford University.

The distribution and mating calls of *Hyla chrysoscelis* and *H. versicolor* in Virginia.
PERRILL, S. A., Butler University.
Noncalling male strategy in the northern cricket frog *Acris crepitans.*
TOWNSEND, D. S. and W. H. Moger, Dalhousie University, Halifax, Nova Scotia.
Androgens and male parental care in the Puerto Rican frog *Eleutherodactylus coqui.*

REPTILIAN THERMAL ECOLOGY
CHAIR: ARTHUR C. ECHTERNACHT

YAMAKOSHI, M. and W. E. Magnusson, Instituto Nacional de Pesquisas da Amazonia, Manaus, Brazil.
Effects of termite mounds, metabolic heat of embryos and season on the temperature of nests of *Paleosuchus trigonatus.*
SMUCNY, D. A. and A. R. Gibson, Cleveland State University.
Heat use patterns in female common garter snakes, *Thamnophis sirtalis.*
LUIZAO, R.C.C. and B. Robertson, Instituto Nacional de Pesquisas da Amazonia Manaus, Amazonas Brasil.
Effects of temperature and insolation on the daily activity rhythm of *Cnemidophorus lemniscatus* in Amazonian savanna.
PAULISSEN, M. A., University of Oklahoma.
Thermoregulation of the six-lined racerunner, *Cnemidophorus sexlineatus* (Sauria:Teiidae): Age-specific comparisons.
WILSON, M. A. and A. C. Echternacht, University of Tennessee, Knoxville.
A portable, non-photo, thermal gradient for use with small arboreal lizards.

REPTILE TAXONOMY
CHAIR: DOUGLAS A. ROSSMAN

CRUMLY, C. R., Harvard University.
A cladistic analysis of the intergeneric relationships of land tortoises (Family Testudinidae).
DUNDEE, H. A. and D. A. White, Tulane University and Loyola University of the South.
Comments on the zoogeography, natural history, and systematics of some Yucatan peninsula amphibians and reptiles.
PETERSON, J. A. and J. W. Wright, Los Angeles Natural History Museum.
Scale surface microstructure of anguid lizards.
SWEET, S. S., University of California, Santa Barbara.
Patterns of scale-organ variation in western North American colubrid snakes.
ROSSMAN, D. A. and C. R. Stewart, Louisiana State University and California State Polytechnic University.
Taxonomic status of the California giant garter snake.

TURTLE REPRODUCTION AND ECOLOGY
CHAIRS: C. KENNETH DODD, DALE R. JACKSON, LEW M. EHRHART, RICHARD C. VOGT

WILLIAMS, E. C., Jr. and W. S. Parker, Wabash College and Mississippi University for Women.
A 27-year study of a box turtle *(Terrapene carolina)* population at Allee Memorial Woods, Indiana.
TURNER, F. B., K. H. Berry, B. L. Burge, J. B. Roberson, and P. Hayden, University of California, Los Angeles; U.S. Bureau of Land Management.
Egg production and nesting success in the desert tortoise *(Gopherus agassizii).*
BERRY, K. H., USDI, Bureau of Land Management, Desert District, Riverside, California.
The incidence of gunshot deaths in desert tortoise *(Gopherus agassizii)* populations in California.
WESTER, E. E., Auburn University.
Demography of predator-free island populations of the gopher tortoise, *Gopherus polyphemus.*
BROOKS, R. J., E. G. Nancekivell and D. A. Galbraith, University of Guelph.
Sex determination and hatchling sex ratio in northern population of *Chelydra serpentina.*
MAHMOUD, I. Y., M. McAsey*, E. James Aiman, C. Cady and R. V. Cyrus, University of Wisconsin-Oshkosh; *The Medical School of Wisconsin.
Levels of testosterone in testes during the testicular cycle of the snapping turtle, *Chelydra serpentina.*
HOTALING, E. C., Rutgers University, Newark.
Factors effecting sex ratio in nests of *Chelydra serpentina.*
WILHOFT, D. C. and E. C. Hotaling, Rutgers University, Newark.
Thermal parameters observed during onshore activity of *Chelydra serpentina.*

Announcement of ASIH 1986 Meeting

The 66th Annual Meeting of the American Society of Ichthyologists and Herpetologists will be hosted by the University of Victoria and the British Columbia Museum in Victoria, British Columbia, Canada, from 15-21 June 1986. Patrick Gregory (University of Victoria) and Alex Peden (British Columbia Provincial Museum) are co-chairmen. The University of Victoria campus will be the main venue for this meeting, with eating and dormitory facilities on-site. Three symposia will be held: 1) Snake Behavior and Ecology (organizer, N. Ford); 2) Physiology and Ecology of Ectotherm Hibernation (G. Ultsch); and 3) Systematics and Biology of Deep-sea Fishes (D. Stein). These symposia will feature the major researchers in their respective fields. An additional planned attraction is a workshop focussing on the application of immunological and molecular techniques to population genetics, systematics and other areas of biology (H. Dessauer). The American Elasobranch Society will meet concurrently with ASIH in Victoria and hold separate sessions. As well as the academic program, there will be a varied menu of social events, including a smoked salmon supper and logging display.

British Columbia is an ideal place to combine this professional conference with a family holiday. This will be especially true in 1986 when there will be a World's Fair (Expo '86) in Vancouver, across the Strait of Georgia from Victoria. A vast number of other holiday possibilities exist, ranging from relaxing at modern vacation resorts, through cruises up the coast to Alaska, to hiking in rugged mountain wilderness.

Proposed Registration Fees (in US funds)

i) Pre-registration

Regular	$40.00	Partner	$12.00
Student	$24.00	Banquet	$16.00
Student Stoye Award	$12.00		

ii) On-site

Regular	$60.00	Partner	$16.00
Student	$24.00	Banquet	$16.00
Student Stoye Award			

Transportation

Air Canada has been designated the official carrier for this meeting. They offer 20% discount on all regular economy fare tickets booked through Convention Central. We encourage you to take advantage of these low rates. Please identify yourself as a delegate to the meeting when reserving flights. Call 1-800-361-7585.

If you wish to receive an announcement of the meeting, including a call for papers and registration form, please write to:

Mary Ransberry
Div. of University Extension and Community Relations
University of Victoria
P.O. Box 1700
Victoria, British Columbia, Canada V8W 2Y2
(604) 721-8465 Telex 049-7222 UVic

GALBRAITH, D. A. and R. J. Brooks, University of Guelph.
Growth in a northern population of *Chelydra serpentina* (Cryptodira: Chelydridae).
MEYLAN, A. B., University of Florida.
Sponge predation by the hawksbill turtle, *Eretmochelys imbricata:* Structural and biochemical defenses of prey.
WITHERINGTON, B. E. and Ehrhart, L. M., University of Central Florida.
Hypothermic stunning of marine turtles in Florida east-coast lagoons in January 1985: A comparison with two previous cold-stunning episodes.
ROBINSON, D. and S. Cornelius, Univ. de Costa Rica, C.R. and R. R. 3, 216, Mountain View, MO.
Seasonal and periodic density of emerging olive Ridley sea turtles *Lepidochelys olivacea* on two Costa Rican beaches.
CHAVES, A. and D. C. Robinson, Universidad de Costa Rica, Costa Rica.
Initial viability of olive Ridley sea turtle eggs in Costa Rica.
FRAZER, N. T., Woods Hole Oceanographic Institution.
Survivorship from egg to adulthood in a declining population of loggerhead sea turtles, *Caretta caretta.*
PRITCHARD, P.C.H., Florida Audubon Society.
Hypothetical functional interpretations of neural bone variation in turtles.
VOGT, R. C., Universidad Nacional Autonoma de Mexico.
Terrestrial activity patterns of a neotropical turtle *Kinostern leucostomum.*
ERNST, C. H., George Mason University, Fairfax, Virginia.
Environmental temperatures and activities in the wood turtle, *Clemmys insculpta.*
GRAHAM, T. E., Worcester State College.
Aspects of the winter ecology of the endangered red-bellied turtle, *Pseudemys rubriventris,* in Southeastern Massachusetts.
SCOTT, D. E., F. W. Whicker and J. W. Gibbons, Savannah River Ecology Laboratory.
Seasonal variation in the field metabolic rates of the yellow-bellied slider *(Pseudemys scripta).*
LOVICH, J. E., University of Georgia, Institute of Ecology.
An analysis of aggressive basking behavior in wild Eastern painted turtles.
NOVAK, S. S. and S. J. Morreale, Savannah River Ecology Laboratory.
Survivorship and growth of hatchling *Pseudemys scripta* in saline environments.
SCHWARZKOPF, L. and R. J. Brooks, University of Guelph.
Annual variation in reproductive characteristics of painted turtles.
CONGDON, J. D. and J. W. Gibbons, Savannah River Ecology Laboratory.
Optimal egg size in turtles revisited.

SQUAMATE REPRODUCTION
CHAIR: SAMUEL S. SWEET

FERGUSON, G. W. and H. L. Snell, Texas Christian University.
Endogenous control of seasonal change of egg, hatchling and clutch size of the lizard *Sceloporus undulatus garmani.*
SOMMA, L. A., University of Nebraska at Omaha.
Egg brooding in the prairie skink, *Eumeces septentrionalis,* and its relationship to the hydric environment of the nest substrate.
RODDA, G. H., Smithsonian Institution, University of Tennessee.
The relative energetic costs of reproduction between the sexes in the green iguana, *Iguana iguana.*
STAHL, S. J. and J. C. Mitchell, University of Richmond.
Reproductive cycle of the copperhead, *Agkistrodon contortrix,* in Virginia.
SECOR, S. M., University of Oklahoma.
A comparative study of the reproductive behavior of three species of snakes, genus *Lampropeltis.*

SQUAMATE ECOLOGY
CHAIRS: NEIL B. FORD, RICHARD A. BYLES, STEVE GODLEY

SEIGEL, R. A., Savannah River Ecology Laboratory.
Ontogenetic variation in foraging ecology and niche overlap in garter snakes.
HOLLAND, D. L. and N. B. Ford, University of Texas at Tyler.
Aggregation tendency in adult checkered garter snakes, *Thamnophis marcianus.*
LORAINE, R. K., Savannah River Ecology Laboratory.
Seasonal changes in foraging success and diet composition of *Seminatrix pygaea.*
GREGORY, P. T. and K. W. Larsen, University of Victoria.
The ecology of garter snakes at the northern limit of their range.
GODLEY, J. S., Biological Research Associates, Inc.
Population ecology of kingsnakes *(Lampropeltis getulus)* at Rainey Slough, Florida.
STEINER, T. M. and G. H. Dalrymple, Florida International University.
Community ecology of a temperate zone fauna in the subtropics: The snakes of Long Pine Key, Everglades National Park, Florida.
SNELL, H. L., R. D. Jennings and H. M. Snell, Texas Christian University, University of New Mexico.
Intrapopulation variation in predator-avoidance performance of Galapagos lava lizards: Relationships among vegetation, sex, wariness, and sprint speed.
FLEISHMAN, L. J., Cornell University.
Motion detection in *Anolis* lizards and cryptic movement by a predatory snake.
LOSOS, J. B., University of California, Berkeley.
Island biogeography of day geckos *(Phelsuma)* in the Indian Ocean.
GUYER, C., University of Miami.
Effects of food supplementation on the demography of a tropical anoline lizard.
GASNIER, T.R.J., A. P. Lima and W. E. Magnusson, Instituto Nacional de Pesquisas da Amazonia, Manaus, Brazil.
Activity and diet of three rainforest lizards.
MORITZ, C., Australian National University and University of Michigan.
Parthenogenesis in the tropical gekko, *Nactus arnouxii.*
JENNINGS, M. R., The University of Arizona.
The Southern California horned toad trade: 1885-1930.
LAZCANO-BARRERO, M. A.[1], E. Gongora[1], and O. A. Flores-Villela[2], (1) INIREB, Chiapas (2) Facultad de Ciencias, UNAM, Mexico.
The Lacandon tropical rain forest herpetofauna: A preliminary report.
WERNER, D. I., Smithsonian Tropical Research Institute.
The influence of social factors on growth rate in juvenile *Iguana iguana.*
MARTIN, W. H.
Phenology of the timber rattlesnake, *Crotalus horridus.*
PORAN, N., University of California at Davis.
California ground squirrel anti-snake adaptations: Behavioral and immunological defenses.
de QUEIROZ, A., Pough, F. H., Andrews, R. M. and A. Collazo, Cornell University, Virginia Polytechnic and State University.
Lack of a temperture effect on prey handling costs in the skink *Chalcides ocellatus.*

SNAKE FORM AND FUNCTION
CHAIR: ALAN H. SAVITZKY

SAVITZKY, A. H., Old Dominion University.
The role of development in the evolution of ophidian pit organs: Hypothesized mechanisms.
McDOWELL, S. B., Rutgers University, Newark.
The homology of the venom gland and position of the proteroglyphs among colubroidea.
JAYNE, B. C., Michigan State University.
Muscular mechanisms of snake locomotion.
MACKESSY, S., Washington State University.
Venom storge and the accessory gland of *Crotalus v. oreganus.*
MARTIN, D. L., D. B. Means and O. G. Brock, Florida State University, Coastal Plains Institute and Florida Department of Natural Resources.
Patterns of foraging behavior in the Eastern diamondback rattlesnake, *Crotalus adamanteus.*
HARDY, D. L., College of Pharmacy, University of Arizona.
Deaths from *Crotalus* envenomation in Arizona.

SEXUAL SELECTION AND MALARIA
CHAIR: JULIAN C. LEE

MORRIS, M. R., Indiana University.
Mating behavior and sexual selection in the gray treefrog *(Hyla chrysoscelis).*
PAGUE, C. A., Old Dominion University.
Testis size reduction in mated *Bufo terrestris:* Implications for sexual selection.
LEE, J. C., University of Miami.
Is the large male mating advantage in anurans an epiphenomenon?
FORESTER, D. C. and D. V. Lykens, Towson State University.
Sexual selection in the spring peeper: Is call frequency an indicator of age?
SCHALL, J. J., University of Vermont.
Malaria and other blood parasites of lizards: Impact on hosts and those who study them.
RESSEL, S., University of Vermont.
Malarial infection and sexual selection in the Western fence lizard *Sceloporus occidentalis.*

WORKSHOP ON THE STATUS OF *Gopherus polyphemus*
CHAIRS: RICHARD FRANZ, REN LOHOEFENER

FRANZ, R., Florida State Museum.
***Gopherus polyphemus*, a species in decline: Introductory remarks.**
LANDERS, L., Tall Timbers Biological Station.
Ecology of the gopher tortoise in southwest Georgia.
OSTERMAN, T. R., University of South Florida.
Reproductive biology of the gopher tortoise.
DEIMER, J., Florida Game and Freshwater Fish Commission.
Gopher tortoise in Florida: Status and research.
DODD, C. K., U.S. Fish and Wildlife Service.
Implications of federal protection for the gopher tortoise.
JACKSON, D. R., Florida Natural Areas Inventory.
The future of the gopher tortoise. What happens next?
FIELDTRIP — To University of South Florida Ecological Research Area for workshop participants.

SSAR ZOO LIAISON COMMITTEE SYMPOSIUM: ECOLOGY AND REPRODUCTION OF WEST INDIAN HERPETOFAUNA
CHAIR: PETER J. TOLSON

TOLSON, P. J., T. A. Reichard, J. M. Terry, C. S Roberts and D. H. Clifford, Toledo Zoological Society; Medical College of Ohio.
Effects of courtship on follicular growth and development in the Cuban boa, *Epicrates angulifer* (Serpentes: Boidae).
TEUBNER, V. A., P. J. Tolson and C. P. Black, University of Toledo, Toledo Zoological Society.
Effects of proximate environmental factors on serum testosterone levels of the Haitian boa *(Epicrates striatus).*
ULRICH, N. and N. B. Ford, University of Texas at Tyler.
The feeding strike of three species of vine snake, *Uromacer.*
JENSSEN, T. A. and D. L. Marcellini, Veterans Administration Tech, National Zoological Park, Washington, D.C.
Seasonal effects upon density and microdistribution of sympatric anoline lizards.
SARMIENTO, R., Oklahoma City Zoo.
Behavioral observations and captive maintenance of the dwarf anole, *Anolis occultus* (Sauria: Iguanidae).
CRUTCHFIELD, T. E., Herpetofauna Inc., Ft. Myers, Florida.
Captive maintenance and propagation of the West Indian iguanid genus *Cyclura.*
MARCELLINI, D. L. and T. A. Jenssen, National Zoological Park, Washington, D.C.
Thermoregulation and activity patterns in the Haitian lizard *Leiocephalus schreibersi.*
WOOD, J. R. and F. E. Wood, Cayman Turtle Farm (1983) Ltd. B.W.I.
Breeding green sea turtles in captivity.

9th ANNUAL REGIONAL HERPETOLOGICAL SOCIETY CONFERENCE "METHODS TO ENHANCE THE REGIONAL SOCIETIES" SPONSORED BY THE SSAR REGIONAL HERPETOLOGICAL SOCIETY LIAISON COMMITTEE
CHAIR: TERRY HIBBITTS

SIMMONS, J. E., Kansas Herpetological Society.
Newsletter techniques used by the Kansas Herpetological Society.
ROSENBERG, M. J., Northern Ohio Association of Herpetologists.
How newsletters can promote regional societies.
VERMERSCH, T., Greater San Antonio Herpetological Society.
Procedures used in the presentation of public live-animal displays by regional societies.
COLLINS, J. T., Kansas Herpetological Society.
The use of auctions as a method to enhance regional societies.
FERGUSON, G. W., Texas Herpetological Society.
Problems of organizing an annual conference.
MEYLAN, P., All Florida Herpetological Conference.
The structure and future of the All Florida Herpetological Conference.
MURPHY, J., Chicago Herpetological Society.
Field trips and the Chicago Herpetological Society.
HIBBITTS, T., Texas Herpetological Society.
The Texas Herpetological Society and forty years of field trips.

POSTERS

KLEESE, W. C. and D. E. Goll, Muscle Biology Group, University of Arizona.
Localization of the CA^{2+}-dependent proteinase and its inhibitor in different tissues of *Crotalus atrox.*
MANIS, M. L., Miami University.
Allozyme variability among *Rana sylvatica* populations.
MINTON, S. A. and S. A. Weinstein, Indiana University and New York University.
Geographic and ontogenic variation in venom of the western diamondback rattlesnake *(Crotalus atrox).*
SCOTT, N. J., JR. and R. D. Jennings, Denver Wildlife Research Center, Museum of Southwestern Biology and University of New Mexico.
The tadpoles of five New Mexican leopard frogs.
STOVALL, R. H. and S. Myers, Valencia Community College and University of Central Florida.
Photographic survey of the reproductive cycle of the peninsula ribbon snake *(Thamnophis sauritus sackeni).*
MYERS, S. and R. H. Stovall, University of Central Florida and Valencia Community College.
Reproductive biology of the peninsula ribbon snake *(Thamnophis sauritus sackeni).*
SANAIOTTI, T.M., Instituto Nacional de Pesquisas da Amazonia.
Home range and body size in lizards: Conceptual, statistical and empirical models.
DePARI, J. A., M. H. Linck and T. E. Graham, Rutgers University, Worcester State College.
Clutch size of the Blanding's turtle, *Emydoidea blandingi*, in Massachusetts.
HARDING, J. H., Cranbrook Institute of Science.
Comments on age determination and growth in a Michigan population of the wood turtle *(Clemmys insculpta).*
MORREALE, S. J. and J. W. Gibbons, Savannah River Ecology Laboratory.
Adult sex ratios in natural populations of turtles.
RAYMOND, P. W. and C. A. Orvetz, National Marine Fisheries Service.
The TED (turtle excluder device): How it works to prevent sea turtle mortality in shrimp trawls.
WYNEKEN, J., University of Illinois.
The implication of allometeric changes in the limb and body proportions of two species of sea turtles, *Caretta caretta* and *Chelonia mydas.*
LEWIS, A. R., University of Puerto Rico.
Body size and growth in two populations of the Puerto Rican ground lizard.
MACDONALD, L. A., University of South Florida.
The diet of the gopher tortoise *(Gopherus polyphemus)* in a sandhill in Central Florida.
WEIG, B. and R. C. Wood, Stockton State College.
Evolution of African Trionychid (Soft-shelled) turtles.
ROCEK, Z., Charles University, Prague, Czechoslovakia.
Main features of the endocranial development in pipids.

LETTER TO THE EDITOR

AN OPEN LETTER TO ALL HERPETOLOGISTS

We wish to add our expressions of concern to those in earlier letters to *Herpetological Review* (King and Miller 1985; Heatwole 1985; Gans 1985; Tyler 1985) about two recent herpetological publications and to advise our intended response to the deplorable situation that has developed recently in Australia. For reasons given below and in anticipation of a successful case being made to the International Commission on Zoological Nomenclature, WE INTEND TO IGNORE ALL NOMENCLATURAL AND TAXONOMIC CHANGES PROPOSED BY WELLS AND WELLINGTON (1984, 1985). The publications which have sparked such controversy appear in two recent issues of the privately published "Australian Journal of Herpetology." They are authored by Richard Wells and Ross Wellington, who also edit the journal. The papers comprise checklists and/or synopses and/or revisions of the whole Australian herpetofauna. They occupy entire sequential issues, Volume 1 Parts 3 and 4 (combined) and Supplement Series No. 1, and propose extensive nomenclatural and taxonomic changes, including the erection and resurrection of hundreds of genera and species. Adequate diagnoses are lacking throughout and rea-

sons for proposed changes are not given except in a few instances.

Some details about the history of the journal have been given in the letters cited above. Previous issues (Volume 1 Parts 1 and 2) contain refereed papers by several authors on a variety of topics, and a number of professional herpetologists acted as an advisory board. None of these knew about the taxonomic reviews proposed for the third and fourth issues and they resigned immediately following the first of these (King and Miller 1985; Heatwole 1985).

We do not fully understand the motivation of Wells and Wellington for publishing these massive and poorly justified nomenclatural and taxonomic changes (which they acknowledge, in their preface to the 1984 paper, may be seen as 'anarchistic taxonomic vandalism'). However, the effect of these publications, if taken seriously, would be to destabilise permanently the nomenclature of the Australian herpetofauna. In our view, to accept the proposed changes is to accept the proposition that taxonomic revision may be undertaken without any attempt at justification of changes, without the usual refereeing process and, presumably, by anybody who has opinions and the money to have them published.

The Australian Society of Herpetologists voted overwhelmingly at its Annual General Meeting in September 1984 to apply to the International Commission on Zoological Nomenclature for formal suppression of the first of these two publications in its entirety (Shine 1985). It can be assumed that the same decision would flow from a similar meeting concerning the second issue, if one were held. A letter foreshadowing the application for suppression of both issues has been forwarded to the Secretary.

Scientists in Australia and elsewhere may be wondering whether or not to take note of the proposed changes. Accordingly, we now advise that we intend to ignore the taxonomic and nomenclatural changes proposed in these two publications. Our reasons are those already alluded to and because we subscribe to the view, in agreement with the Code, that it is desirable to provide "the maximum universality and continuity in the scientific names of animals, compatible with the freedom of scientists to classify animals according to taxonomic judgements." We encourage others also to ignore these publications. Further, we urge caution in accepting nomenclatural changes which are foreshadowed for further publications of this and other journals from the same stable, to include similar treatment for the Australian fishes, the Pacific herpetofauna and Australian Buprestidae (Coleoptera).

Finally, we wish to assert our belief that taxonomic researchers should feel obliged to meet at least minimum standards with respect to justification of decisions and recommendations made. Normally this restraint is self-imposed and is encouraged by the knowledge that acceptance for publication will depend upon the judgement of referees (whose identity is usually unknown to the author). Whereas this undoubtedly has shortcomings, it seems to have provided at least some check on taxonomic anarchy. It may be, however, that present happenings in Australia are uncovering a need for stricter guidelines.

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GORDON C. GRIGG
Associate Professor of Biology
University of Sydney
and
RICHARD SHINE
Senior Lecturer in Biology
University of Sydney

[EDITOR'S NOTE: A list of more than 150 other signatories, representing the Australasian herpetological community and some North Americans with Australian connections, accompanied this letter. Space limitations did not permit the list to be printed.] ●

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NEWSNOTES

SUMMER COURSE ON PLETHODONTID SALAMANDERS

The Highlands Biological Station, located in the Southern Blue Ridge Mountains in Highlands, North Carolina, will offer a course on "The Biology of Plethodontid Salamanders," 7 July-8 August 1986. The instructor will be Dr. Stephen G. Tilley of Smith College.

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Six semester hours of credit are available through either Western Carolina University or the University of North Carolina at Chapel Hill.

For further information and application forms write Highlands Biological Station, P.O. Box 580, Highlands, North Carolina 28741, U.S.A. ●

REQUEST FOR INFORMATION

Over the past few years the Memphis Zoo and Aquarium and the Lichterman Nature Center, Memphis, Tennessee, have been working with a technique for repairing turtle shell fractures. The use of fiberglass mat and polyester resin enabled injured specimens to be repaired and released after recuperation. This technique has been used in the past for shell defects in tortoises. We have repaired and rehabilitated approximately a dozen specimens of red-eared turtle *(Pseudemys scripta elegans)*, Eastern box turtle *(Terrapene c. carolina)*, and three-toed box turtle *(T. c. triunguis)*. We invite anyone with experience or interest on this topic to correspond.

Donna Martin
Rehabilitation Specialist
Lichterman Nature Center
5992 Quince Road
Memphis, Tennessee 38119, U.S.A.

George Heinrich
Herpetology Department
Memphis Zoo and Aquarium
2000 Galloway
Memphis, Tennessee 38112, U.S.A. ●

HERPETOPATHOLOGIA

The journal of the International Group on Herpetopathology publishes research articles, reviews and short notes on diseases of reptiles and amphibians, covering physiopathology, immunology, neoplasia, microbiological and parasitic diseases, teratology and environmental injury.

Papers presented at the Colloquia organised by the International Group will also be published in Herpetopathologia.

Libraries or individuals interested in subscribing to the journal should contact:

Professor Gilbert Matz
Laboratoire de Biologie animale
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INFORMATION REQUEST

Inventories are requested for inclusion in the "Inventory of Live Reptiles and Amphibians in Captivity."

In the 1986 edition, the bibliography on husbandry and captive breeding will be expanded. Everyone is asked to contribute by sending in titles which may be beneficial to others. The 1986 revision will also expand the longevity records. Include dates for any specimen which may be a new longevity or noteworthy record.

Please submit the following information current 1 January 1986:

(1) A complete inventory of all reptiles and amphibians held. Sexes should be listed "male (1.0) female (0.1) unknown (0.0.1)."
(2) A list of species which bred and produced young during 1985, including numbers of young for each species.
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(5) A listing of any publications relating to reproduction in reptiles and amphibians. Emphasis should be placed on "How to do it" publications, but general articles, and references relating to temperature, light cycle, hibernation, etc. are also of interest.
(6) When submitting inventories, follow the taxonomic order listed in the 1985 edition. Type or print legibly and include your complete address and phone numbers as you would like them listed.

All information should be sent to:

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IN MEMORIAM

Dr. Braulio Orejas-Miranda, the well-known herpetologist, passed away on 8 May 1985, at the age of 52. At the time he was Program Specialist at the UNESCO's Regional Office for Science and Technology for Latin America and the Caribbean, at Montevideo, Uruguay, the culmination of a long scientific career.

Orejas-Miranda was born in Montevideo, Uruguay, on 19 February 1933. In the same city, he obtained a Primary School teacher degree, and then a Licenciado degree in Biological Sciences from the University of the Republic. His postgraduate training was at the University of São Paulo, Brazil, the Central University of Venezuela, and at the University of Michigan, USA, where he focused on natural resources management and conservation.

From the very beginning Orejas-Miranda divided his time between scientific research in herpetology and science policy and conservation problems. In this second area, he worked as a secondary education teacher, National Overseer for Sciences at the Primary School Education Council, and taught at the teacher's formations institutes of Montevideo



and San José. He also held teaching positions in other countries: Professor at the Central University of Venezuela, and Professor at the School of Medicine, Universidad del Valle, Colombia. His interests in conservation led him to involvement with many zoos, particularly the Caracas Zoo, of which he was Director.

Prior to his position with UNESCO, he was a Specialist at the Basic Sciences Unit, Organization of American States, Washington, USA. In that position he reviewed research projects in the Americas, allowing him to keep abreast of the scientific activities on the continent. He participated in the conservation movement from the very beginning, with the Club of Rome's "The Limits to Growth" and the 1972 United Nations Conference at Stockholm. While with the OAS he contributed to the Institute of Ecology's books "Man in the Living Environment" and "Fragile Ecosystems."

His work in herpetology began with his research positions with the National Museum of Natural History of Montevideo, and the "Clemente Estable" Institute of Biological Research. Soon after, he began a close friendship with the late James A. Peters, and Orejas-Miranda was appointed as research associate at the Smithsonian Institution, Washington, D.C. With Peters he wrote the now classic Snakes volume of the "Catalogue of the Neotropical Squamata" (1970), a primary reference to the herpetology of the region. His research involved the Leptotyphlopidae, and produced numerous contributions, including descriptions of several new taxa. This interest led him to most Latin American herpetological collections, and to the most important ones in the U.S. and Europe. He was one of the first herpetologists to start a serious analysis of this small snake, and his contributions have been a landmark. In his recent position at UNESCO he worked with the Man and the Biosphere Program (MAB), and maintained close contact with almost all Latin American herpetologists.

During this long career Orejas-Miranda received many awards: The Guggenheim Award; the Condecoración Duarte, from the government of the República Dominicana; the Portuguese Parque Pineda Ceres medal; and a formal recognition from the OAS for his outstanding work.

Orejas-Miranda had a variety of talents and interests. He was a fine photographer and a good handyman, maintaining a home workshop. He was a likable and warm person,

always active. He retained his youth and I'll never forget him driving his Japanese motorcycle from one place to the other in the city. My loss is great: Since his return to Uruguay, in May 1982, I benefitted greatly from Orejas-Miranda's friendship and scientific guidance, as have many other Uruguayan biologists. The Latin American scientific community has lost one of its most brilliant biologists.

EDUARDO GUDYNAS
Div. Zoología Experimental
Instituto de Investigaciones Biológicas
"Clemente Estable"
Av. Italia 3318,
Montevideo, Uruguay ●

SOCIETIES

KANSAS HERPETOLOGICAL SOCIETY

The Kansas Herpetological Society is a conservation-oriented group of people interested in amphibians and reptiles. Founded in 1974, membership has now grown to nearly 200 members worldwide.

The annual meeting is held in a different part of Kansas each fall, and one or more field trips are conducted in the spring and early summer. The Kansas Herpetological Society Newsletter is published four times a year, and runs 18-26 pages per issue. The Society also publishes special publications from time to time which are distributed free to members.

Membership includes a subscription to the Kansas Herpetological Society Newsletter, and is open to anyone with an interest in amphibians and reptiles. Dues for calendar year 1986 are as follows:

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MINNESOTA HERPETOLOGICAL SOCIETY

The Minnesota Herpetological Society has recently published the "Distribution Maps of Minnesota's Amphibians and Reptiles," available from MHS for $4.50 postpaid.

MHS has initiated an Occasional Paper Series on a wide range of topics. Papers are being solicited and will be reviewed by two referees. Manuscripts should be sent to the address below.

MHS is completing its second survey of the amphibians and reptiles of Minnesota. The 1985 survey took place in Southeast Minnesota and was funded with a joint grant of $1700 from the Minnesota Nongame Program and the Minnesota TNC for $1700.

For further information, contact:

The Minnesota Herpetological Society
Bell Museum of Natural History
10 Church Street S.E.
Minneapolis, Minnesota 55455, U.S.A. ●

(Editor's Note: Regional Herpetological Societies are invited to submit short (250 words) descriptions of their activities, publications, and dues structures, for publication in this column.) ●

FEATURES

DISTRIBUTION OF THE LIZARD *Anolis cooki*, WITH COMMENTS ON ITS POSSIBLE FUTURE EXTINCTION

Instances of natural extinction are rarely observed, even though it is a major process predicted by evolutionary theory. However, the Puerto Rican lizard *Anolis cooki*, may be a species about to disappear due to naturally occurring phenomena (Williams 1972). Recent studies by Ortiz and Jenssen (1982) and Jenssen, Marcellini, Pague and Jenssen (1984) have shown that *A. cooki* is in direct

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interference competition with *Anolis cristatellus*, where *A. cristatellus* is the dominant species. These studies revealed that when the two species are sympatric, *A. cristatellus* displaces *A. cooki* from complex microhabitat (i.e., trees and large bushes) into dead snags and small shrubs. In addition, field and lab-held encounters between the species have shown *A. cooki* to be aggressively dominated by *A. cristatellus*. What makes *A. cooki* a strong candidate for extinction is its limited and peculiar distribution which is largely sympatric with its more ubiquitous competitor, *A. cristatellus*.

In this report, we verify and expand the known range of *A. cooki* and give a detailed description of distribution for an important segment of the species' range. Our objective is to determine whether or not the distribution of *A. cooki* is shrinking. This report provides the initial observations of longitudinal study.

METHODS

While *A. cristatellus* is found throughout Puerto Rico, *A. cooki* is restricted to the southwestern part of the island (Fig. 1). We conducted censuses in the latter during August 1980, January 1982 and November 1983. A four-wheel drive vehicle was used to census an area along the coast from the Cabo Rojo Peninsula on the west to beyond the Guanica Forest Reserve in the east, and from the coast as a southern boundary to several kilometers inland as a northern limit. We used all available roads and tracks as east-west and north-south transects, stopping 5-15 times per kilometer to search surrounding habitat for *A. cooki* and *A. cristatellus*. Lizards were noosed, identified and released. In addition, the entire Cabo Rojo Peninsula was censused on foot to produce a microdistribution of the two species. Extensive ecological data on *A. cooki* and *A. cristatellus* at the Cabo Rojo locality appear elsewhere (Jenssen et al. 1984).

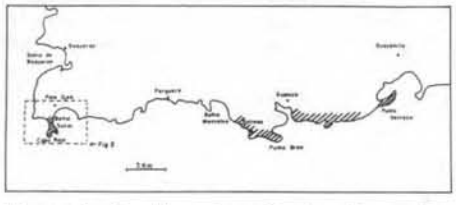


Figure 1. Southwestern Puerto Rico with diagonal lines showing approximate distribution of *Anolis cooki*.

RESULTS AND DISCUSSION

Our results confirmed the previously reported localities for *A. cooki* (Rivero 1978) and found additional sites on both sides of Salinas (Fig. 1). The large gap (~ 25 km) between the Cabo Rojo population and a population 3 km southwest of Salinas is verified. There is a small disjunction between the Punta Brea and Guanica populations, and another small gap about 9 km southeast of Guanica to the base of Punta Verraco. All *A. cooki* localities are less than 1 km from the coast. In contrast, *A. cristatellus* was found throughout the censused region.

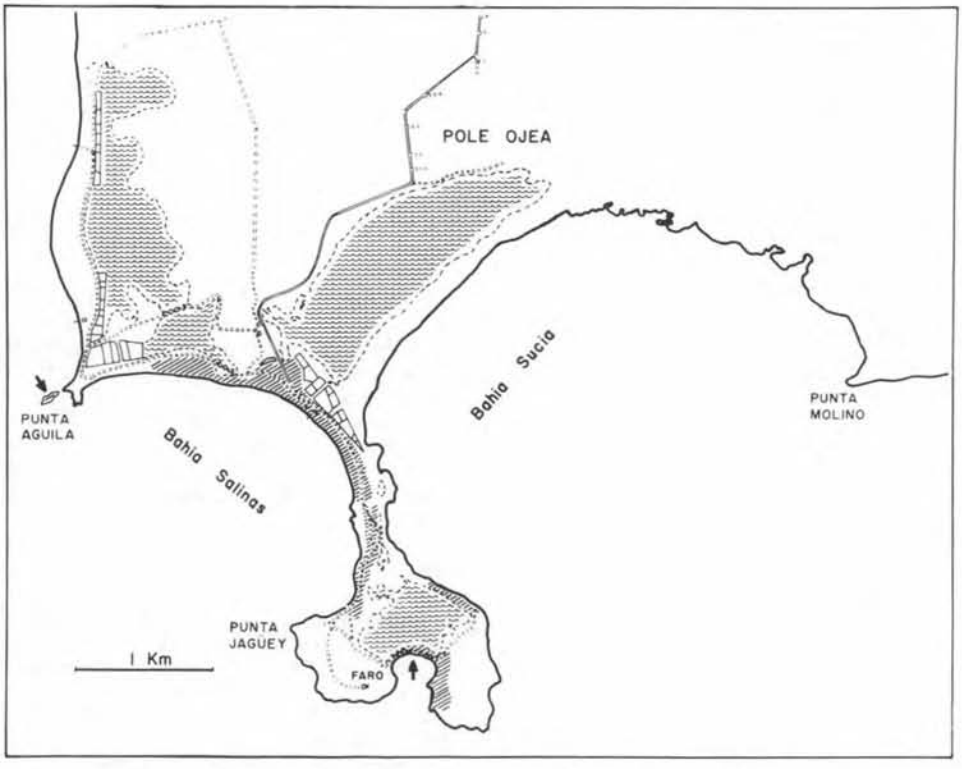


Figure 2. The peninsula at Cabo Rojo. Wavy lines show inland or brackish water, parallel dashed lines indicate unimproved roads, irregular polygons mark evaporation impoundments, and diagonal lines delineate the *Anolis cooki* distribution, with arrows indicating where the species was allopatric to *Anolis cristatellus* prior to 1983.

Except for the Cabo Rojo Peninsula, all visited localities in which *A. cooki* was allopatric (on a micro-scale) to *A. cristatellus* were xeric limestone ridges vegetated with cacti and thorny scrub. In adjacent mesic areas with trees and extensive shade, *A. cooki* was sympatric with *A. cristatellus*. Though not quantified, it was obvious that as one censused away from the xeric hillsides, the likelihood of encountering *A. cooki* dropped to zero after a few hundred meters, while *A. cristatellus* continued to be common.

The above qualitative observations plus ecological data from a study at Cabo Rojo (Jenssen et al. 1984) suggest that the xeric ridge habitats are refugia for *A. cooki* from the competitive effects of *A. cristatellus*. At Cabo Rojo, *A. cooki* and *A. cristatellus* both prefer to perch on trees and large bushes, but where the two are in microsympatry, *A. cooki* is restricted to more open microhabitat (Jenssen, et al. 1984). Similar to the open Cabo Rojo habitat, it is likely that the xeric limestone ridges provide a non-preferred habitat for *A. cooki* which is exclusive of *A. cristatellus*.

On the Cabo Rojo Peninsula, there is no xeric limestone habitat that typifies *A. cooki* habitat in other parts of its range. There are also no extensive areas where *A. cooki* is allopatric to *A. cristatellus*. *Anolis cristatellus* is more extensively distributed on the peninsula than *A. cooki*, being common except on salt flats and the plateaus above the escarpments at the southern tip of the peninsula (Fig. 2). There were only two areas where we found *A. cooki* without *A. cristatellus*. One was a small cay off Punta Aquila and the other a low-lying crescent of land at the southern end of the peninsula. In 1980 and 1982 the latter was the only extensive allopatric *A. cooki* area, and *A. cristatellus* had invaded by the time of the 1983 census.

The current distribution of *A. cooki* indicates that the species once had a more extensive range. Thomas and Schwartz (1966) suggested that in the past, the southwestern region of Puerto Rico could have been isolated from the main island mass by a higher than present sea level. The low llanos to the north of the *A. cooki* distribution completely surrounds all present-day *A. cooki* populations, and in the scenario may have been a channel. *Anolis cooki* could have evolved and populated this smaller island land mass in isolation from *A. cristatellus*. Then when a falling sea level re-joined the two islands, *A. cooki* became exposed to the euryecious colonizer, *A. cristatellus*. Subsequent competition between the two species resulted in the spotty, limestone ridge-centered populations of *A. cooki*. The Cabo Rojo population of *A. cooki* may be the most unstable because of the absence of limestone ridges for refugia and any nearby population as sources for recolonization.

With its limited and disjunct distribution and its competition with the more aggressive common *A. cristatellus*, *A. cooki* is a candidate for natural extinction. Our data provide an initial vantage point from which to monitor the species' possible extinction.

ACKNOWLEDGMENTS

We are grateful to David Barker, Bela Demeter, Lars Jenssen and Peter Ortiz for their assistance in the field. Our special thanks to Richard Thomas of the University of Puerto Rico for sharing his *A. cooki* locality records with us. The four-wheel drive vehicle was generously furnished by the Department of Natural Resources of Puerto Rico.

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FIELD NOTES ON *Otophryne robusta steyermarki*

This subspecies was described by Rivero (1967) on the basis of a male and a female collected by J. Steyermark in 1955 and 1953 respectively on the Chimantá-tepui massif in southern Venezuela. During February 1984 the author located a population of *O. r. steyermarki* in the northeastern sector of the central part of Chimantá-tepui (05°19'N, 62°07'W, 2140 m), and collected an additional four specimens. The data for these specimens (MBUCV:6178, 6179, 6180, 6181) and an example of the lowland subspecies *O. r. robusta* (MBUCV 6182) that was collected to the east of the Chimantá-tepui massif in Pratawaga (04°57'N, 61°26'W, 960 m) are presented in Table 1. All five specimens are males.

The live colors of the highland subspecies were very contrasting when compared to the lowland form. All *O. r. steyermarki* had a light yellow line from the heel to the tip of the outer toe, and distinct bright yellow lines along the lateral folds which continued onto the thighs and shanks. These markings were absent in the lowland subspecies. The dorsum of MBUCV 6178 was dark brown with rufous blotches bordered in black, and the ventral surface reddish brown with yellow infuscations. The dorsum of MBUCV 6179 was gray with rufous blotches bordered in black. MBUCV 6180 had a rufous dorsum with faint dark blotches, and a pale ventral surface with dark marmorations. The dorsum of MBUCV 6181 consisted of chocolate brown marmorations on an ochre surface, and a brown belly with yellow spots. The dorsum of MBUCV 6182 was dark rust color, the throat pale grayish brown, the ventral surfaces of the limbs and belly pinkish gray, and the chest gray with faint brown speckling. The coloration of the latter was cryptic, and blended very well with the dry leaf substrate on the dry stream bed of the montane forest in which it was found.

Males of *O. r. steyermarki* were located along a rocky stream that appeared to be very oligotrophic. The only other organisms found in the stream were occasional caddis fly and may fly larvae. More than a kilometer of stream was examined. About half the length examined was bordered by *Bonnetia roraimae* woodland, and the rest by peat bogs. No birds usually associated with aquatic environments, such as kingfishers, herons or rails, were seen along the stream's course. Calling males were distributed along the bank of the stream in a clumped fashion. In any one clump the individual males were separated by several meters. There were estimated to be between 2 to 6 calling males per clump. The occurrence of clumps did not seem to be correlated with any obvious features such as vegetation or the presence of waterfalls. The overall density of calling males was in the order of 50 to 100 per kilometer of stream. Males called only during daylight hours (Figure 1).

A single nest of *O. r. steyermarki* was encountered. The entrance to the nest was almost level with the water level of the stream. The nest cavity was some 10 cm in diameter and contained a total of 24 large white noncapsulate eggs. These eggs were subsequently lost during a flash flood at another camp, and were therefore not measured. A photograph of one egg suggests that the total diameter (including albumen) was about 15 mm. While the nest was being opened the male retreated into a recess in the far wall of the nest cavity. Both nest and recess are presumed to have been constructed by the male rather than being natural cavities.

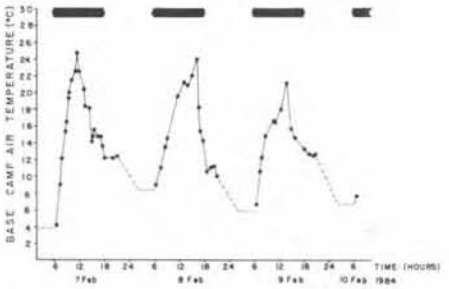


Figure 1. Calling periods for male *Otophryne robusta steyermarki* (horizontal bars) and air temperatures on Chimantá-tepui in February 1984.

Calling males apparently detected an observer when several meters away from their perch or tunnel, and ceased calling. This reaction was rather surprising considering the apparent absence of any diurnal predators. One possible predator was a diurnal snake, *Thamnodynastes chimanta*. It is, however, a small snake and probably could not swallow an adult *Otophryne*. Another possible predator was *Nasua nasua* that was observed at this locality. At another site some feces that were similar to those of *Nasua* were found to contain hylid frog bones and teeid lizard eggs.

Although a total of six localities were visited in the Chimantá-tepui massif by the author, *O. r. steyermarki* was only heard (but not collected) at Akopán-tepui (05°11'N, 62°00'W, 1920 m). Five days of field work on nearby Aprada-Tepui and nine days field work on Auyantepui did not reveal its presence in similar habitats. It is thus suggested that *O. r. steyermarki* is endemic with a restricted habitat on the Chimantá-tepui massif only.

Table 1. Capture data for *Otophryne robusta*.

MBUCV Number	6178	6179	6180	6181	6182
Date of Capture	8 Feb 84	8 Feb 84	9 Feb 84	9 Feb 84	12 May 83
Time of Capture (hrs)	1011	1045	1219	1230	daytime
Air temp. (°C)	17.5	—	19.4	—	—
Stream temp. (°C)	15.4	—	17.5	—	—
Perch air temp. (°C)	—	—	18.8	—	—
Nest water temp. (°C)	—	—	—	17.2	—
Snout-vent (mm)	42.5	40.9	45.0	47.0	48.8
Head length (mm)	13.3	13.6	14.0	14.6	13.6
Head breadth (mm)	12.9	13.5	13.7	14.9	15.8
Femur (mm)	16.3	15.8	16.6	15.2	20.2
Tibia (mm)	14.6	17.5	16.5	16.5	18.3
Heel-tip—toe 3 (mm)	24.0	27.0	27.0	26.0	27.0
Foot (mm)	10.1	11.1	10.6	10.5	11.6
Tympanum (mm)	5.7	6.1	6.9	6.8	6.0
Eye diam. (mm)	4.0	4.3	4.0	4.3	5.2
Inter-orbital (mm)	5.1	5.4	5.8	5.9	7.2
Inter-nasal (mm)	4.2	4.5	4.6	4.8	4.1
Snout length (mm)	5.0	3.9	4.6	4.4	3.6

ACKNOWLEDGMENTS

This report is an incidental result of an inventory of terrestrial ecosystems being carried out by C.V.G. Electrificación del Caroní C.A., The Instituto Venezolano de Investigaciones Científicas, the Universidad Central de Venezuela, and the New York Botanical Garden. The expedition to the Chimantá massif was partially financed by CONICIT grant # SI-1343 to Otto Huber. The author is indebted to AEREOTECNICA and the staff of the Campamento Canaima of C.V.G. Electrificación del Caroni C.A. for the excellent logistic support that was provided. The Chimantá massif is within the boundaries of the "Canaima" National Park, which is administered by the National Parks Institute of Venezuela.

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THE DISTRIBUTION OF *Crocodylus acutus* IN CUBA

During the past 30 years I have been documenting the past and present distribution of *Crocodylus acutus* in Cuba. During this time many of the Cuban populations of *C. acutus* have become extinct due to predation and displacement by man. The growth of the human population and the expansion of agriculture during this century are directly responsible for the eradication of crocodiles in many localities. A lack of appreciation for the conservation of our fauna has also contributed to this decrease.

Currently *A. acutus* is most abundant (if the word can be used) in the brackish lagoons of the southwestern corner of Isla de Pinos and in Lanier's Lagoon. On the main island of Cuba the only substantive populations of the species are in the Cienaga de Zapata. In 1959, a great number of large specimens of *C. acutus* were collected from various localities and transported to "La Boca" in Guama, Cienaga de Zapata. Both *C. acutus* and *C. rhombifer* are penned together at Guama.

In Cuba, until about 1960, the distribution of *C. acutus* overlapped that of *C. rhombifer* in some areas — the upper portions of the Rio Hatiguanico, the adjacent river mouth, and to the south at Punta Gorda. Nevertheless, over most of their distribution the two species were allopatric.

The data here presented summarize the past and present distribution of *C. acutus* in Cuba. The following is a list of localities where *C. acutus* has been reported during this century. An asterisk (*) after the locality indicates that the presence of *C. acutus* was confirmed until December 1980. The number after the locality, indicates the map reference (Fig. 1). The pre-1960 names and boundaries of the provinces are used for the list of localities, but the map has the boundaries of the new provinces.

Pinar del Rio Province

— Northwestern coast of Guanahacabibes peninsula, from Cabo San Antonio to Guadiana*, in the coastal marshes and the several lagoons, mostly of brackish water.

— Playa Blancarena*, between Cabañas and Bahía Honda (1).

— Rio Bandera that drains into Bahía Ortigosa*; there are caymans from mouth to at least 6 km up stream (2).

— Las Compuertas ditch*, near La Jaula, Guanahacabibes (3).

— Laguna Lugones* (4).

— Laguna Yagua* (5).

— Los Palacios (6).

— Laguna el Tablazo*, some 10 km from the mouth of the Rio San Diego, to the south of Herradura; fresh water (7).

— Rio Dominica*, 7 km up stream (8).

— Laguna Maldonado*, in Catalina de Guane; fresh water (9).

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— Laguna del Fraile*, near San Julian (10).

— Playa Punta Colorada*, Guane. I examined a female, 4 m in length (11).

— La Jítima*, Hoyo de Marpostón, near San Cristobal (12).

— Laguna de Piedra*, between Candelaria and San Cristóbal, in the south coast; fresh water (13).

Habana Province

— Southern coast*, near El Cajío, to the west of Batabanó.

Matanzas Province

— Coastal zone (septentrional), north of Itabo.

Las Villas Province

— Coastal zone in the southwest, between Rio Hatiguanico and Punta Gorda*, in western portion of the Cienaga de Zapata. Also in nearby small lagoons and canals; brackish water. Very few individuals in the mouth of Rio Hatiguanico, due to human presence. Very abundant a few years ago.

— Coastal zone*, south of Playa Caimito (14).

— Ciénaga de Yaguajay, to the east of Caguanes, in the north coast (15).

— Estero de Macurije*, to the east of Casilda: more than 100 individuals were captured in 1962 for the enclosures in Zapata (18).

— Estero La Alegría*, near Casilda (19).

— Rio Agabama*, near Trinidad, southern coast (22).

— Rio Manatí*, (21).

Camagüey Province

— La Palmita, in the south coast (16).

— La Güira*, near Verraco, in Caonao; freshwater lagoon (17).

— Rio San Pedro* (20).

— Coastal zone, in the south, between Santa Cruz del Sur and Playa Florida (23).

Oriente Province

— Cobarrubia point, to the west of Puerto Padre (24).

— Cienaga de Birama or Buey*, from Rio Cauto to Manzanillo (25).

— Laguna Baconao*, near Caney; brackish water (26).

— Laguna Sevilla, to the west of Santiago (27).

— Yateritas zone, between Caimanera and Baracoa (28).

Isla de Pinos

— Rio Júcaro, 6 km to Santa Fe (29).

— Cienaga Lanier*, from west to east (30).

— Bahia Siguanea* (31).

Sabana-Camagüey Archipelago

— Cayo Santa María, to the northeast of Caibarién* (32).

Canarreos Archipelago

— Cayo Largo*; an interior lagoon, and the coasts (33).

— Cayo Cantiles*; in brackish water lagoon to the southeast; some individuals larger than 3 m (34).

— Cayo Estopa* (35).

— Cayo de la Piedra* (36).

— Cayos Maja* (37).

— Cayo Diego Perez* (38).

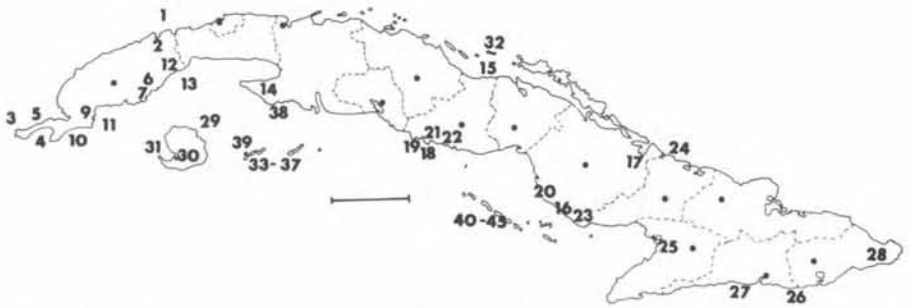


Figure 1. Map of Cuba showing the location of some of the localities from which *Crocodylus acutus* has been reported. See text for list of localities. The provincial boundaries on the map are for the new provinces established after 1960. The black dots represent the provincial capitals. Scale = 100 km.

— Cayo Avalos* (39).

Doce Leguas Archipelago

— Cayo Breton*, an interior lagoon (40).

— Cayo Cinco Balas* (41).

— Cayo Caballones* (42).

— Cayo el Inglés* (43).

— Cayo Boca Grande* (44).

— Cayo las Auras* (45).

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REDISCOVERY OF *Tantilla bairdi* STUART AND A DEFINITE GUATEMALAN LOCALITY FOR *Tantilla taeniata* (BOCOURT)

The Central American species of *Tantilla* were recently reviewed by Wilson (1982). He listed but a single specimen of *T. bairdi*, the female holotype, described by Stuart (1941). No definite record for Guatemala exists for *T. taeniata* (Bocourt), even though the holotype is from that country (Wilson 1982).

A specimen of each species was recently collected in Guatemala and was made available to me by Jonathan A. Campbell. *Tantilla bairdi* (KU 191102) was collected 5 km S La Union Barrios at Agua Zarca at an elevation of 1524 m in the department of Baja Verapaz on 22 August 1980 by P. Lucas Pineda for J. A. Campbell. It is an adult male and, thus, represents the first known male for the species from the second known locality. It possesses the following characteristics: 163 ventrils; 36 subcaudals; ventrals + subcaudals 199; dorsal scale rows 15-15-15; anal plate divided; supralabials 7-7 (3rd and 4th entering orbit); infralabials 6-6, first pair not in medial contact, 4 in contact with anterior chin shields; preocular single and in contact with postnasal; postoculars 2-2; temporals 1+1; total length 455 mm; tail length 65 mm; tail length/total length 0.143. These data are in close agreement with those of the female holotype (Wilson 1982). No data are available on color in life. The color in preservative is as follows: dorsum dark brown; venter pale orange (bright red-orange in life?); head same color as dorsum; nuchal collar, pre- and postocular spots cream.

The *Tantilla taeniata* (KU 187350) came from 10.4 km N Santo Tomas at an elevation of 585 m in the department of Izable. It was collected on 19 June 1980 by Jonathan A. Campbell, Linda S. Ford, and K. Kennedy. It is an adult female and represents the first definite locality data from Guatemala. It possesses the following characteristics: 165 ventrals; 69 subcaudals; ventrals + subcaudals 234; dorsal scale rows 15-15-15; anal plate divided; supralabials 7-7 (3rd and 4th entering orbit); infralabials 6-6, first pair not in medial contact, 4 in contact with anterior chin shields; preocular single and in contact with postnasal; postoculars 2-2; temporals 1+1; total length 389 mm; tail length 90 mm; tail length/total length 0.231. These data are in agreement with those given by Wilson (1982) for this species, except that the subcaudal count is 5 scales above the range (58-64) given in that paper.

Jonathan A. Campbell kindly allowed me to examine a color slide of KU 187350 in life. The coloration is typical of *T. taeniata*. The middorsal stripe is golden yellow; the lateral one and venter are cream-colored.

ACKNOWLEDGMENTS

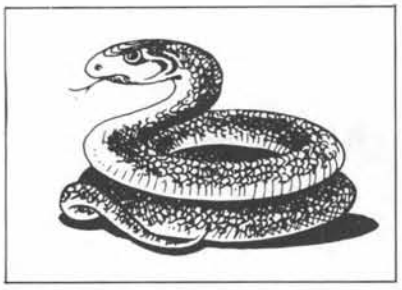
I would like to thank Jonathan A. Campbell for permission to report upon these specimens and for the loan of a slide of one of them. I am also indebted to S. K. Dutta and Joseph T. Collins for the loan of material in the collections of the University of Kansas Museum of Natural History (KU).

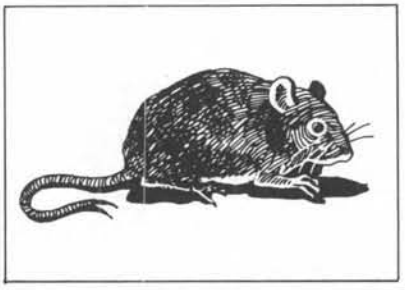
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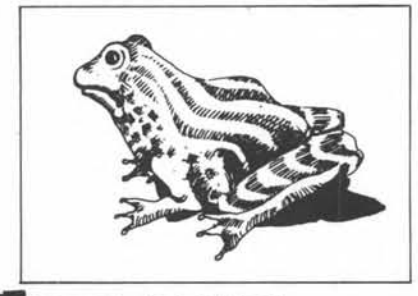
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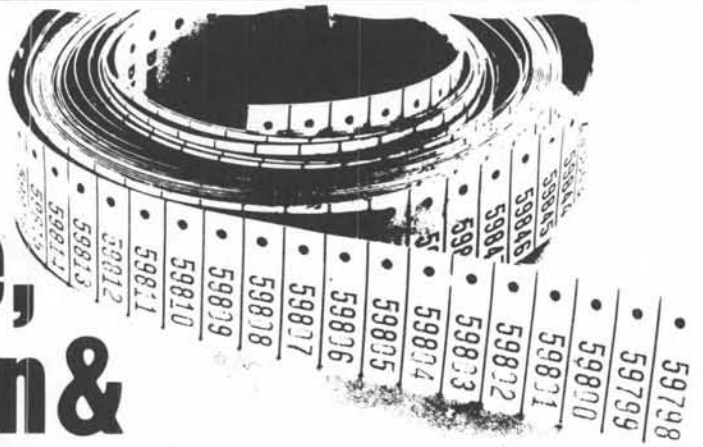
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CORRECTION OF THE TYPE-LOCALITY OF *Phrynosoma coronatum schmidti*

The supposed occurrence of *Phrynosoma coronatum schmidti* on Cedros Island, Baja California, Mexico (Barbour 1921), has long been an enigma, because *P. cerroense* is the only horned lizard confirmed from this island (Reeve 1952). Previous authors tried to solve this dilemma by calling all Cedros Island horned lizards *P. cerroense* (Van Denburgh 1922) or *P. coronatum* (Linsdale 1932). Because *P. cerroense* is distinct from *P. coronatum* on the basis of scalation and osteological characters (Reeve 1952; Presch 1969), these explanations are not tenable. Banta (1968) was the first person to question the presence of *P. c. schmidti* on Cedros Island.

Only five specimens of *Phrynosoma cerroense* are present in U.S.A. collections. These lizards were taken on Cedros Island between 1881 and 1976. No specimens of *P. coronatum schmidti* have been collected on Cedros Island except the four type specimens collected by Wilmont W. Brown, Jr., on "Cerros Island" in 1906 (Barbour 1921). Examination of many letters and a manuscript by Brown (Archives of the Museum of Comparative Zoology, Harvard University (MCZ)), and supporting publications (Thayer and Bangs 1907a, 1907b, 1908; Thayer 1909; Nelson 1921) indicate that Brown collected many birds and miscellaneous other natural history specimens throughout Baja California during 1906-1910 for the John Elliot Thayer Museum of Lancaster, Massachusetts. Brown's herpetological collection is now housed at the MCZ. According to Brown's manuscript (no date) and itinerary (Thayer and Bangs 1907a), Brown collected "five species of lizards" on Cedros Island from March 26 to April 24, 1906 and captured no lizards on neighboring San Benito and Natividad Islands. According to MCZ catalogues, three *Sceloporus rufidorsum*, one *Uta concinna*, and four *Phrynosoma schmidti* derive from Cedros Island and two *Uta stellata* from San Benito Island. The mismatch of actual specimen data and Brown's manuscript suggests confusion; this and the absence of *P. c. schmidti* in all other known herpetological collections from Cedros Island suggests that the MCZ *P. c. schmidti* specimens are mislabeled with regard to locality. Since Brown collected extensively on the adjacent Baja California mainland, the horned lizards were probably captured from a locality within the known distribution of *P. c. schmidti*. Brown only visited two localities within the *schmidti* distribution (Jennings 1985): San Quintín and El Rosario. Comparison of specimens from the San Quintín (N=20) and El Rosario (N=5) areas with the holotype (MCZ 15142) and paratypes (MCZ 15144-45; AMNH 20583) of *P. c. schmidti* demonstrates the type series most likely derived from San Quintin because of the well developed second lateral row of fringe scales and dark dorsal pattern of the San Quintin specimens. Thus, the type-locality of *P. c. schmidti* is re-designated as San Quintín, Baja California. The probable date of collection is July, 1906, based on Brown's itinerary (Nelson 1921) and the presence of a hatchling (24 mm SVL) (MCZ 15145) in the type series.

ACKNOWLEDGMENTS

I would like to thank J. Berrian, G. Pregill, J. Rosado, J. Vindum, and R. Zweifel for the loan of specimens under their care. The MCZ Archives Librarian A. Blum graciously allowed me to quote material from copies of Wilmont Brown's unpublished manuscript and letters. Special thanks to to H. Smith and two anonymous reviewers who greatly improved the quality of the manuscript.

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Plectrohyla matudai HARTWEG AND *Norops petersi* (BOCOURT): ADDITIONS TO THE HERPETOFAUNA OF HONDURAS

Wilson (1983) recently listed the members of the known herpetofauna of Honduras. In July 1983, we collected specimens of two species heretofore unknown from the country. Both were collected in the vicinity of the village of Quebrada Grande, located below the peak of Cerro Azul (15° 05' N, 88° 55' W) in the department of Copán.

On 17-19 July we collected both adults and tadpoles (KU 195447-54) of the hylid frog *Plectrohyla matudai* Hartweg, 1941, at 1370 m alongside a small stream and associated seepage area on a hill above the village. The stream lies on the border between a cattle pasture (formerly cloud forest) and disturbed cloud forest (Lower Montane Wet Forest formation; see map in Meyer and Wilson 1971). Adult males were found calling on low bushes and on the ground along the stream and tadpoles in the slow-moving water. Anuran associates included an undescribed species of red-eyed *Hyla*, *Plectrohyla guatemalensis*, and *Ptychohyla spinipollex*. Tadpoles of *P. guatemalensis* and *P. spinpollex* were collected in association with those of *P. matudai*. Macro- and microhabitat were as described for *P. matudai* by Duellman (1970), who noted this species' occurrence "along small streams and rivulets."

The coloration of an adult male (KU 195448) was as follows: dorsum dirty mustard yellow with scattering of small pale green spots; upper portion of limbs colored as dorsum; side of body golden yellow with black spotting; iris copper; venter pale gray.

Duellman (1970) gave the distribution of *P. matudai* as "elevations of 1000 to 2300 meters on the Pacific slopes of the Sierra Madre from extreme eastern Oaxaca, Mexico, to central Guatemala . . . ." He further noted that "this species also is known from the Grijalva depression in western Guatemala and from the Las Nubes block in central Guatemala." Our specimens represent a new record for Honduras, the easternmost record for the species, and a Caribbean slope record for this largely Pacific versant form. The Honduran locality is about 180 km ENE of the nearest Guatemalan record (Duellman 1970).

On 20 July 1983 a specimen of *Norops petersi* (Bocourt), 1873 (KU 195463) was delivered to us by a local villager. The locality is the same as that for *P. matudai*. The anole was collected on the edge of a corn field carved from cloud forest just below undisturbed vegetation of the same type on the slopes of Cerro Azul. The elevation is about 1400 meters.

The specimen is an adult female with a snout-vent length of 110.6 mm. The color in life was as follows: middorsum olive green, marbled with black and pale olive green grading to pale olive green on the sides with black and pale green marbling; head olive green

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above with black marbling; side of head pale yellowish green with black marbling; tail with indistinct bands of olive gray marbled with black, separated by pale greenish gray; front limbs olive green, mottled with black; hind limbs pale olive-green mottled with black, separated by bands of pale olive-green; venter very pale green mottled with olive brown; dewlap pale greenish yellow with black spots.

The locals term this lizard *charancaco tigre.*

Stuart (1963) described the range of *Norops petersi* as "moderate elevations along the Caribbean versant from San Luis Potosi, Mexico, and on the Pacific from the Isthmus of Tehuantepec, Mexico, south to Honduras." Neither Meyer and Wilson (1973) nor Wilson (1983), however, listed the species for Honduras. The Honduran locality is about 130 km ESE of the nearest Guatemalan locality (Stuart 1948).

We follow Savage and Talbot (1978) in the use of the generic name *Norops* for this giant anole.

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LIFE HISTORY NOTES

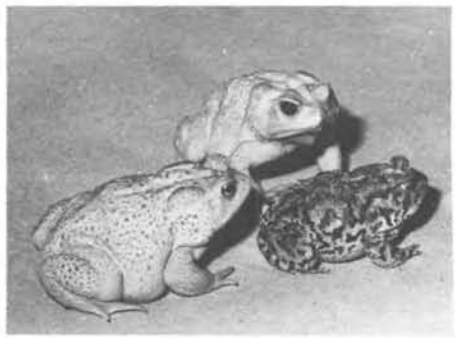
LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. Reports of clutch or litter size should include snout-vent and total lengths of females. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1982. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

Please submit Life History Notes in the standard format directly to the ***SECTION EDITOR*** to avoid delays in publication: Bern W. Tryon, Knoxville Zoological Park, Box 6040, Knoxville, Tennessee 37914, U.S.A.

ANURA

BUFO HOUSTONENSIS (Houston Toad). **COLORATION.** On 16 March 1984, 120 Houston toad eggs were collected from a shallow pond in Bastrop County, Texas (Houston Zoological Gardens (HZG) study site C). These eggs were taken to the HZG as part of an ongoing conservation project. Fifty of the eggs were maintained at the HZG. The remaining eggs were cultured, and the tadpoles were raised through metamorphosis, then released at study sites at Attwater Prairie Chicken National Wildlife Reserve. After the eggs at the zoo hatched and metamorphosis was complete, we observed that two of the immature toads (ca. 25mm SUL at that time) were dorsally beige in color, which is lighter than the normal brown to black coloration. An ontogenetic color change to grey-white was seen, and one toad's eyes changed from black to pink, while the other's changed from black to yellow-gold (Fig. 1). Both toads, now adults (ca. 60 mm SUL), have no other apparent abnormalities and appear to be growing at a normal rate. Upon their deaths, the toads will be deposited in the vertebrate collection at Texas A&M University.



Financial support for this research was provided by the United States Department of Interior, Fish and Wildlife Service, Office of Endangered Species, and the Zoological Society of Houston. Appreciation is also acknowledged to the Texas Parks & Wildlife Department and the U.S. Fish and Wildlife Service for supplying permits.

Submitted by **STANLEY R. MAYS** and **PAUL S. FREED,** Department of Herpetology, Houston Zoological Gardens, Houston, Texas 77001, U.S.A. ●

GASTROPHRYNE OLIVACEA (Great Plains Narrowmouth Toad). **COEXISTENCE.** Blair (1936. Copeia 1936:115) was the first to note the sharing of burrows of *Microhyla (= Gastrophryne) olivacea* with tarantulas *(Dugesiella hentzi)* from Tulsa Co., Oklahoma. Similar relationships have been reported in north-central Texas (Hunt 1982. Texas Parks and Wildlife 40:12-14). Freiberg (1951. Trans. Kans. Acad. Sci. 54:374-386) listed the following animal associates found under rocks and logs with *G. olivacea:* various invertebrates, *Acris crepitans, Bufo terrestris, Rana pipiens, Eumeces fasciatus, E. obsoletus* and *Scalopus aquaticus.* Here, we report the first documented instance of *G. olivacea* coexisting with Eastern collared lizards *(Crotaphytus collaris collaris).*

On 26 May 1985 in Somervell Co., Texas, 12.4 km NE of Glen Rose off U.S. 67 on county rd. 406, an adult *G. olivacea* (head-body length = 26 mm, tibia length = 10 mm) was found in a burrow beneath a large (61 X 51 X 20 cm) limestone rock coinhabited by an adult male and female *C. c. collaris.* Immediately upon turning over the rock shelter, the disturbed collared lizards escaped into *Juniperus ashei* debris while the *G. olivacea* remained in its retreat. After collecting the toad, the rock was carefully put back in its original position. Following a waiting period of ca. 20 minutes, we overturned the rock and found that both lizards had returned. One of us (CTM) visited the site 41 days later (6 July 1985) and noted, presumably, the same male *C. c. collaris* under the rock. Evidently, this particular rock shelter is a primary retreat in the home range of these collared lizards.

The significance, if any, of this incidental association is unknown. Collared lizards are a very aggressive and highly territorial species and do not normally tolerate others near or in their retreats.

Blair (op. cit.) reported that *G. olivacea* may benefit from protection against summer heat and drought and possibly against predation in the presence of tarantulas. In addition, Hunt (op. cit.) suggested a similar theory after observing an encounter of a *Thamnophis proximus* being attacked by a seemingly protective tarantula. Interestingly, the noxious and irritating skin secretion of the eastern narrowmouth toad *(G. carolinensis)* has been noted to be protective against some predators (Anderson 1954. Tulane Stud. Zool. Bot. 2:15-46); however, *Agkistrodon contortrix* (Anderson 1942. Bull. Chicago Acad. Sci. 6:203-220), *Nerodia sipedon* (Fitch 1956. Univ. Kans. Mus. Nat. Hist. Misc. Publ. 8:275-306) and *T. sirtalis* (Fitch 1965. Ibid. 15:493-564) will prey on *G. olivacea.* Garton and Mushinsky (1979. Can. J. Zool. 57:1965-1973) suggested that *Gastrophryne* spp. benefit from their toxicity in evolving a response to the swarming attack of their preferred prey (ants) and in the avoidance of predators ("toxic phenotypes").

The *G. olivacea* is deposited in the Arkansas State University Museum of Zoology (ASUMZ 4644).

We thank Mr. Jim Riddle for allowing us access to his property. We also acknowledge Drs. Henry R. Mushinsky and Hobart M. Smith for technical assistance. Finally, we thank Drs. H. M. Smith and Stanley E. Trauth for critically reviewing this note.

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, 4500 S. Lancaster Road, Dallas, Texas 75216 and **STEPHEN P. TABOR,** 224 S. W. Thomas Street, Burleson, Texas 76028, U.S.A. ●

PHRYNOHYAS VENULOSA (Veined treefrog). **FOOD.** The known biology of this treefrog is largely summarized in Duellman (1970. Monogr. Mus. Nat. Hist., Univ. Kansas No. 1, vol. 1). In that work and other primary literature that we searched there was no mention of food habits.

On the night of 28 October 1984 we found a 60 mm S-V *Phrynohyas venulosa* on a road 12 km N Chunchucmil, Yucatán, México that had a 30 mm S-V *Hypopachus variolosus* (sheep frog) in its mouth; only the hind limbs of the *Hypopachus* were visible. The *Hypopachus* was still alive when removed from the *Phrynohyas.* Whether this was a deliberate act of eating the smaller frog or an accidental ingestion resulting from the two frogs simultaneously grabbing the same prey could not be determined, but the only other material in the *Phrynohyas* was some dead microphyll leaves in the mouth and stomach, and the *Hypopachus* alimentary tract contained only a few partially digested ants. The *Phrynohyas* showed no ill effects from the supposedly toxic skin secretions of the *Hypopachus.* We subsequently examined over 70 stomachs of Mexican *P. venulosa* from six different states and the contents were entirely arthropod, particularly the insects, including Orthoptera (crickets and unidet.), Coleoptera (Coccinellidae, Chrysomelidae, Elateridae, Scarabaeidae, and unident.), Diptera, and Homoptera (Cercopidae); a few spiders also were found. Most stomachs were empty.

Submitted by **HAROLD A. DUNDEE,** Department of Biology, Tulane University, New Orleans, Louisiana 70118 and **ERNEST A. LINER,** 310 Malibou Boulevard, Houma, Louisiana 70364, U.S.A. ●

PHRYNOHYAS VENULOSA (Veined treefrog). **REPRODUCTION AND SIZE.** The latest breeding date that has been reported is 3 Aug. (McDiarmid 1968. L.A. County Mus. Contrib. Sci. 134) in Sinaloa, México. On 2 Sept. 1962 Dundee collected three males that were uttering songs (Grrraaack) from trees along the Tuxpan River at Tuxpan, Vera Cruz, México. Also taken at that time were 10 females. The male (56-69 mm S-V, $\bar{X}$ = 63.7) and female (56-68 mm S-V, $\bar{X}$ = 58.1) averages are equal to or smaller than the smallest aggregated animals reported (63.7 mm S-V for 13 males and 63.5 for 14 females; McDiarmid 1968, op. cit.). None of our females, however, though near the singing males, contained mature ova. One might speculate that size of breeding animals varies with time of year.

Submitted by **HAROLD A. DUNDEE,** Department of Biology, Tulane University, New Orleans, Louisiana 70118 and **ERNEST A. LINER,** 310 Malibou Boulevard, Houma, Louisiana 70364, U.S.A. ●

RANA CATESBEIANA (Bullfrog). **FOOD.** *Rana catesbeiana* are known to prey on other anurans (Korschgen and Moyle 1956. Amer. Midl. Nat. 54:332-341; Smith 1973. Ph.D. dissertation, Univ. Kansas, 206 pp.; Corse and Metter 1980. J. Herpetol. 14:231-238). However, only Holman (1957. Copeia 229) reported bullfrog predation on a spadefoot toad, when he recorded *Scaphiopus holbrooki* as prey. This note records a western spadefoot, *S. hammondi,* as bullfrog prey.

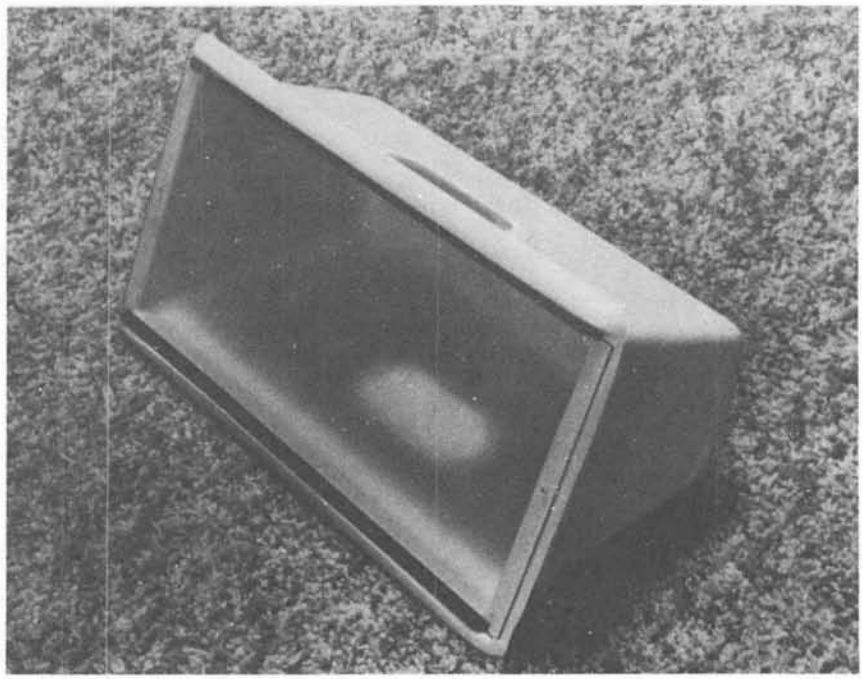
At 0130 h on 4 March 1978, we collected an adult (SVL = 141 mm) male *R. catesbeiana* crossing Cherokee Road ca. 50 m east of its juncture with Thompson Flat Road, Butte County, California. Dissection of the male's stomach revealed an adult (SVL = ca. 60 mm) female *S. hammondi,* apparently recently swallowed because evidence of digestion was not yet detectable by examination of the skin of the toad. *R. catesbeiana* are locally abundant and move overland during spring rains warm enough to allow activity since over one hundred *R. catesbeiana* had been observed on roads in the general vicinity over the previous three hours. During that time there had been a consistent soft rain and wet substrate temperatures exceeding 10° C (the collection site substrate temperature was 11° C). *S. hammondi* may be cued into surface activity by rains (Dimmitt and Ruibal 1980. J. Herpetol. 14:21-29), so they may fall prey to *R. catesbeiana* that exhibit overland movements under the same conditions.

The female *S. hammondii* is deposited in the Los Angeles County Museum of Natural History (LACM 136709).

Submitted by **MARC P. HAYS,** Department of Biology, P.O. Box 249118, University of Miami, Coral Gables, Florida 33124 and **JOAN WARNER,** 1780 Modoc Drive, Chico, California 95928, U.S.A. ●

RANA SYLVATICA (Wood Frog). **PREDATION.** On 12 April 1984 I noted many caddisfly (Tricoptera) larvae crawling on submerged vegetation, *Rana sylvatica* egg masses, and the bottom of a temporary pond in the Sandyston Township, Sussex County, New Jersey portion of the Delaware Water Gap National Recreation Area. Some of the larvae appeared to be attempting to break through the gelatinous envelopes encasing the eggs, but certainty was impossible due to the surface motion of the water and the fact that most egg masses were 30 cm or more away. I collected a gallon of pond water with

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two of the smaller egg masses and four caddisfly larvae and took them to the New Jersey State Museum for further observation.

All of the larvae were actively crawling about in the container and over the egg masses the next day and were observed at 15 to 30 minute intervals. They frequently tugged at the gelatin with their front pairs of legs but did not break through. Whether it was a deliberate attempt to reach the eggs or only their method of maintaining footholds on the jelly-like surfaces remains uncertain. Seven hours passed before it was witnessed by science bureau staff member Shirley Albright and myself that one of the caddisfly larvae had actually penetrated a portion of an envelope and was in the process of devouring a *R. sylvatica* egg. About one-third of the egg was eaten, after which the larva resumed its scurrying about in the container.

The following day I noted that six more eggs had been partially eaten from a mass containing 143 eggs and portions of three from a mass of 147 were also devoured. However, the water temperature had risen to 24° C, a 13° C increase since its removal from the pond. Two of the larvae died and the other two appeared near death, probably due to this increase in water temperature and a decrease in dissolved oxygen. It must be noted that no food (except the frog eggs) had been provided for the larvae and that it is not known if the *R. sylvatica* eggs were alive or dead when eaten. Although the restrictive conditions in the container may have contributed to the larvae's behavior, the observation is nevertheless noteworthy, inasmuch as I know of no other records of caddisfly larvae preying or scavenging on amphibian eggs.

The larvae were preserved and identified as members of the genus *Limnephilus*, a group that contains a hundred or more species of climbers, sprawlers and clingers which inhabit all types of lotic and lentic habitats, including temporary ponds. Their distribution is widespread in the northern portions of North America.

I am grateful to William Wolfe, Rutgers University, and Gunther Schuster, Eastern Kentucky University, for assistance in identification of the caddisfly larvae and to the administration and staff of the Delaware Water Gap National Recreation Area for logistic support and permission to work at the site.

Submitted by **RAYMOND J. STEIN,** Biostar Associates, RFD Box 165, Far Hills, New Jersey 07931, U.S.A. ●

CAUDATA

PLETHODON VANDYKEI IDAHOENSIS (Coeur d' Alene Salamander). **PREDATION.** On 13 July 1985 at 0735 Mountain Daylight Time (approximately 1.5 hr after sunrise) we observed an American Robin *(Turdus migratorius)* capture and partly consume a Coeur d' Alene Salamander *(Plethodon vandykei idahoensis)*. The incident occurred during a continuing study of the foraging behavior of *P. v. idahoensis* in Lincoln Co., Montana. Predation upon this salamander has not previously been reported (see Nussbaum et al. 1983. Amphibians and Reptiles of the Pacific Northwest. University Press of Idaho).

The robin was first seen alighting approximately 3 m up a vertical, moss-covered cliff where we had earlier been observing nocturnal salamander activity. We saw the bird snatch an object from the moss and carry it to the base of the cliff. On the ground, the bird thrashed and pecked at the object for about 20 sec when it was frightened away by our approach. We then discovered that the robin had captured an adult male salamander of 4.48 cm SVL. The salamander had lost approximately half of its tail, which we assume was eaten by the robin. The only other marks on the salamander were two impressions, presumably made by the bird's beak, 0.40 cm anterior to the tail breakage. The salamander was collected and lived for two days, apparently dying of internal injuries. It will be deposited in the Amphibian Collection of the Department of Zoology at Washington State University, Pullman.

Submitted by **ALBERT G. WILSON,** Department of Zoology, Washington State University, Pullman, Washington 99164 and **EVELYN M. SIMON,** 115 N.E. Pine Street, Pullman, Washington 99163, U.S.A. ●

SERPENTES

DIADOPHIS PUNCTATUS PUNCTATUS (Southern Ringneck Snake). **SIZE.** An exceptionally large *Diadophis punctatus punctatus* was caught by Martin Nowak on 14 April 1985 as it was crossing a road at 2130 h during a warm rain in eastern Jefferson County, Alabama (T15S, R1W, Sec. 26). The snake, a gravid female, had a total length of 482 mm (396 mm SVL, 86 mm TL) and a mass of 20.2 g. The record length for *D. p. punctalis* is listed as 470 mm by Conant (1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston). Mount (1975. The Reptiles and Amphibians of Alabama, Auburn Univ. Agricultural Experiment Station, Auburn) reported *D. p. punctatus* attains a maximum total length of approximately 445 mm in Alabama.

The new record specimen has been deposited in the University of Alabama at Birmingham Vertebrate Museum (VM-UAB 0384).

Submitted by **KEN R. MARION,** Biology Department, and **MARTIN C. NOWAK,** Hospital Administration, University of Alabama at Birmingham, Birmingham, Alabama 35294, U.S.A. ●

DISPHOLIDUS TYPUS (Boomslang). **BEHAVIOR.** When threatened, *Dispholidus typus* usually responds by cylindrical inflation of the neck and anterior half of the body, as described by several authors (see Broadley 1983. Fitzsimons' Snakes of Southern Africa, Delta Books). Another method of defense is detailed here.

On 23 February 1985 in an area of tree savanna approximately 1 km north of Moeding College, Otse, Botswana (25.02 S: 25.45 E), a brown female boomslang (1.25 m TL) was observed resting on the ground under a bush at 0910 h. The snake was seized with a grabstick and responded by inflating its body in the manner previously described, and striking. It then pulled free from the grabstick and fled through the bush. About 20 sec later, the snake was observed some 6 m away, lying totally motionless on a patch of open ground, with its body kinked in such a manner as to resemble a stick, several of which were lying on the ground nearby. The snake remained motionless in this position until a press stick was placed on its neck, whereupon it again struck and attempted to inflate its body.

Psammophis and *Thelotornis* are known to mimic branches in attempts to conceal themselves, but such behavior is usually observed in trees, not on the ground.

The snake is at present alive and will be deposited in the National Museum, Bulawayo, Zimbabwe.

Submitted by **STEPHEN SPAWLS,** Moeding College, Private Bag 11, Lobatse, Botswana. ●

HETERODON PLATYRHINOS (Eastern Hognose Snake). **BEHAVIOR.** Assateague Island is a narrow 37-mile long barrier island located along the coasts of Maryland and Virginia. *H. platyrhinos* is the most common species of snake found there, where it apparently thrives on the abundant *Bufo woodhousei fowleri*. While the presence of *H. platyrhinos* on barrier islands and in similar saline environments is well documented, there appear to be few if any records of this species spending time in sea water.

During the hot summer and fall months, *H. platyrhinos* is frequently observed resting on the Assateague beach just above the reach of breaking waves, or swimming in the breakers a few feet beyond the swash zone. The snakes have been seen spending up to five minutes in the water, usually swimming parallel to shore. They exit the water by "body surfing" on an incoming wave, and are left on the beach as the wave recedes. Entrance into the surf does not appear to be the result of the presence of an observer, and no feeding or activity other than swimming and floating has been recorded. While resting on the wet sand during hot weather may represent an attempt at thermoregulation, the advantages of entering and spending time in the surf are unclear.

Submitted by **R. BRUCE RODGERS,** Assateague Island National Seashore, Berlin, Maryland 21811, U.S.A. ●

NERODIA SIPEDON SIPEDON (Northern Water Snake). **COLORATION.** A subadult male amelanistic specimen of *Nerodia sipedon* was collected in a small remote stream in southwestern Botetourt Co., in Blue Ridge, Virginia. The snake, collected by Conny Wallace and David Jobe, was reported submerged in the stream in a sunny location at ca. 1400 h on 18 June 1983. It has a normal pattern with ground color of a light flesh tone and a pattern of slightly darker flesh tone. The ventral side is mostly white and the eyes are a

pinkish brown color. The small dark patches on the head and body are assumed to be indications of pigment retention.

At the time of capture the snake measured 558 mm total length and 427 mm s-v length with an incomplete tail of 131 mm. In a recent publication of albinism (Dyrkacz 1981. Recent Instances of Albinism in North American Amphibians and Reptiles. SSAR Herp. Circ. 11:22p), E. J. Maruska reported a juvenile albino *Nerodia sipedon* from Marion, IN. Another incidence of albinism in *Nerodia* was reported by Freed (1983. Herp. Review. 14). The snake is currently being maintained in the collection of David Jobes.

Submitted by **LYNN D. ROBERTSON,** Rt. 1 Box 346, Roanoke, Virginia 24012, U.S.A. ●

THAMNOPHIS SIRTALIS SIRTALIS (Eastern Garter Snake). **CANNIBALISM.** Ophiophagy is common in some snake genera (e.g. *Lampropeltis*) but in others, its occurrence is rare or unreported (Polis and Myers 1985. J. Herpet. 19:99-107). Stomach contents often serve as the primary evidence for this feeding behavior. In *Thamnophis sirtalis* very low frequencies of ophidian prey, including conspecifics, have been found in stomach contents (0.37%, Fitch 1965. Univ. Kansas Publ. Mus. Nat. Hist. 15:493-564), but the problem with such data is in determining how the snakes came to be ingested. They may have been dead when encountered or one snake may have been swallowed while competing with another for the same food item (Genter 1984. Herp. Review 15(2):49-50). It is also possible that these cases of ophiophagy were the result of an active attack by one snake on another. Here I report such a conspecific attack.

Neonate *T. s. sirtalis* were obtained from four litters born in captivity on 17-19 September 1984 to recently collected females from Wayne County, Michigan. A total of 28 (6,6,8,8) neonates were housed in a large (1 m dia.) round enclosure with a pea-gravel substrate, 6 (16 cm dia.) circular cover objects, and water dishes, on a 12:12 LD cycle. The activities of the animals were continually recorded with a low-light slow-motion video system. The animals were being studied as part of a research program on conspecific aggregation and had not been fed at the time of the incident reported here.

On 29 September 1984 at 1644 h EST, one of the snakes (Snake A: female, 133 mm SVL, 159 mm total length, 1.57 g mass) was observed attacking another new-born (Snake B: unidentified), grasping it in the middle of the body. The two snakes struggled for about four minutes before separating. Within three minutes there was a second attack by snake A. This time the bite was directed towards the head of a third unrelated snake (Snake C: male, 134 mm SVL, 171 mm total length, 1.97 g mass). This attack was considerably shorter (30 secs.), and ended with the release of snake C which quickly moved away. Within four minutes snake A began to follow closely the trail of snake C. It was not possible to observe tongue flicking. After a brief pause, it once again grasped the other snake by the head. Snake C again responded by rapidly twisting its body. The struggle continued for 48 min, with ingestion lasting more than four hours, at which time the half-consumed male was discovered and removed.

These observations indicate that in *T. s. sirtalis*, a species not known for its ophiophagous activities, cannibalism may involve the active pursuit and attack by conspecifics.

G. M. Burghardt, B. C. Bock and C. L. Sagers made helpful comments on the manuscript. The work was supported by NSF grant BNS-8217509 to GMB.

Submitted by **JAMES M. SCHWARTZ,** Graduate Program in Ethology, Life Sciences, M303 WLS, University of Tennessee, Knoxville, Tennessee 37996, U.S.A. ●

SAURIA

IGUANA IGUANA (Green Iguana). **TERRESTRIALITY.** In June 1982 researchers at Hato Masaguaral, about 50 km SSW of Calabozo, Guarico, Venezuela, led us to an abandoned, seasonally-inundated borrow pit (on Hato Flores Moradas, 8.543° N, 67.583° W) with over one hundred burrows, used as nocturnal refuges by green iguanas. Throughout most of its range, the green iguana sleeps in trees, seeking temporary refuge in burrows only when away from water and exposed to a potential predator. Fig. 1 shows the densest group of burrows, most of which were unoccupied at any one time. More than one iguana were seen to use a single entrance.



Figure 1. Communal iguana burrows.

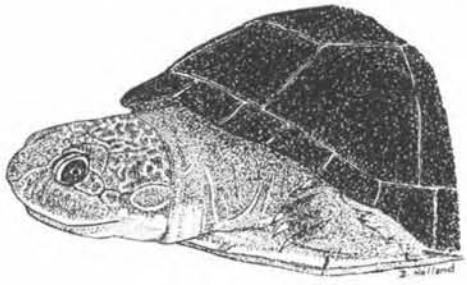
Approximately 20 visits over the following 1-1/2 years revealed that these iguanas had greater flight distances (>80 m) than their adjacent arboreal conspecifics (20-60 m), perhaps because the burrow-living iguanas were more vulnerable to mammalian predators. An apparent decrease in the numbers of the terrestrially-refuging iguanas followed a period when a grison *(Grison vittata)*, a burrowing mustelid, frequented the area (as indicated by tracks, sightings, and several partially-consumed iguana carcasses).

One isolated burrow was excavated, beginning at its 20 X 20 cm entrance in a small bank 50 cm below the surrounding, level terrain. The burrow's single horizontal passage, gradually became narrower (10 X 15 cm) to a bend of about 30° 1.7 m from the entrance. At 2.5 m from the entrance the passage became slightly larger (20 X 20 cm), turned 90° and gradually ascended, until a loose plug of soil separated the passage from the surface, about 4.5 m from the entrance. *Iguana* feces were found at the end of the burrow. We saw evidence that the iguanas modified their burrows, but we did not witness any being constructed. Female iguanas excavate nest burrows, but these are ordinarily shorter and sharply downward-sloping, ending 1-2 m underground.

Burrow-refuging iguanas were seen at sites away from trees further west on Hato Masaguaral (8.56° N, 67.65° W) and in road banks on Hato El Frio, Estado Apure (7.77° N, 68.91° W).

Iguanas are known to live among rocks when deprived of trees by human activities (Roze 1956. *In:* El Archipielago de Los Roques y La Orchila. Sociedad de Ciencia Naturales La Salle. Caracas.), but the burrows photographed here were occupied voluntarily, as numerous suitable trees surrounded the borrow pit.

Submitted by **GORDON H. RODDA** and **GORDON M. BURGHARDT,** Department of Psychology, University of Tennessee, Knoxville, Tennessee 37996, U.S.A. ●



TESTUDINES

CLEMMYS MARMORATA (Western Pond Turtle). **FEEDING.** Neustophagia (modified filter feeding) on small aquatic invertebrates has been noted in the turtles *Podocnemis unifilis* and *Chrysemys picta* (Belkin and Gans 1968. Ecology 49:768-769) and *Emydura* sp. (Legler 1976. Vict. Nat. 93:40-43). Herein I report on the occurrence of this mode of feeding in the Western pond turtle *(Clemmys marmorata)*.

On 23 and 24 July 1981, I observed three adult *C. marmorata* ca. 130-150 mm CL feeding on cladocerans at Pico Pond, San Luis Obispo County, California. Each turtle moved with the body just below (1-2 cm) the surface. Short thrusts (10-15 mm) of the head broke the surface, such that the eyes and maxilla were exposed. Distensions of the pharyngeal region were clearly visible from a distance of less than 2 m. A small volume (est. 0.5 ml) of water was occasionally noted to be ejected through the nares. One animal was observed to make 19 feeding movements in one min, and another was noted to make 79 movements in five min. A small bubble (ca. 6-8 mm dia.) was left at the surface after each movement. This behavior persisted for the duration of the period of observation (ca. 30 min), and was confined to an area of 3 m^2 near the observation blind free of emergent vegetation (*Scirpus* sp.).

Stomach flushings (Legler 1977. Herpetologica 33: 281-284) of these individuals produced up to 2 cc (containing several hundred

individuals) of *Daphnia* sp. Feeding on this temporarily abundant resource appeared to be preferential, as the turtles noted contained only these prey items. Additional samples from other animals taken concurrently produced typical prey (Chironomid and Odonatan larvae).

Submitted by **DAN C. HOLLAND,** Department of Biology, California State University-Fresno, Fresno, California 93740, U.S.A. (Current Address: Department of Biology, University of Louisiana, Lafayette, Louisiana 70504, U.S.A.) ●

PSEUDEMYS SCRIPTA ELEGANS (Red-eared Slider) **BEHAVIOR.** Kramer (1984. Herp. Review 15(4):113-114.) reported an instance of unusual behavior in *Pseudemys nelsoni*. The present article reports on similar behavior in a captive colony of *Pseudemys scripta elegans* at the Sedgwick County Zoo (SCZ), Wichita, Kansas.

The colony consists of 15 females and five male adult specimens of this taxon and all have been in the SCZ collection for at least two years. They are maintained in a large display unit which is partially aquatic, partially terrestrial. The animals are housed with *Chrysemys picta belli, Pseudemys floridana hoyi, Trionyx spiniferus hartwegi,* and *Chelydra serpentina*. The *P. s. elegans* rarely if ever interact with their cagemates.

Of the group of red-eared sliders, two males are dominant over all others and are the primary courters and only successful breeders. In the spring (March—mid-May) of 1985, these two individuals were observed to display behavior similar to that described for *P. nelsoni*. They were seen to approach subordinate females and align themselves anterior to and facing these females. The males assumed a "fighting bull" posture typical of courting *P. s. elegans:* head withdrawn, hindquarters raised, scraping the substrate with alternate forelimbs. Approached females were quiet. They withdrew their limbs but constantly faced the attending males. Occasionally, these approached females would extend their heads and necks as if to investigate an attending male. At this moment, the male would immediately bite and hold firmly onto the nape of the female's neck. The bitten female would then swim off frantically and attempt to dislodge the male. After 3-7 minutes, the female would become quiescent and sink to the bottom of the exhibit.

Both animals remained quiet for several minutes whereupon the male began violently ramming his shell into the female's carapace by extending and retracting his neck while retaining his bite hold. This ramming was repeated 7-15 times over 3-5 seconds. The pair typically would then remain quiet for several minutes before another ramming bout began. Anywhere between 5-10 ramming bouts were observed in any given session.

These ramming bouts were distinctly audible and could be felt through the concrete floor outside the exhibit. Normally, after 15-20 minutes, the female would make another effort to dislodge the male, usually successfully. If the effort to dislodge the male was unsuccessful, further, less intense ramming bouts occurred until the female dislodged the male. Males have not been observed to release their holds voluntarily.

Interestingly, this behavior is directed only at subordinate females. The dominant male *P. s. elegans* do interact aggressively with subordinate males but this behavior consists only of chasing and biting shell margins. Non-subordinate females react to aggressive males by returning bites and swimming away. Of the 15 females in the group, seven bear nape scars, evidence of past biting/ramming bouts. Non-subordinate females have no scars.

It is unknown whether this behavior is an artifact of captivity, possibly due to overcrowded conditions. Kramer's and Jackson and Davis' (1972. Herpetologica 28:58-64) observations suggest that this behavior is natural and possibly widespread in *Pseudemys*. My observations also suggest that the behavior is not related to courtship but rather is part of establishing a social hierarchy, at least in captivity.

Submitted by **ERIC M. RUNDQUIST,** Department of Herpetology, Sedgwick County Zoo, Wichita, Kansas 67213, U.S.A.●

PSEUDEMYS SCRIPTA ELEGANS (Red-eared Slider) **DEFORMITY.** An adult female *Pseudemys scripta elegans* was collected by a motorist on a road in or near Houston, Harris Co., TX, during the third week of June 1983 and was brought to the Houston Zoological Gardens on 21 June 1983. The central portion of both the carapace and plastron were constricted transversely at mid-body, giving the shell a figure-eight like appearance (Figure 1). A nylon band measuring 6.2 mm wide and 265 mm in circumference was removed from the area of constriction and was apparently the cause of this gross deformity. The band probably became lodged at mid-body when the turtle was a juvenile, preventing the growth of the central portion of the shell. Considering the central location and the non-elastic properties of the band, it is likely that it had been placed around the turtle deliberately. This man-made deformity (either accidental or on purpose) is notable because of its severity and minimal effect on the general health of the turtle.



Shell measurements of this specimen are: Carapace L = 235 mm, plastron L = 215 mm, height anteriorly = 97 mm, height posteriorly = 97 mm, width anteriorly = 170 mm, width posteriorly = 164 mm, constriction height = 70 mm, constriction width = 95 mm. Width and height measurements were taken at the location of their maximum values.

I thank Paul S. Freed for the photo used in Figure one.

Submitted by **R. ANDREW ODUM,** Department of Herpetology, Houston Zoological Gardens, 1513 Outerbelt Drive, Houston, Texas 77054, U.S.A. ●

ANOTHER REASON FOR HERPETOLOGISTS TO PICK UP THEIR BEER CANS. An adult *Nerodia sipedon*, found along the Flint River, Macon Co., Georgia. The snake appears to have been searching for small fish (known to enter such containers) and when it tried to pull its head out of the can it became helplessly trapped by the inner part of the top and drowned in ca. 1 m of water. (Submitted by Bob Herrington, Department of Zoology, Washington State University, Pullman, Washington). ●



GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION

AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.



ANURA

BUFO AMERICANUS COPEI (Hudson Bay Toad). CANADA: QUEBEC PROVINCE: Roberval CO: Réserve Faunique Ashuapmushan, 129 km mark on route 167, Elev. 380 m, (49° 15'N, 73° 46'W). 3 August 1984. N. Denman and L. Denman. Verified by F. R. Cook. National Museums of Canada, National Museum of Natural Sciences, Ottawa (NMC 26193). Fills a 400 km gap between the records in the Laurentides Park and Lake Mistassini (Bleakney. 1958 NMC Bull. 155).

Submitted by **NORRIS S. DENMAN** and **LUISE DENMAN,** 350 William Birks St., St. Bruno, Quebec. Canada, J3V 1P2. ●

GASTROPHRYNE CAROLINENSIS (Eastern Narrowmouth Toad). BAHAMAS: NEW PROVIDENCE ISLAND: Cable Beach, south side of West Bay St., 8 km west of Nassau at site of old horse track. 12 May 1985. B. I. Crother and C. H. Crother. Verified by J. M. Savage. University of Miami (USC 6551). First record on New Providence Island. Only prior record for the Bahamas is Grand Bahama Island (Schwartz and Thomas 1975. A Check-list of West Indian Amphibians and Reptiles. Carn. Mus. Nat. Hist. Special Publ. No. 1. 216 p.).

Submitted by **BRIAN I. CROTHER,** Department of Biology, University of Miami, P.O. Box 249118, Coral Gables, Florida 33124, U.S.A. ●

GASTROPHRYNE OLIVACEA (Great Plains Narrowmouth Toad). USA: TEXAS: Somervell Co: 12.4 km NE Glen Rose off US 67 on County Rd. 406. 26 May 1985. C. T. McAllister. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 4644). New county record, completely filling a distributional gap between Johnson (Carl 1980. Herp. Review 11:116-117), Bosque, Erath and Hood Counties (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **CHRIS T. McALLISTER,** Renal-Metabolic Lab (151-G), Veterans Ad-

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ministration Medical Center, Dallas, Texas 75216 and **STEPHEN P. TABOR,** 224 S. W. Thomas Street, Burleson, Texas 76028, U.S.A. ●

HYLA CRUCIFER CRUCIFER (Northern Spring Peeper). CANADA: QUEBEC PROVINCE: Chambly Co: Mont St. Bruno, Elev. 100 m, (45° 33' N, 73° 19'W). 4 April 1981. L. Denman. Verified by F. R. Cook. National Museums of Canada, National Museum of Natural Sciences, Ottawa (NMC 22462). Extends range 60 km N on the south side of the St. Lawrence R. (Bleakney 1958. NMC Bull. 155).

Submitted by **NORRIS S. DENMAN** and **LUISE DENMAN,** 350 William Birks, St. Bruno, Quebec, Canada, J3V 1P2. ●

PSEUDACRIS STRECKERI STRECKERI (Strecker's Chorus Frog). USA: ARKANSAS: Pope Co: Holla Bend National Wildlife Refuge, NW ¼ NE ¼ NE ¼ S25T6N R20. 2 March 1985. Glyn Turnipseed, Bill Shepherd, Michael Schiffl, Mel White, and Wendy Margolis. Verified by Glyn Turnipseed. Carnegie Museum of Natural History (CM 112036). First record for Pope County and a significant eastward range extension. Nearest locality is ca. 80 kilometers WNW to Franklin County. (Smith 1966. Cat. Amer. Aphib. Rept. 27.1-27.2).

Submitted by **GLYN TURNIPSEED,** Department of Biology, Arkansas Tech University, Russellville, Arkansas 72801 and **BILL SHEPHERD,** Arkansas Natural Heritage Commission, Little Rock, Arkansas 72801, U.S.A. ●

RANA SYLVATICA (Wood Frog). USA: ARKANSAS: Marion Co: Rush Creek near Rush, 16.1 km SE of Yellville (T17N R15W S10). 27-28 June 1984. R. Tumlison and G. R. Cline. Oklahoma State University (OKSU A6271). New county record and northernmost Arkansas record. Extends range 69 km NE of Newton County (Plummer and Godwin 1979. SSAR Herp. Review 10(1):23.) and 35 km NW of the Independence County (Schuier, Dickson and Harvey 1972. Proc. Arkansas Acad. Sci. 26:61-66.), and partially fills the gap between previous Arkansas localities and Stone County, Missouri (Johnson 1977. The Amphibians of Missouri. Univ. Kansas Mus. Nat. Hist., Publ. Ed. Ser. No. 6, ix + 134p.).

Submitted by **GEORGE R. CLINE** and **RENN TUMLISON,** Museum of Natural History and Department of Zoology, Oklahoma State Univeristy, Stillwater, Oklahoma 74078, U.S.A. ●

CAUDATA

AMBYSTOMA MACULATUM (Spotted Salamander) CANADA: QUEBEC PROVINCE: Chambly Co: Mont St. Bruno, Elev. 100 m, (45° 33'N, 73° 19'W). 4 April 1984. L. Denman. Verified by F. R. Cook. National Museums of Canada, National Museum of Natural Sciences, Ottawa (NMC 22461). Extends the range 60 km N on the south side of the St. Lawrence R. (Bleakney 1958. NMC Bull. 155).

Submitted by **NORRIS S. DENMAN** and **LUISE DENMAN,** 350 William Birks, St. Bruno, Quebec, Canada, J3V 1P2. ●

ENSATINA ESCHSCHOLTZII OREGONENSIS (Oregon Ensatina). USA: WASHINGTON: Clallam Co: Ozette Island, 1.2 km SW of Cape Alava, T31N R16W Sec. 27. 17 July 1982. K. B. Aubry. Verified by K. B. Aubry. University of Washington Burke Museum, Seattle (UWBM 86-87). First record from Ozette Island. This species has been reported from only one island off the Washington coast: Tatoosh Island in Clallam Co. (Slater 1955. Occ. Pap. Dept. Biol., Coll. Puget Sound, Tacoma 16:122-154).

Ozette Island lies 1.2 km from the mainland and is 10 ha in extent with a maximum elevation of 61 m. There are no permanent sources of fresh water. The island supports a dense forest of sitka spruce *(Picea sitchensis)* with an understory consisting almost entirely of sword fern *(Polystichum munitum).* Extensive areas on exposed, windward slopes are covered with salal *(Gaultheria shallon).* Small patches of grassland and of coastal mugwort *(Artemesia suksdorfii)* also occur.

We thank Pamela F. Yorks for identifying plant specimens.

Submitted by **KEITH B. AUBRY,** College of Forest Resources, AR-10, and Burke Museum, DB-10, University of Washington, Seattle, Washington 98195 and **STEPHEN D. WEST,** College of Forest Resources, AR-10, University of Washington, Seattle, Washington 98195, U.S.A. ●

PLETHODON VEHICULUM (Western Redback Salamander). USA: WASHINGTON: Clallam Co: Ozette Island, 1.2 km SW of Cape Alava, T31N R16W Sec. 27. 17 and 19 July 1982. K. B. Aubry. Verified by K. B. Aubry. University of Washington Burke Museum, Seattle (UWBM 88-90). First record from Ozette Island. This species has been reported from two islands off the Washington coast: Tatoosh Island in Clallam Co. and Destruction Island in Jefferson Co. (Slater 1955. Occ. Pap. Dept. Biol., Coll. Puget Sound, Tacoma 16:122-154). See Aubry and West. 1985. SSAR Herp. Review 16(4): for island description.

Submitted by **KEITH B. AUBRY,** College of Forest Resources, AR-10, and Burke Museum, DB-10, University of Washington, Seattle, Washington 98195 and **STEPHEN D. WEST,** College of Forest Resources, AR-10, University of Washington, Seattle, Washington 98195, U.S.A. ●

SAURIA

ANOLIS SAGREI (Brown anole). USA: FLORIDA: Monroe Co: Loggerhead Key, Dry Tortugas. 26 December 1984. T. M. Steiner. Verified by P. Meylan. Florida State Museum (UF57175). First record on this island. Ten individuals were seen. A population was reported on Garden Key, Dry Tortugas by Winegarner et al. (1984. SSAR Herp. Review 15:77-78). The specimen was collected under permit from the National Park Service.

Submitted by **TODD M. STEINER,** Department of Biology, Florida International University, Tamiami Trail, Miami, Florida 33199, and **LYNETTE T. McLAMB,** University of Miami Medical School, Miami, Florida 33101, U.S.A. ●

EUMECES ANTHRACINUS PLUVIALIS (Southern Coal Skink). USA: ARKANSAS: Marion Co: 4.8 km SE Oakland. 16 June 1985. S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 4603-4605). Jackson Co: Swifton. 23 April 1963. J. and C. D. Bullard. (ASUMZ 1183); Randolph Co: 9.0 km E Warm Springs. 7 April 1985. P. Brown. (ASUMZ 4325-4326); Sharp Co: Hardy. 1 April 1977. L. J. Booth. (ASUMZ 3560); Van Buren Co: 6.4 km NE Scotland. 18 August 1979. G. L. Harp. (ASUMZ 3746); Craighead Co: 11.2 km S Jonesboro. 20 February 1973. L. Clifford. (ASUMZ 1857). All verified by S. E. Trauth. New county records (Dellinger and Black 1938. Occ. Pap. Univ. Arkansas Mus. 1:1-47; Dowling 1957. Occ. Pap. Univ. Arkansas Mus. 3:1-51). Craighead County specimen represents the first record from Crowley's Ridge (an alluvial ridge) and extends known range into the deltaic region of eastern Arkansas (Conant 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston).

Submitted by **STANLEY E. TRAUTH,** Department of Biological Sciences, Arkansas State University, State University, Arkansas 72467, U.S.A. ●

SERPENTES

DIADOPHIS PUNCTATUS ACRICUS (Key Ringneck Snake). USA: FLORIDA: Monroe Co: Little Torch Key. 15 February 1978 - mid-July 1984. James Hardiman. Museum of Comparative Zoology (MCZ 156556, 156989, 158989, and 169211). Middle Torch Key. 28 January 1980. Peter Warny. (MCZ 158990). Verified by James Lazell. First records off Big Pine Key (Ashton and Ashton 1981. Handbook of Reptiles and Amphibians of Florida. Part One. The Snakes. Windward Publ., Inc., Miami. 1-176) and first definite records for tropical hardwood hammocks (Ruttenber and Weiner 1978. Florida Keys hardwood hammock atlas. Florida Keys Land Trust, Key West).

Submitted by **JAMES D. LAZELL, JR.,** The Conservation Agency, 6 Swinburne St., Jamestown, Rhode Island 02835, U.S.A. ●

HYPSIGLENA TORQUATA JANI (Texas Night Snake). USA: TEXAS: Somervell Co: 12.4 km NE Glen Rose off US 67 on County Rd. 406. 26 May 1985. C. T. McAllister. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 4643). New county record, extending the range north

from Bosque County (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2), near the eastern limit of the species' range (Conant 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton Mifflin Co., Boston).

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical center, Dallas, Texas 75216 and **STEPHEN P. TABOR,** 224 S.W. Thomas Street, Burleson, Texas 76028, U.S.A. ●

NERODIA RHOMBIFERA (Diamondback Water Snake). USA: TEXAS: Collin Co: Farm Road 1377, 2.7 km S of Farm Road 75. 24 May 1985. R. Ward. Verified by R. Ward. North Texas State University Herpetological Collection (NTSUHC R-635). First record for county, helps fill distributional hiatus in the upper drainage of the Elm Fork, Trinity River (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. 2).

Submitted by **ROCKY WARD,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203, U.S.A. ●

NERODIA TAXISPILOTA (Brown Water Snake). USA: GEORGIA: Habersham Co: Lake Demorest, 1.0 km E of US 441, Demorest, 420m. 15 March 1984. C. D. Camp and M. K. Tanner. Verified by C. D. Camp. University of Georgia Museum of Natural History (UGAMNH 19313). Ca. 80 km north of previously recorded locality (Camp and Howland 1983. SSAR Herp. Review 14(1):28) and highest elevation recorded for species.

Submitted by **CARLOS D. CAMP,** Biology Department, Piedmont College, Demorest, Georgia 30535, U.S.A. ●

SISTRURUS MILIARIUS STRECKERI (Western Pigmy Rattlesnake). USA: TEXAS: Sabine Co: 4.8 km N Milam at Stephen F. Austin State University Forestry Field Camp. 9 June 1979. S. P. Tabor. Verified by J. F. Scudday. Sul Ross State University (SRSU 5616). New county record; fills hiatus between Jasper, Newton (Raun and Gehlbach 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2) and San Augustine counties (Rakowitz et al. 1983. Herp. Review 14:85-89).

Submitted by **STEPHEN P. TABOR,** 224 S.W. Thomas Street, Burleson, Texas 76028, U.S.A. ●

THAMNOPHIS ORDINOIDES (Northwestern Garter Snake). USA: WASHINGTON: Clallam Co: Ozette Island, 1.2 km SW of Cape Alava, T31N R16W Sec. 27. 18 July 1982. K. B. Aubry. Verified by K. B. Aubry. University of Washington Burke Museum, Seattle (UWBM 91). First record from Ozette Island. This species occurs on many islands in Puget Sound (Slater 1963. Occ. Pap. Dept. Biol., Coll. Puget Sound, Tacoma 24:212-233), but has not previously been reported from islands off the Washington coast. See Aubry and West 1985. SSAR Herp. Review 16(4): 115 for island description.

Submitted by **KEITH B. AUBRY,** College of Forest Resources, AR-10, and Burke Museum, DB-10, University of Washington, Seattle, Washington 98195 and **STEPHEN D. WEST,** College of Forest Resources, AR-10, University of Washington, Seattle, Washington 98195, U.S.A. ●

TESTUDINES

CLEMMYS MARMORATA MARMORATA (Northwestern Pond Turtle). USA: CALIFORNIA: Modoc Co: Ash Creek, 2 km W Adin. 18 August 1985. L. Sinclair and J. Buskirk. Verified by Harry W. Greene. Eight individuals (juveniles and adults) were seen, photographs deposited in Museum of Vertebrate Zoology, Univ. of California, Berkeley. First record for Modoc County and easternmost record for California east of the Sierra-Cascade crest (Bury 1970. Cat. Amer. Amphib. Rept. 100.1-100.3). Extends range 100 km SE Lower Klamath Lake (California Academy of Sciences) and ca. 50 km ENE Fall River Mills (Los Angeles County Museum of Natural History).

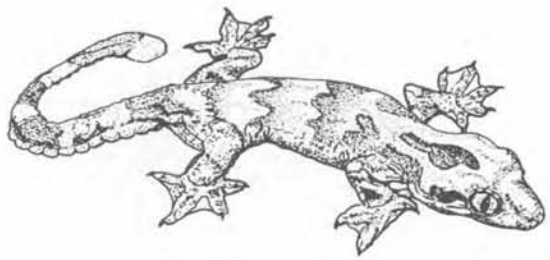
Submitted by **JAMES R. BUSKIRK,** 4108 Howe Street, Oakland, California 94611, U.S.A. ●

EMYDOIDEA BLANDINGII (Blanding's Turtle). USA: WISCONSIN: Oconto Co: Pipeline Road, several hundred m south of Logan Road (T30N, R18E, Sec. 18). 2 March 1985. J. R. Hodgson and P. A. Cochran. University of Wisconsin-Madison Zoology Museum (UWZM H-22626). First record for Oconto County (Vogt 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum, Milwaukee. 205 pp.); the only other record listed by Vogt from northeastern Wisconsin is from adjacent Marinette County.

Submitted by **PHILIP A. COCHRAN** and **JAMES R. HODGSON,** Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115, U.S.A. ●

CORRIGENDUM

TESTUDINES. Clemmys muhlenbergii (1985. Herp. Review 16(1):32). The first sentence of the second paragraph should be changed to read: "We consider this the first adequately documented record of a population of this species in Massachusetts." *Ed.* ●



BOOK REVIEWS

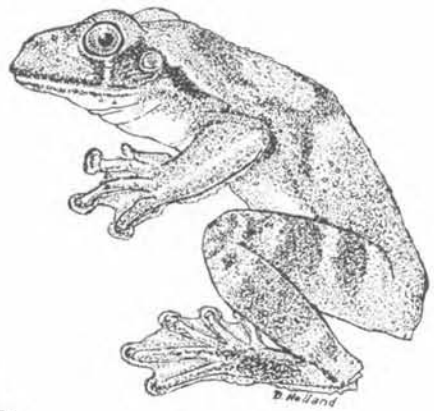
Guide to the Amphibians and Reptiles of Fresh Water Italy (Guide per il Riconoscimento delle Specie Animali delle Acque Interne Italiane, No. 27. Anfibi, Rettili), by Benedetto Lanza. 1983. Consiglio Nazionale delle Ricerche (Ufficio Pubblicazioni), Piazalle Aldo Moro, Roma, Italy. 1-196, 72 figs. Price 9,000 Lire (about U.S. $5.00).

This is one in a series of publications about the freshwater fauna of Italy. This attractive volume is printed on high quality glossy paper trimmed to 14 X 21.5 cm and has a soft cloth binding. Although treating all of the nine species of salamanders and 19 species of anurans in Italy, only the truly aquatic or aquatic-margin reptiles are included—one turtle *(Emys orbicularis)* and three species of *Natrix*.

Seventeen pages are devoted to a general account of the structure of amphibians, and six pages are devoted to the same material on reptiles. Detailed, well-illustrated keys to the eggs, larvae, and adults of amphibians occupy 35 pages, whereas the key to the four species of reptiles is contained on one page. The remainder of the book is devoted to accounts of each of the species, with abbreviated accounts of the subspecies.

The book is extremely well illustrated with drawings of all of the species, including eggs and larvae of the amphibians, as well as skeletons of some of the taxa. This little book will be highly useful to anyone attempting to identify amphibians from Italy. Furthermore, it provides moderately detailed accounts of the structure of each of the species and illustrations of variation in color patterns.

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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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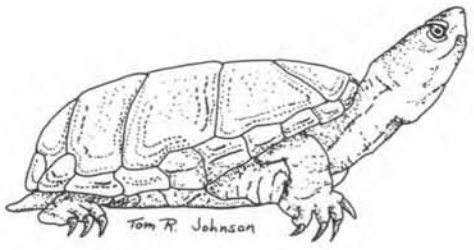
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Herpetological Review

Volume 16 **September 1985** **Number 3**

SSAR BUSINESS

1986 ANNUAL MEETING

The 1986 annual meeting will take place at Southwest Missouri State University, Springfield, Missouri, 10-15 August.

SSAR members are reminded that this meeting will include the ever-popular Annual Auction of herpetologically related books and other items. It is not too early to start collecting your collectibles, forwarding them (or a statement of your intention to bring them) to meeting co-chairman:

Robert Wilkinson
Life Sciences Department
Southwest Missouri State University
Springfield, Missouri 65802, U.S.A.

David Dennis and Kraig Adler, co-producers of the "Herpetologists Then and Now" slide presentation given at past SSAR meetings, request that society members send them duplicate slides of memorable (or forgettable) herpetological happenings — and their participants — for inclusion in future presentations. Anonymity of donors is guaranteed. Slides should be mailed to:

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SPONSORSHIP OF NON-U.S. MEMBERS

SSAR is expanding its sponsorship of non-U.S. members by requesting contributions to a fund established to defray the membership dues of herpetologists in countries that face difficulties with exchange of foreign currency. We encourage your participation in this program. Please contact our Treasurer, Dr. Henri C. Seibert, if you can assist in the identification of colleagues who can benefit from this program. All contributions are tax deductible. ●

ZOO LIAISON COMMITTEE REPORT

The SSAR Zoo Liaison Committee has established a liaison with the Species Survival Plan (SSP) group of the American Association of Zoological Parks and Aquariums (AAZPA). The intent of this is to inform the SSAR membership of the conservation-oriented activities of zoo-based members, and to perhaps involve other SSAR members in the SSP programs. AAZPA Conservation Coordinator Thomas J. Foose provides this summary of SSP herp activities to date:

The AAZPA Species Survival Plan is an attempt to develop more scientific and coordinated programs to propagate endangered and unique taxa in captivity. It should be emphasized that the primary objective of such captive propagation is to reinforce, not replace, natural populations by assisting in the preservation of species gene pools.

Gene pool preservation requires that captive collections be managed as biological populations, hence the need for collective and coordinated activity. Moreover, the limited capacity of captive facilities and resources in relation to the number of taxa in need of help (potentially thousands) and the size of the populations necessary for long-term viability (at least hundreds of individuals) require that allocation of the captive habitat also occur in a collective and coordinated way. Thus the SSP attempts to confront two major problems:

(1) designation of the taxa for the program;
(2) management of the designated taxa as biological populations to preserve gene pools.

To date, one amphibian taxon (the Puerto Rican crested toad, *Bufo lemur*) and three reptile taxa (Chinese alligator, *Alligator sinensis;* Dumeril's ground boa, *Acrantophis Dumerili;* Aruba Island rattlesnake, *Crotalus unicolor*) have been designated for the SSP. Many more are anticipated, but the early strategy has been to develop programs that can serve as models. Once they are organized and operating well, the SSP can be extended to many more taxa. Indeed what is needed in the near future is a comprehensive and systematic analysis of all the major herp radiations (e.g. turtles, crocodilians) to assign priorities for the captive habitat available. Bill Zeigler of Metrozoo-Miami has already initiated this process for crocodilians. Even further, Hugh Quinn of the Houston Zoo has commenced formulation of a masterlist of herps for SSP treatment.

Each SSP program is organized around a leader known as the Species Coordinator. Since population analysis and management necessitates good records, each program also needs a Studbook Keeper, who often is the same person as the Species Coordinator. Species Coordinators and Studbook Keepers appointed so far for SSP taxa are:

Taxon	Species Coordinator	Studbook Keeper
Bufo lemur	Rick Paine, Buffalo Zoo	
Alligator sinensis	John Behler, New York Zoo. Soc.	
Acrantophis dumerili	John McLain, Houston Zoo	Rick Hudson, Ft. Worth Zoo
Crotalus unicolor	Andrew Odum, Houston Zoo	Karl Peterson, Houston Zoo

Assisting the Species Coordinator and Studbook Keeper is a Propagation Group of 9 persons elected from and by all the participating institutions in a program. Institutions document their involvement in a program by signing a Memorandum of Participation.

The core of an SSP Program is the Masterplan that provides recommendations for genetic and demographic management, i.e., mate selection, breeding schedules, animal relocations, and culling programs. The objective is to provide a genetically diverse and demographically stable population. Masterplans have already been formulated for the toad and the rattlesnake.

Since support of natural populations is the ultimate goal of SSP programs, reintroduction projects are of particular interest and importance. The Puerto Rican crested toad program has already reintroduced captive hatched toads into the natural range.

More details about each SSP program can be obtained from the Species Coordinators, Studbook Keepers, Hugh Quinn, and Bill Zeigler. The Aruba Island rattlesnake program is also publishing a newsletter which is available from Andrew Odum.

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CAREERS IN HERPETOLOGY

The Society has recently published "Herpetology as a Career," which describes opportunities and academic preparation for a career in herpetology. The brochure is intended for students, counselors and others who have a strong interest in amphibians and reptiles.

Single copies are available free from the Publications Secretary; additional copies may be purchased for 25¢ each. SSAR members are encouraged to provide a copy of this brochure to those individuals in their communities who are frequently asked about such matters. ●

SSAR GRANTS-IN-HERPETOLOGY

The Society for the Study of Amphibians and Reptiles is pleased to announce that proposals are now being accepted for the 1986 Grants-in-Herpetology Program. This Program is designed to provide financial support to deserving individuals or organizations engaged in research on or conservation of amphibians and reptiles. All applicants (or their advisor or sponsor) must be a member of SSAR. Grant proposals will be considered in the following areas.

1. GRADUATE STUDENT HERPETOLOGICAL RESEARCH. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only, with a letter of support from the student's major advisor or committee chairperson.
2. HERPETOLOGY-ORIENTED CONSERVATION. Proposals should address research on endangered or threatened species at the state, national or international levels, or address research on critical herpetological habitats. Proposals may be received from individuals only.
3. REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS. Proposals may address any herpetological research endeavor or project, provided said endeavor or project concerns herpetology within the implied geographic limits of the regional society. Proposals may be submitted by regional herpetological societies or by individual members of the society. If the latter, a sponsoring letter from the current societal president or an advisor should accompany the proposal.
4. HERPETOLOGICAL RESEARCH IN ZOOS. Proposals may address any herpetological research endeavor which is conducted at a zoo. A letter from the represented zoo or supporting institution should accompany the proposal.
5. FIELD WORK (Auto mileage). Proposals may address any area of herpetological research and may be submitted by any member of SSAR. Funding will only be granted for expenses associated with auto travel for collecting (or observing) study animals.

Each proposal must include the following information: A) *Abstract,* B) *Background & Objectives* of the proposed project, in terms of its relevance to herpetology, C) *Methods* of carrying out the research or conducting the project, D) *Budget* for the project, which should not exceed $430 in each category, and E) *Curriculum Vitae* and *Letter of Support* (if applicable). The proposal must be typed double spaced and must *not* exceed five pages, excluding cover page, abstract, budget, curriculum vitae, and bibliography.

Successful applicants will be expected to submit to SSAR a written report of their research or project within a reasonable time after the project year is completed. They are also encouraged to submit for publication the results of their research or project, preferably to *The Journal of Herpetology* or *Herpetological Review.*

Individuals submitting proposals must designate to which of the five areas their proposals applies. All proposals must be typewritten, submitted in duplicate, and postmarked no later than **31 JANUARY 1986.** Failure to meet the deadline or follow the guidelines may result in rejection of the proposal. The awards will be announced by 15 March 1986. Submit proposals to:

Thomas H. Fritts
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University of New Mexico
Albuquerque, New Mexico 87131, U.S.A.

If you are employed by an organization which will match donations made to non-profit educational organizations, please notify your employer that you have made a donation to the Grants-in-Herpetology program. ●

ABSTRACTS OF 1985 GRANTS-IN-HERPETOLOGY WINNERS

The SSAR Grants-In-Herpetology Committee receives, evaluates and prioritizes grant proposals from members in good standing in the SSAR. The Committee awards small grants (up to roughly $450) to the best proposal in five categories. In order to stimulate additional interest in these grants, we are publishing the abstracts of the winning proposals for 1985.

CONSERVATION RESEARCH

Lee A. Fitzgerald, Department of Biology, Museum of Southwestern Biology. "Reproductive Biology and Demography of *Caiman yacare* and *Caiman latirostris* in Paraguay."

Two endangered species of caimans occur in Paraguay: *Caiman latirostris* and *Caiman yacare.* Many local populations of both species have been exterminated by hide hunters without regard to either the species or the hide industry that is based on their harvest. I propose an eight month study that will quantify parameters of breeding biology and demography of both species in National Park Tinfunque in the Paraguayan Chaco. This research will help answer questions relevant to herpetology and conservation such as: Which environmental factors influence *Caiman* breeding cycles? How do the two species use the habitats available to them? What are the differences and similarities in the reproductive biology and population dynamics between the two species? Which factors limit reproductive success? What steps should be taken to promote the recovery of these species? The ultimate goal of this study is to provide scientifically defensible recommendations for conservation efforts for caiman in Paraguay. The completion of demographic and reproductive studies and the training of Paraguayan biologists and technicians are our immediate goals. These goals will be accomplished by quantifying breeding and demographic parameters such as clutch size, principal sources of mortality, reproductive success, and population size and age structure. The results of the study will be used to formulate recommendations for a management plan for caimans in Paraguay. The study will be conducted in collaboration with the Paraguayan National Forest Service, National Biological Inventory Project. Counterpart training will be conducted in all aspects of the study.

GRADUATE STUDENT RESEARCH

1. Frances J. Irish, Harvard University. "The Evolution of Tooth Replacement Patterns in Snakes: Mechanisms and Implications."

The primitive pattern of tooth replacement in squamate reptiles is approximately alternate - every other tooth is firmly attached to the jaw (ankylosed) while the intervening visible teeth are loose. Colubrid snakes exhibit a number of derived replacement patterns; in the most extreme case, all teeth are shed and replaced simultaneously. Examination of preserved specimens of 194 colubrid genera has generated the following hypotheses:

a. Observed deviations from the primitive alternate replacement pattern are produced by heterochrony (changes in the relative timing of replacement events).

b. Simultaneous replacement has evolved separately in three of the currently recognized colubrid subfamilies; in all of these species, active tooth replacement occurs only during epidermal sloughing. This suggests that tooth replacement is coupled to the epidermal sloughing cycle in all snakes.

c. Simultaneous replacement is correlated with a diet restricted to earthworms and/or molluscs.

The first two hypotheses cannot be critically tested without the development of a marking technique which allows individual tooth generations to be followed through time. I propose to develop such a technique using fluorescent dyes (tetracycline and alizarin in red S, which have been used successfully to label calcified tissues in vivo in mammals), and apply it in a year-long study of the tooth replacement and epidermal sloughing cycles of juvenile *Thamnophis sirtalis* (a locally common species with alternate tooth replacement).

2. George R. Cline, Oklahoma State University. "Gene Flow Between Two Forms of the Gray Treefrog, *Hyla chrysoscelis* in Geographic Areas of Contact."

Hyla chrysoscelis and *Hyla versicolor* are members of a cryptic diploid-tetraploid species pair in North America. The two species are distinguished by karyology and by subtle differences in their calls. Two forms of the diploid, *H. chrysoscelis* are recognized: western populations have shorter calls and are fixed for a slow electromorph of lactate dehydrogenase (LDH), while eastern populations have longer calls and are fixed for a fast electromorph of LDG. Clinical variations might explain the observed differences between the two forms, but previous studies have been hampered by separation of the diploid range by the tetraploid. I will sample *H. Chrysoscelis* in Oklahoma, Kansas, Missouri, and Arkansas where the eastern and western forms are not separated by the tetraploid species and are thus potentially free to hybridize. Acoustics of the calls will be analyzed on a sound spectrograph. Ploidy levels will be verified by measurement of blood cell size. Thirteen morphological characters will be submitted to multivariate analysis. Tissue samples will be processed electrophoretically

to determine genetic composition of the populations. These three methods have never been simultaneously applied to members of this complex in areas of sympatry of the two diploid forms. Maintenance of genetic and acoustical identities would provide evidence supporting the hypothesis that two diploid species exist in this group. Pilot studies now underway verify differences between forms of *H. chrysoscelis* that have previously been reported in the literature and are helping narrow the search for the geographic zone of contact between the eastern and western forms.

REGIONAL SOCIETY RESEARCH

Harold F. De Lisle, The Southwestern Herpetologists Society. "The Present Status of the Herpetofauna of the Santa Monica Mountains."

This proposal is designed to study the reptile and amphibian species and populations in the Santa Monica Mountains, Los Angeles County, California, as compared to those of the 1950s and 1960s when extensive collecting was last done in this area by the Los Angeles Co. Museum of Natural History, the University of California, and several members of the Southwestern Herpetologists Society. An attempt will be made to determine the effects of urban development on the herpetofauna of this region for which major land use decisions are now being made by the U.S. Park Service, California State Division of Parks and Recreation, and several local and private agencies.

FIELD WORK

1. Douglas E. Ruby, Department of Biological Sciences, Drexel University. "Variation in Territorial Behavior in the Iguanid Lizard, *Sceloporus iarrovi.*"

Different behavioral "strategies" should be selected in populations which offer distinct sets of opportunities for acquiring resources (such as food and mates) (Dunbar 1982; Dominey 1984 and others). The factors that affect this behavioral flexibility are less well understood in amphibians and reptiles compared to other groups of vertebrates. I propose to investigate apparent non-territorial behavior in a dense population of the iguanid lizard *Sceloporus iarrovi* located on Mt. Graham in southeastern Arizona simultaneously with another high elevation population in comparison with published work on typical behavioral patterns. By simultaneously documenting time budgets, food levels and feeding rates, and male access to females of these two populations, differences in behavior can be related to variation in resource levels and spacing patterns. The data collected will permit testing of hypotheses about the value of territorial behavior for controlling resources (food, mates, basking sites, etc.) given different densities and levels of resource availability. This information will contribute toward elucidating the relationship between the social and mating structure of a population and the ecological conditions (density, feeding levels, demography, climatic conditions) bearing upon a population.

2. Chris T. McAllister, Renal-Metabolic Lab, Veterans Administration Medical Center. "The Role of Environmental Constancy on Oxygen Consumption and Thermal Sensitivity in Relict Populations of Hemidactyline Plethodontid Salamanders."

Cave and spring ecosystems are fragile and energy-limited natural resources. They are important components of the subterranean hydrology in many areas, especially those with limestone or dolomite formations. Caves and springs are inhabited by endemic biota which frequently are rare, endangered or otherwise threatened. The inherent fragility of these ecosystems renders them susceptible to human intrusions. Potentially harmful activities range from cave visitation and exploration to water pollution. Recent interest in utilizing underground water in residential and commercial heat-exchangers portends to be a thermal threat to aquatic biota which have evolved under thermal constancy (e.g., subterranean water has relatively constant temperature annually, lower than surface temperatures during the summer and higher in the winter). The proposed investigation examines thermal sensitivity, adaptations and physiological ecology of an obligate cave salamander *(Typhlomolge rathbuni)* and two spring salamanders *(Eurycea nana* and *E. neotenes).* The results will be compared with the extensive literature on metabolism and thermal acclimation of salamanders from variable thermal environments.

ZOO RESEARCH

Victoria A. Teubner, University of Toledo. "Endocrine and Behavioral Aspects of Reproduction in the Haitian Boa *(Epicrates striatus)."*

Many of the world's reptile species are classified either as threatened or endangered. Attempts to augment populations by captive breeding programs have been largely unsuccessful. Once many reptiles are removed from their natural habitats and placed in captivity, their reproductive rates decline drastically, primarily because of our failure to recognize and provide the proximate cues found within the natural environment which induce reproduction. These cues fall into the categories of external environmental factors (temperature, photoperiod, moisture, food quality) and social stimulation (reproductive behavior and presence or absence of other conspecifics). These two major factors in turn affect internal regulation systems (i.e., production and secretion of the reproductive hormones). In this study, males from a tropical snake species, the Haitian Boa *(Epicrates striatus)* will be maintained under optimal conditions during the first year in order to define the breeding season and to insure a population of breeding animals. The boas will then be subjected to a variety of experimental environments which will determine the importance of temperature, photoperiod, moisture, and the presence of females upon their reproductive cycle. Male reproductive status will be assessed by behavioral observation and monitoring of serum testosterone levels by radioimmunoassay. Testosterone will be characterized using high pressure liquid chromatography.

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NEW SUBSCRIPTION CATEGORY — *HERP REVIEW* ONLY

At SSAR's 1985 Annual Meeting, the Society approved the addition of a separate subscription to *Herpetological Review.* Recognizing that some members of the herpetological community may not find subscription to all of our publications equally useful, the SSAR Board established this category at a cost of $10 per year. Individuals selecting this option will not be members of the Society nor will they receive the Journal of Herpetology or other publications offered with membership. However, subscribers are encouraged to register for and attend our annual meetings and may join the Society as regular members at any time.

A subsciption form will appear in the next issue of *HR* and as part of the dues envelope which will be distributed in September. Please mention this new category to friends and colleagues whom you think will benefit from it.

HENRI SEIBERT,
SSAR Treasurer ●

LETTERS TO THE EDITOR

ICZN PETITIONS

Cyrtodactylus pelagicus; Correct Usage

EDITOR:

In a recent study of gecko relationships, Kluge (1983. Copeia 1983 (2):465-475) discovered that the Pacific naked-toed gecko *(Cyrtodactylus pelagicus)* and several other Indoaustralian species represented a unique lineage. He assigned this monophyletic lineage of species to a new genus *Nactus.* In the same article, he also stated that the holotype of *Gymnodactylus arnouxii* A. Duméril, 1851, and *Heteronota pelagica* Girard, 1857, were identical and, thus, *arnouxii* is the senior synonym.

Kluge proposed, incorrectly, that the commonly used name *pelagica* be replaced by the unused *arnouxii.* The International Code of Zoological Nomenclature (Article 23 in both the 1961 and 1985 editions) states that should the application of the Principle of Priority upset stability of use or cause confusion in use, existing use should be maintained and the case be referred to the Commission. Since Kluge ignored this nomenclatural dictum, I have applied to the Commission for the suppression of *arnouxii* and the placement of *pelagica* on the Official List of Specific Names.

I wish to notify zoologists working in the Pacific that *Nactus pelagicus* (or *Crytodactylus pelagicus*) is the correct name and should be used until the Commission rules otherwise.

LITERATURE CITED

Kluge, A. G. 1983. Cladistic relationships among gekkonid lizards. Copeia 1983(2): 465-475.

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Conservation of the Name *Anniella pulchra* for the California Legless Lizard

EDITOR:

Hunt (Copeia 1983:79-89) recently rearranged the nomenclature of the two species in the legless lizard genus *Anniella*. He placed *A. geronimensis* Shaw, 1940 in synonymy with *A. pulchra* Gray, 1852 and applied this name to the southernmost species. In doing so, *A. nigra* Fischer, 1885, replaced the name *pulchra* for the northernmost species, and the southern subspecies of *nigra* became nameless, which was redescribed as *A. n. argentea* Hunt, 1983. In proposing this rearrangement, Hunt overturned a nomenclature which had been stable for over 130 years.

If the name *pulchra* as it applies to northernmost species of *Anniella* was rather obscure, receiving little attention from research and popular writing, the changes would have been relatively inconsequential, or at least innocuous. However, we found over 200 usages of the name *pulchra* referring to the northernmost species, including many significant morphological contributions, and of equal importance, popular field guides and state check lists; and our list is doubtless incomplete. (Our literature list will be sent upon request to RWM.) Hunt's changes are particularly unfortunate because the nomenclature rearrangement was unnecessary, and thus unwarranted.

The origin of the problem stems from Gray [1852, Ann. Mag. Nat. Hist. (2)10:437-440] not designating a specific animal as the holotype of *pulchra* in his original description. Richardson [1854, Reptiles and Fish, Part 3 *In:* E. Forbes (ed.), Zoology of the Voyage of the H.M.S. Herald . . .] redescribed and figured "Gray's holotype." Boulenger [1885, Catalogue of the Lizards in the British Museum (Natural History)] reported that the single specimen donated by Gray in 1852 via Richardson to the British Museum (Natural History) was the holotype of *pulchra*. Hunt (1983) discovered that the supposed holotype of *pulchra* neither matched the description of Richardson (1854) nor could be identified as the specimen originally described by Gray (1852). Indeed, Hunt (1983:80) stated "in a strict sense the name *pulchra* may be a nomen dubium since it is not possible to verify absolutely the specimen or species on which Gray based his ('cursory') description . . . ." Nevertheless, Hunt "hypothesized" that Richardson described and figured the wrong specimen of two - a specimen belonging to a species other than that described by Gray. An agonizing question about the true identity of the holotype thus remains.

Because of the necessity of a hypothesis to account for the discrepancy in the identity of the holotype, Hunt's nomenclatural rearrangement is only an educated, yet conjectured, opinion, and as such is not binding; his nomenclature does not have to be followed. Nevertheless, because the name *pulchra* has been extensively applied in the literature to the northernmost species of *Anniella*, we believe it desirable to set aside the "holotype" referred to by Boulenger (1885) and designate in its place a neotype thereby stabilizing the nomenclature. Before preparing a petition to the International Commission of Zoological Nomenclature (ICZN) for use of plenary powers to accomplish this goal, we sought, and received, the opinions of 15 eminent herpetologists directly concerned with *Anniella* relative to our intentions; the response was overwhelming approval.

Not only is the nomenclatural rearrangement suggested by Hunt based upon an arbitrary decision from ambiguous data, but more importantly it violates the very heart of international nomenclatural regulation to which zoologists preponderantly subscribe as the only safeguard against chaotic anarchy. The objects of the International Code of Zoological Nomenclature include, most importantly, promotion of nomenclatural stability (1985 edition, p. 3). Stability is achieved most commonly by application of the law of priority, but it is expected that when such application threatens instead of promotes stability, the case should be appealed to the International Commission of Zoological Nomenclature. The Commission is empowered to suspend application of any part of the Code in order to preserve stability (Art. 79), and it is the obligation of any taxonomist to avail himself of the Commission's plenary powers in any significant threat to nomenclatural stability.

We, and obviously most of our canvassed colleagues, regard the proposed nomenclatural rearrangement in *Anniella* as a significant and unnecessary threat to nomenclatural stability, hence worthy of a petition, now submitted, for consideration of the case by the Commission. Article 80 of the Code requests that "existing usage" be maintained until a decision by the Commission is published. "Existing usage" is defined as "the most common usage," certainly in this case, that of the century, and more, prior to 1983.

This advance notice of our petition which has been submitted to the ICZN is provided at the suggestion of Dr. C. Gans (University of Michigan) in an attempt to minimize further confusion in the literature. We strongly urge authors and editors to observe the regulations of the Code, and not to follow Hunt's proposed nomenclature, at least until the outcome of our petition is known. Use of his names can only result in greater confusion than already anticipated, especially in literature indexing services. On the other hand, a delay in the use of Hunt's nomenclature will not add to confusion, especially if authors specify the use of *pulchra* sensu Richardson (1854).

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EDITOR:

An investigation of turtle breeding farms in Louisiana by Clifford Warwick, wildlife consultant to BBC's TV program, *Wildtrack*, as published in *BBC Wildlife*, September 1984, has been brought to the attention of The Humane Society of the United States.

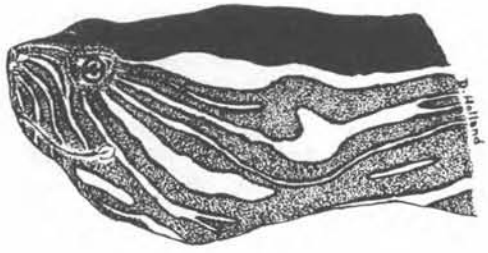
The article reveals that turtle farmers in the United States are exporting 4 to 5 million hatchlings annually for the pet trade and that the farmers may be taking up to 100,000 adult red-eared turtles (*Pseudemys scripta elegans*) from the wild each year to replace that part of their breeding stock which has died during the winter. It is stated that there are about 25 farms in Louisiana and another 25 in other southern states. The four farms visited in Louisiana averaged 27,000 breeding adults each in artificial ponds (about 13,000 to a pond). These four farms collected a total of 9,400 adults from the wild each year. The farmers admitted to a noticeable depletion of local stocks, and it was learned from the author, although not mentioned in the article, that some farmers are buying wild-caught adults from a dealer in Arkansas.

The article states that farmers are making efforts to get the existing domestic ban by the Food and Drug Administration on the sale of hatchlings lifted, which, if they are successful in so doing, would provide a market for an additional 10 to 15 million hatchlings, and would seem to necessitate the taking of three times as many adults from the wild and would possibly lead to the starting up of some 50 farms that closed after the ban was issued.

The Humane Society of the United States generally opposes the keeping of wild animal species by the general public and the trade in such species. In this particular case, the HSUS is concerned over the drain on wild turtle populations in addition to its concern over the health hazard to non-U.S. children and the fate of the turtles, the vast majority of which will die in the first six months due to improper care and abuse in homes. The HSUS would like to see the present export trade in turtle hatchlings stopped.

Feeling that the membership of the Society for the Study of Amphibians and Reptiles shares these concerns, we thought it advisable to make known to your organization the above information.

ROGER A. KINDLER
Associate General Counsel
The Humane Society of the United States
2100 L Street, N.W.
Washington, D.C. 20037, U.S.A.



NOMENCLATURE OF THE AUSTRALIAN HERPETOFAUNA: ANARCHY RULES O.K.

EDITOR:

At some stage in their careers most herpetologists encounter a situation in which a planned action is in some way constrained, following a last-minute examination of the Code for Zoological Nomenclature. Whether the experience induces a sense of awe, disagreement, disappointment, or plain frustration, is less significant than the fact that it involves conceding that the directives of the Code are highly influential, if not always respected.

In general, Australian herpetologists have acted more conservatively over the years (in a taxonomic sense) than the common view of their national image might lead one to anticipate. Whether this inclination simply is due to the lack of access to literary dynamite, or to an inherent reluctance to use such explosives is questionable. Certainly it can be argued that national deficiencies in library resources (particularly of significant 18th and 19th century publications), places Australian herpetologists at a huge disadvantage if they desire to participate in the most masterly of all taxonomic sports: The Discovery of Primary Homonyms.

In recent years the nomenclature of many Australian taxa has become unstable, reflecting the increased level of interest in systematics and, particularly, the rising number of contributors. Insofar as the Australian Amphibia are concerned, the current areas of disagreement are at four levels. Firstly the use of the family names Pelodryadidae and Myobatrachidae for the Hylidae and Leptodactylidae respectively; secondly the recognition of genera such as *Philoria, Metacrinia* and *Paracrinia* (perhaps a splitting or lumping issue); thirdly the use of particular species names such as *Litoria serrata* or *L. eucnemis* for the Australian population of this species and, fourthly the correct specific suffices for several species of *Cyclorana.*

One would anticipate that the current state of flux is a transient situation, and that a stable nomenclature will emerge shortly. But this expectation is unlikely because an entirely new dimension has been added in the form of contributions by Wells and Wellington (1984, 1985) in a journal that they apparently control: "The Australian Journal of Herpetology."

The first attempt to compile a list of the entire herpetofauna of Australia was that of Cogger, Cameron and Cogger (1983). Within just a few months of its publication Wells and Wellington (1984) produced a reptile checklist involving "a few re-interpretations of our own." This description of their work is far too modest because the 57 pages include more taxonomic changes than had been proposed by all other authors in the previous decade.

The response of contributors from the Australian Society of Herpetologists representing the professional field, was one of condemnation (*Herp. Review* 16(1):1985). This action had no effect, and there has now emerged from the same stable "Aust. J. Herp. Suppl. Ser. No. 1," a 98 page treatise entitled, "A Classification of the Amphibia and Reptilia of Australia." Eight pages of this work are devoted to the amphibia. With a remarkable economy, included in those pages are the resurrection of 12 genera, the description of 19 new genera, the resurrection of 33 species, and the description of two new species. So in just eight pages the number of genera of Australian frogs has been increased by 150%, and the number of species by 20%.

Does it matter one jot what Wells and Wellington perceive? My first inclination is to assert that it doesn't. They are entitled to express opinions far removed from those of other workers if that is their desire. But if nomenclature is to remain a dynamic process, it matters a great deal if we follow the assumption that adopted systematics is in some way beholden to the most recent published contribution.

I've always regarded the current nomenclature of taxa to be valid (and so supported by me) until argued otherwise. Hence to effect change in the *status quo* involves the healthy exercise of arguing a case, producing data in support of the contrary stand, and running the gauntlet of the scientific community via the refereeing process. It may not be an infallible procedure, but at least it ensures that nomenclatural changes are not effected solely following a whim on the part of a contributor. It has the effect that we may not agree with the results, but at least we can object to them via a similar avenue.

It follows that I do not support the actions of Cogger et al. (1983) involving introducing nomenclatural changes in a checklist, simply because it provided no explanation of the reasons or justifications for the changes. But Cogger et al. (1983) are true-blue conservatives when their nomenclatural changes are compared with those of Wells and Wellington (1985).

Take, for example, the conclusions of Wells and Wellington (1985) relating to the small frog *Ranidella signifera.* In the space of just 16 lines they resurrect *Ranidella englishi, R. halmaturina, R. montana* and *R. varius* from the synonymy of *R. signifera.* The most detailed account explaining any of these actions is for *R. halmaturina* which reads, "Herein formally resurrected from the synonymy of *R. signifera; R. halmaturina* is believed confined to Kangaroo Is., South Australia." It happens that these conclusions are at variance with the evidence published (Littlejohn 1959). Even if Wells and Wellington have a hot-line with the Deity, the above conclusion is nonsense. Few Australian frogs have been studied in a detail comparable to that of *R. signifera.*

Because of the divergence between most of the taxonomic and nomenclatural decisions of Wells and Wellington (1985) with data published, two options are open to those persons who disagree with these authors. One is to refute each of their decisions *seriatim;* but such an action would constitute an admission that their publications are legitimate expressions of scientific opinions. The Code may well demonstrate that Wells and Wellington have fulfilled the various criteria of publication, but the Code assumes (quite wrongly) that all zoologists will respect its Recommendations. The privately published journal in which an author controls the acceptance of papers is a back-door exercise. I believe it is time that this avenue of effecting nomenclatural changes be blocked.

The second option open to herpetologists in Australia is to ignore the Wells and Wellington publications in their entirety. The action will be at variance with the intent of the Code, but I submit that if the Code really is oriented to maintaining stability and universality of nomenclature, the Commission should be concerned at the action of Wells and Wellington — steps that undermine the total framework. And if it is concerned and either unwilling or unable to act, it can scarcely criticise my proposal.

LITERATURE CITED

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Littlejohn, M. J. 1959. Call differentiation in a complex of seven species of *Crinia* (Anura, Leptodactylidae). Evolution 13(4):452-468.

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Wells, R. W. and C. R. Wellington. 1985. A classification of the Amphibia and Reptilia of Australia. Austr. J. Herp. Suppl. Ser. No. 1:1-98.

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Australia ●

NEWSNOTES

INDEX TO THE GENERA OF AMPHIBIA: A DEVICE TO ASSIST CURATORS

A limited number of copies of the 4th edition are available at cost. This index is privately produced and has 41 pages (8½ x 11 inches) plus stiff paper covers. It was initially distributed at the ASIH/HL/SSAR meeting in the summer of 1984. Included are all available generic names within the living families of amphibians. Each name is followed by its author(s), year, and in the case of synonyms the currently accepted valid name. The index has two parts, a straight alphabetical list followed by the same names grouped by families.

For each copy please send $2 plus $1 for handling to:

John S. Applegarth
Box 532 - Lorane Route
Cottage Grove, Oregon 97424, U.S.A. ●

WILDLIFE REHABILITATION GRANTS

The Awards and Grants Committee of the National Wildlife Rehabilitation Association would like to announce its small grants program. Funding is available to support a single $1000.00 project or several smaller projects that add up to $1000.00 for a project in the field of wildlife rehabilitation.

Applicants must demonstrate financial need, and submit a typewritten proposal which includes name(s) and résumé of personnel involved, objectives, a brief statement of literature reviewed, methods, and an itemized budget. An annual progress report will be required.

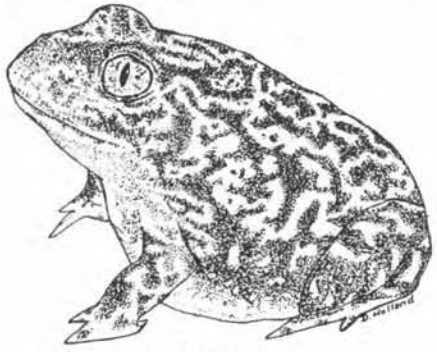
Two additional awards are:

Lifetime Achievement Award - This would go to an individual whose primary identification is that of a wildlife rehabilitator who has contributed to the field in a major way for many years. The awardee will receive a plaque, $100.00 and free conference registration. The award will be presented at the N.W.R.A. conference.

Significant Achievement Award - This would go to a person who has contributed something of significant merit to the field of wildlife rehabilitation within the last 2 years. Contribution can be a research finding, publication, organization of a program, etc., as long as the major theme is that of wildlife rehabilitation. The awardee would receive the same benefits as for the Lifetime Achievement Award.

Deadline for the submission of proposals and award nominees is 1 December 1985. Nominations and proposals should be submitted to:

Dr. Daniel R. Ludwig
Willowbrook Wildlife Haven
Forest Preserve District of
DuPage County
P.O. Box 2339
Glen Ellyn, Illinois 60138, U.S.A.
(312) 790-4913, Ext. 283 ●



JOB OPENING

The Smithsonian Tropical Research Institute in Panama is seeking to fill the position of Manager in the Iguana Management Project. This is a tentative two-year position, beginning 15 February 1986. Minimum requirement: Master's degree in zoology. Candidates must be fluent in Spanish and English, have an interest in reptiles, and be able to work well with Latin Americans. Organizational duties include administration, field work, supervision of experiments and B.S. degree students, and interfacing between Project and Panamanian institutions and individuals.

Salary: $12,000 and up, depending on qualifications. The first three months of employment will represent a probationary period. The position is renewable after one year.

Send a Curriculum Vitae and three letters of recommendation to:

Dagmar Werner
Smithsonian Tropical Research Institute
APO Miami, 34002, U.S.A. ●

LEGISLATIVE ALERT

FEDERAL REGISTER NOTICES

Volume 49, No. 244, p. 418. 18 December 1984. 50 CFR Part 17. Notice of petition findings and review. Relevant information or comments can be submitted until further notice.

This notice announces that four petitions to add five species to the list of endangered and threatened wildlife may be warranted and announces the review of the status of three of the species. Petition for **Coeur d'Alene salamander** *(Plethodon vandykei idahoensis)* was submitted by Mr. Thomas Koenigs on 5 July 1984, received by USFWS on 17 July 1984. Recent declines in populations may be attributed to human disturbance. Petition is for endangered status.

Petition for **gopher tortoise** *(Gopherus polyphemus)* was submitted by Drs. Ren Lohoefener and Lynne Lohmeier on 15 July 1984. Petition is for endangered status for that population occurring west of the Tombigbee River in Alabama, Louisiana, and Mississippi. Recent declines can be attributed to habitat destruction and killing by humans.

Submit comments to Associate Director—Federal Assistance (OES), U.S. Fish and Wildlife Service, Washington, D.C. 20240.

Volume 50, No. 26, pp 5279-5282. 7 February 1985. 50 CFR Part 23. Notice of proposed amendments. Foreign proposals to the Convention on International Trade in Endangered Species of Wild Flora and Fauna. Comments were accepted until 15 March 1985.

The CITES regulates international shipment of certain wildlife and plant species. This notice announced proposals submitted by certain foreign countries and requested comments from the public to help formulate U.S. policy statements. Proposals will be reviewed during the April and May 1985 meeting of the convention.

The petition included the following species: **Nile crocodile** *(Crocodylus niloticus)*, **saltwater crocodile** *(Crocodylus porosus)*, **green sea turtle** *(Chelonia mydas)*, **hawksbill sea turtle** *(Eretmochelys imbricata)*, **Indian sawback turtle** *(Kachuga tecta tecta)*, **Indian flap-shelled tortoise** *(Lissemys punctata punctata)*, **Indian softshell turtle** *(Trionyx gangeticus)*, **peacock softshell turtle** *(Trionyx hurum)*, **broadheaded snake** *(Hoplocephalus bungaroides)*, **Bengal monitor** *(Varanus bengalensis)*, **yellow monitor** *(Varanus flavescens)*, **Monteverde toad** *(Bufo penglenes)*, **Asian bullfrog** *(Rana hexadactyla)*, **Indian bullfrog** *(Rana tigerina)*, and **platypus frog** *(Rheobatrachus* spp.). The reader is referred to the federal register and other sources to determine further details of the petitions and the U.S.' proposed positions.

Volume 50, No. 40, pp. 8122-8131. 50 CFR Parts 450-453. Final Rules Applying for Endangered Species Act Exemptions and for Endangered Species Committee Considerations of Such Applications. Effective date was 1 April 1985.

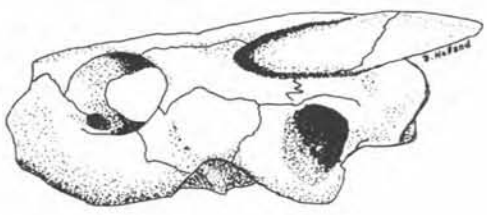
This rule implements the changes in the exemption process made by the Endangered Species Act. The rule covers the process from the time of application to the final determination by the committee. Exemptions are from section 7, which requires federal agencies to comply with the intent of the Act. This notice summarizes the background and rule-making actions of the USFWS in this issue.

Volume 50, No. 63, pp. 13054-13055. 50 CFR Part 17. Notice of petition findings and review . . . for two herptiles. Comments may be submitted until further notice.

The service announces findings that a petition to reclassify the **American alligator** *(Alligator mississippiensis)* to threatened s/a throughout South Carolina has presented substantive data to warrant review of the action. A petition to list the **desert tortoise** *(Gopherus agassizii)* also warrants further review. Also announced is a review of the status of the **alligator** in South Carolina. The petition to reclassify the alligator was submitted by the South Carolina Wildlife and Marine Resources Department on 27 July 1984. The petition to list the gopher tortoise as endangered was submitted by the Defenders of Wildlife, The Natural Resources Defense Fund and the Environmental Defense Fund on 11 September 1984. The petition is to list the entire population of the species; currently only the Beaver Dam Slope, Utah population is listed as endangered.

OTHER GOOD NEWS: The Endangered Species Technical Bulletin (Volume IX, No. 11, 1984, pp. 3, 11) tells us that a 327 acre area of beach at Sandy Point on the island of St. Croix, USVI, was purchased in September 1984 for protection as a national wildlife refuge. Of particular note is that this area is one of the most important nesting areas for the critically endangered **leatherback sea turtle** *(Dermochelys coriacea)*, as well as for the endangered **hawksbill** *(Eretmochelys imbricata)* and the threatened **green sea turtle** *(Chelonia mydas)*. This area was previously zoned for commercial development that would have severely impacted the breeding of these species. The cost of the acquisition was $2.5 million, which was appropriated by Congress from the Land and Water Conservation Fund.

PATRICIA RIEXINGER
New York State Department
of Environmental Conservation
Albany, New York 12233, U.S.A. ●



SOCIETIES

NEW HERP SOCIETIES

The SSAR Regional Herpetological Society Liaison Committee has recently learned of the establishment of four new herpetological societies. These are:

Kaw Valley Herpetological Society
Rt. 1, Box 29B
Eudora, Kansas 66025, U.S.A.

Lubbock Turtle and Tortoise Society
c/o Dr. Carl Anderson
3311-24th Street
Lubbock, Texas 79410, U.S.A.

South Texas Amphibian and Reptile Society
c/o Greg Luther
P.O. Box 233
Angleton, Texas 77515, U.S.A.

Southern Mississippi Herpetological Society
c/o Ted Crawford
404 Ridge Drive
Biloxi, Mississippi 39532, U.S.A.

Other regional societies are asked to place these new organizations on their newsletter mailing list as exchange members. ●

LUBBOCK TURTLE AND TORTOISE SOCIETY

We are announcing the formation of the Lubbock Turtle and Tortoise Society. The society is an educational and service organization committed to 1) conservation and preservation of turtles in the natural habitat, 2) captive care, and 3) captive reproduction. Members will be assisted in the acquisition of captive specimens.

The society will meet on the 3rd Tuesday of each month at 7 P.M. We currently meet in the home of Dr. Carl Anderson, 3311-24th St., Lubbock, Texas 79410. We will remain there until numbers force a move to larger quarters. For information concerning membership or meetings call (806) 795-9700 evenings and weekends. ●

MEETINGS

ASIH SYMPOSIUM

A symposium on "Snake Behavior and Ecology" will be conducted during the annual meeting of the American Society of Ichthyologists and Herpetologists which will be held on June 15-21 of 1986 at The University of Victoria, Victoria, British Columbia. A number of speakers will review and discuss new research in the areas of snake:

I. Social Behavior and Reproduction
II. Feeding Behavior and Ecology
III. Physiological Ethoecology
IV. Population Ecology

We feel this is a timely symposium and hope all researchers interested in snake ecology and behavior will make plans to attend. For further information concerning this symposium contact:

Neil B. Ford
Department of Biology
University of Texas at Tyler
Tyler, Texas 75701, U.S.A.

Inquiries about the 1986 ASIH meeting should be directed to:

Pat Gregory
Department of Biology
University of Victoria
Victoria, British Columbia
Canada V8W 2Y2 ●

RAIN WATER DRINKING BY THE MANGROVE WATER SNAKE, *Nerodia fasciata compressicauda*

Reptiles may satisfy their water requirements in ways other than by drinking from natural streams and ponds. Meyer (1966) reported that three species of desert lizards *(Holbrookia, Phrynosoma)* lick dew drops. Bradshaw and Shoemaker (1967) observed that Australian desert lizards *(Amphibolurus)* emerge during thunderstorms, run rapidly about and catch drops of water as they fall. It is not clear, however, if the lizards catch rain drops directly, or drink water dripping from rock outcrops. Before thunderstorms the desert tortoise *(Gopherus agassizi)* excavates depressions to catch water (Medica et al. 1980). Three species of African land tortoises *(Psammobates, Kinixys, Homopus)* have recurved plastrons that act as gutters during rain. These turtles raise their hind ends during rain, causing water to flow to their mouths (Auffenburg 1963). The side-winding viper *(Bitis peringueyi)* flattens itself against the substrate during a falling mist, collecting water on its dorsum. The snake then coils and moves its head along its body, licking the water off its dorsum (Louw 1972). This behavior is adaptive to the frequent occurrence of advective fog in the Namib Desert. The following field observation concerns a snake drinking rain water directly.

On 8 July 1983, 2125 hours at Placido Bayou, Tampa Bay, Florida, a *Nerodia fasciata compressicauda* was observed perched 1.2 meters high in a red mangrove tree *(Rhizophora mangle)* during a heavy rain. The specimen was a red phase female, 730 mm snout-vent length and 380 grams. The anterior half of the body was suspended downward from a branch at an angle of 30 degrees from horizontal. Water ran along the snake's body, trickling off the tip of it's mouth. Drinking was indicated by jaw movements. After 3 minutes, the snake raised itself to an angle 5 degrees below horizontal and rested its chin against a twig, continuing its jaw movements. Some water accumulated between the snake's jaw and the twig. After 15 seconds, the snake resumed its original posture, and after another 20 seconds, ceased jaw movements. Upon capture, palpating the live snake forced 2.2 ml of fluid from the snake's stomach. Water from three other specimens was obtained in a similar manner after rain; however, these snakes were not observed actually drinking.

The drinking response of *N. f. compressicauda* was also observed in the laboratory. Nine snakes were kept in an aquarium (505 x 255 x 305 mm) without food and water. When kept in this manner, the snakes congregated and raised their heads above the floor of the aquarium. After 21 days, water was dripped from a pipet upon the snakes' heads. The snakes responded with jaw movements characteristic of drinking. One snake oriented its head upward and moved toward the dripping water while drinking. Five snakes tilted their heads downward while drinking. Three other snakes also tilted their heads downward, but continued to lower their heads until they were drinking from water pooling on the floor of the aquarium. Two of these three snakes also licked water from the floor of the aquarium.

The behavior of one individual illustrated the magnitude of the drinking response to falling drops of water. While the snake was drinking from a bowl, water was dripped upon the snake's head from a pipet. Instead of continuing to drink from the bowl, the snake raised its head above the bowl and drank the falling drops of water. After the pipet was empty, the snake lowered its head and resumed drinking from the bowl. On every successive trial, the snake preferred to drink falling drops of water rather than drink from the bowl.

These observations contradict Pettus' (1958) suggestion that estuarine snakes satisfy their water requirements exclusively from the water content and oxidation of their prey. Estuarine snakes apparently rely upon frequent rain storms for water acquisition. The drinking behavior elucidates how an estuarine snake can inhabit a saline environment without a salt gland.

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A COASTAL HABITAT FOR THE FIJI GROUND FROG AND A FIRST RECORD FROM GAU ISLAND

The ground frog (Ranidae: *Platymantis vitianus*) is the rarer of Fiji's two endemic frog species. In the 130 years since it was described (Duméril 1854) only 120+ specimens can be found in museum collections. It has been recorded from the islands of Viti Levu, Vanua Levu, Taveuni, Ovalau, Beqa and Viwa. Until recently I had found only four animals, two from alongside a stream on Taveuni and two from under logs on Ovalau. Zug (1983) found four specimens on Ovalau at an elevation of at least 200 m. These frogs, all from under rotting vegetation, were more than 100 m away from the nearest permanent stream. This contrasts strongly with the stream habitat reported by Gorham (1968) and Pernetta and Goldman (1976). Gorham listed a Fiji Museum specimen from the island of Viwa, but in his map showed Viwa Island in the Yasawa Group. That dry island chain is unsuitable habitat for frogs and the Fiji Museum specimen probably comes from Viwa Island in the Rewa Delta. Viwa (178° 37' 30"E, 17° 56' 30"S) is a small hilly island approximately 1.5 km by 0.75 km.

The vegetation includes an extensive mangal (*Rhizophora* spp) along the coast and several areas of Ivi *(Inocarpus fagiferus)* forest further inland. The hill vegetation is secondary rainforest heavily disturbed by agriculture, interspersed with many food trees and shrubs. There are no permanent streams on Viwa and very few pools of standing water. The ground frog however lays terrestrial eggs which develop directly into froglets (Gorham 1968). There is a small Fijian village (population 100) on the northern coast.

In November 1982 J. Gibbons collected four Viwa specimens for me, all from under logs. I visited Viwa on 11 March 1983 and captured 8 specimens of *P. vitianus.* One juvenile (SVL 36.8 mm) was captured during the day above leaf litter in Ivi forest at the eastern end of the island. The area was riddled with large land crab *(Cardisoma carnifex)* holes and under tidal influence. The remaining specimens were caught at night on stones or tidal debris at the high tide mark on the beach. One specimen on the beach side vocalised loudly upon capture with a series of croaks. It continued to call until released. This is the first record of vocalisation by *P. vitianus.* Although Viwa villagers recognise the mating call of the cane toad *Bufo marinus,* they have apparently never heard the ground frog.

Visits on 15 April and 19 May yielded 7 and 9 specimens respectively. On 15 April three frogs were captured from the high tide mark, the others from the steeply sloping bank above the beach. On 19 May two specimens were collected from the highly saline Ivi forest leaf litter (see colour photograph, Ryan 1984), three specimens from the high tide mark and four from the bank. No frogs vocalised.

On 11 March I brought a large female (90 mm SVL) back to Suva. During the return trip in an open punt, her plastic bag filled partially with salt water. Despite 40 minutes immersion the frog apparently suffered no ill-effects. Forty-eight hours after capture she produced a fecal pellet which contained the remains of a large crab. These observations suggest that ground frogs actively forage on the beach and are somewhat resistant to salt water.

In December 1983, J. Gibbons collected 2 specimens of *P. vitianus* from Gau. Gibbons (pers. comm.) informed me that the people from the south end of Gau are familiar with *P. vitianus,* which although difficult to find is not necessarily rare on the island. Gau Island (179° 19'E, 18° 1'S) is a mountainous volcanic island 20.9 km by 7.2 km. A female, 75 mm SVL, was captured from under a tree fern log in the rainforest (*ca.* 50 m elevation), the other an immature female, 53 mm SVL, was from a wet dalo (*Colocasia* sp.) plantation (*ca.* 15 m elevation).

All islands from which the ground frog have been reported are high volcanic islands. The species may occur also on Koro and other smaller islands.

This is the first record of *P. vitianus* from Gau. Based on these observations and those by Zug (1983), *P. vitianus* uses a variety of habitats ranging from rainforest floor, streams, stream banks and beaches. These extend considerably its previously known habitats.

ACKNOWLEDGMENTS

I wish to thank the people of Viwa for the great help and hospitality they have extended to me. John Gibbons and Tim Emery accompanied me on field trips and their support has been much appreciated. This work has been funded by a University of the South Pacific research grant (R106) which is gratefully acknowledged.

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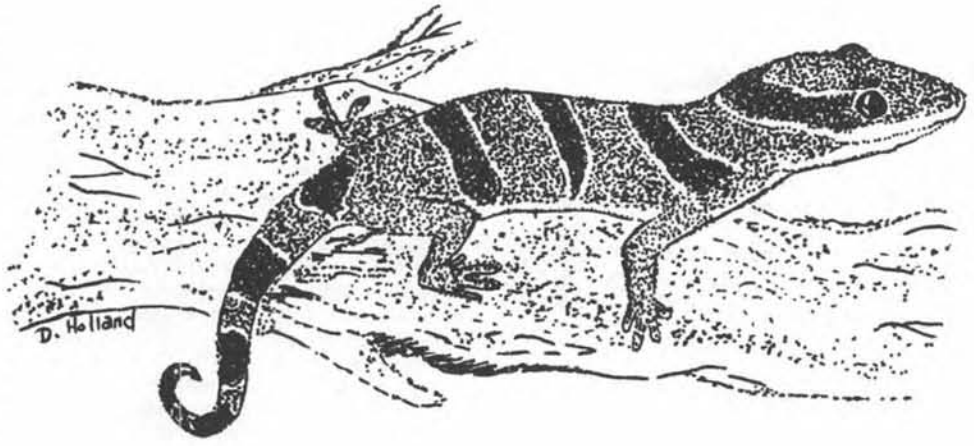
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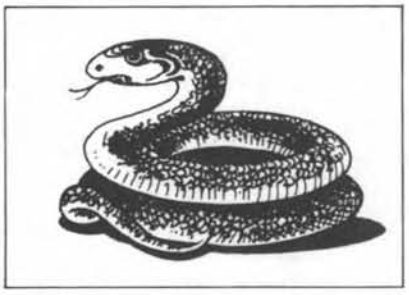
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DISTRIBUTION OF THE GENUS *Rana* IN SOUTHWESTERN SAUDI ARABIA

The Kingdom of Saudi Arabia covers an area of more than two million square kilometers and represents the largest part of the Arabian Peninsula. The western coastal plain (Tihamah) on the Red Sea is narrow in the north, widening irregularly toward the south with a maximum width of about 40 km near the city of Jizan. It is a hot, dry plain crossed by dry river channels (wadi) that periodically flood with drainage from nearby mountains. The Tihamah is bounded on the east by the escarpment of the Hijaz Mountains, which rise abruptly to a height of over 3300 meters at Soodah Mountain near Abha. These mountains of the southwest have the coolest temperatures and the highest precipitation in the Kingdom. The rainfall of 250 to 500 mm per year supports dry land terrace farming and scattered juniper woodlands in the high mountains (Bindagji 1978). The eastern side of the Hijaz drops more gradually to the central plateau. The plateau is desert steppe with large areas of moving dunes extending to the Arabian Gulf coast. Some areas of the central plateau may go without rain for several years (Chapman 1978).

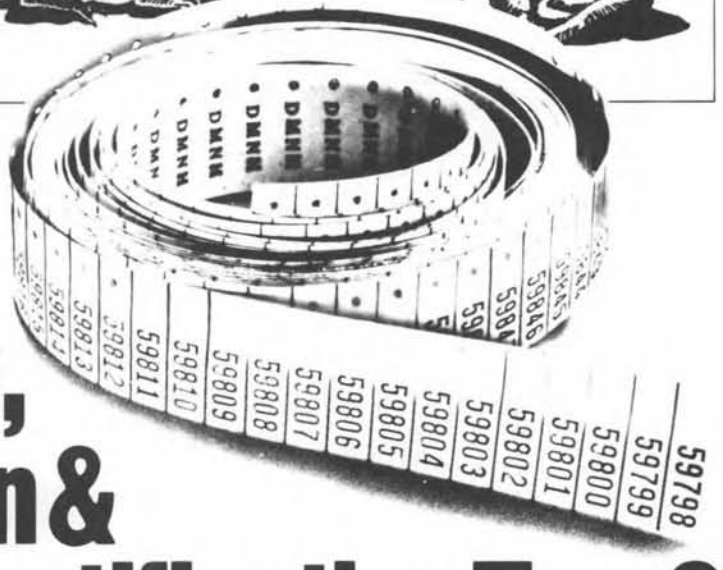
Two species of *Rana* are known from the peninsula: *Rana ridibunda* Pallas, 1771, with affinities in Europe and northern Africa, and *Rana cyanophlyctis ehrenbergi* Peters, 1864,











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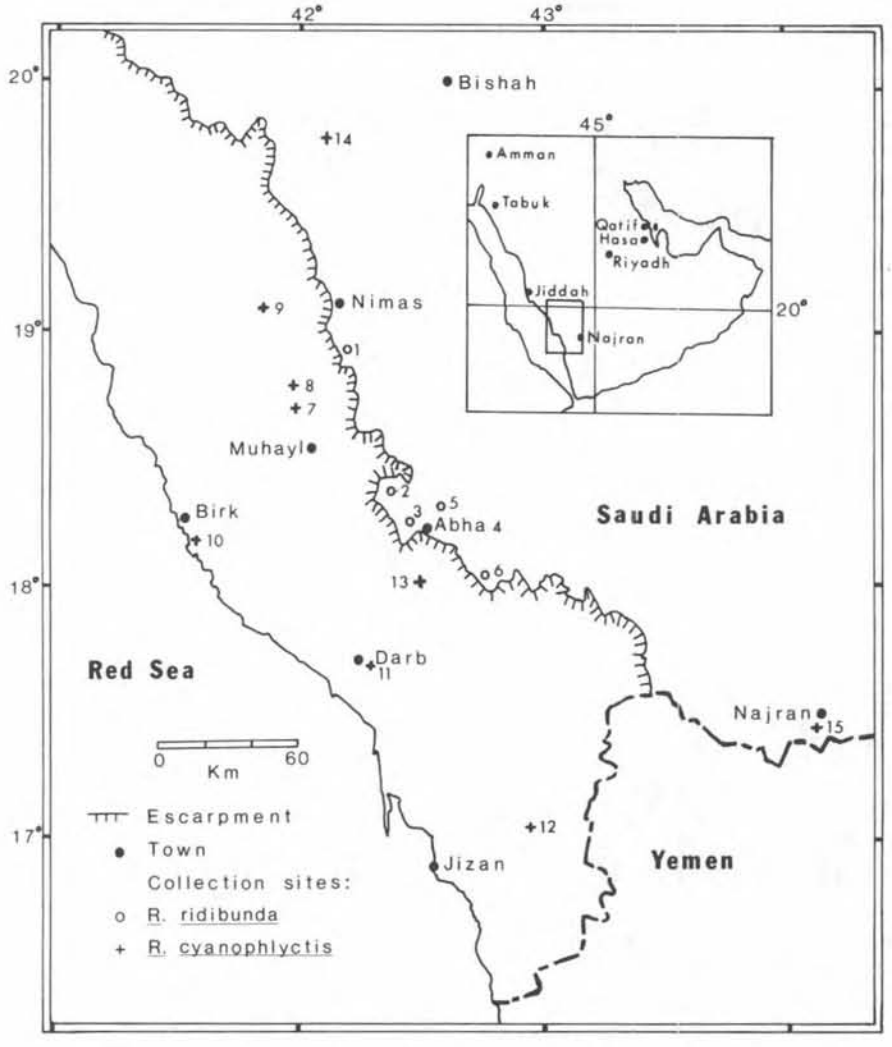


Figure 1. Map of *Rana* collecting sites for September 1983 expedition to southwestern Saudi Arabia. Map modified from the "Road Map and Tourist Resorts in the Asir Area" published by the Kingdom of Saudi Arabia and Asir Quadrangle Map, scale 1:500,000, Geographic map 217, Ministry of Petroleum and Mineral Resources, Kingdom of Saudi Arabia.

with affinities to the east in southern Asia (Arnold 1980). Collections of *Rana* from the peninsula have been limited in the past by inaccessibility to zoologists.

R. ridibunda has been reported from the eastern oasis regions (Arnold 1980; Briggs 1981; Haas 1961; Parker 1933) and the southwestern mountains of Saudi Arabia (Arnold 1980; Parker 1938). *R. cyanophlyctis* has been reported from the southwestern region of Saudi Arabia and Yemen (Anderson 1901; Arnold 1980; Boulenger 1920; Haas and Battersby 1959; Parker 1941; Schmidt 1953; Steindachner 1903).

The distribution of the genus *Rana* in Arabia is necessarily fragmented due to the spotty distribution of permanent surface water. In September of 1983 we investigated 22 aquatic sites in southwestern Saudi Arabia to better establish the ranges of these two species in the region. *Rana* were found at 15 of these (Table 1). Since September is part of the drier period, these sites represent habitats likely to retain surface water year round. At no site were the two species found to be syntopic.

R. ridibunda occurs in two widely separated areas: the mountains of the southwest (Asir) and the major oasis areas of the Eastern Province and the island country of Bahrain 26 km off the eastern Saudi coast (Fig. 1). In the Asir they are found only in high mountain wadis (valleys) above about 1900 meters, typically in places where gravel is thin and water is forced into surface pools by impervious rock ledges or in pools at the bases of waterfalls. Since these localities are high in the mountains, the seasonal flooding is not as torrential as that of the wadis at lower altitudes, which drain more extensive watersheds.

Over 1000 km northeast of the mountain populations are the three disjunct oasis populations of Al Qatif (ca. 35 km), Al Hasa (ca. 200 km), and northern Bahrain (ca. 25 km). These three natural oases are supplied by artesian karst springs dating at least to the early Pleistocene (Hötzl et al. 1978). The mountains of the southwest and the karst springs of the east may have served as refugia for relict populations of *Rana ridibunda* throughout the periodic humid and arid phases of the Pleistocene and Holocene in Arabia.

R. cyanophlyctis is confined to the lower altitudes from sea level to about 1800 meters west of the escarpment and from about 1500 to 1900 meters on the eastern slope. These altitudes are similar to those reported for Asian populations (Boulenger 1920). Typically these lower wadi systems of the southwest are subject to periodic flooding, sometimes of devastating proportions, which completely scrubs and rearranges the wadi floor.

In February of 1982 and again in February of 1983 the southwest experienced tremendous flooding that washed out numerous bridges and highways in the lower wadis. Populations of *R. cyanophlyctis* were found breeding in the pools of these wadis in September 1983, indicating that they have the ability to survive the passing floods and disperse quickly into newly formed pools.

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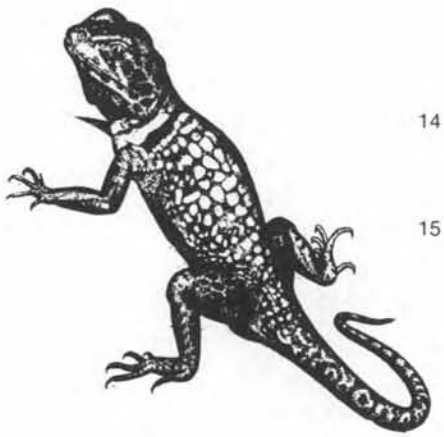
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Table 1. Collecting localities for *Rana ridibunda* and *Rana cyanophlyctis* in southwestern Saudi Arabia, September 1983.

Rana ridibunda		*Rana cyanophlyctis*	
Map site number	**Description**	**Map site number**	**Description**
1	Al Dahna shalal 5 km S of Tunomah. Small pond, ca. 15 X 20 m at base of cliff with trickle of a waterfall. 2160 m Asir Province. 18°55'N, 42°11'E		WESTERN SLOPE
2	Wadi T'hall about 15 km N by road from Soodah Lookout, Asir Nat. Park. In old well broken in on one side. 2460 m. Asir Province 18°22'N, 42°24'E	7	Wadi Roosh 19 km N of Muhayl. Pools in wadi under highway bridge. 410 m. Asir Prov. 18°42'N, 42°00'E
3	Wadi Mouqadda in pools below falls about 10 km NW of Abha on Soodah road. New dam now floods site. 2600 m. Asir Province 18°15'N, 42°28'E	8	Wadi Baqarah under bridge 29 km N of Muhayl in pools. 440 m. Asir Province 18°47'N, 41°59'E
4	Wadi Abha on W side of city of Abha 0.5 km below Abha dam. 2200 m. Asir Province 18°12'N, 42°34'E	9	Wadi Hart (upper Wadi Yiba) at 2 sites 71 and 78 km N of Muhayl in pools in wadi bed. ca. 460 m. Asir Prov. 19°05'N, 41°53'E
5	Wadi Mahala about 10 km NE of Abha near sports stadium. Pools in wadi bed. 2180 m. Asir Province 18°17'N, 42°34'E	10	Wadi Dhahaban near sea with large amount of flood damage. 16 km S of Al Birk. ca. 5 m. Mecca Province 18°10'N, 41°35'E
6	Wadi Jerrah at flood control dam about 31 km SE of Abha on road to Jerrah. 2290 m. Asir Province 18°05'N, 42°45'E	11	Wadi Itwad 2 km SE of Al Darb in pools near bridge on road to Jizan. 64 m. Jizan Prov. 17°42'N, 42°17'E
		12	Wadi Jizan in pools 4 km below Jizan dam. ca 150 m. Jizan Prov. 17°03'N, 42°57'E
		13	Wadi Al Dila along road from Abha to Al Darb. Six sites in wadi pools 28 to 52 km SW by road from Abha. From ca. 250 m to ca. 900 m. Asir Province 17°55'N, 18°04'N 42 30'E
			EASTERN SLOPE
		14	Wadi Malaha 32 km SW of Al Thaniyah on Bisha road. 69 km NE jnct. of Bisha road with Taif highway. ca. 1800 m Asir Prov. 19°48'N, 42°07'E
		15	Wadi Najran 2 km to 8 km below Najran dam, about 10 km SW of Najran. ca. 1400 m. Najran Pro. 17°26'N, 44°06'E



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TECHNIQUES

A SIMPLE TECHNIQUE FOR TRAPPING PRAIRIE RATTLESNAKES DURING SPRING EMERGENCE

A technique for live trapping snakes depends on an individual's design which may vary according to time of year, terrain and species sought. One technique is a modified wire funnel trap set along side drift fences or natural objects (i.e. fallen logs, rocks, walls) guiding a snake into the mouth of the funnel (Imler 1945, Gloyd 1947, Dargan and Stickel 1949, Fitch 1951, Fitch and Shirer 1971). Another is a wire enclosure around the mouth of a den (Hirth et al. 1969, Brown and Parker 1976). This paper reports a simple effective capture technique using sectioned, commercially available black plastic tile or tubing (10 cm in diameter) running from blocked entrances of prairie rattlesnake *(Crotalus viridis viridis)* hibernacula. The technique relies on solar heat absorption of black plastic attracting rattlesnakes during spring emergence and the ability to block off sections of tubing so rattlesnakes could not retreat.

"Rattlesnake coulee" on the Old Man River, 4.3 km south of the city limits of Lethbridge, Alberta, Canada, received its name because of regular sightings of prairie rattlesnakes over the years. Five known former rattlesnake hibernacula entrances were located during the second week of April 1983 and 1984 and "plugged" with 7.5 cm thick foam rubber shaped to firmly wedge into each entrance. In each "plug" a small hole (5 cm in diameter) was cut, through which one end of a continuous length of black plastic tubing was inserted. The tubing protruded approximately 7.5 cm beyond the foam rubber into the hibernaculum. The "plug" of foam rubber was covered with a layer of earth to ensure that no holes were present between the foam rubber and walls of the hibernaculum entrance through which rattlesnakes could escape. Tubing protruded varying lengths depending on the terrain and the depth of a hibernaculum entrance below ground surface - total lengths varied from 2.0-5.1 m. Each length of tubing was sectioned (by cutting) into approximately equal (0.6 m) lengths and then reattached by taping (sectioning facilitated confining rattlesnakes in a shorter section of tubing and later blocking their retreat into the hibernaculum). Wire fly screening taped into position blocked the terminal end of the tubing (Fig. 1).

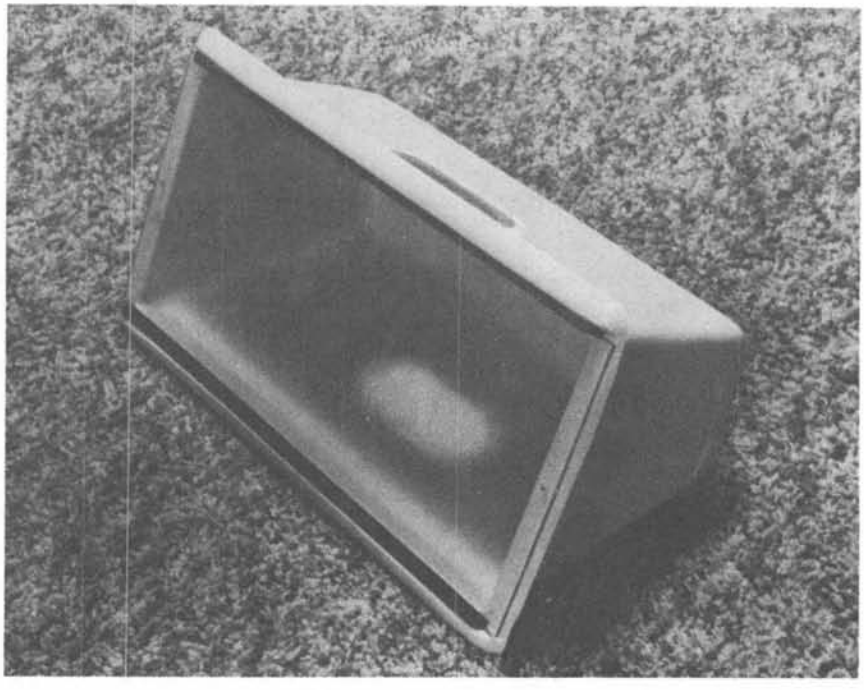


Figure 1. An exposed trap constructed of sectioned black plastic tubing and a foam rubber "plug."

The traps were checked daily and a rattlesnake's position in the tubing was easily detected by the resonating rattle. A knife was then used to quickly but carefully cut through the tape separating 2 sections - the sections separated depended on the position of the "last" (closest to the hibernaculum entrance) rattlesnake. For safety reasons, at least 60 cm distance was kept between the "last" rattlesnake in the tubing and the separation of sections. As the sections were held in place, 2 flat metal discs (12.5 cm in diameter) were inserted and taped to the respective ends of the separated sections blocking any move-

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A. DALE BELCHER, Curator of Herpetology, Rio Grande Zoological Park, 1979-present. Attended University of Missouri, 1964-1968, majors in psychology, sociology, anthropology; non-degree candidate. Meramec Community College, 1970-72; A.A. Liberal Arts, minors in field biology, communication. Keeper, Senior Keeper, St. Louis Zoological Park (1972-1978). Research interest: Synecology of isolated montane crotalid populations. SSAR activities: Zoo Liaison Committee (1983-present). Publications: two papers and many popular articles.

LYNNE D. HOUCK, Research Associate (Assistant Professor), Department of Biology, University of Chicago; Ph.D., University of California at Berkeley (1977). Research interests: Sexual selection and the evolution of courtship behavior in plethodontid salamanders. SSAR Activities: Chair, Joint Annual Meetings Committee for SSAR and HL (1981-1984); Editorial Board, Journal of Herpetology (1984-1987). Publications: 11.

VICTOR H. HUTCHISON, George Lynn Cross Research Professor of Zoology, University of Oklahoma, Norman; Ph.D., Duke University (1959). Research interests: Physiological ecology of amphibians and reptiles, especially respiratory gas exchange, thermal relations and energetics. SSAR activities: Chair, Committee on Cooperation SSAR/HL (1969-1972); Joint HL/SSAR Meetings Committee (1985-present); Chair, Local Meeting Committee SSAR/HL (1972), ASIH/HL/SSAR (1984); reviewer for SSAR publications. Publications: ca. 110.

JAMES S. JACOB, Professor of Biology, Glendale Community College, Glendale, Arizona; Ph.D., University of New Mexico (1977). Research interests: Comparative morphology and physiology of reptiles and amphibians. SSAR activities: Chair of Memphis Local Committee (1981); Secretary (1982-present); Long-range Planning Committee (1983-present); Meetings Committee (1983-present). Publications: 15+.

WILLIAM W. LAMAR, Curator of Herpetology, The Caldwell Zoo, Tyler, Texas; Adjunct Assistant Professor, School of Sciences and Mathematics, The University of Texas at Tyler; M.Sc., The University of Texas at Arlington (1986).Research interests: Systematics, ecology, zoogeography, and captive management of Neotropical amphibians and reptiles. Publications: 14.

LINDA R. MAXSON, Professor, Departments of Genetics and Development and Ecology, Ethology and Evolution; Curator, Amphibians and Reptiles, UIMNH, University of Illinois at Urbana-Champaign (1983-present); Ph.D. jointly at University of California, Berkeley and San Diego State University (1973). Research interests: Molecular systematics and biogeography, speciation, amphibian phylogenetics. SSAR activities: Board of Directors (1982-1985); Editorial Board of Journal of Herpetology (1982-present). Publications: ca. 70.

NORMAN J. SCOTT, JR., Zoologist, Denver Wildlife Research Center, U.S. Fish and Wildlife Service; Adjunct Associate Professor, Department of Biology, University of New Mexico; Ph.D., University of Southern California (1969). Research interests: Systematics, ecology and zoogeography of amphibians and reptiles, especially Neotropical and southwestern United States forms; status of endangered and threatened species. SSAR activities: Editor of HL/SSAR Symposium "Herpetological Communities" (1982); Board of Directors (1982-1984). Publications: 20+ on reptiles, amphibians, monkeys and ducks.

HENRI SEIBERT, Professor of Zoology, Ohio University; Ph.D., University of Illinois, Urbana (1937). SSAR activities: Board of Directors (1962 to date); Publications Secretary (1966-1976); Treasurer (1970 to date). Publications: dozens.

Society for the Study of Amphibians and Reptiles

BALLOT

This is the official ballot of the SSAR to elect officers for 1986. All SSAR members are urged to vote. This ballot must be received no later than 15 December 1985. Please use the attached self-addressed envelope.

For President-elect (vote for one):

- ☐ Linda Maxson
- ☐ Norman J. Scott, Jr.

For Secretary (unopposed):

- ☐ James S. Jacob
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ZOOLOGICAL PARKS

- ☐ A. Dale Belcher
- ☐ William W. Lamar

REMOVE THIS PAGE FROM *HR* TO VOTE

ment of rattlesnakes through the tubing.

Rattlesnakes were forced to the terminal end of the tubing and into a collecting bag by manually lifting and tapping the tubing along its length (tapping was necessary because large rattlesnakes will coil, holding themselves secure even when the tubing is held vertical). The sections of tubing were then replaced and taped back into position. The rattlesnakes were taken to a laboratory for sexing, weighing, length measurements, photographing and tagging. In total, 23 rattlesnakes were captured from 3 hibernacula. No rattlesnakes died using this technique.

Originally, "funnel flaps" (made of wire fly screening and painted black) were put in entrances to the tubing and were successful in preventing retreat to the hibernacula. However, the flaps were removed because of the possibility of rattlesnakes' overheating in the black tubing (checking traps more than once daily and/or using perforated tubing might prevent this). With the flaps removed, rattlesnakes were free to move back into the hibernacula. Although different coloured tubing could be used for this trapping technique, the low cost and availability of commercial black plastic tubing were the reasons for its use.

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LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. Reports of clutch or litter size should include snout-vent and total lengths of females. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1982. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

Please submit Life History Notes in the standard format directly to the ***SECTION EDITOR*** to avoid delays in publication: Bern W. Tryon, Knoxville Zoological Park, Box 6040, Knoxville, Tennessee 37914, U.S.A.

CAUDATA

AMBYSTOMA TIGRINUM (Tiger Salamander). **BEHAVIOR.** Defense posturing by salamanders is well documented by Brodie (1977. Copeia 1977(3):523-535). The following is submitted as a case history. On 22 October 1978 at Squaw Creek National Wildlife Refuge, Holt County, Missouri, defense posturing was observed in a small *Ambystoma t. tigrinum* measuring about 170 mm in total length. The individual was crossing a gravel road when tail waving was first elicited by the approach of a motor vehicle, and again upon the approach of two persons on foot. At this time the tail was held almost vertically and waved back and forth, the hind legs were extended lifting the posterior portion of the body higher into the air, and the neck was strongly flexed depressing the rostrum into the ground. After several bouts of stimulation by the observers, the body was severely curved, assuming a u-shaped configuration, and the tail was lowered (Fig. 1).



Figure 1. Antipredator response assumed by *Ambystoma tigrinum*.

The time of occurrence was approximately 0900 h CST, and associated temperatures were 16° C (soil) and 14.6° C (air at 25 mm). The sky was overcast and the wind from the northwest at 8 to 16 km per hour.

Another *A. tigrinum* observed on the Refuge the same day did not respond with similar behavior. However, on 25 October 1981 during a visit to the same locality and under similar weather conditions, a larger tiger salamander was observed to exhibit the tail waving.

It is interesting to note that during fall diurnal movements two of three specimens from this locality responded with defense posturing and that tail waving was observed prior to physical contact, in the first case, probably in response to visual and/or vibratory cues.

Thanks to Dr. E. D. Brodie, Jr. for commenting on an earlier draft of this note.

Submitted by **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th Street and Rainbow Boulevard, Kansas City, Kansas 66103, U.S.A. ●

EURYCEA LUCIFUGA (Cavé Salamander). **BEHAVIOR.** A specimen of *Eurycea lucifuga* was captured in Onyx Cave, Mark Twain National Forest, 4 km S of Roaring River State Park, Barry County, Missouri, on 27 June 1974. Later, when the specimen was placed on a dampened rock for photographic purposes, it elevated the anterior portion of its body in an exaggerated manner, exposing its gular region. The movement appeared very robotic in nature, and the posture was held immobile and apparently quite rigid for several seconds. A number of attempts, by tactile stimulation, to elicit repetition of this behavior did not result in a response exhibiting the

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same degree of spontaneity or intensity of the first. The accompanying photograph (Fig. 1) was taken after the initial display, but the body position approximates that of the observed posture.

It may be important to note that this behavior was not observed under controlled conditions nor at initial contact with the salamander, but only after capture, several hours of confinement in a moist collecting tube, and then exposure to a new regime of light, heat and humidity. These variables may have triggered the response, however, specimens of *Plethodon glutinosus* and *P. dorsalis* captured at the same locality and photographed at the same setting, immediately after the *E. lucifuga*, did not respond in the above manner.



Figure 1. The low intensity rigid posturing exhibited by a specimen of *Eurycea lucifuga*.

Brodie (1977, Copeia 1977(3):523-535) extensively documented defense posturing in salamanders, and presented a photograph and described an antipredator posture for *E. lucifuga*. It included coiling of the body and elevation of the tail. The low intensity, rigid posturing, with elevation of the anterior portion of the body observed in our specimen may be another form of defense posturing by this salamander. It is apparently very similar to the infrequent behavior observed in *Aneides flavipunctatus* which was postulated to be defensive in nature by Jones (1984. SSAR Herp. Review 15(1):17).

Thanks to Dr. E. D. Brodie, Jr. for commenting on an earlier draft of this note.

Submitted by **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th Street and Rainbow Boulevard, Kansas City, Kansas 66103 and **LON C. BALCH,** Babler State Park, Chesterfield, Missouri 63017, U.S.A. ●

EURYCEA LUCIFUGA (Cave Salamander). **COLORATION.** Neither Hensley (1959. Publ. Mus., Mich. State Univ. 1(4):133-159) nor Dyrkacz (1981. SSAR Herp. Circ. No. 11:1-31) listed albinistic specimens of *Eurycea lucifuga*. A leucistic specimen of this species was collected in Mauss Cave, 21 km WNW of Camdenton, Camden County, Missouri, on 28 September 1968 by an Ecology Class from the University of Missouri-Kansas City. The specimen exhibited normal eye color but only two small patches of normal skin pigmentation on its left flank and dorsum of the tail. It measured about 60 mm in total length, with a tail length of 20 mm, extremely short for this species, and had probably only recently metamorphosed.

Minckley (1959. Herpetologica 15(4):240) described a predominantly white specimen of this species, and cited references to several other color variants from the western periphery of the Ozark Plateau Region. The Camden County locality is near the northern edge of that Region.

The speciman was apparently not preserved and has been lost.

Submitted by **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th Street and Rainbow Boulevard, Kansas City, Kansas 66103, U.S.A. ●

SERPENTES

CEMOPHORA COCCINEA COPEI (Northern Scarlet Snake). **COLORATION.** Amelanistic specimens of *Cemophora coccinea* previously have been reported from Rockingham Co., North Carolina (Brimley 1942. Carolina Tips 5(1):3) and Clayton Co, Georgia (Herman 1983. SSAR Herp. Review 14(4):119). On 9 March 1985, an amelanistic adult female was collected on the Katharine Ordway Preserve/Swisher Memorial Sanctuary, ca. 8.5 km E and 1.5 km S of Melrose, Putnam Co., Florida. The snake, which measured 450 mm (397 mm SVL) with a mass of 13.5 g, was first captured at 2350 h in a pitfall trap on the inside of a continuous terrestrial drift fence encircling an intermittent pond (nicknamed Breezeway pond, 0.1 km S Smith Lake, Putnam Hall Quadrangle) in longleaf pine-turkey oak sandhills habitat.

The dorsal pattern and coloration of the snake resembled the description of the two previously reported specimens. The parts of the dorsum that are normally black in *Cemophora* and the tip of the tongue were pale white, and the eyes were red. The dorsal saddles were reddish-pink and narrow; there were 23 complete saddles on the body and one complete and 4 partial saddles on the tail. No other *Cemophora* have been observed in the vicinity of the drift fence since it was erected in late January, though the species is reportedly not uncommon in the area (R. Franz, pers. comm.).

Submitted by **JAMES N. STUART** and **C. KENNETH DODD, JR.,** Denver Wildlife Research Center, 412 N.E. 16th Ave., Room 250, Gainesville, Florida 32609, U.S.A. ●

COLUBER CONSTRICTOR PRIAPUS (Southern Black Racer). **FOOD.** At 1515 h on 22 January 1984,7.8 km S Monroe Station on State Highway 94, Monroe County, Florida, I observed an adult (SVL = 936 mm; mass = 159 g) female *Coluber constrictor* carrying a small rodent. When first observed, the snake moved slowly in mid-roadway, head elevated ca. 15 cm above the substrate. The prey struggled feebly as it was maneuvered into a position to facilitate swallowing. The snake made no attempt at constriction and completed swallowing in ca. four min. At that point, I captured the snake, measured, palped and released it. The prey proved to be a juvenile rice rat (*Oryzomys palustris coloratus;* mass = 10.2 g) less than 30 days old (based on tooth eruption pattern and ossification of the frontoparietal region).

C. constrictor is well known for its catholic diet, which includes an impressive array of small mammals (see summary in Fitch 1963. Univ. Kansas Publ. Mus. Nat. Hist. 15:351-468). Despite a variety of dietary studies and anecdotes, *O. palustris* is not reported as prey. *O. palustris* is a cricetid rat abundant in marshy habitats of the southeastern U. S. (Pournelle 1950. J. Mammal. 31:310-319; Ivey 1959. J. Mammal. 40:585-591; Sharp 1967. J. Mammal. 48:557-563), whose morphology and physiology allow it to lead a semi-aquatic existence (Esher et al. 1978. J. Mammal. 59:551-558). The site of this observation is a cypress *(Taxodium distichium)* swamp, a habitat where *C. constrictor* is typically rare, being usually restricted to adjacent larger hammocks that have substantially higher ground. However, the elevated roadbed (of Highway 94) seems to provide enough area for *C. constrictor* nest and refuge sites to support a substantial population because one can observe three to six adult *C. constrictor* per kilometer in the vicinity of this site on warm, sunny days. Because rice rats often nest along similar water-edge habitats (Ivey 1959; Sharp 1967), they appear to be accessible to *C. constrictor* in this juxtaposition of swamp and man-made terrestrial habitats.

Hank Setzer (Florida State Museum, Gainesville) kindly identified and aged the rat.

Submitted by **MARC P. HAYES,** Department of Biology, P.O. Box 249118, University of Miami, Coral Gables, Florida 33124, U.S.A. ●

CROTALUS ATROX (Western Diamondback Rattlesnake). **COLORATION.** In the spring of 1984, a female *Crotalus atrox* (575 mm SVL) was collected at Fort Sam Houston, San Antonio, Bexar Co., Texas and donated to the San Antonio Zoo by Raymond Cross.

The snake has a gold-brown dorsum which gradually changes to a cream colored venter. There is a dark brown mid-dorsal stripe, varying in scale width, that runs down the entire body, excluding the tail. The tail is black dorsally and the lateral and ventral surfaces are white and cream respectively with black mottling throughout. In front of each eye is a light stripe that extends down to the mouth.

This type of color and pattern has been recorded before in *C. atrox* (Gloyd 1958. Bull. Chicago Acad. Sci. 10:185-195; Karges 1979. Trans. Kansas Acad. Sci. 82(4):205-208; Holmback 1981. Herp Review 12:70; Tennant 1984. Snakes of Texas, 463 pp.). An interesting note is that despite the extensive range of *C. atrox* throughout southwestern North America, all of these specimens have been from localities in south central Texas.

This female will be used for breeding purposes at the zoo with a similarly aberrant male already in the collection.

Submitted by **ERIK HOLMBACK,** Reptile Department, San Antonio Zoological Gardens and Aquarium, San Antonio, Texas 78212, U.S.A. ●

CROTALUS MOLOSSUS (Blacktail Rattlesnake). **ANOMALY.** A male *Crotalus molos-*

sus captured 11 May 1980 on the Rosillo Ranch, 20 km north of Panther Junction (Big Bend National Park), Brewster County, Texas, has no vestige of a rattle. The tail terminates abruptly (Fig. 1) and shows no scarring or signs of previous trauma. Total length is 934 mm with the tail having 26 subcaudal scales and measuring 64 mm (6.9% of the total body length). Wright and Wright (1957. Handbook of snakes of the United States and Canada, Vol. II, Comstock Publ. Assoc.: pp. 565-1105) noted that the tail of *C. molossus* is relatively short, seldom measuring over 7.1% of the total body length and rarely with more than 27 subcaudals in males.

Klauber (1972. Rattlesnakes, their habits, life histories, and influence on mankind, 2nd Ed., Vol. 1, Univ. Calif. Press: 740 pp.) stated that the most common cause of missing rattles is trophy hunting by man with subsequent recovery and survival of the traumatized snake. However, four cases of missing rattles were thought to be congenital defects, including a *C. cerastes* and a *C. pricei* with no vestiges of rattles.

Since measurements and scalation of our specimen are so close to reported maxima, and there is no sign of trauma, we conclude that the anomaly is congenital, and due to the lack of the radio dense style or shaker (Fig. 2).



Figure 1. Tail of *C. molossus* (BWMC 1502) showing no sign of scarring or trauma.



Figure 2. Radiograph of tail of *C. molossus* (BWMC 1502) illustrating lack of a radiodense style or shaker. Inset is the tail of a normal rattlesnake. This structure is normally formed by the fusion of several terminal vertebrae, a process only suggested in the anomalous specimen (arrow).

The specimen is deposited in the Bobby Witcher Memorial Collection (BWMC 1502), housed at Avila College, Kansas City, Missouri 64145.

Submitted by **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th and Rainbow Boulevard, Kansas City, Kansas 66103, **NICHOLAS A. LAPOSHA,** Jackson County Parks Department, 22807 Woods Chapel Road, Blue Springs, Missouri 64015, **ROBERT POWELL** and **JOHN S. PARMERLEE, JR.,** Department of Natural Sciences, Avila College, 11901 Wornall Road, Kansas City, Missouri 64145, U.S.A. ●

DASYPELTIS SCABRA (African egg-eating snake). **FEEDING.** Gans (1974. Biomechanics. J.B. Lippincott Co.) discussed the adaptations that make *Dasypeltis* ssp. successful obligate egg eaters, in particular the capacity of these snakes to swallow extremely large eggs. An example given by Gans was of an individual with a head width of 10 mm swallowing an egg 44.0 mm in diameter. Rabb and Snediger (1960. Copeia 1961:59-60) fed an African egg-eating snake (mass, 180 g; total length, 850 mm) chicken eggs that averaged 51.2 g, 54.7 mm in length, and 41.4 mm maximum width. On 10 October 1981, the following observations on the feeding of a female African egg-eating snake *(Dasypeltis scabra)* were made at the University of Oklahoma Animal Behavior Laboratory.

The snake (mass, 52.0; total length, 630 mm; head width, 10 mm) was given a freshly laid, domestic duck egg (mass, 70.4 g; volume, 69.0 ml; length 65.0 mm; maximum width, 46.0 mm) at 0730 h. It immediately examined the egg and began to swallow it at 0745 h. One hour later the egg was approximately 30% ingested (Fig. 1). The egg was completely swallowed and being cracked 2.5 h later, and reduced to its final size (Fig. 2) after an additional hour (4.5 h after it was first given to the snake). The snake was quietly checked every 30 min rather than watched continuously. Despite this, the snake was sufficiently disturbed to temporarily cease feeding when watched. Thus, the time taken to swallow the egg was probably increased by observer disturbance. The shell was found disgorged at 1600 h; its measurements were: length, 5.5 mm; maximum width, 3.2 mm, and it exhibited the characteristic non-elliptical "boat" shape described by Gans. A total of



Figure 1. Position of egg 1 hour after the snake first began to swallow it.



Figure 2. Position of egg 3.5 hours after the snake first began to swallow it.

40.6 g (38.0 ml) of the content was extracted and consumed by the snake, an amount equivalent to 78% of the snake's initial body mass. The following day a portion of the meal was regurgitated and the snake's skin around the throat sagged from the previous day's stretching. These observations demonstrate an African egg-eating snake's ability to consume exceptionally large eggs.

I wish to thank Mark A. Paulissen and Dr. Charles C. Carpenter for their suggestions on this manuscript.

Submitted by **JAMES J. KRUPA,** Department of Zoology, 730 Van Vleet Oval, University of Oklahoma, Norman, Oklahoma 73019, U.S.A. ●

HYPSIGLENA TORQUATA DESERTICOLA (Desert Night Snake). **BEHAVIOR.** Many species of snakes are known to exhibit unusual postural and physiological responses such as death feigning, head cocking, defecation, cloacal sac discharge, erratic crawling, and body bridging in the presence of ophiophagous snakes (see reviews by Gehlback 1970, Herpetologica 26:24-34; Carpenter and Gillingham 1975, Herpetologica 31: 293-302; Carpenter and Ferguson 1977, *In:* Gans and Tinkle, Biology of the Reptilia, Vol. 7, pp. 335-554; Weldon and Burghardt 1979, J. Chem. Evol. 5:141-151). This note desribes several of these behaviors displayed by a desert night snake when placed in the cages of two ophiophagous snakes.

On 30 May 1984 I placed a ca. 45 cm night snake into the cage of a ca. 65 cm western yellow-bellied racer, *Coluber constrictor mormon.* The night snake immediately began flicking its tongue, and assumed a slow, stiff crawl with the lateral coils of its body raised 0-1 cm above the artificial turf substrate. About 60 sec later the tongue flicks subsided, and the tail cocked upward at a 45° angle from the cloaca. The cloacal sac was slowly everted through the cloaca, discharged, and withdrawn. The tail remained erect for about 120 sec as the night snake slowly crawled along the edge of the cage, and during the latter half of this period the head was cocked upward at a 30° angle. Throughout this incident the respiratory rate of the snake was rapid, about 70 per min. After about five min, the racer showed no apparent interest. When touched with a stick, the night snake responded with rapid erratic escape movements.

I removed the night snake from the racer cage and placed it into the cage of a ca. 90 cm California kingsnake, *Lampropeltis getulus californiae.* The night snake crawled semirigidly along the side of the cage, and was

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quickly grasped 30 sec later near the cloaca by the kingsnake. The night snake initially attempted to burrow into the cedar shavings substrate, but soon ceased struggling. As the kingsnake slowly engulfed its prey tail first, the night snake was virtually motionless, with occasional feeble movements, and appeared to be feigning death. The entire feeding process terminated within 180 sec.

Submitted by **FLOYD E. HAYES,** Department of Biology, Loma Linda University, Riverside, California 92515, U.S.A. ●

LAMPROPELTIS CALLIGASTER CALLIGASTER (Prairie Kingsnake). **REPRODUCTION.** A fresh road kill (UOMZ 35373) was collected on 20 June 1984 two mi E of Hugo, Choctaw Co, Oklahoma near the junction of state highways 70 and 93. The gravid female measured 104 cm (snout-vent)/119 cm (total length) and contained 21 eggs near term with shells formed. Clutch size exceeds by four the maximum of 17 listed by Fitch (1970, Misc. Publ. #52, Univ. Kansas, Mus. Nat. Hist.).

Submitted by **CHARLES C. CARPENTER,** Department of Zoology, University of Oklahoma, Norman, Oklahoma, U.S.A. ●

NERODIA ERYTHROGASTER TRANSVERSA (Blotched Water Snake). **REPRODUCTION.** Dystocia (difficulty in delivery of eggs or young) is common among captive reptiles, particularly chelonians. Mummified fetuses are apparently less common but a case has been reported in *Thamnophis sirtalis* (Frye 1981. Biomedical and Surgical Aspects of Captive Reptile Husbandry. Vet. Med. Publ. Co. pp. 297-307).

On 27 May 1983 we captured a large female *Nerodia erythrogaster transversa* measuring 827 mm S-V, by the Rio Sabinas at San Juan de Sabinas, Coahuila, Mexico. Its abdomen was greatly distended and contained several large, hard, palpable masses. The snake was in poor condition, obviously emaciated, and died three days later. Upon dissection we found six granular masses (Fig. 1), still in the oviduct, but apparently the cause of a severe case of peritonitis. Radiographs showed three of these masses to contain mummified fetuses (Fig. 2), and three, probably individual infertile ova, showed no skeletal fetal remains.

The specimens are deposited in the Bobby Witcher Memorial Collection (BWMC 2144), Avila College, Kansas City, Missouri.



Figure 1. Six ovarian masses dissected from an oviduct of *N. erythrogaster*. The small one at the lower left has been cut in half, and the one at the lower right has been partially teased apart.

The authors thank the Direccion General de Flora y Fauna Silvestres, Mexico, D. F., for permission to collect herpetological specimens in Mexico, and Dr. J. A. Mauck, D.V.M., Farview Animal Hospital, Independence, Missouri, for radiographs of the ovarian masses.



Figure 2. Radiograph of one of the ovarian masses showing skeletal remains of mummified fetuses.

Submitted by **NICHOLAS A. LAPOSHA,** Jackson County Parks Department, 22807 Woods Chapel Road, Blue Springs, Missouri 64015, **JOHN S. PARMERLEE, JR.** and **ROBERT POWELL,** Department of Natural Sciences, Avila College, 11901 Wornall Road, Kansas City, Missouri 64145, and **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th and Rainbow Boulevard, Kansas City, Kansas 66103, U.S.A. ●

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TANTILLA GRACILIS (Flat-headed Snake). **ALBINO.** Juvenile specimen (snout-vent = 88 mm, total length = 106 mm) collected 13 June 1984 where many normally colored individuals have been observed over the past 33 years. Specimen was beneath a slab of limestone on the side of a limestone bluff in open forest near Briar Creek, ca. 5 mi NW University of Oklahoma Biological Station, Marshall Co, Oklahoma. Melanin was completely lacking, no head pattern apparent, the eyes pink with a slight pinkish tinge to the belly. It was maintained in captivity for 40 days, then preserved and placed in the collections of the Stovall Museum of Science and History of the University of Oklahoma (UOMZ 35372).

Submitted by **CHARLES C. CARPENTER,** Department of Zoology, University of Oklahoma, Norman, Oklahoma 73019, U.S.A. ●

TROPIDOCLONION LINEATUM ANNECTENS X TEXANUM (Central X Texas Lined Snake). **COLORATION.** Three amelanistic partial albino *Tropidoclonion lineatum* have previously been reported from Texas by Hensley (1959 Publ. Mus., Mich. State Univ. 1(4):133-159), Dyrkacz (1981, SSAR Herp. Circ. 11) and Tennant (1984, Snakes of Texas, Texas Monthly Press, Austin).

An additional, amelanistic partial albino *Tropidoclonion lineatum annectens* X *texanum* was collected on 21 August 1984 by Lynn Madewell in a residential area of Haltom City, Tarrant Co., Texas. The juvenile male was donated to the Fort Worth Zoological Park and at the time of capture had a total length of 108 mm.

In life, the specimen had a ground color of light tannish pink with darker pink specks bordering a white middorsal stripe and cream lateral stripes. The eyes were pink and the normally black ventral half-moons were dark pink.

The collector reported that an adult specimen of similar coloration had previously been killed by a neighbor, but was discarded.

The juvenile specimen was maintained in captivity for several months and then deposited in the Vertebrate Collection, University of Texas at Arlington (UTACV #10055).

Submitted by **JOHN F. COVER, JR.,** Department of Herpetology, Fort Worth Zoological Park, Fort Worth, Texas 76110, U.S.A. ●

TESTUDINES

GEOCHELONE ELEPHANTOPUS VANDENBURGHI (Galapagos Giant Tortoise: Volcan Alcedo Race). **MORPHOLOGY.** Minor shell anomalies occur frequently in the large population of 3,000-5,000 Galapagos tortoises on Volcan Alcedo, a large shield volcano on Isabela Island in the Galapagos Archipelago. Deformities of a large magnitude are seldom observed among adult tortoises in the wild since such individuals die at a relatively young age. We report such an individual to document its occurrence in a wild population and to speculate upon the causes of the deformity.

On 21 June 1984, an adult female Galapagos tortoise was found with an extremely deformed carapace near the sulphur beds on

the southwest side of Volcan Alcedo, Galapagos Islands. The carapace, which bulged radically to the left, was 92.0 cm long and 109.6 cm wide. A line drawn from the nuchal notch to the center of the rear marginal scute afforded measurements of the deviation of vertebral scutes from center (see Fig. 1). Width measurements of the five vertebral scutes and the distance from the right edge to the center line are given as follows: (1) 27.0 cm, 10.5 cm; (2) 23.2 cm, 3.5 cm; (3) 23.6 cm, 2.7 cm; (4) 20.6 cm, 3.5 cm; and (5) 23.9 cm, 9.2 cm.

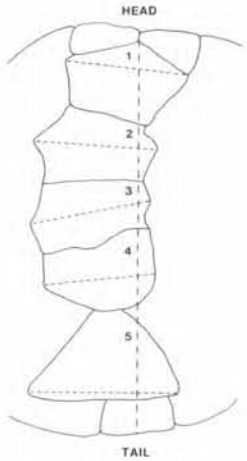
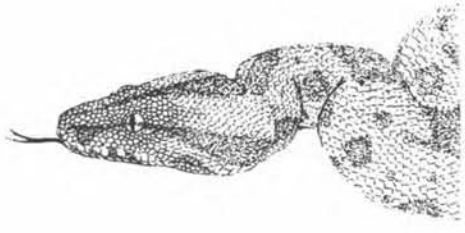


Figure 1. Drawing of deformed Galapagos tortoise carapace showing deviation of vertebral scutes from the midline of the carapace.

The deformity may be the result of (1) a congenital deformity of a genetic and/or teratogenic nature, (2) a post-zygotic pathological condition (e.g. tumor), (3) an injury sustained from a fall or falling rock, or (4) an injury inflicted by a feral burro *(Equus asinus)* when the tortoise was young. Although the exact cause of this deformity remains speculative, the injury from a burro hypothesis merits special attention.

In a recent study of tortoise nesting success on Volcan Alcedo, Fowler de Neira and Rose (1984. Copeia 1984:702-707) found that 18.2% of 88 nests on the caldera floor were disturbed by feral burros. Many hatchlings undoubtedly die as a result of this disturbance, but the deformed tortoise may have survived such an incident with sublethal injuries. Authorities are presently eradicating the feral burros on Volcan Alcedo in an effort to save the tortoise from competition for food and interference in nesting success.

Submitted by **FLOYD E. HAYES** and **KENT R. BEAMAN,** Department of Biology, Loma Linda University, Riverside, California 92515, U.S.A. ●



LEPIDOCHELYS OLIVACEA (Olive Ridley Sea Turtle). **REPRODUCTION.** Olive ridleys were tagged at Punta Raton, Honduras (13° 16' N, 87°31' W) on the Gulf of Fonseca during the 1984 nesting season. The internesting intervals recorded between egg layings are listed in Table 1. Almost half the internesting intervals were 15 to 17 days long. This is in accord with data reported for olive ridleys nesting in Surinam where 17 days was the most common internesting interval (Pritchard 1969. Sea turtles of the Guianas. Bull. Fla. State Mus., 13:85-140; Schulz 1975. Sea turtles nesting in Surinam. Zoologische Verhandelingen, uitgegeven door het Rijksmuseum van Natuurlijke Historie te Leiden, 143:1-144.) In contrast, on the west coast of Mexico, olive ridleys follow a 28 day internesting cycle (Marquez 1982. pp. 153-158, *In:* Biology and Conservation of Sea Turtles, Smithsonian Institution Press).

Table 1. Internesting intervals and frequencies between recorded successful nests of *Lepidochelys olivacea.*

Internesting interval (days)	Frequency
4	1
9	1
10	1
12	1
13	2
14	1
15	4
16	2
17	4
27	2
28	1
39	1
75	1
Total	22

At Punta Raton, one turtle bearing a monel metal tag on each front flipper laid 93 eggs on 2 October 1984, and 96 eggs 10 days later on 12 October. She was seen nesting again only four days later on 16 October.

I acknowledge the help of Dr. Jeanne A. Mortimer in the preparation of this paper.

Submitted by **CYNTHIA J. MINARIK,** 2631 Ulysses Street N.E., Minneapolis, Minnesota 55418, U.S.A. ●

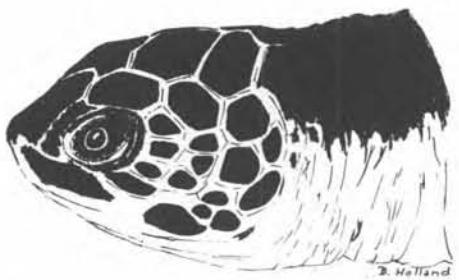
MALACLEMYS TERRAPIN TERRAPIN (Northern Diamondback Terrapin). **BEHAVIOR.** Juvenile diamondback terrapins with shell lengths from 2.5 to 7.5 cm were observed over a three-year period from 1979 to 1981 at Barneget Bay, Beach Haven, New Jersey. These *M. terrapin* used surface debris to conceal themselves on a 4-5 acre tidal mud flat. They were always found at low tide, ca. 100 yards from the water's edge on well-drained ground.

From 30 May 1979 to October 1981, 12 observations were made of juvenile *M. terrapin* hiding under accumulated surface debris and matted *Spartina* grass. In early June 1979, one specimen was discovered under a piece of board. On 30 May 1980 two were found under a piece of a wooden chair seat on the same mud flat. On 4 July 1980 one specimen was discovered hiding under a dense, low-growing blueberry (*Vaccinium* spp.) bush. Two more were found by rolling back matted sections of *Spartina* grass that same year.

In early July 1981, two were found under large rocks, and another by rolling back matted *Spartina* grass. In September 1981 one was located under a large rock and a second under matted *Spartina* grass. In October 1981 two more were found under rocks.

Surface debris and matted *Spartina* grass apparently offers adequate cover for predator avoidance and permits thermoregulation. This hiding behavior has not been described previously for *M. terrapin.*

Submitted by **ROBERT PITLER,** 10 Lloyd Place, Belleville, New Jersey 07109, U.S.A. ●



GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be

adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

ANURA

PSEUDACRIS STRECKERI STRECKERI (Strecker's Chorus Frog). USA: TEXAS: Somervell Co: 12.1 km NE Glen Rose on US 67 at Jct. county rds. 406 and 407. 5 May 1985. C. T. McAllister. Verified by S. E. Trauth. Arkansas State University Museum of Zoology (ASUMZ 4576-4578). New county record filling a hiatus between Bosque, Erath and Hood counties in the northcentral Brazos River watershed (Raun and Gehlbach. 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **CHRIS T. MCALLISTER** and **ELIZABETH A. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, U.S.A. ●

RANA CLAMITANS MELANOTA (Green Frog). CANADA: QUEBEC PROVINCE: Roberval Co: Réserve Faunique Ashuapmushan, 110 km mark on route 167, Ruisseau Lepage. 330 m. (49 08' N, 73 33' W). 3 Aug. 1984. Norris Denman and Luise Denman. Verified by F. R. Cook. National Museums of Canada, NMC 26192). Extends range 250 km to the NW (Bleakney 1958. NMC Bull. 155).

Submitted by **NORRIS S. DENMAN** and **LUISE DENMAN,** 350 William Birks Street, St. Bruno, Quebec J3V 1P2, Canada. ●

CAUDATA

AMBYSTOMA TREMBLAYI (Tremblay's Salamander). CANADA: ONTARIO: *A.* Simcoe Dist: Tay Twp, Victoria Harbour (44°44'N 79°46'W). 20 April 1982. W. F. Weller. National Museums of Canada, National Museum of Natural Sciences, Ottawa (NMC 26318). Verified by J. P. Bogart. First record from southern Georgian Bay area. Reduces hiatus between published localities ca. 150 km to the south (Weller et al. 1978. Canadian Field-Naturalist 92(2):174-181; Weller et al. 1979. Herp. Review 10(2):61-62); to the north approximately 60 km near Parry Sound (Bogart 1982. Canadian Journal of Zoology 60(5):848-855); to the east-northeast ca. 85 km to near Dorset (Weller et al. 1978. ibid); and, to the northeast approximately 140 km into Algonquin Park (Brunton and Weller. 1979. Ontario Field Biologist 33(1):42-43; Mountjoy. 1983. SSAR Herp. Review 14(4): 124). *b.* Algoma Dist: Prince Twp, Gros Cap (46°31'N 84°35'W). 25 September 1981. W. F. Weller, P. Niblett, and J. Webber. Verified by W. F. Weller. (NMC 26326). 10 October 1981. W. F. Weller. Verified by J. P. Bogart. (NMC 26315). Algoma District: Prince Twp 2.8 km E Gros Cap (46°31'N 84°32'W). 10 May 1982. W. F. Weller. Verified by W. F. Weller. (NMC 16323). The Algoma District records extend the range ca. 26 km north and 250 km west of the Sudbury area (Weller and Glooschenko. In press. Canadian Field-Naturalist). NMC 26315-6 from Gros Cap is only the second male *A. tremblayi* reported from Ontario; the first being NMC 26316 from the Sudbury area (Weller and Glooschenko. In press. ibid). All verifications on basis of electrophoretic patterns, chromosome counts, morphology or dissection.

Submitted by **WAYNE F. WELLER,** 9 Mississauga Road North, Mississauga, Ontario L5H 2H5, Canada ●

DESMOGNATHUS FUSCUS FUSCUS (Northern Dusky Salamander). CANADA: QUEBEC PROVINCE: Shefford Co: 8 km south of Roxton Falls on route 241, Elev. 210 m. (45 30'N, 72 33'W). 23 July 1981. N. Denman. Verified by F. R. Cook. National Museums of Canada, National Museum of Natural Sciences, Ottawa. (NMC 22497). Extends range 30 km to the N and to the edge of the St. Lawrence lowlands (Weller 1977. Can. Fd.-Nat. 91: 299-303).

Submitted by **NORRIS S. DENMAN** and **LUISE DENMAN,** 350 William Birks Street, St. Bruno, Quebec, J3V 1P2 Canada ●

EURYCEA BISLINEATA BISLINEATA (Northern Two-lined Salamander). CANADA: QUEBEC PROVINCE: Kamouraska Co: 18 km SE Mont-Carmel. Rivière du Loup. 330 m (47° 21'N, 69°42'W). 24 August 1983. National Museums of Canada, National Museum of Natural Sciences, Ottawa. (NMC 26202). Second growth spruce forest. Temiscouata Co: 9 km SE of St.-Joseph-de-la-Riviere-Bleue, discharge of Lac des Cèdres. 290 m (47°23'N, 69°56'W). 24 August 1983. (NMC 26201). Second growth transition forest. Chicoutimi Co: 44 km W of Sacré Coeur, torrent entering Rivière Ste. Marguerite. 120 m (48°23'N, 70°13'W). 23 August 1983. (NMC 26200). Boreal forest. Chicoutimi Co: 15 km E of St.-Fulgence, Rivière Pelletier. 90 m (48°27'N, 70°42'W). 22 August 1983. (NMC 26199). Second growth transition forest. Roberval Co: Rèserve Faunique Ashuapmushan, 73 km mark on route 167, Rivière Vermillion. 330 m (48°52'N, 73°13'W). 5 August 1984. (NMC 26198). Boreal Forest. Roberval Co: Rèserve Faunique Ashuapmushan, 83 km mark on route 167, Rivière a la Pèche. 330 m (48°57'N, 73°13'W). 3 August 1984. (NMC 26191). Boreal Forest. Roberval Co: Rèserve Faunique Ashuapmushan, 162 km mark on route 167, Rivière au Tonnerre. 400 m (49°23'N, 74°05'W). 3 August 1984. (NMC 26194). Boreal Forest. Ungava Co: Rèserve Faunique Mistassini, 266 km mark on route 167, Rivière Bordeleau-Hudson's Bay drainage. 400 m (50°04'N, 74°02'W). 4 August 1984. (NMC 26195). Boreal forest. Ungava Co: Rèserve Faunique Mistassini, 286 km mark on route 167, Rivière Bignal—Hudson's Bay drainage. 400 m (50°11'N, 73°50'W). 4 August 1984. (NMC 26196).Boreal forest and barrens. Ungava Co: Rèserve Faunique Mistassini, 304 km mark on route 167, Rivière a la Perche-Hudson's Bay drainage. 370 m (50° 20'N, 73°45'W). 4 August 1984. (NMC 26197). Boreal forest and barrens. These records close the gap between the St. Lawrence River, Lac St. Jean (Trapido and Clausen. Copeia. 1938:117-125) and the Rupert River (Cook and Preston, Can. Field-Nat. 93:178-179). All collected by N. Denman and L. Denman, and verified by F. R. Cook.

Submitted by **NORRIS S. DENMAN** and **LUISE DENMAN,** 350 William Birks Street, St. Bruno, Quebec J3V 1P2, Canada ●

HEMIDACTYLIUM SCUTATUM (Four-toed Salamander). USA: MISSOURI: Camden Co: Ha Ha Tonka State Park. 24 March 1985. B. Brandon. Verified by R. Powell. Bobby Witcher Memorial Collection, Avila College, Kansas City, MO (BWMC 02311-02312). First records from Camden County and the western-most population in the Ozark Plateau of Missouri, ca. 70 km west and northwest of previous localities in Phelps and Texas counties. (Johnson. The amphibians and reptiles of Missouri. Missouri Dept. Cons. In press).

Submitted by **ROBERT POWELL,** Department of Natural Sciences, Avila College, Kansas City, Missouri 64145, U.S.A. ●

AMPHISBAENIA

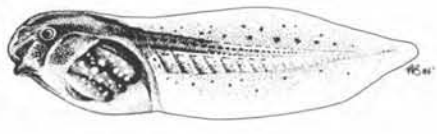
AMPHISBAENA GRACILIS (Morrona) VENEZUELA: ESTADO BOLIVAR: Ciudad Bolivar (08°09'N-63°33'W), 50 m. 1979. Deciderio Rendón. Verified by S. Gorzula. Museo de Biologia, Universidad Central de Venezuela (MBUCV 7040). Third known locality, extending range 210 km southwest. Differs from the other four known specimens (Gonzalez Sponga and Gans. 1971. Copeia 1971(4):589-595) in the following: autotomy constriction on 8th segment; chin segments 3 + 7 + 0; cloacal segments 5 + 6 + 13.

Submitted by **STEFAN J. GORZULA,** Centro de Ecologia, Instituto Venezolano de Investigaciones Cientificas, Apartado 1827, Caracas 101, Venezuela. ●

SAURIA

CNEMIDOPHORUS SEXLINEATUS VIRIDIS (Prairie Lined Racerunner). USA: TEXAS: Somervell Co: 7.7 km NE Glen Rose, off U.S. 67 on Co Rd. 316. 18 May. 1985. C. T. McAllister and S. P. Tabor. Verified by R. Ward. North Texas State University Herpetological Collection (NTSU R636-R646). First record for county, partially filling gap in a tri-county area of northcentral Texas (Raun and Gehlbach. 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **CHRIS T. MCALLISTER** and **STEPHEN P. TABOR,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, U.S.A. ●



SERPENTES

ADELOPHIS COPEI. MEXICO: MICHOACAN: 11.25 km SE Zamora on Mex. Hwy 15. 29 July 1976. T. Papenfuss. Verified by D. A. Rossman. California Academy of Sciences (CAS 142449). New state record, previously reported from Guanajuato, Jalisco, and Morelos (Rossman and Blaney. 1968. Occ. Pap. Mus. Zool. Louisiana St. Univ. 35:1-12). First female of the species to be recorded.

Submitted by **DOUGLAS A. ROSSMAN,** Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana 70803, U.S.A.●

NERODIA ERYTHROGASTER TRANSVERSA (Blotched Water Snake). USA: TEXAS: Young Co: 6.4 km S Graham on FM 1287. 16.3 km SE Graham at Jct. FM 1191 and TX 16. 12 May 1985. S. P. Tabor and C. T. McAllister. Verified by R. Ward. North Texas State University Herpetological Collection (NTSU R651-R652). New county records filling a hiatus between Archer and Stephens counties in the Brazos River watershed (Raun and Gehlbach. 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **STEPHEN P. TABOR** and **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, U.S.A. ●

NERODIA RHOMBIFERA RHOMBIFERA (Diamondback Water Snake). USA: TEXAS: Young Co: 1.6 km S Graham on TX 16. 8.0 km NE Eliasville on FM 701, Clear Fork of Brazos River. 12 May 1985. C. T. McAllister and S. P. Tabor. Verified by R. Ward. North Texas State University Herpetological Collection (NTSU R656-R658). New county record filling distributional gap between records for Archer (Raun and Gehlbach. 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2) and Stephens (Karges 1982. Herp. Review 13:27) counties.

Submitted by **CHRIS T. MCALLISTER** and **STEPHEN P. TABOR,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, U.S.A. ●



TESTUDINES

CLEMMYS INSCULPTA (Wood Turtle) CANADA: QUEBEC PROVINCE: Brome Co: Knowlton's Landing, Elev. 210 m. (45° 09'N, 72° 18'W). 21 August 1977. A. Denman. Verified by F. R. Cook. National Museums of Canada, National Museum of Natural Sciences, Ottawa. (NMC 14885).

Submitted by **NORRIS S. DENMAN** and **LUISE DENMAN,** 350 William Birks Street, St. Bruno, Quebec J3V 1P2, Canada ●

PSEUDEMYS CONCINNA (River Cooter). USA: WEST VIRGINIA: Border of Summers and Raleigh Co: New River Gorge National River, 8.2, 13.4 and 19.4 km downstream (north) from Bluestone Dam. 7 July-15 October 1984. K. A. Buhlmann, M. R. Vaughan and R. Eades. Verified by M. E. Seidel. Photographs deposited in the New River Gorge file, Department of Fisheries and Wildlife Sciences, Virginia Polytechnic Institute and State University. First records from below Bluestone Reservoir, although species has been recorded from Greenbrier River, near its junction with New River (Seidel 1981. Brimleyana

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(6):25-44), and further downstream in the Kanawha River System (Seidel and Green. 1982. SSAR Herp. Review 13(4):132-134).

Submitted by **KURT A. BUHLMANN** and **MICHAEL R. VAUGHAN,** Department of Fisheries and Wildlife Sciences, VPI&SU, Blacksburg, Virginia 24061, U.S.A. ●

PSEUDEMYS CONCINNA CONCINNA (Eastern River Cooter). USA: KENTUCKY: McCreary Co: Lake Cumberland, in Little South Fork arm, 2.4 km upstream of confluence with Big South Fork. 17 June 1982. (KDFWR 8002-8003); Lake Cumberland, in Big South Fork, 0.3 km SE of confluence with Little South Fork. 14 October 1982. (KDFWR 8004). Wayne Co: Lake Cumberland, in Beaver Creek arm, 3.2 km upstream of confluence with Cumberland River. 8 June 1982. (KDFWR 8000-80001, EKU-uncatalogued). Douglas E. Stephens. Verified by John R. MacGregor and Paul V. Cupp. Kentucky Department of Fish and Wildlife Resources (KDFWR) and Eastern Kentucky University (EKU). New county records. Extends range approximately 150 km ESE of nearest Kentucky record in Edmonson Co. (Bailey. 1933. Amer. Mid. Nat. 14(5):385-635); approximately 120 km WNW of the Norris Lake specimen in Tennessee (Ewert. 1979. SSAR Herp. Review 10(3):101); and approximately 330 km WSW of the Bluestone Reservoir population in West Virginia (Seidel and Green. 1982. SSAR Herp. Review 13(4):132-134).

Submitted by **DOUGLAS E. STEPHENS,** Kentucky Department of Fish and Wildlife Resources, No. 1 Game Farm Road, Frankfort, Kentucky 40601, U.S.A. ●

DISTRIBUTIONAL RECORDS OF AMPHIBIANS AND REPTILES FROM THE STATE OF MEXICO

Field work in the state of Mexico has yielded seven new state records as well as new localities within the area, which are presented below.

Preserved specimens are deposited in the collection of Vivarios y Colecciones de la Escuela Nacional de Estudios Profesionales Iztacala, Universidad Nacional Autónoma de México (ENEPI). Oscar Sanchez-Herrera verified the identities of the specimens.

LEPTODACTYLUS MELANONOTUS. Bejucos (18°45'N, 100°27'W), 578 m. 18 February 1983. J. L. Camarillo. (ENEPI 502-503). First state record (Smith, H. M. and R. B. Smith 1976. Synopsis of the Herpetofauna of Mexico, Vol. IV, John Johnson, North Bennington, Vermont).

PHYLLODACTYLUS LANEI RUPINUS. Nuevo Santo Tomás de Los Plátanos (19°10'N, 100°15'W), 1380 m. 28 May 1983. J. L. Camarillo. (ENEPI 700). Easternmost record (Dixon, J. R. 1964, New Mexico State Univ. Sci. Bull. 64-1:1-139) and second from the State (Camarillo 1983. Bull. Maryland Herp. Soc. 19:39-46).

ANOLIS NEBULOSUS. Bejucos. 4 July 1981. J. L. Camarillo. (ENEPI 308); Nuevo Santo Tomás de Los Plátanos, 26 May 1983. O. Sánchez-H., (ENEPI 702). Tingambato (19° 05'N, 100°16'W); 1230 m. 22 June 1981. O. Sánchez-H. (ENEPI 284) 19 February 1983. J. L. Camarillo. (ENEPI 518) 100 km W Chalma (Camarillo 1983. ibid).

CTENOSAURA PECTINATA. Nuevo Santo Tomás de Los Plátanos. 25 September 1983. L. Alcantar. (ENEPI 710). 50 km N of Bejucos (Caramillo 1983. ibid).

SCELOPORUS PYROCEPHALUS. Bejucos. 25 June 1982. J. L. Camarillo. (ENEPI 662-663); 28 September 1982. J. L. Camarillo. (ENEPI 416-417); 25 February 1983. J. L. Camarillo. (ENEPI 665); 4 July 1983. J. L. Camarillo. (ENEPI 310). First state records (Smith and Smith 1976. ibid. Vol. III).

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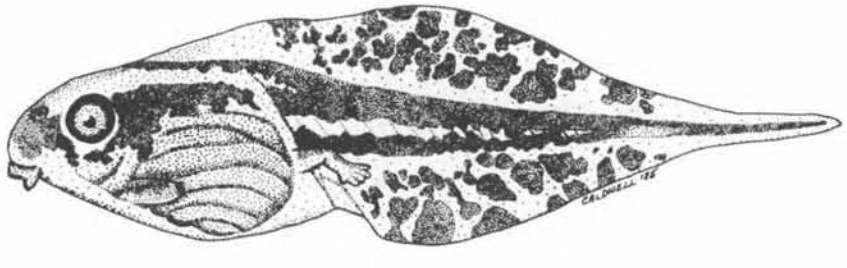
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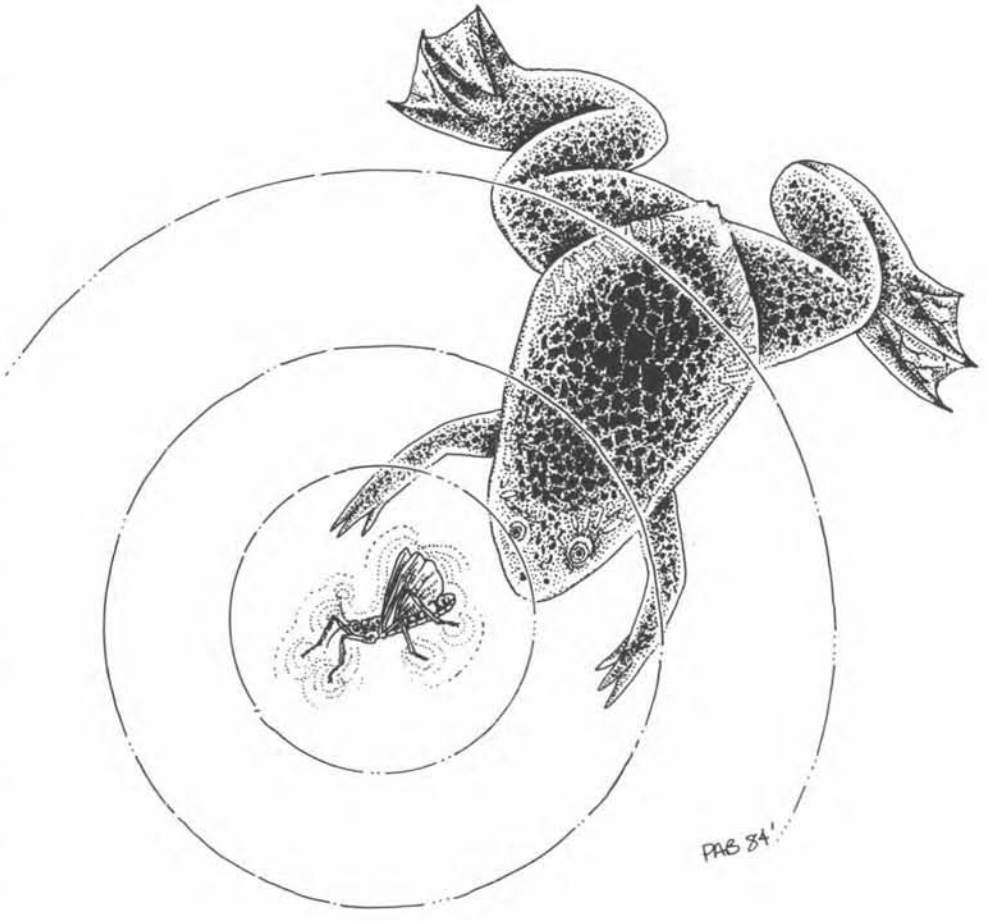
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BOOK REVIEWS

The Amphibians of British Columbia, by David M. Green and R. Wayne Campbell. British Columbia Provincial Museum, Handbook 45, 1984. 101 pp. Illustrated by Keith Taylor and Brigitta M. Van Der Raay. $3.00.



A 62 page booklet bearing the same title was first published in 1943, written by the late herpetologist Clifford G. Carl. The current handbook is completely rewritten with the addition of range maps and up-to-date information. It does, however, retain some of Carl's original features, including a section on folklore with the line drawing border of frogs (or toads) on a blanket drawn by Charles Edensaw, Masset, Queen Charlotte Islands.

Preceding the species accounts is a wealth of well-researched information which includes sections on Folklore, Fossil History and Distribution, Ecology and Economics, and a good section on Care of Captives — missing from Clifford Carl's booklet as amphibian pets were rarely popular in those days.

The Province of British Columbia has a great diversity of terrain. There are mountains, dense forests, valleys with rich vegetation, and desert-like areas. There is also the seashore, and crystal-clear mountain lakes and streams. With the infinite variety of landscape comes a diversity of amphibians. Nineteen species are known to occur in British Columbia.

The species accounts begin with general information on salamanders — breeding, regeneration, and a key to the eight species of adult salamanders in the province. Some interesting ones include the rough-skinned newt *(Taricha granulosa),* which, when threatened, will arch its back, bringing its tail and head up to expose its bright orange belly. The Pacific giant salamander *(Dicamptodon ensatus),* at a length of about 300 mm, is British Columbia's largest salamander. This rather rare species, if molested, can "bark" or "yelp," and sometimes attempts to bite; neotonic individuals are common. Three kinds of plethodontid salamanders also occur in this province.

The section on frogs and toads follows the same format as that of the salamanders, with an excellent account on Voice and Social Behavior in anurans. There are 11 species of frogs and toads in British Columbia. The cascades frog *(Rana cascadee),* although it has never actually been found in British Columbia, is included because of the proximity of its known range to the British Columbia border and the possibility that it may indeed occur in that province. Some frogs, including the bullfrog *(Rana catesbeiana)* (whose French name "Ouaouaron" was misspelled in the text) and the green frog, *(Rana clamitans)* were introduced into western Canada. Two fascinating anurans are the tailed frog *(Ascaphus truei)* and the Great Basin spadefoot toad *(Scaphiopus intermontanus).* The "tail" of the male tailed frog is, of course, only an extension of the cloaca. This little creature of ancient origin has many of the most primitive features to be found among living frogs. The squat-bodied spadefoot toad, like the tailed frog, has vertical pupils. It has an enlarged tubercle or "spade" on the sole of each hind foot so it can burrow to escape the drying conditions of its desert or semi-desert habitat. The Pacific treefrog *(Hyla regilla)* and Northern chorus frog *(Pseudacris triseriata)* are also native to British Columbia.

The book has a glossary and two-and-a-half pages of Useful References which include Field Guides, Handbooks, Scientific Journals, and Societies. On the last page is a list of other handbooks in this series, including number 44, **The Reptiles of British Columbia** by Patrick T. Gregory and R. Wayne Campbell.

The Amphibians of British Columbia is an exceptionally accurate work. The manuscript was reviewed by experts — James P. Bogart, Francis R. Cook (Curator of Herpetology, National Museum of Natural Sciences, Ottawa), Fred W. Schueller (inadvertently misspelled in the book), Patrick T. Gregory, and David L. Servage. The book will be of particular interest to Americans on the west coast, and those living in states near the British Columbia border, where many of the same species are to be found.

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Proceedings of the First International Colloquium on Pathology of Reptiles and Amphibians, Edited by: C. Vago and G. Matz. Publiés avec Concours du Centre National de La Recherche Scientifique. Distribués Par les Presses de Univerite l'Université d'Angers, 1983 258 pp. ISBN 2-903075-21-7.

This is a published collection of papers presented at a symposium held in Angers, France, from 29 September to 2 October 1982. The book illustrates the aphorism that, unlike children, symposia should be heard and not seen. Added to the usual problems with symposia is the fact that this was a multilingual conference, and the papers are in English, French, or German. None of the English papers have summaries translated into a foreign language, and the English summaries of the French and German papers are often inadequate. An exception is the excellent and clearly written summary in the article, Developpement Somatique et Inversion Sexuelle Sous L'Action de la Temperature Chez les Embryons de Reptiles by C. Pieau.

A number of the papers which are in English were written by authors for whom English was clearly a second language. In most of these, editing was totally inadequate. The English is often clumsy and difficult to understand. Errors in spelling and syntax are numerous.

There is no introductory section explaining

to the reader the purpose of the symposium or the criteria used for acceptance of papers. Thus, we do not know to whom this book is addressed. Are the intended readers veterinary practitioners, amateur or professional herpetologists, or basic biologists? There are selected papers which might appeal to members of each of the above groups, but there is no cohesion of purpose that is apparent in the entire symposium. Instead, it seems that anyone who had something to say about a disease in a reptile or amphibian, was welcome to present his or her material.

Papers vary from individual case reports (e.g., of two-headed snakes by G. Naulleau and very randomly selected cases presented by E. Elkan) to reviews of broader topics (e.g., public health aspects of parasitic disease in snakes and amphibians by P. Hocquet) to research reports (e.g., induction of malformations in regenerating limbs of newts by the fungicide Maneb by E. Arias, N. P. Zaffaroni and T. Zavanella). The papers which present individual case reports should have been published as brief articles in various journals rather than in this symposium, which should have had a more overall sweep in its context.

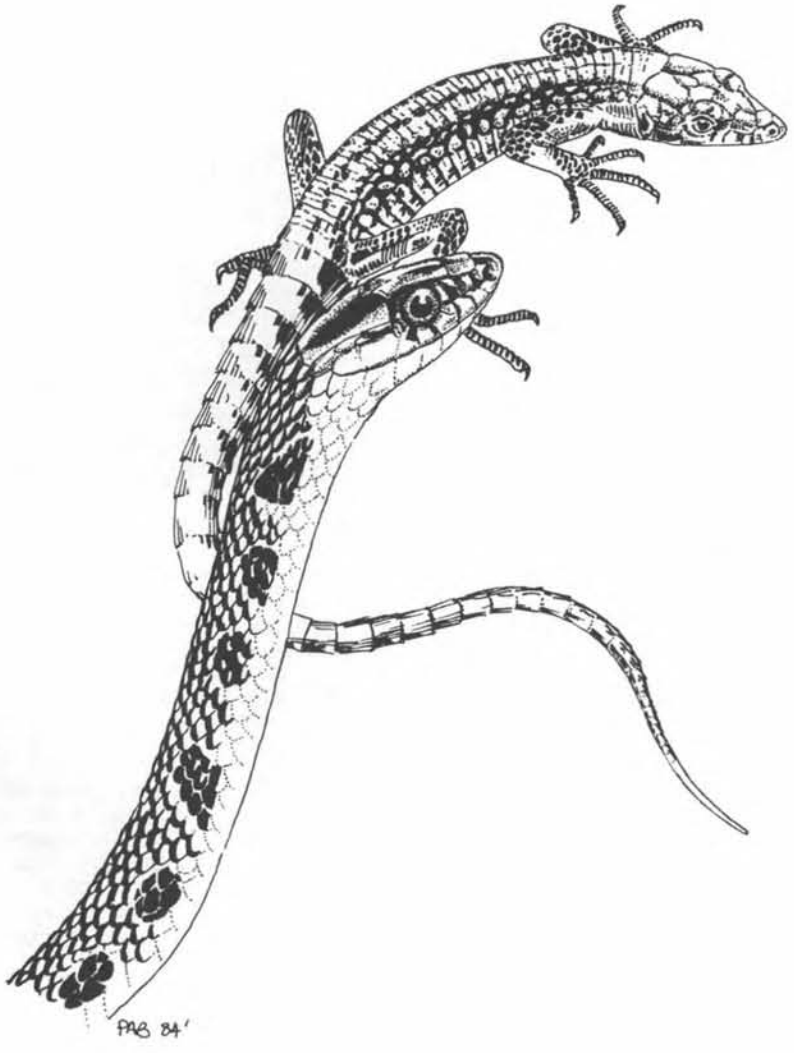
A few papers stood out as clearly worthy of presentation and of better quality than most of the rest of the symposium. For example, Monocercomoniasis in Reptiles by P. Zwart, S.F.M. Teunis and J.M.N. Cornelissen was clearly written and combined empirical clinical observation, pathologic findings, and results of experimental infections. The authors clearly were competent observers of naturally occurring phenomena, and competent in experimental design. Pathological Studies on Skin Lesions in Reptiles by J. E. Cooper and L. Lawrence was a useful review even though some specific viral, parasitic and bacterial infections were omitted.

M. Balls, R. H. Clothier, et al. coauthored several papers about the effect of potentially carcinogenic agents on amphibians. These articles might be considered controversial by some, but they offer a critical review of the literature. The authors present data for their argument that amphibians, such as *Xenopus laevis*, are relatively resistant to chemical carcinogens, in contrast to claims published previously. Their discussions are one of the more useful aspects of this symposium. On the other hand, the article, Lesions Induced in *Xenopus laevis* by Exposure to Dimethylnitrosamine, by K. R. Knowles, R. H. Clothier and M. Balls is a study without adequate controls. The authors inappropriately compared their experimental results to their previous experience with normal animals. This is not justified because all of the conditions that were present during the experimental trial may not have been present during previous observations. Since these authors have been quite vocal in their criticism of technique and observations made by other authors, it behooves them to be particularly careful in their own work.

Very often the most useful aspect of a symposium is the informal communication that occurs among attendees and speakers. Furthermore, oral presentations lose much of their flavor when they are transcribed. Illustrations also suffer. It is likely that slides projected on the screen in color were much clearer than the black and white reproductions in the book, many of which are of poor quality.

In summary, there are several texts which offer much better, broader coverage of reptilian diseases. This book has some limited value in reviewing current research. I can think of no specific audience that would find the entire book useful.

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Keys to the Vertebrates of Texas, by Allan H. Chaney. 1982. Caesar Kleberg Wildlife Research Institute, v-99 pp; softcover. Available: College of Agriculture, Texas A&I University, Campus Box 218, Kingsville, Texas 78363. $3.50.

After years of waiting for the "Chaney Keys" and having several editions as mimeographed copies, they have now been published by the Caesar Kleberg Wildlife Research Institute. The book is 8¼ x 10¾ inches. Keys to other groups are forthcoming. The author states that these keys were not written for the professional, but were developed for students and teacher workshops.

The **Keys to the Vertebrates of Texas** is somewhat of a misnomer, as keys to the birds are not included. The first 41 text pages are keys to the common fish of Texas followed by a one page line drawing of a composite fish. Pages 43 through 51 are keys to the adult amphibians of Texas, followed by a page of line drawings of a salamander and one page of line drawings of a frog and toad. Pages 55 through 78 are keys to the reptiles of Texas followed by one page each showing turtle, lizard and snake characteristics. Pages 83 through 99 are keys to the adult terrestrial mammals of Texas. The author suggests that the keys be used with various publications listed in the Preface. Typographical errors as well as several other lapses occur because the author was not given the opportunity to read page proofs. Accordingly, the corrections are given here. Recent changes in fish

nomenclature necessitate too many corrections to be listed in this review. It is best to await the second edition, which is in preparation.

On p. 12, the first couplet 60% should be 70%; p. 23, *O. emilieae* should be *O. emiliae;* p. 25, *N. atherinoides*, not *atherenoides;* p. 35, couplet 20 should read . . . more than 50 lateral scales, omit line; p. 39, couplet 5 is *punctulatus*, not *puntulatus;* and p. 41, couplet 4, *anisotremus*, not *anistremus*.

The amphibian keys and the line drawings (composites for the sake of brevity) are adequate.

The corrections in the reptile keys are: p. 62, should be *Cnemidophorus gularis septemvittatus;* p. 63, should be *Cnemidophorus gularis gularis;* p. 66, *disparilis* is now *microlepidotus;* p. 68, in couplet 112 between smooth and scales, omit belly; p. 69, *melanoleucus* instead of *melanoleucas;* p. 72, add 153 to last couplet; p. 73, omit *(Natrix)* in couplet 161; p. 74, change *sipedon* to *fasciata;* p. 75, couplet 171 (upper) change to *Hypsiglena torquata jani* (Texas night snake); *Trimorphodan* to *Trimorphodon;* couplet 176, omit first statement about scale rows; p. 76, couplet 183, change 185 to 186, and in couplet 184 change 186 to 185.

Mammal corrections are: p. 87, *Eutamias canipes*, not *E. speciosus;* p. 88, *Geomys breviceps* and *G. attwateri* have been inadvertently omitted from the key; p. 95, *Cervus merriami*, not *C. elephus;* p. 96, *Blarina brevicauda* should be *B. carolinensis* and *B. hylophaga*.

The above corrections are trivial compared to the real value of this publication. For the many students of the past who utilized the older keys and helped bring them to their present state, the student of the present and future should be grateful. While not aimed toward the professional, they can also benefit from the keys.

In this day of high book costs, the modest price of $3.50 for this one is a welcome relief. I would recommend it to anyone interested in the vertebrates of Texas.

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Checklist and Keys to the Terrestrial Proteroglyphs of the World, by P. Golay. Spec. Publ. 'Elapsoidea' Foundation Culturelle, Geneve. i-x, 1-91, 4 figs., 1985. Obtainable from P. Golay, 1 Vieux-Moulin 1213, Onex, Switzerland, US$25.00 + $3.00 air mail.

Herpetological checklists seem to be 'in' at the moment. For many years Boulenger's Catalogues on Snakes (1893-6) and Lizards (1885-7) formed the basis of most regional and taxonomic summaries. They are now out-of-date, and although they remain an indispensible guide for taxonomic studies, they are of little regional use. A growing tide of new checklists is appearing to fill the gap.

This particular offering is of limited scope, and therein lies its advantages and disadvantages. It is less likely to contain mistakes, but then it has a more limited appeal. Due to its restricted field it would seem less likely to go out of date; however, a single major taxonomic change can undermine its whole value.

The family Elapidae has been the focus of intensive study in recent years, stimulated in no small measure by the provocative studies of Sam McDowell. Major changes in the content and relationships of proteroglyph snakes have been proposed (e.g., McDowell 1967, 1968; Savitsky 1979) and many of these have been incorporated into this Checklist. Unfortunately these are not discussed in an Introduction, and readers unfamiliar with the modern literature (much of which has appeared in diverse and obscure publications) may be surprised at some of the inclusions and omissions, e.g., the presence of the family Hydrophiidae (sea snakes) in a book on terrestrial species. This arrangement stems from McDowell's (1967) proposal that the Hydrophiinae (restricted in scope by the removal of *Laticauda*) is derived from the "Australian elapid radiation, most probably from the *Demansia* group." This relationship has been incorporated into the classification formally proposed by Smith et al. (1977).

In another revolutionary proposal that threatened taxonomic upheaval in the family Elapidae, McDowell (1968) demonstrated that the type genus *Elaps* (containing the South African species *E. lacteus* and *E. dorsalis)* was not related to other proteroglyph snakes, but had closer affinities with aparallactine colubrids. To avoid unnecessary nomenclatural chaos a successful application was made to the International Commission on Zoological Nomenclature (Opinion 1201, 1982) for the suppression of *Elaps*, the validation of the junior synonym *Homoroselaps* Jan for the South African snakes *lacteus* and *dorsalis*, and the retention of Elapidae as the family name.

In another development Savitsky (1979 - a widely quoted, but as yet unpublished doctoral thesis) questioned the affinities of New World coral snakes *(Micrurus)* with other proteroglyphs, considering them more closely related to South American elapomorphines. This remains a disputed relationship, and the proposal has not been followed in Golay's checklist, and is unsupported by recent immunological (Cadle and Sarich 1981) or morphological (McCartney 1985) studies. Its acceptance, and/or the transfer of the Australian terrestrial proteroglyphs back into the Elapidae, would require radical changes in the content and arrangement of this checklist.

The book is printed on good quality glossy paper, with a soft cover illustrated with a rather etiolated mamba *(Dendroaspis viridis).* Ninety-six pages of text break down into: Titles and Acknowledgments, 4 pp.; Preface, 2 pp.; Figs. (scutellation), 3 pp.; Generic List, 1 pp.; Generic Key, 2 pp.; Checklist and Key to Species, 54 pp.; Bibliography, 19 pp.; Journal Abbreviations, 39 pp.; and Index, 8 pp. I could find no typographical errors in the sections I am most familiar with (i.e., African genera). Keys to all recognised taxa (including races) are present, although these are somewhat abbreviated and may cause confusion with anomolous or intergrade specimens, e.g., many Namibian coral snakes *(Aspidelaps lubricus infuscatus)* lack distinct body bands and would be confused with the northern race *(A. l. cowelsi)* using Golay's key. Overall, this **Checklist** is very thorough, up-to-date (as of 1984), and well produced.

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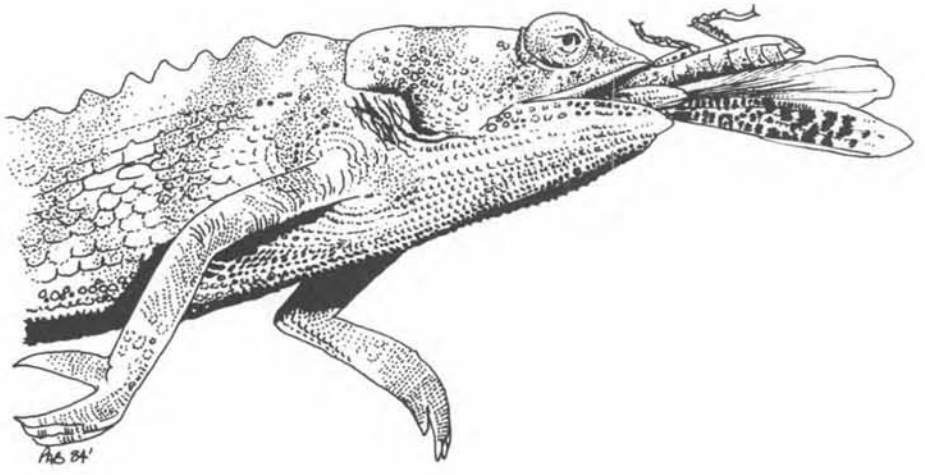
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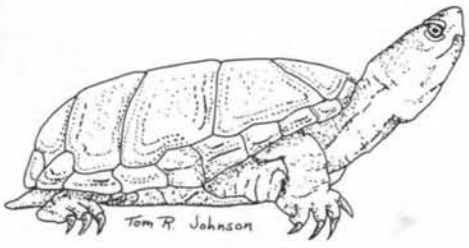
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Herpetological Review

Volume 16 June 1985 Number 2

SSAR BUSINESS

9TH ANNUAL REGIONAL HERPETOLOGICAL SOCIETIES CONFERENCE

The Ninth Annual Conference of the Regional Herpetological Societies sponsored by the SSAR will be held on the afternoon of Wednesday, 7 August 1985 with the joint meeting of the SSAR and HL at the University of South Florida in Tampa, Florida. The title of the conference is "Methods to Enhance the Regional Herpetological Society." The program will include the following presentations:

John Simmons (Kansas Herpetological Society) and Martin Rosenberg (Northern Ohio Association of Herpetologists) will present techniques used to enhance the KHS and NOAH through the publication of newsletters.

Thomas Vermersch (Greater San Antonio Herpetological Society) will discuss the procedures for putting on a mall show.

Joseph Collins (Kansas Herpetological Society) will discuss how auctions can be used to enhance the regional society.

Dave Barker (Texas Herpetological Society) will discuss the problems of organizing an annual conference.

Peter Meylan (All Florida Herpetological Conference) will give the rationale for the Florida conference and discuss ways in which the herpetologists of Florida might be better served by an enlarged or different system than presently practiced.

John Murphy (Chicago Herpetological Society) will present the CHS philosophy of field trips and how field trips have enhanced the society.

Terry Hibbitts (Texas Herpetological Society) will present the rationale of the THS's forty years of annual field trips and how they have enhanced the society.

There will also be tables available for regional societies to distribute information about their society. Each society should provide approximately 100 brochures about their society to be distributed at the conference. The brochure should include purpose, history, activities, membership categories, dues, and contact person for additional information.

Additional information on the conference may be obtained from:

Terry Hibbitts
Chair Regional Society Liaison
309 S. 4th Street
Wylie, Texas 75098 U.S.A. ●

LETTER TO THE EDITOR

EDITOR:

I was disappointed to learn that the SSAR and the HL was offering (selling at $11.00 a plate) "alligator and turtle" at this year's combined meeting for the closing night dinner in Tampa, Florida. It seems ironic to me that societies concerned with the study and preservation of herpetofauna would sanction such an activity.

I noticed that the description in this announcement stated that both these species are "legal game animals in Florida." It should be noted that not always is an act ethically or philosophically proper simply because it is legal.

Please do not misunderstand . . . I fully support placing a commercial value on and/or the take of wildlife when such a value or take *benefits* the species involved, such as some legal crocodile farming, Alfrican wildlife conservation programs, etc.

In my profession, working for the government in the field of wildlife protection, I have the opportunity to observe thousands of commercial shipments of wildlife and wildlife products. At least once a week large crates containing hundreds of wild caught and "farmed" adult turtles arrive at the San Francisco International Airport destined for various food markets. Usually these shipments consist of live and semi-live *Trionyx, Pseudemys* and *Graptemys* which are carelessly packed on top of each other three to four feet in depth. Turtles that can survive the packing and shipping traumas (usually the animals on top) are often boiled to death at the market place or in the hands of the final consumer. Oftentimes these consignments are left for days at the airport of destination before they are picked up by the wholesaler or retailer. This activity tends to make me lose my appetite rather than enhance it . . .

Since societies such as the SSAR and HL can affect the attitudes of the scientific community as well as the general public, I feel it is extremely important that careful consideration be given on which activities they "place their stamp of approval."

KEN McCLOUD
1290 Howard Avenue, Room 209
Burlingame, California 94010, U.S.A. ●

NEWSNOTES

NIXON GRIFFIS FUND FOR ZOOLOGICAL RESEARCH

The Nixon Griffis Fund for Zoological Research established in 1984 by New York Zoological Society Trustee Nixon Griffis, announced its first seven grant recipients on 7 March 1985. Grants are available to members of the zoo and aquarium community. Recipients may be curators, keepers, veterinarians, or research and consulting biologists.

One of the seven grants awarded in March 1985 was in the area of herpetology. Dr. Dale Marcellini, National Zoological Park, received an award for "A study of the ecology, behavior, and captive husbandry of the New Zealand Gecko, *Naultinus elegans*."

Grants, not to exceed $3000, are awarded semi-annually. Closing dates for grant requests are 1 January and 1 July each year.

For further information write to the Nixon Griffis Fund for Zoological Research, c/o New York Zoological Society, 185th Street and Southern Boulevard, Bronx, New York 10460, U.S.A. ●

CHUCKWALLA RESEARCH EXPEDITION

The Zoo and Aquarium Travel Association is planning a series of expeditions to San Esteban Island in the Sea of Cortez to study the endangered San Esteban Island chuckwalla. Staff from the Arizona-Sonora Desert Museum and ZATA will lead this zoo research program which will gather data about the behavior, blood chemistry, natural diseases, weights and measurements of this lizard to use and apply in the care and breeding of captive populations. Any individual interested in becoming a member of this research expedition should contact:

Zoo and Aquarium Travel Association
1776 Independence Court
Birmingham, Alabama 35216, U.S.A. ●

PROCEEDINGS OF THE 2ND EUROPEAN CHELONIAN SYMPOSIUM, OXFORD 1981

The 2nd European Chelonian Symposium was held in the Department of Zoology, University of Oxford, 3-4 October 1981 and was

integrated with the first two days of the International Herpetological Congress (3-9 October 1981) organized by J. Coborn. Edited by M.R.K. Lambert (Chairman, British Herpetological Society, London), the Proceedings have now been published in two parts.

PROCEEDINGS A— Published in *Amphibia-Reptilia* 5(1):1-80, March 1984, the Journal of the Societas Europaea Herpetologica. Contains papers on the status, conservation, breeding, and ecology of tortoises, including *Testudo hermanni robertmertensi, T. h. hermanni, Chersina angulata,* and *Psammobates geometricus.*

PROCEEDINGS B— Published in *Testudo* 2(2):1-32, 1983, the journal of the British Chelonia Group, Bristol. Contains papers on *Testudo hermanni robertmertensi, Testudo h. hermanni, Mauremys caspica leprosa,* reviews of films concerning the tortoise trade, and a paper on the R.S.P.C.A. and the tortoise trade.

ORDERS— Proceedings A may be ordered through any bookseller or direct from the publisher of Amphibia-Reptilia: E. J. Brill, Postbus 9000, 2300 PA Leiden, The Netherlands. Back numbers may only be available in complete volumes (120 Dutch guilders + 16 guilders postage and packing). Proceedings B are available at £1.50 ($3.50) from Mr. G. N. Wallace, Librarian, British Chelonia Group, 36A Wetlands Lane, Portishead, Bristol BS20 8NF, U.K. Cheques, postal orders and international money orders should be made payable to British Chelonia Group. ●

PHOTOGRAPHS NEEDED FOR VENOMOUS SNAKE BOOK

Work is presently underway on a manual of the venomous snakes of Latin America (Mexico southward). Assistance from the herpetological community is urgently needed in the form of color transparencies (slides) and negatives (color and black-and-white) depicting venomous snakes of the region. For further information please contact immediately: **J. A. Campbell** or **W. W. Lamar,** Department of Biology, The University of Texas at Arlington, Box 19498, Arlington, Texas 76019, U.S.A.

IN MEMORIAM

On October 14, 1983 Kenneth Ichiro Miyata died in a fishing accident in Montana. He was then thirty-two years old, just at the beginning of multiple careers. He was already and simultaneously an author whose first book was about to come out, a nature photographer whose pictures were very publishable, a world class fly fisherman, and a well-known and respected herpetologist, collaborating with the top men in the field. He had just begun a job with Nature Conservancy International.

Born in Los Angeles, Ken was sansei, third-generation Japanese American. He was raised in Covina, a suburb of Los Angeles, learning about wildlife and fishing in the mountains just north of that urban sprawl. Even before kindergarten he was sketching snakes and lizards. At 10 he was taught fly casting by his grandfather in the West Fork of the San Gabriel River. At 12 he was tieing his own trout flies. By 18 he was earning a living selling them.

He graduated summa cum laude from Berkeley in the Department of Conservation, having done salamander mapping for David Wake. With excellent recommendations, he entered Harvard. I met him first in the Miami Airport when he joined my group that was about to visit Puerto Rico, the Dominican Republic, Venezuela, Colombia, Panama and Jamaica. He was never again long out of touch with tropical America, making more than 20 trips and adding Costa Rica, Ecuador, and Peru as well as the Galapagos to the areas that he knew. Ecuador he came to know best, becoming an expert on its herpetofauna. Between 1976 and 1982 most of his trips were Earthwatch-supported: he was collecting data for his thesis and at the same time proving to be a very effective recruiter for field biology. His thesis, for which he was given a Ph.D. in 1980, was one of the thickest ever produced at Harvard — but it was not padded. Its major chapter — on patterns and factors in diversity in world herpetofaunas —still to be published — will be important.

There was a period of uncertainty after the degree; some called it drifting. Ken had the skills of a scientist, but he did not want to be an academic. He applied, with reservations, for the vacant Curatorship of Herpetology at the San Diego Natural History Society. Although he was one of the "short list," his failure to commit himself was recognized. He was not chosen. He then obtained a Post-doctoral Fellowship in the Department of Herpetology at the National Museum of Natural History and was finishing his year of study when he was hired by Nature Conservancy. He had been there for only a few months and had gone on a short vacation — a condition of his acceptance of the job — to go to a fishing spot he had often visited, when, quite alone, he drowned after taking a picture.

He was never inactive either before or after his degree. His period of uncertainty was a reflection of his unwillingness to give up any of his careers. While doing his thesis, and after, he was trout-fishing, writing or planning the writing of herpetological articles and formal papers, fishing articles, and the book on "Tropical Nature" posthumously published by Scribners, and photographing all the while. He was superb at all of these, but until he was hired by Nature Conservancy, he did not have any secure way to make a living. His "hobbies" were expensive, his love of them compulsive, his pursuit of Academia at best desultory. He was attempting something that in the crass world around him was very difficult.

He carried his science into the sport of fishing, taking notes on each fish for his microcomputer, as though he were about to invent a science of fly-fishing. (Those who are afficionados of the sport would say he was well on his way to doing so.) He brought to the observation and collection of frogs, lizards and snakes the joy, the patience, the field knowledge, the hands-on knowledge that were also his in fishing and photography. He brought to his writing as well a sense of the joy that he felt in the field but also the discipline and accuracy that made him very genuinely a scientist in every respect except the economic — and that tide was turning at the time of his death. He was already at his young age a conspicuous, an extraordinary success.

Only when Ken died did I discover how little I knew about him, about his multiple lives. I then found I was not alone. Yet while Ken was quiet, he was not at all secretive. He put no effort into the separation of his several lives. He entered each fully, combined more than one when he could. Mark Skinner tells of him that "he carried his camera whenever he was outside so that up to his thighs in water, he had this expensive Nikon in a back pouch. It was as if he couldn't bear to be doing only one of the things he loved." His several lives did touch — wherever and whenever it was natural for them to do so. He just lived the lives he wanted to — much more than most of us ever do. (There was also the corresponding pattern — inevitably — of reluctance to do those things he did not enjoy.)

It is true tragedy when death comes to the young, before whom the world is just opening. In Ken's case the loss is not only to his family — an extended family with roots all over the United States and in Japan as well —nor to me nor his other friends, often totally unknown to each other, but also to each of the several fields in which he had already made a stellar place. Great things were expected of him, and we who knew him knew that in each area the expectations would have been realized.

It is the personality that we most remember. Many adjectives could and have been used regarding him, all with some special sense. Honest — in the most rigorous sense; honest about himself, self-knowing. And with the other face of honesty: intolerance of fraud, fuss and pretense. Ambitious in the most important sense — having the wish and the will to be first rate. Gentle — in the sense of a natural friendliness that is the reverse of demanding, that gives without requiring return.

My acquaintance with parts of Ken's life and with many of his friends and family really began after his death. I had hoped with the aid of the memories of his friends to pull together an adequate but very personal portrait of a friend whom I knew too briefly and incompletely. That portrait will not be written; the task has defeated me. Ken deserves a better memorial than I am to provide. However, there are other memorials possible. Three memorials are already in place:

1. ***HIS BOOK.*** Coauthored with Adrian Forsyth, the book was written with separate chapters by each author. Ken's chapters bear his distinctive stamp. Those who wish to know him better than they did and those who never knew him will relish "Tropical Nature" by Forsyth and Miyata (Scribner Book Company). It is a book that should be supplemen-

tary reading for any course in ecology, particularly any that mention or emphasize tropical ecology.

2. ***AN ARCHIVE OF MEMORABILIA,*** especially reminiscences of Ken, that is accumulating at the MCZ, and to be added to the formal archives of the Museum. In addition the Miyata family has deposited Ken's field notebooks — superbly detailed accounts of each of his field trips — in the Department of Herpetology MCZ.

I invite all those who knew Ken to send slides, reminiscences or anecdotes to the MCZ for inclusion in Ken's personal archives. These reminiscences will be available for inspection only with the consent of the sender. The notebooks and herpetological slides will be accessible to any serious researcher — as Ken would certainly have wished.

3. ***A MEMORIAL FUND*** has been established at Harvard University, the income to be used for graduate or undergraduate field research in herpetology. Gifts to this fund are solicited.

ERNEST E. WILLIAMS
Museum of Comparative Zoology
Harvard University
Cambridge, Massachusetts 02138, U.S.A. ●

THE KENNETH MIYATA FUND IN HERPETOLOGY

Named as a memorial to Kenneth Miyata, herpetologist, fisherman and writer, who died in a fishing accident in late 1983, this fund is restricted to support of graduate or undergraduate field research in herpetology or, in the event of no suitable project during any year, additions to the herpetological collections of the Museum of Comparative Zoology, or other uses relevant to the advance of herpetology. The fund is to be administered by a committee chaired by the Curator of Herpetology and including two other members to be appointed by the Director of the Museum of Comparative Zoology.

Gifts to the fund should be sent to the Museum of Comparative Zoology, Cambridge, Massachusetts 02138, U.S.A. (Attention either Ernest E. Williams or James J. McCarthy, Director). They will be acknowledged by the Recording Secretary, Harvard University and by Dr. McCarthy. ●

SOCIETIES

ANNOUNCING THE FORMATION OF A.P.E.A.

We are pleased to announce the formation of the Associazione Piemontese Erpetologia e Acquariologia. After several meetings held in 1983 by a small group of enthusiasts from the Piedmont area, in mid-1984 A.P.E.A. was founded, an official constitution and by-laws were adopted, and a precise program was scheduled for 1985.

At present, A.P.E.A. is the only Italian herpetological and ichthyological association, with a membership of about 70, with local and out-of-area membership.

Meetings are held every second Friday of each month (except July and August) beginning at 7:00 p.m. in Turin 7th District Hall. A bimonthly newsletter is distributed to all members and a Bulletin will start in late 1985, following collaboration with other acquariological societies. It will contain articles and original papers on all aspects of herpetology and ichthyology, translations of articles, and book reviews, all illustrated with b/w photos and drawings. We hope to have at least two issues of our Bulletin in 1986, after the formation of a federation of Italian Societies expected for October 1985. Manuscripts, notes etc. for the newsletter and Bulletin are invited from members and non-members.

Organized field trips and tours are held regularly. Various other activities such as live animal displays, conferences, educational and research programs have already been scheduled for 1985, in collaboration with other naturalistic organizations, museums and regional ecology departments.

Current officers for 1985 are:
President: Ettore R. Peyrot
Vice-President: Franco Andreone
Secretary-Treasurer: Luciano Mariotto
Councillors: Roberto Saracco
Nicola Mancuso

We are now looking forward to liaison with other societies, worldwide, for exchange of publications and information. All persons, amateur or professional, interested in fishes, amphibians and reptiles are invited to join us. 1985 dues rates are £ it. 15,000 for regular members, £ it. 25,000 foreign and £ it. 30,000 institutions.

For further information write to:
Luciano Mariotto
Secretary A.P.E.A.
Via Leoncavallo 57/c
10154 TORINO ITALY ●

NORTH TEXAS HERPETOLOGICAL SOCIETY

The North Texas Herpetological Society was conceived by four individuals in September of 1982. The first meeting was held 24 October 1982 in the Fort Worth Museum of Science and History, where the Society continues to meet the second Sunday of each month at 2:30 PM.

The purpose of the NTHS is to "promote, stimulate and perpetuate the knowledge of reptiles and amphibians; to encourage continued education of members on all aspects of Herpetology; to promote the preservation of all reptiles and amphibians; and to contribute to the advancement of Herpetology."

The Society is presently working on a slide presentation entitled "A Pictorial Guide to the Reptiles and Amphibians of Dallas and Tarrant Counties, Texas." Members have presented shopping mall exhibits, local cable TV shows, lectures to public school groups, and have aided the City of Fort Worth in rewriting their Animal Control Ordinance. The Society also publishes a monthly newsletter.

Membership rates:

Regular Membership	$ 8.00/year
Family	$10.00/year
Subscribing	$ 6.00/year

For information contact:
North Texas Herpetological Society
c/o Fort Worth Museum of Science and History
1501 Montgomery Street
Fort Worth, Texas 76107, U.S.A. ●

MEETINGS

AAZV MEETING

The American Association of Zoo Veterinarians will be hosting its 1985 annual meeting at the Scottsdale Hilton Hotel in Scottsdale, Arizona from 5-10 October. There will be a session on veterinary care of reptiles. Interested persons should contact:

Mort Silberman, DVM
214 WMB
Emory University
Atlanta, Georgia 30322, U.S.A. ●



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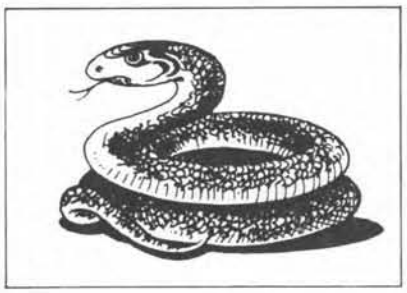
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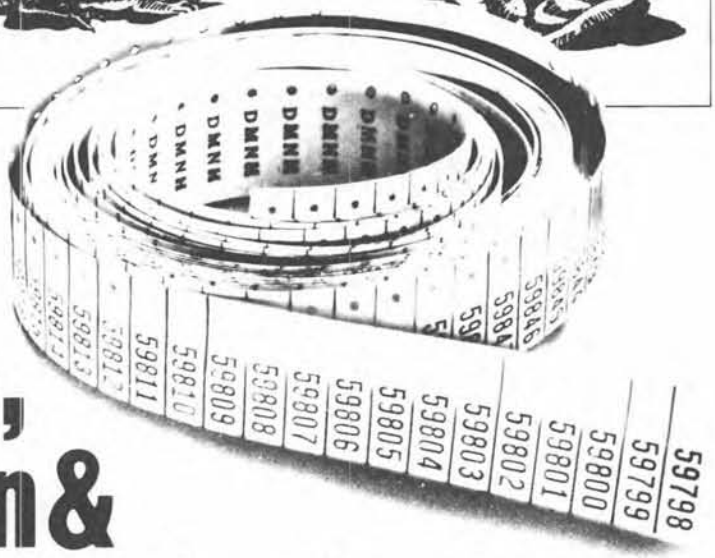
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FEATURES

DISTRIBUTION OF THE EASTERN INDIGO SNAKE, *Drymarchon corais couperi*, IN FLORIDA

Although earlier workers had reported the eastern indigo snake *(Drymarchon corais couperi)* to range more or less continuously from South Carolina to southern Louisiana (e.g. Schmidt and Davis 1941; Smith 1941), Neill (1954) concluded that there was a distributional hiatus in west Florida between Okaloosa and Gulf counties. Further restricting the distribution, Conant (1958) reported the snake to occur in two major separate population centers, peninsular Florida and southeastern Georgia, and in three smaller western disjunct populations, one near Mobile, Alabama, another extending from Okaloosa County, Florida into Covington County, Alabama and a third centered in the lower Apalachicola region of Florida. Subsequent workers have attempted to refine our knowledge of *Drymarchon* distribution, with the result that the ranges of the separate population units have been enlarged somewhat and in some cases coalesced (Conant 1975; Mount 1975; Kochman 1978; Ashton and Ashton 1981), though typically without discussion or documentation. Diemer and Speake (1983) have recently reported the results of an intensive investigation of the distribution of the eastern indigo snake in Georgia. This paper documents the distribution of this snake in Florida.

The preserved collections of the Florida State Museum (UF), Tall Timbers Biological Station (TT), and Archbold Biological Station were personally examined. Records from the following collections were provided by personnel of the respective institutions: Academy of Natural Sciences, American Museum of Natural History, California Academy of Sciences, Carnegie Museum of Natural History, Charleston Museum, Cornell University, Duke University (DU), Field Museum of Natural History, Illinois Natural History Survey, Indiana State University, Louisiana State University, Museum of Comparative Zoology, Museum of Zoology of NE Louisiana University (NELU), National Museum of Natural History (USNM), Natural History Museum of Los Angeles County, Natural History Society of Maryland, North Carolina State Museum of Natural History, Peabody Museum of Natural History, San Diego Natural History Museum, Savannah Science Museum, Southern Illinois University, Texas Natural History Collection (TNHC), University of Central Florida, University of Colorado (UCM), University of Georgia Museum of Natural History, University of Illinois Museum of Natural History, University of Kansas Museum of Natural History, University of Michigan Museum of Zoology, University of Minnesota Museum of Natural History, University of Nebraska State Museum (UNSM), University of New Mexico, University of South Alabama, University of South Florida, University of Southwest Louisiana (USWL), College of William and Mary (CWM). Records from the University of Miami Reference Collection were provided by J. Kushlan.

Museum records were initially compiled in early 1981. Records for the Florida State Museum have been updated and are current to January 1984. In order to supplement museum records, biologists and other individuals familiar with the indigo snake were interviewed. Although this interview process provided records statewide, a particular effort was made to locate individuals with knowledge of indigo snakes in the panhandle and northern peninsula. For a more detailed treatment of the distribution of the indigo snake in extreme southern Florida see Steiner et al. (1983).

Complete lists of the museum and interview records included here have been deposited in the libraries of the Herpetology Section, Florida State Museum and the Division of Amphibians and Reptiles, National Museum of Natural History.

Of 39 institutions surveyed, 7 (DU, NELU, TNHC, UCM, UNSM, USWL, CWM) had no Florida *Drymarchon* in their collections. The remaining 32 institutions reported a total of 236 Florida *Drymarchon*, of which 197 specimen localities could be mapped with reasonable accuracy. Museum specimens are available from 44 counties.

Another 355 records were derived from interviews with 95 individuals judged to be reliable sources. Sighting records were provided from 63 counties.

Altogether 552 occurrence records were mapped (Figure 1). These include records for all Florida Counties except Gulf, Lafayette and Union.

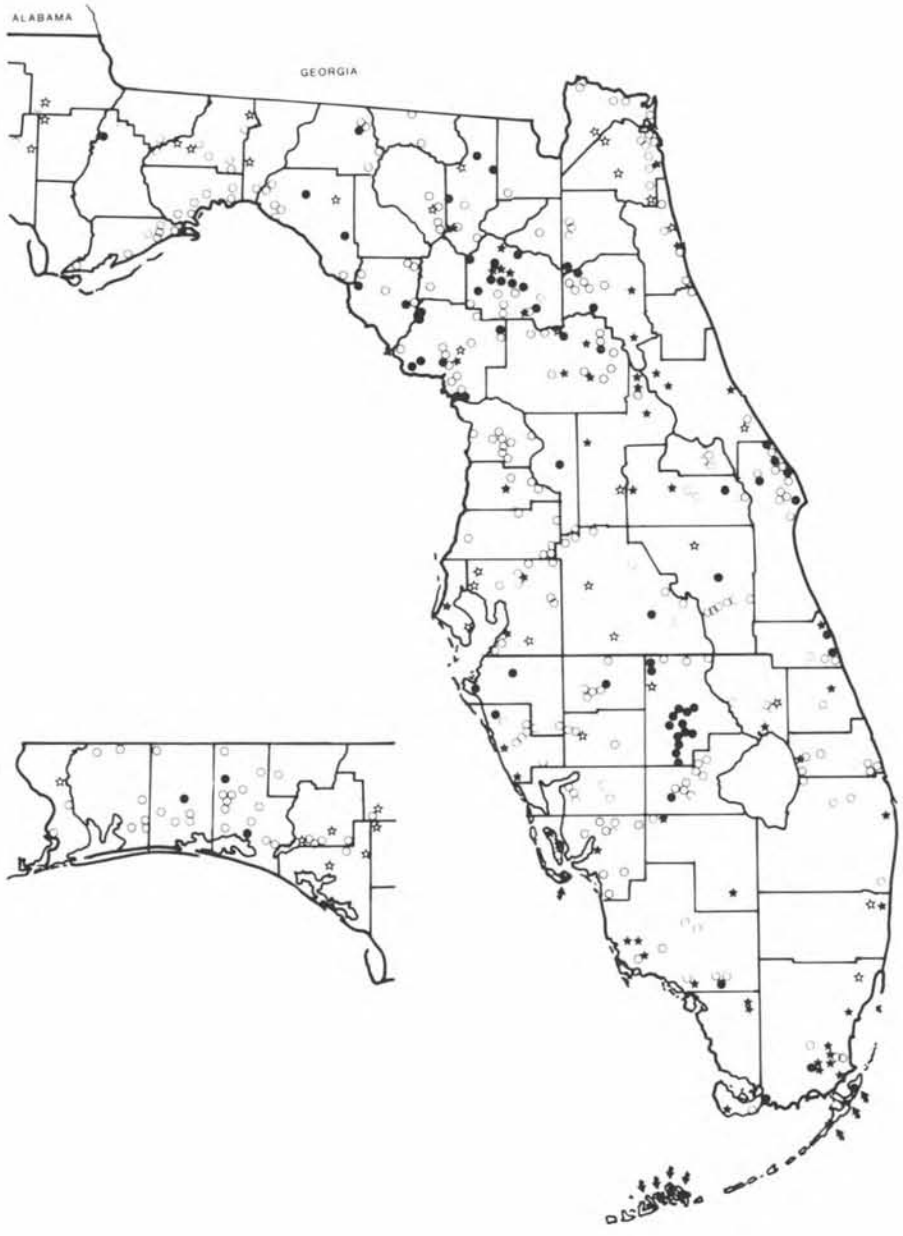


Figure 1. Florida distribution of the eastern indigo snake. Circles: recent records. Stars: records prior to 1970. Solid symbols: museum specimens. Open symbols: sighting records. Individual symbols may include more than one locality.

Although sandhills are a dominant feature of the west Florida landscape, the three herptiles which people most often associate with Florida sandhill habitats, the indigo snake, the gopher tortoise *(Gopherus polyphemus)* and the gopher frog *(Rana areolata),* have each at one time been suggested to have a distributional hiatus in west Florida (Goin and Netting 1940; Neill 1954). Subsequent workers have concluded that the gopher tortoise (Neill 1954; Auffenberg and Franz 1978) and the gopher frog (Mount 1975; Altig and Lohoefener 1983) are more or less continuously distributed through west Florida and extreme southern Alabama. However, the perception has persisted that the indigo snake occurs in Alabama and panhandle Florida only in two or three widely disjunct populations (McCranie 1980; U.S. Fish and Wildlife Service 1982). This impression may derive in part from the fact that prior to 1973 there were no museum specimens available from Florida west of the Suwannee River. [Note - USNM 10565, collected in 1881 and presumably the basis for the Santa Rosa County record mapped by Ashton and Ashton (1981), proved upon examination to be a black racer *(Coluber constrictor)* (R. McDiarmid, pers. comm.)]. Since 1973, ten *Drymarchon* have become available from Okaloosa (UF 54664), Walton (TT 679, UF 54665), Liberty (TT 731), Franklin (TT 704), Madison (UF 47362), Taylor (UF 51206, UF 52583) and Dixie (UF 55135, UF 55136) counties. From these specimens and the additional records provided here it is clear that the indigo snake is distributed widely, though not necessarily commonly, throughout Florida, including the panhandle.

Diemer and Speake (1983) have recently shown the indigo snake to be more widely distributed in Georgia than previously thought, and it is here demonstrated that it is continuously distributed throughout Florida. In view of the several recent Florida records within a few miles of the Alabama border, it seems likely that research would show *Drymarchon* to still occur naturally in that state.

The cumulative nature of museum records perhaps makes them less reliable than sighting records as an indicator of current distribution. The interview process, with its emphasis on active biologists, tended to produce a preponderance of recent records. Whereas only 34% of museum specimens have been collected since 1970, 86% of the sighting records have occurred since 1970. Altogether, 387 (70%) of the 552 records reported here have occurred since 1970. Disallowing all records prior to 1970, it is apparent that *Drymarchon* still occurs widely throughout Florida.

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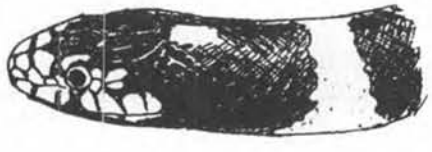
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CORRECTION OF THE NORTHERNMOST LEATHERBACK NESTING ON THE U.S. ATLANTIC COAST

Nichols and Du Toit (1983) reported a nesting emergence of a leatherback *(Dermochelys coriacea)* at Beverly Beach, Flagler Co., FL, to be "the furthest north on the U.S. Atlantic coast that a leatherback nesting has been definitely documented." This is incorrect. Ruckdeschel, Ellis, and Shoop (1982) documented nestings in 1981 on Cumberland and Blackbeard Islands, GA. Voucher specimens (embryos and dead hatchlings) from both nestings were deposited in the Savannah Science Museum Herpetology Collection: SSM 9884 (Cumberland Is. series) and SSM 10147 (Blackbeard Is. series).

Thus, the Blackbeard Is., GA, record is actually the leatherback's northernmost confirmed nesting on the U.S. Atlantic coast.

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A REVIEW OF SQUAMATA OVIPOSITING IN ANT AND TERMITE NESTS

There are widely disseminated reports of lizards, snakes and amphisbaenians ovipositing in the nests of termites and ants. This important, but neglected, aspect of squamate brood provision is reviewed here for the first time. The full names of all the reptile species mentioned in the text, together with the author and date, are presented in Table 1.

ANT NESTS

Tschudi (1867) appears to be the earliest report of Squamata depositing eggs in ant nests: he mentions an egg clutch of *Coluber* (i.e. *Chironius*) *bicarinatus* in the upper "Panellen" (we are unsure as to what area of the nest this refers) of ant nests ("Tanajuras") in Brazil. He also notes that *Amphisbaena flavescens* (=*A. alba*) and *A. fuliginosa* inhabit similar regions of the same ant nests and there lay eggs but it is not clear from the original text which of the two amphisbaenians was responsible for the eggs. These observations (also cited in Vaz-Ferreira et al.

1970) have not been confirmed in any subsequent publication. Boulenger (1885b) comments upon two eggs of an amphisbaenian *(Anops kingii)* recovered by Ihering from "an ant nest" (species unknown) in Rio Grande do Sul, Brazil, and Goeldi (1897) provides evidence that *Lepidosternon* (= *Leposternon*) *microcephalum* regularly lays its eggs in ant hills of the genus *Camponotus* in Rio de Janeiro.

Smith (1935) mentions that the eggs of *Varanus monitor* (= *V. bengalensis*) are "deposited in a hole or ant-heap." This species is well known for its habit of excavating holes in which to lay eggs (Deraniyagala 1958; Misra 1960) and it may be that they do occasionally dig into ants' nests, possibly by accident: the available evidence does not suggest that there is a regular association between *V. bengalensis* and ants. This is the only species for which there is an egg-laying association with both ants and termites. Deraniyagala (1953) states that *Varanus cepedianus cepedianus* (= *V. bengalensis*) in Sri Lanka deposits its eggs "either in the ground or in a decaying log or a termite hillock which ensures daily warmth by the sun and a moderate degree of moisture."

Vaz Ferreira et al. (1970, 1973) excavated 697 nests of 5 species of leaf-cutter ant (all of the genus *Acromyrmex*) in Uruguay and found eggs, eggshells or, more rarely, hatchlings of 8 species of snake and one species of lizard in 103 nests (indicated by an asterisk in Table 1). Two snake species, *Philodryas patagoniensis* and *Liohis obtusus* accounted for the vast majority of findings, at least 146 egg clutches being recovered from 83 nests (mostly nests of *A. lobicornis*). The remaining 7 Squamata, infrequently encountered, were each represented by between 1 and 5 clutches. Eggs were mostly located in the central fungus chamber of ant nests, although those of *Liophis obtusus* also occurred in secondary fungus chambers and in roof passages close to the central chamber. Eggs of *Elapomorphus bilineatus*, found on one occasion, were in connecting passages close to the central chamber and egg clutches of *Teius teyou* were frequently in peripheral passageways, away from the fungus chambers. A point of particular interest is worth mentioning: a single nest contained a total of 200 eggs and eggshells comprising 17 clutches, 16 of *P. patagoniensis* and one of *L. obtusus*. In healthy fungus gardens eggs were of normal shape and colour but in abandoned or dying gardens they were frequently shrivelled and discoloured and contained proportionately more dead embryos. Clearly the conditions provided for egg incubation by normal nests are necessary for successful development. However Gudynas (1979) has found a clutch of eggs from the teiid *Teius teyou* under a rock but he points out that individuals laying their eggs in ant hills may be afforded some selective advantage.

Weber (1972) has found snake eggs (species unknown) on several occasions in the fungus gardens of *Atta colombica tonsipes* (= *A. colombica* Guérin, 1845) in Panama. In Trinidad Emsley (1977) mentions that the eggs of another South American snake, *Pseudoboa neuweidii*, have been found in the nests of bachac ants (*Atta* sp., *Acromyrmex* sp.) and Riley & Winch (1985) also report the eggs of two other colubrids in the nests of these leaf-cutter ants; *Leptodeira annulata* in *Acromyrmex octospinosus* nests and *Tripanurgos compressus* in an *Atta cephalotes* nest.

TERMITARIA

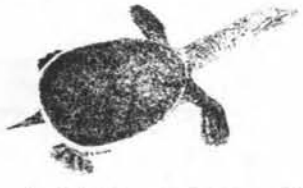
Schomburgk (1848) provided the first account of a lizard using termite nests for brood provision when he described the tegu *"Podinema tequixin"* (undoubtedly *Tupinambis nigropunctatus*, following Boulenger (1885a) in our use of species names in the genus *Tupinambis)* laying 50-60 eggs in tree termite nests in Guiana. Further accounts of the eggs of this species in termitaria, provided by Kappler (1854), Goeldi (1897), Hagmann (1906), Reese (1922) and Beebe (1945), serve to confirm an obligate association: it is not known to lay eggs in other situations. The termite species in one instance reported by Beebe (1945) was *Nasutitermes ephratae* (Holmgren 1910). Newly hatched lizards apparently claw their way through the nest to effect escape, a process which may be facilitated when nests are softened by rain (Everard and Boos 1975).

Goeldi (1897) states that *Tupinambis teguixin* also prefers to lay its eggs in termite nests but he gives no evidence. *T. tequixin* is well known to lay eggs under vegetation and in holes (Schouten 1929; Serié 1932). Goeldi (1902) repeats his claim, stating that the phenomenon had been reported by Schomburgk and confirmed by his (Goeldi's) eldest son. We know that Schomburgk's observations relate to *T. nigropunctatus*. However, Goeldi's son's observations were said to have been made in the Serra dos Orgaos which is near Rio de Janeiro, within the range of *T. tequixin* and well outside the range of *T. nigropunctatus*.

Gosse (1850), in a general account of *Typhlops lumbricalis* (Jamaican populations of which are now assigned to the species *T. jamaicensis*) stated simply that "the egg is laid in the earthy nests of termites." Later Gosse (1851) relates finding a single egg of this species in a deserted termite nest. Gosse's observations appear to have been either overlooked or ignored by subsequent workers. For example, Grant (1940) states "The writer has heard much of their occurrence in termite nests, but has not found any in hundreds of nests he has examined." However, recent confirmation of the association of this species with termite nests has been provided by Dr. Garth Underwood (pers. comm.) when, in July 1957, a collector in Jamaica brought him a clutch of four *T. jamaicensis* eggs that had been found in a termite nest: whether this nest was active or deserted is not known.

Goeldi (1897) states that it is a fact beyond doubt that *Dracaena guianensis* lays its eggs in termitaria. However, he admits that practically nothing is known of the natural history of this species and seems to have based his claim on the fact that two species of tree termites make their nests in areas inhabited by this lizard. As far as we know, the eggs of this species are still unknown in the wild.

Hagmann (1906) describes clutches of 2-3 eggs of the gecko *Gonatodes humeralis* in termitaria. However, there are many observations of this particular species laying beneath bark and in hollows at the bases of trees (Hoogmoed 1973). Hoogmoed states that *G. humeralis* lays a single egg and although females often contain two eggs they are always at different stages of development and the first is laid long before the second. Hagmann's clutches were clearly therefore not true clutches: that he observed the phenomenon in several nests suggests that its



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Table 1. A synopsis of Squamata ovipositing in ant (A) or termite (T) nests.

	Species Mentioned		Type of Association		
			Probable Obligate[1]	Possible Obligate[2]	Faculative[3]
LIZARDS	Gekkonidae	*Gehyra mutilata* (Weigmann 1835)			T
		Gehyra pilbara Mitchell 1965	T		
		Gonatodes humeralis (Guichenot 1855)			T
	Teiidae	*Dracaena guianensis* Daudin 1802		?	
		**Teius teyou* (Daudin 1802)			A
		Tupinambis nigropunctatus Spix 1825	T		
		Tupinambis teguixin (Linnaeus 1758 *sensu* Boulenger 1885)			T
	Varanidae	*Varanus bengalensis* (Daudin 1802)			TA
		Varanus niloticus (Linnaeus 1766)	T		
		Varanus varius (Shaw 1790)			T
		Varanus gouldii (Gray 1838)			T
		Varanus rosenbergi Mertens 1957	T		
	Scincidae	*Sphenomorphus sanctus* (Dumeril & Bibron 1839)		T	
AMPHISBAENIANS	Amphisbaenidae	*Amphisbaena alba* Linnaeus 1758		A	
		Anops kingii Bell 1833		A	
		Leposternon microcephalum Wagler 1824	A		
SNAKES	Typhlopidae	*Typhlops caecus* (Duméril 1856)		T	
		Typhlops jamaicensis (Shaw 1802)		T	
	Colubridae	*Chironius bicarinatus* (Wied 1820)		A	
		Lamprophis fuliginosus (Boie 1827)			T
		**Liophis jaegeri* (Günther 1858)		A	
		**Liophis obtusus* (Cope 1863)	A		
		Boiga drapiezii (Boie 1827)		T	
		Boiga jaspidae (Duméril, Bibron & Duméril 1854)		T	
		**Clelia rustica* (Cope 1878)		A	
		**Elapomorphus bilineatus* (Duméril, Bibron & Duméril 1854)		A	
		Leptodeira annulata ashmeadi (Hallowell 1845)		A(?)	
		**Philodryas aestivus subcarinatus* Boulenger, 1902	A		
		**Philodryas patagoniensis* (Girard 1857)	A		
		**Pseudablabes agassizii* (Jan 1853)		A	
		Tripanurgos compressus (Daudin 1803)		A	
		Pseudoboa neuwiedii (Duméril, Bibron & Duméril 1854)		A	
	Elapidae	**Micrurus fontalis altirostris* (Cope 1860)		A	

? Awaits confirmation
1 Probable obligate association, many records of oviposition in ant or termite nests, not known to nest elsewhere
2 Possible obligate association, relatively few records of oviposition, but not known to nest elsewhere
3 Facultative association, known to lay eggs in other sites
* Reported in Vaz-Ferreira et al. 1970, 1973

occurrence may be quite normal. These observations are confirmed by Beebe (1944) who noted that these geckos use the outer, semi-deserted parts of the nest in order to avoid being walled in. According to Hoogmoed (1973:83), Beebe (1944) had misidentified the geckos as *Gonatodes annularis* Boulenger, 1887; they were, in reality, *G. humeralis*.

The habit of using termitaria for brood provision seems to be well established in monitor lizards. The association was first reported by Theobald (1868) although in that case the termite nests were said to be deserted and it is not clear to us whether the species involved was *Varanus flavescens* (Hardwicke and Gray 1827) or *V. bengalensis*. Cowles (1928), FitzSimons (1932) and Branch and Erasmus (1982) report *Varanus niloticus* laying its eggs in termitaria: we have been unable to find any reference to its laying in other situations. Also Bustard (1970) states "that a number of large *Varanus* including the Australian lace and sand monitors sometimes use termite mounds as incubators for their eggs" and Cogger (1967) reports that *V. varius* and *V. gouldii* lay eggs in other situations. But the association between Rosenberg's sand monitor *Varanus gouldii rosenbergi* (actually a full species according to Storr, 1980) and termites might be more specific than the above implies. King and Green (1979) for example, record two clutches of 10 and 12 eggs of this species in termite mounds and we can find no record of its laying elsewhere.

Kopstein (1929) describes *Dipsadomorphus* (now *Boiga*) *jaspidea* eggs hatching in the nest of the termite *Lacessititermes sordidus* (Haviland 1898) and later (Kopstein 1932) he reports Dr. Kalshoven finding two *Sphenomorphus sanctus* eggs in a *Nasutitermes matangensiformis* (Holmgren 1913) nest in Java. In summaries of the species of reptile known to oviposit in termitaria in Java, Kopstein (1935, 1938) adds *Boiga drapiezii* to the list, bringing the total to three.

Bogert (1940) reports the presence of an adult female, young and eggs of *Typhlops avakubae* (now considered a synonym of *T. caecus*) in a termite nest under a roof at Kassa, French Congo, and Loveridge (1942) describes a clutch of 6 eggs of *Boeadon* (=*Lamprophis*) *lineatus* (actually *fuliginosus*) found in a termitarium at Mushongero, Kenya. This species also lays its eggs in decaying vegetable matter, manure heaps, etc. (Broadley 1983).

A remarkable association between the gecko *Gehyra pilbara* and the nests of the termite *Eutermes* (now *Nasutitermes*) *triodiae* (Froggat 1897) is described by Mitchell (1965). This species is found only within termitaria - in numbers of up to an estimated thirty per nest - together with numerous gecko eggs, both fertile and infertile, and egg fragments. This lizard shares this habitat with, and is preyed upon by, the dwarf python *Liasis perthensis* Stull, 1932 (Mitchell 1965). L. A. Smith (pers. comm.) adds that of the four species of the *L. childreni* complex he proposes to recognise, only two utilize termitaria, but not, as far as is known, for egg incubation. He adds that some *Ramphotyphlops* and *Delma* also utilize ant nests but again it is not known if they use them as nest sites.

Pongsapipatana (1975) reports that another gecko *Peropus* (= *Gehyra*) *mutilatus* "lays its eggs in termite nests" although this ubiquitous species is also known to lay eggs beneath bark and in holes in the ground (Gibson-Hill 1950; Oliver and Shaw 1953).

DISCUSSION

The eggs of at least eight of the reptile species mentioned herein have been found in the nests of ants and termites sufficiently often (and never elsewhere) to indicate a probable obligate association; another dozen or so may eventually be included in this category as more information becomes available (Table 1). By contrast nine species are known to oviposit in other locations and apparently most only occasionally make use of ant or termite nests for brood provision (Table 1).

Reptiles that regularly utilize nests as incubators for eggs are afforded a number of obvious advantages. Most reptile eggs are highly sensitive to changes in humidity and most oviparous species deposit eggs in substrates or situations which provide high, and relatively constant, humidities. Such conditions are characteristic of the nests of termites and particularly of leaf-cutter ants. For example, Mitchell (1965) noted that the termite *Nasutitermes triodiae* maintain the internal humidity of the nests close to saturation by varying the pattern and extent of ventilation. Vaz-Ferreira et al. (1970) observed that the fungus gardens of *Acromyrmex* spp. rapidly disintegrate in nests that have been broken open (by predators) or when they are transferred to conditions of low humidity. They further observe that *Acromyrmex* nests offer the only humid environments during the hot dry summer in Uruguay.

Thermoregulation of the nest environment is a general capability of social insects (Wilson 1976). Termite nests, harbouring the obligate inquiline *Gehyra pilbara*, were found to be on average 5-11° C higher than the surrounding air (Mitchell 1965) and evidence was provided that such a relatively constant microclimate enabled geckos to sustain a long, continuous breeding period, combined with an uninterrupted growth cycle. Likewise, Vaz-Ferreira et al. (1970) recorded that fungus-chamber temperatures of *Acromyrmex* spp. nests were stable in the range 27-29° C despite fluctuations in the external temperature of 21-32° C. Clearly nests make excellent incubators and Bustard (1970), in a discussion of the use of termitaria for varanid brood provision, mentions another advantage in that they also afford a degree of safety from predation. Likewise Vaz-Ferreira et al. (1970) comment that *Acromyrmex* nests provide both a physical barrier and a biological defence against predation. This factor will become increasingly important in species with long incubation times. *Varanus rosenbergi* eggs, for example, require 6-7 months to incubate at about 27° C (King and Green 1979) and *V. niloticus* hatch after 9-10 months in termite nests (Cowles 1930).

Reptile eggs in soil or humus are also susceptible to microbial attack and this possibility may be obviated if incubatory inquilinism is employed. Leaf-cutter ants in particular, which cultivate pure fungus cultures (Weber 1957) are meticulous about the hygiene of their nests: alien fungal spores and other particulate contaminants are licked up and temporarily stored in an infrabuccal pocket to be later removed from the immediate environment of the fungus (Weber 1972). Ants devote much time to licking all the internal nest surfaces (Quinlan and Cherrett 1977) and about 30% of ants on the surface of the fungus garden are at any time involved in this activity (Quinlan and Cherrett 1978). The same attention is apparently given to reptile eggs sequestered within fungus gardens which are often used as supports for fungus cultures and consequently their surfaces are kept clear of adhering foreign material (Vaz-Ferreira et al. 1970).

The problem facing reptiles in gaining access to solidly constructed termitaria for the purposes of oviposition, and the subsequent escape of hatchlings, are likely to be considerable and may only be possible for small species (e.g. *Typhlops*) or for species equipped with sharp claws for digging (e.g. *Tupinambis* and *Varanus* spp.). For most snakes therefore, this particular habitat is precluded and the observations of Kopstein (1929, 1935, 1938) of two *Boiga* spp. eggs in termitaria are all the more intriguing. Cogger (1967) mentions several instances of adult monitors being disturbed at termite mounds when newly hatched young are found emerging. He suggests that the female digs a tunnel into the mound when young are hatching to aid their escape. Beebe (1944) highlights the problem in his observations of the gecko *Gonatodes annularis* (actually *G. humeralis*) where he discovered two eggs and a newly hatched but dead gecko which apparently was too weak to free itself when walled in.

Some interesting observations of the behaviour of snakes emerging from eggs maintained in laboratory colonies of *Acromyrmex* have been made by Vaz-Ferreira et al. (1970). Hatching takes several hours and is preceded by a leakage of amniotic fluid through a split in the egg membrane. The head of the snake remains within the ring of fluid which apparently protects it from initial attack by ants. Once liberated from the egg, hatchlings seek rapid escape from the fungus gardens and are sometimes bitten by ants.

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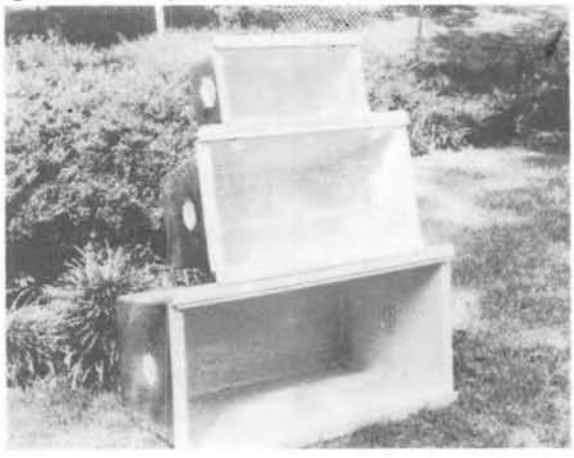
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TECHNIQUES

RETENTION OF FLIPPER TAGS ON HATCHLING SEA TURTLES

The inability of researchers to find a tag suitable for hatchling sea turtles has been mentioned repeatedly in the literature (Carr 1967*a*, 1967*b*; Hirth 1971; Hughes 1974; Carr et al. 1978; Mrosovsky 1978*b*, 1982, 1983; Rudloe 1979; Hendrickson and Hendrickson 1980). Body dimensions and weight increase substantially as a hatchling grows from a few centimeters long to an adult of 70 cm or more. This factor has been viewed as a major obstacle to devising a practical tag that will stay in place. Furthermore, an added demand on such a tag is the many years (10-60) that may be required for a turtle to reach adult size (Balazs 1979, 1982*b*; Limpus 1979; Limpus and Walters 1980; Mendonca 1981). A successful tag for hatchlings has considerable potential for answering important questions about survival rates, geographical dispersal, the "lost year" pelagic phase, early growth rates, and nesting site affinities. It would also help in evaluating hatchery and head-start projects attempting to replenish depleted turtle populations.

Existing published information on attempts to tag hatchlings with an external mechanical tag suggests that such a tag is "... soon either overgrown or popped off by the increasing thickness of the tissue it perforates" (Carr 1967*b*; see also Hirth 1971; Hughes 1974; Mrosovsky 1983). However, the details of the experimental evaluation leading to this conclusion have not been reported. Plastic tags have been used on the hind flipper (Carr 1967*b*) and carapace (Uchida 1973; Hughes 1974) of hatchlings released into the wild, but no recoveries have been reported, and shedding rates have apparently not been estimated through captive rearing. There is no specific mention in the literature of the use of metal tags on hatchlings. Metal flipper tags have been regularly used on adult sea turtles at nesting sites since the early 1950s.

Besides external mechanical tags, other marking techniques that have been tried on hatchlings include the internal implantation of small magnets (Carr 1967*b*) and stainless wire (Hughes 1974; Schwartz 1981), branding (Carr 1967*b*), tattooing (Carr 1967*b*; Balazs 1978), injection of europium (Shoop 1978) and autografts (Hendrickson and Hendrickson 1980). Some workers have also marked hatchlings by cutting away or notching marginal scutes (Bustard 1972, 1979; Hughes 1974; Limpus 1978). However, this technique has not resulted in reliable long-term recoveries. Furthermore, a potentially confusing situation has developed because hatchlings have been notched in many different research programs over the years. There are also inherent difficulties in distinguishing a notch-mark from a natural injury (Mrosovsky 1978*a*).

An externally applied tag, such as a flipper tag, has substantial advantages over other marking techniques if it remains in place. These tags are far more likely to be recognized as a tag by the person resighting the turtle. They also permit a specific message to be visibly inscribed (i.e., return address, identification number) so that resighting data can be communicated back to the tagger.

A recent study in Hawaii of the shedding rates of metal flipper tags on small sea turtles indicates that this method of marking hatchlings should be seriously reconsidered. This note presents the results of the study, along with a discussion of its implications and requirements for further tag evaluation.

METHODS

In September 1980, hatchling green turtles, *Chelonia mydas*, were collected from French Frigate Shoals in the Northwestern Hawaiian Islands for use in testing a "living-tag" marking system involving autografts of contrasting pigmented tissue (Hendrickson and Hendrickson 1980). The hatchlings ranged from 5 to 6 cm in straight carapace length (SCL). Small Monel* tags (style 4-1005, size 1) from the National Band and Tag Co. of Newport, Kentucky were attached to the last right marginal scute of each hatchling to identify individuals during the study. These tags measure 8 x 2.5 x 2.5 mm when applied. They have been commercially available for many years, being advertised for use on fingerling fish, small mammals, and birds.

At 1 month of age, when the turtles ranged from 7 to 10 cm SCL, the tags had to be removed from the carapace due to distorted growth and necrosis of surrounding tissue. Replacement tags of the same size were then attached by the author to the trailing edge of the right front flipper. At 6 months of age (15-19 cm SCL) the same size tag was also applied to the left front flipper of each turtle.

Captive rearing of most of the turtles used for the living-tag study was completed at 12 months. The results of this work are reported elsewhere (see Hendrickson and Hendrickson 1981, 1983). The 174 surviving turtles averaged 23 cm SCL (range 16-30 cm) and 2.6 kg (range 0.7-5.2 kg). Each turtle was examined for the retention of flipper tags. At the same time, a larger Inconel® tag (size 681) was attached to a front flipper. Shortly thereafter, 169 of the turtles were released into the wild at several locations throughout the Hawaiian Islands.

RESULTS

Of the 174 yearling turtles, 147 (84.5%) still had both small flipper tags. One tag was missing from 26 (14.9%) turtles, and only a single turtle (0.6%) had lost both tags. Some tags were slightly corroded, but nearly all were still securely attached with little evidence of being overgrown or sloughing off (Fig. 1). Many tags had, however, rotated so that the long axis was perpendicular, instead of parallel, to the flipper's trailing edge. Of the 26 that lost 1 tag, 18 were from the right flipper applied at 1 month of age, and 8 from the left flipper applied at 6 months.

Five turtles were retained in captivity for continued rearing; four of these had two tags still in place, and one had a single tag. As of August 1983 when the turtles were 35 months old, three of the turtles that had both tags still attached at 1 year of age had each shed one tag. Of the other two turtles, one still had both tags, and one had the single tag that was present at 1 year of age (Table 1).

Two of the 169 turtles released have been resighted after a sufficient interval to yield further information on tag retention. Five others were reported washed or crawling



Figure 1. Size 1 Monel® and size 681 Inconel® tags on the right front flipper of a yearling Hawaiian green turtle. The size 1 tag was attached at 1 month of age.

*Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

ashore during the first 2 months following release. The two longer-term resightings involved turtles 22 and 32 months of age. Both retained the two small tags present at the time of release. During their time in the wild, the turtles had grown from 29.5 to 33.6 cm, and from 27.2 to 36.0 cm. The 22-month old turtle was found speared just 3 km from its release site on the Island of Oahu. The 32-month old animal was released at the same site but was captured alive in a net 5,600 km away, at Truk, in the western Pacific.

DISCUSSION

Contrary to earlier reports, the external tags used in this study showed impressive retention rates. The success achieved is probably because small metal tags have not been fully tested on the front flipper. Another key factor may be that the tags used in the present study only showed minor corrosion. Corrosion is known to be an important factor in tag loss experienced in some research programs. Although long thought to be one of the better alloys available for turtle tags, Monel® is now known to corrode in a highly variable and sometimes severe fashion, even on turtles within the same population. If Monel® flipper tags were previously used on hatchlings by other workers, the tag shedding they observed may have been mainly due to corrosion. Tag corrosion and various other factors affecting tag retention have been discussed in Balazs (1982*a*).

Since late 1976, size 681 flipper tags made from Inconel®, an alloy far superior to Monel® in corrosion resistance, have been used on adult and immature green turtles in Hawaii. No corrosion has been seen in these tags, although some tags are still shed from tearing and other factors. Placing two or more tags on each turtle has greatly offset this problem (Balazs 1983). Inconel ® tags are not currently available due to high production costs. However, a company in Western Australia (Stockbrands Co. Pty. Ltd. of Mt. Hawthorn) has recently offered titanium flipper tags at a reasonable price ($120 per 1,000). Titanium has nearly as high corrosion resistance as Inconel® (LaQue 1975). The author and C. J. Limpus (Queensland National Parks and Wildlife Service, Townsville, Australia) have arranged for the manufacture of titanium tags equivalent to the size 1 Monel® tags tested in the present study. Future evaluations on hatchlings will therefore be possible using a product that is superior to Monel® in corrosion resistance.

Previous workers tagging hatchlings often stressed the need for a tag to persist into adulthood. The protracted time to maturity, and the increasing level of research now being conducted on immature turtles in the sea, now seem to make this goal less critical. Similar information can probably be gathered by catching wild juveniles already tagged as hatchlings, and retagging them with larger tags as needed.

ACKNOWLEDGMENTS

Helpful comments on a draft of this note were provided by Larry Ogren, Harold Hirth, Nicholas Mrosovsky, and C. Kenneth Dodd.

Table 1. Growth and tag shedding of five green turtles retained in captivity from 12 to 35 months of age.

	Straight carapace length (cm)		Increase in growth (cm)	Size 1 tags	
	12 months	35 months		Right[1]	Left[2]
1.	20.9	41.8	20.9	Shed	On
2.	24.3	46.7	22.4	Shed	On
3.	20.0	40.2	20.2	On	Shed
4.	24.6	40.3	15.7	On	On
5.	22.0	41.4	19.4	On	[3]

[1]Tags initially put on at 1 month of age when the turtles ranged 7-10 cm SCL.

[2]Tags initially put on at 6 months of age when the turtles ranged 15-19 cm SCL.

[3]Tag not present at 12 months of age.

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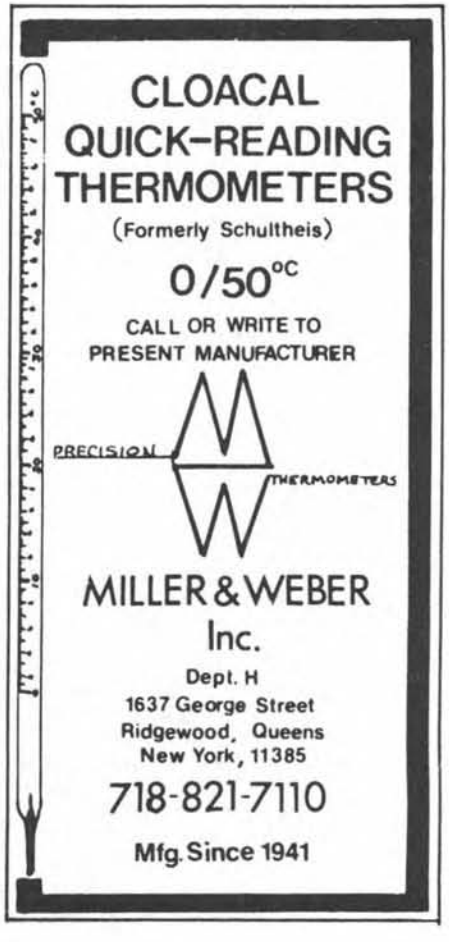
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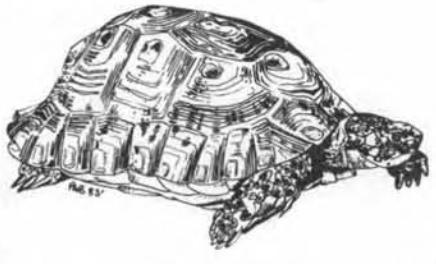
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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Knoxville Zoological Park, Box 6040, Knoxville, Tennessee 37914, U.S.A.

NOTES ON THE REPRODUCTIVE BIOLOGY OF AUSTRALIAN PYTHONS, GENERA *Aspidites, Liasis* AND *Morelia*

Snakes of the family Boidae (pythons and boas) are among the largest and most spectacular reptiles, and consequently are often maintained in captivity. Hence, despite the scarcity of studies on natural populations (e.g. Hoyer 1974), considerable information is available on the reproductive biology of captive specimens (e.g. Ross 1978). One finding of great interest is that female pythons do not desert the eggs after oviposition (as is the general rule in reptiles), but instead coil around the clutch and defend the eggs against potential predators. In some, and perhaps all species, the female warms the clutch by metabolic heat production through muscular contractions of her body ("shivering thermogenesis") (see Shine 1985, for a review). Although about half of the world's python species are restricted to Australia, these forms have attracted less study than the Asian or African species. The present paper (i) provides information on reproduction of captive *Aspidites melanocephalus, Liasis fuscus, Morelia amethistina, M. oenpelliensis* and *M. spilota;* (ii) describes natural nest sites and thermal regimes of four *M. spilota* clutches; and (iii) reviews published literature on reproductive biology of these species.

BLACK-HEADED PYTHON, *Aspidites melanocephalus*

This species is found over a wide area of northern Australia, and was studied by us near Townsville in coastal Queensland. In this region it is primarily nocturnal (20 of 24 specimens seen in the field were active at night) and feeds on a variety of vertebrate species. Captive specimens often refuse to feed on rats or mice, but readily accept other snakes as food.

Four *A. melanocephalus* were maintained in captivity in Townsville. The two males measured 1.9 and 2.1 m total length (TL), and the females 1.5 and 2.0 m. The snakes were housed separately in cages measuring 1.1 x 0.5 m, with artificial heating. Based on experience with other locally-occurring pythons *(Morelia spilota, Liasis fuscus),* we judged that mating in *A. melanocephalus* should occur in late winter or early spring (July-September). Hence, the snakes were placed together on 20 June 1981.

Mating occurred immediately with both pairs (Fig. 1). The males moved constantly about the cages, pressing their tails beside and under the females' tails. In the initial matings, the males persistently raked their "spurs" into the sides of the females' bodies near the cloaca. The spurs were raked rapidly (approximately two to three strokes per second) and vigorously. Spur use was seen only at the initial matings. Copulation was observed at all times of the day and night, but most frequently in early mornings (0800 h).

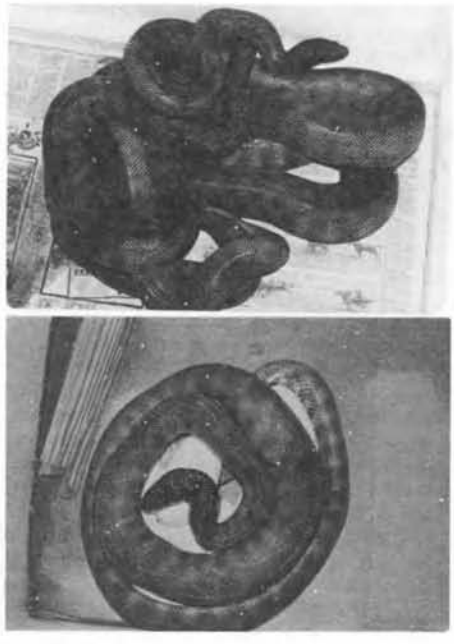


Figure 1. Upper: mating of captive *A. melanocephalus.* Lower: female *A. melanocephalus* coiled around clutch of eggs.

Duration of copulation was difficult to determine, but on at least one occasion exceeded 150 minutes.

When the two males were introduced to the same cage (without females), the larger male immediately began biting and constricting the smaller male vigorously. The snakes were forcibly separated and the smaller male removed and replaced by a female. The large male showed no signs of aggression towards this female. However, removal of the female and reintroduction of the other male instantly resulted in attack by the large male. This procedure was repeated once more with the same results.

Both females were noted to show slight swelling of the posterior half of the body in early September. The females at this time were observed to lie with their ventral surfaces facing outward or upward for long periods. The smaller female had returned to her usual proportions (i.e. no swelling) by early October and began accepting food. The swelling in the larger female gradually increased in size, and this snake did not feed.

Eight eggs were laid by the larger female on 12 November, between 1100 and 1730 h. The eggs were laid in a loose group before being drawn together by the female and encircled by her coils. The eggs were supported off the floor by the female's body. Spasmodic "shivering" bouts, each of less than 20 seconds duration were observed (Fig. 1).

The eggs were removed in a single adherent mass, and incubated in moist vermiculite at 30° C (range 29.5 to 31° C). Egg dimensions averaged 9.2 (s.d. = 0.6) x 5.2 (s.d. = 0.2) cm. A "window" was cut in one egg after 55 days incubation, revealing en embryo which was fully-formed but only lightly pigmented. Hatching occurred on 16, 17 and 18 January (one, two and five eggs, respectively). The neonates emerged 24 to 30 hours after initial slitting of the shells. The hatchling pythons

(two males, six females) averaged 61.9 cm snout-vent length (SVL) (s.d. = 1.1, range 60 to 63 cm), 68.6 cm TL (range 66 to 70) and 94.4 gm mass (s.d. = 3.2, range 89 to 98 cm).

The young snakes began feeding (most on mice) 20 to 37 days after hatching. At three months (16 April) they averaged 76.6 SVL (range 71 to 84) and 258 gm mass (range 195 to 280). By twelve months, the juvenile *A. melanocephalus* averaged 124 cm SVL (range 96.5 to 144) and 748 gm (range 425 to 1080). By twenty-four months of age, they averaged 174 cm SVL (132 to 198) and 2150 gm (1100 to 3700).

Another female *A. melanocephalus* from Weipa, Qld., laid 10 eggs on 13 October, but none hatched. Previous records of *A. melanocephalus* reproduction reveal considerable variation in egg size, hatchling size, and incubation period. Whereas we recorded hatchlings of 69 cm (94 gm), hatching after 66 days, Boos (1979) recorded hatchlings of 50 to 53 cm (45 to 60 gm), hatching after 93 days. The prolonged incubation probably is due to the lower temperature (24-27°, versus 30°) at which Boos (1979) incubated the eggs. Hatchlings recorded by Murphy et al. (1981) were intermediate in size (60 cm, 81 gm) and incubation period (83 days) between the above values. Clutch sizes of *A. melanocephalus* range from five to twelve eggs, with specific records of 5, 6, 7, 8, 9, 10, 11 and 12 (Gow 1976; Boos 1979; Murphy et al. 1981; P. Harvey, pers. comm.; present study).

WATER PYTHON, *Liasis fuscus*

The northern Australian water python has recently been moved from *Liasis* to *Bothrochilus* (Cogger et al. 1983). However the ICZN is currently considering an application that would cause *fuscus* to revert to *Liasis* (H. Cogger, pers. comm.). There is disagreement over whether the Australian form should be placed in the species *mackloti* (McDowell 1975) or *fuscus* (Cogger 1975).

A specimen from Townsville, Qld., deposited 19 eggs (four infertile) on 15 November 1982. The eggs were laid at intervals of approximately 10 minutes, with the first at 0610 h and the last before 1030 h. Although the male caged with this female had shown courtship in early August, no copulation had been observed. The 15 fertile eggs varied in mass from 51.8 to 59.1 ($\overline{X}$ = 55.0, s.d. = 2.2), in length from 4.7 to 5.68 cm ($\overline{X}$ = 5.2, s.d. = 0.3) and in width from 3.7 to 4.4 cm ($\overline{X}$ = 4.0, s.d. = 0.2). The four infertile eggs were much smaller, with masses of 20.4 to 22.4 gm ($\overline{X}$ = 21.1), lengths of 4.0 to 4.2 cm ($\overline{X}$ = 4.0), and widths of 2.5 to 2.6 cm. The eggs were incubated in moist vermiculite at 30° C (range 29.5 to 31.0). Hatching occurred from 27 to 31 January; of the 15 fertile eggs, 14 produced normal young and one a deformed individual with a severe body kink. The 14 normal neonates averaged 31.4 gm (s.d. = 4.4, range 23 to 37), 35.5 cm SVL (s.d. = 2.8, range 31.0 to 40.5) and 41.5 cm TL (s.d. = 3.0, range 35.7 to 46.9).

Two years after the breeding recorded above, the female oviposited again (17 eggs on 4 November 1984). The eggs were tightly adherent and were incubated by the female, with 14 young hatching from 10 to 13 January 1985. The neonates averaged 56.1 gm (s.d. = 5.2, range 45 to 65), 41.3 cm SVL (s.d. = 2.3, range 36.0 to 44.5) and 48.6 cm TL (s.d. = 2.7, range 42.4 to 52.3). Hence, they were significantly larger in all these respects than were the previous clutch from the same female. Data are also available for a clutch laid on 28 October 1984 by a captive *L. fuscus* in Townsville. The clutch of 16 eggs had a mass of 999 gm, with the female having a mass of 2200 gm after oviposition (Relative Clutch Mass = 0.45). Eleven fertile eggs averaged 77.7 gm (s.d. = 4.4, range 69 to 84), with length 66.5 mm (s.d. = 2.2, range 64 to 72) and width 45.3 mm (s.d. = 1.8, range 41 to 48). Five infertile eggs averaged 28.8 gm (27 to 31 gm), and 44 x 33 mm. Following artificial incubation at approximately 30 to 31° C, the eggs hatched from 6 to 8 January 1985. The 11 neonates averaged 60.4 gm (s.d. = 4.3, range 52 to 67), 42.6 cm SVL (s.d. = 2.7, range 38.5 to 46.2), and 50.1 cm TL (s.d. = 2.7, range 46.3 to 53.7).

Another female water python maintained in Renmark, South Australia, mated in June and July, and laid 14 eggs on 17 August 1979 (J. Bredl, pers. comm.). One egg was measured and found to be 55 x 45 mm and 55.0 gm mass. The female coiled around the eggs, reacted aggressively to interference by humans, and underwent regular "shivering" behaviour on cool days (J. Bredl, pers. comm.). The eggs were removed from the female on 28 September, and artificially incubated at 28 to 30° C. Hatching occurred on 18 to 25 October, and the offspring ranged from 43 to 47 cm TL (30 to 40 gm mass). Another specimen of 250 cm length laid 16 eggs on 2 November; artificially incubated at 30° C, these hatched on 12 to 19 January (G. Parker, pers. comm.). Captive specimens maintained by B. Barnett (pers. comm.) produced 11 to 23 eggs, with a mean clutch size of 17. Finally, three female *L. fuscus* from the Townsville region oviposited in late November: fecundities were 6, 19 and 20 eggs.

Published data on reproduction of *L. fuscus* are consistent with the information given above. Murphy et al. (1981) noted a clutch size of 12 (eggs 63 x 40 mm, 57 gm), hatching after 74 days at 32° C, with hatchlings measuring 44.1 cm length (30.6 gm). There is some doubt, however, whether the specimens providing this record were from Australia (*L. fuscus*) or New Guinea (*L. mackloti*). Boos (1979) described a 160 cm female *L. fuscus* mating in August and October and laying 11 eggs on 10 October. These were maternally incubated and hatched after 57 to 61 days. Other published records of reproduction in *L. fuscus* note clutch sizes of "approximately 30" (Kinghorn 1964), "up to 11" (Gow 1976), 10 to 15 (McPhee 1979) and 11 (Ross 1978).

AMETHYSTINE PYTHON, *Morelia amethistina*

This species is the largest Australian python, attaining lengths up to 8.5 m. Its generic allocation has recently been changed from *Liasis*, to *Python*, to *Morelia* (Cogger et al. 1983). It is found only in coastal tropical Queensland; the two specimens kept by us were both collected in Cairns. The male was collected in April 1976 and measured 140 cm total length; at the time of successful reproduction (April 1982) it measured 270 cm total (234 cm SVL) and had a mass of 4.5 kg. The female measured 215 cm TL in October 1977, and 270 cm TL (231 cm SVL) and 3.0 kg in April 1982. The specimens were kept in Brisbane and housed together in a cage 2 m x 1 m x 1 m with artificial heating and natural (Brisbane) photoperiod.

The snakes were found *in copulo* at 2300 h on 24 September 1981. Their tails were intertwined and the rest of their bodies stretched out loosely side-by-side. Copulation continued for at least 60 min and was repeated on the next night. The female bled from the cloaca at each mating. From the time of mating, the female refused to feed and spent long periods basking. She often lay with her ventral surface facing outwards or upwards.

Seven eggs were deposited on 26 December 1981, and the female coiled tightly around them. No "shivering" was observed, but temperature readings from within the coils revealed a constant 30° C over 16 measurements during 8 days and nights. (Measurements taken daily at 0630 and 1900 h.) Cage temperature ranged from 28° to 30° C over this time. The eggs were removed on 5 January. They were tightly adherent and the seven eggs had a mass of 700 gm. The female began to feed normally after the eggs were removed.

The eggs were incubated at 29 to 31° C on moist vermiculite (50% water by weight), and one egg hatched on 10 April, 105 days after laying. Another egg was slit on 11 April, three on 12 April, and one on 13 April. The last egg was opened artificially on 13 April, revealing a live neonate which then emerged successfully. Most neonates remained inside the eggs for 48 h between the time of first slitting the shell, and final emergence. All neonates were light brown in colour, and were not as distinctly reticulated as the adults. The hatchlings comprised four females and three males, with a mean SVL of 54.1 cm (s.d. = 1.5, range 52.0 to 56.0), mean TL 63.9 cm (s.d. = 1.6, range 61.0 to 66.0 s.d. = 1.6), and mean mass 60 gm (s.d. = 1.0, range 58 to 61).

There are few published reports of reproduction in *Morelia amethistina* with which to compare our data. Shivering thermogenesis has been noted by Boos (1979). Fecundity has been estimated at 19 (Pope 1969; McPhee 1979) and 10 to 20 (Gow 1976), whereas Boos (1979) provides data on two clutches of 7 and 12 eggs. The incubation period reported by Boos (on a maternally-incubated clutch) was shorter than that observed by us (78 versus 106 days), but the hatchlings were of similar size (64 cm, 50 to 60 gm).

CARPET PYTHON, *Morelia spilota*

This species is one of the most common and widespread Australian pythons. Two brooding female *M. s. variegata* were discovered in suburban Brisbane in January 1982, and one in January 1985. The first snake (total length 215 cm) was under a pile of iron and "fibro" building materials (Fig. 2), and had been observed by workmen to emerge and bask in the sun each morning for the preceding week. When the material covering the python was lifted, she was seen to be tightly coiled around a mass of eggs (Fig. 2). She was very aggressive, striking vigorously and repeatedly. The probe from an electronic thermometer was inserted between her coils, and three readings were taken over the next



Figure 2. Upper: sheet of iron under which brooding female *M. spilota* located. Lower: position of snake and eggs when iron lifted.

week without disturbing the snake. All readings (taken at 1000, 1430 and 1545 h) were 30° C, whereas maximum air temperatures over this period averaged 28-30°.

The snake and eggs were collected on 9 January. The adherent mass of 23 eggs (two of which were discoloured and clearly dead) had a mass of 900 gm. As soon as she was placed in a cage, the female coiled around the eggs. Again, temperatures taken four to six times per day within the python's coils remained at 30° C, except for one reading. At this time, air temperature in the cage fell to 26° C (rather than the usual 28°) and egg temperature was 34° C. "Shivering" behaviour was not observed.

At 0830 h on 14 February, the python was seen to be draped only loosely around the eggs. Eleven of the eggs were slit, with several hatchlings having their heads protruding from the shells. The first four neonates fully emerged approximately 11 hours later. All 21 pythons had emerged by 16 February, although one neonate died soon after emergence. The hatchlings comprised ten females and eleven males, with mean mass 30.3 gm (s.d. = 2.6, range 24 to 35 gm) and mean SVL 39.3 cm (s.d. = 2.2, range 32 to 41 cm).

The second brooding female *M. s. variegata* was found on 25 January 1982 in a suburban garden. The snake (TL 180 cm) was coiled tightly around her eggs on a mound of dried grass clippings. She was very aggressive when disturbed. Temperatures within her coils, recorded over several days, remained at 30° C. The python was not seen to leave the eggs at any time, even during heavy rain. However, on 14 February she was seen to be draped only loosely around the eggs. The temperature within the coils at this time was the same as air temperature (26° C). Closer inspection revealed that only seven eggs had been laid, and the rest retained within the female's body. The snake and eggs were collected, the eggs incubated in vermiculite at 30° C, and the remaining uterine eggs (badly decomposed by this time) surgically removed from the female python. Four of the incubated eggs were slit on 19 February, and the hatchlings had emerged by the next morning. The remaining eggs were opened on 22 February; one contained a dead full-term embryo, the other a live specimen. The five live hatchlings were all males with a mass of 20 to 22 gms ($\bar{X}$ = 21 gm, s.d. = 0.7) and measured 37 to 39 cm SVL ($\bar{X}$ = 37.9 cm, s.d. = 0.7).

Another Brisbane specimen attending a clutch of 15 eggs was found in January 1985, between bales of hay in a suburban yard. The female was observed to regularly leave the eggs to bask in the morning sun at a site about three metres from the eggs. The nest site between the bales was moist, being protected by another two overlaying bales. Temperatures measured at 1100 h were 28° C between the snake's coils, and 29° C in the surrounding air. The python abandoned this clutch following a heavy hail storm on 19 January, so the clutch (total mass 540 gm) was moved and artificially incubated at 25 to 29° C. Hatching occurred on 21 to 24 February 1985, with neonate masses of 22 to 25 gm, and approximately 40 cm total length (R. Drams, pers. comm.).

A fourth brooding carpet python was discovered on 15 January 1985 in Townsville. As in the previous case, the clutch was laid at ground level between and under bales of hay. Readings at 1300 h revealed an air temperature of 31° C, and a clutch temperature of 32° C. The female returned to the clutch after disturbance on two occasions. The clutch of ten eggs had a mass of 385 gm, and the female 680 gm (145 cm SVL). Following removal to the laboratory at 31° C, the eggs hatched on 11 February 1985. Neonates averaged 29.7 gm (s.d. = 1.5, range 27 to 32), 40.1 cm SVL (s.d. = 1.2, range 37.3 to 41.5), and 47.2 cm TL (s.d. = 1.2, range 44.4 to 48.7).

Two captive *Morelia s. variegata* maintained in Townsville, northern Queensland, were observed to mate several times in August, always in the early morning. Mating was first recorded on 4 August 1982, and last recorded on 26 August 1982. The female laid twelve fertile eggs, beginning at 1930 h on 23 November 1982 and finishing at 0630 h the following morning. She coiled around ten of the eggs, but all developed fungal infections and failed to hatch. The twelve eggs averaged 50.5 gm (s.d. = 1.6, range 48.7 to 54.3), and measured approximately 55 x 38 mm (range in lengths 51.7 to 71.5; range in width 30.2 to 40.8).

Data were obtained on another Townsville pair of *M. spilota* in the following year. The male (255 cm) and female (230 cm) mated on 11 August, beginning at 1730 h (duration of mating at least 90 minutes). From mid-September the female was often seen basking with the ventral surface turned upward or outward. Twenty-nine eggs were laid on 16 November 1983. Only four of these eggs had normally calcified shells, and most of the abnormal eggs failed to develop. The female coiled around the eggs, with spasmodic "shivering" bouts persisting for several days after the eggs were removed on the day of oviposition. The clutch had a mass of 1609 gm, and the female 3700 gm after oviposition. Three infertile eggs were smaller (approx. 52 x 34 mm, 46 gm) than the other 26 fertile eggs (length: $\bar{X}$ = 63.1 mm, s.d. = 3.1, range 57 to 68; width: $\bar{X}$ = 41.7 mm, s.d. = 1.9, range 39 to 45; mass: $\bar{X}$ = 58.5 gm, s.d. = 2.8, range 52 to 63). Only six of these eggs, incubated at 30° C, hatched: on 17 January (one), 18 January (four), and 20 January (one). The hatchlings averaged 37 cm SVL (s.d. = 1.8, range 34 to 39), and 26 gm mass (s.d. = 2.0, range 25 to 29).

Another captive *M. spilota* in Townsville laid 11 eggs on 28 November 1984 (mean egg mass 49.1 gm, s.d. = 4.0, range 44 to 59 gm; dimensions 48 x 39 mm to 65 x 39 mm). The clutch mass was 540 gm, and the female 2600 gm after oviposition (RCM = 0.21). Following incubation at 30 to 31° C, all eggs hatched on 2 February 1985. Hatchlings averaged 33.8 gm (s.d. = 1.3, range 32 to 35), 41.0 cm SVL (s.d. = 1.1, range 39.8 to 42.9) and 49.1 cm TL (s.d. = 1.1, range 48 to 51.2). Agonistic behaviour by male *M. spilota* was recorded on 18 September 1985, when two males and two females (all between 230 and 280 cm length) were placed together. Both males began hissing and moved rapidly around the cage. When the pythons were next inspected 50 minutes later, one male and one female had many deep lacerations on the posterior thirds of the bodies, mostly around the cloacal region. The cuts were up to 60 mm long and 10 mm deep, and apparently inflicted by the teeth (or spurs?) of the other male.

One final record comes from a female python from Wingham, N.S.W., intermediate in coloration between the subspecies *Morelia s. spilota* and *M. s. variegata*. The snake was found coiled around a clutch of 22 eggs in *Lantana* scrub close to a stream. During a short period after capture and removal to a cage, the female continued to brood the eggs, and was aggressive when disturbed. She refused food until the eggs were removed, at which time she commenced feeding. Following a brief (6-day) period of artificial incubation, the eggs hatched to produce neonates 37.5 to 43 cm TL (L. Naylor, pers. comm.).

There have been few previous observations of female pythons brooding eggs in the wild. Published records of reproduction in *Morelia spilota variegata* include clutch sizes of 12 to 47, with specific records of 12, 14, 15, 16, 26, 32, 34, 40, 47 (Fleay 1960; Covacevich 1970; Ross 1978; Boos 1979; Banks 1979). Similar fecundity characterizes the other subspecies, *M. s. spilota* (9 to 54: Boos 1979; Banks 1979; Gow 1976; McPhee 1979; Harlow and Grigg 1984). Clutch sizes of 14 and 16 eggs were recorded by B. Barnett (pers. comm.). Incubation periods apparently are variable, with extremes of 37 to 103 days (Boos 1979; Banks 1979). Hatchling sizes reported by us (37 to 41 cm, 21 to 30 gm) are similar to those previously published (38 cm - Fleay 1960; 30-38 cm - Gow 1976, 1977; 30-45 cm - Banks 1979).

OENPELLI PYTHON, *Morelia oenpelliensis*

A female of this large and rare species, collected in the Arnhemland escarpment on 29 September 1984, laid a single egg with a mass of 184.9 gm (measuring 120 x 50 mm) on 20 October 1984. Nine remaining eggs were

removed surgically on 27 October 1984 and were of similar size of the first egg. All were apparently fertile but failed to develop. Egg mass averaged 185.8 gm (s.d. = 8.8, range 176 to 203 gm), and dimensions ranged from 90 x 60 mm to 105 x 60 mm. No previous data on *M. oenpelliensis* reproduction are available.

DISCUSSION

Data gathered in the present study generally are consistent with the results of previous studies. Maternal egg-brooding was seen in all four of the species in which reproduction in captivity was observed. Temperature measurements and/or observations of "shivering" suggest that females utilize metabolic thermogenesis to warm the eggs in all four forms. Our measurements of clutch temperature in *M. spilota* are, to our knowledge, the first made of brooding pythons in the field: although scanty, they are consistent with the prediction that maternal thermogenesis may enable a high and constant temperature to be maintained in the egg clutch (e.g. Harlow and Grigg 1984).

Our study also reveals interspecific similarities in some reproductive parameters (e.g. times of mating and oviposition) and differences in others (e.g. egg and offspring sizes; incubation periods). Many of these differences are surprising. For example, *A. melanocephalus* has a much larger egg and offspring, relative to adult body size, than the other species studied. Indeed, the hatchlings of *A. melanocephalus* are considerably larger than those of the amethystine python, *M. amethistina*. Nonetheless, the incubation period for these large offspring is very brief, similar to that for the much smaller offspring of *L. fuscus* and *M. spilota*. Additionally, the growth rates recorded for captive neonates of *A. melanocephalus* are surprisingly high. Any attempt to interpret the evolutionary and ecological significance of such differences would be premature at the moment: comparative data on the reproductive biology and natural history of other Australian pythons are needed for such a synthesis.

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MAINTENANCE, EXHIBITION, AND BREEDING OF THE TAILED FROG, *Ascaphus Truei*, IN A ZOOLOGICAL PARK

Ascaphus of North America and *Leiopelma* of New Zealand are currently the only two genera in the family *Ascaphidae*, differing from other frogs by their amphicoelous vertebrae. They also share some primitive evolutionary anuran traits such as free bony ribs and the retention of two tail-wagging muscles, the pyriformis and the caudalipuboischiotibialis (Noble 1931; Stebbins 1954; Griffiths 1963; Duellman 1975).

Ascaphus truei, the only North American species and commonly called the tailed frog, inhabits the permanent cold water streams of the Coast and Cascade Mountain Ranges from southwestern British Columbia through western Washington and western Oregon to the northern California coast. This cryogenic anuran is also found in the northern Rocky Mountains of Idaho and Montana, the Wallowa Mountains of northeastern Oregon and the Blue Mountains of southeastern Washington, at timbered elevations ranging from sea level to 2000 m (Stebbins 1954; Behler and King 1979).

Unlike most other anurans the tailed frog lacks a tympanum and is voiceless (Noble 1931; Stebbins 1954; Behler and King 1979; Nussbaum et al. 1983).

A. truei is rare among frogs in using internal fertilization. *Nectophrynoides occidentalis*, a viviparous toad of Africa, is the only other anuran in which fertilization of the eggs is internal (Noble 1931; Cochran 1961; Browning 1973; Brown 1975). The male *A. truei* is unique, however, in possessing a vascular extension of the cloaca which is used during amplexus as an intromittent organ to transfer sperm into the cloaca of the female (Noble 1931; Stebbins 1954; Nussbaum et al. 1983).

After autumn mating the sperm overwinter in the female's oviduct. She lays fertilized eggs in the spring. These colorless balls of jelly are attached singularly or in strings to the undersides of rocks in mountain streams. The eggs hatch in approximately one month. The small black to brown larvae are equipped with a sucking disc around their mouthparts for holding onto rocks in fast-moving streams as they feed on algae and diatoms (Behler and King 1979; Nussbaum et al. 1983). Tadpoles metamorphose into froglets at two to three years of age. Adult frogs reach sexual maturity in their seventh year. Life expectancy is thought to be greater than 14 years (Daugherty and Sheldon 1982a).

Although field studies (Gaige 1920; Noble and Putnam 1931; Metter 1964a, 1964b, 1967; Landreth and Ferguson 1967; Wernz 1969; Brown 1975; Hailman 1982; Daugherty and Sheldon 1982a, 1982b) as well as laboratory studies (Noble 1931; Metter and Pauken 1969; Wernz and Storm 1969; Altig and Brodie 1972; Claussen 1973a, 1973b; Brown 1975; Hailman and Jaeger 1978; Green et al. 1980) have been conducted on *A. truei* there are no published reports on zoological exhibitry and husbandry of this species.

This study describes captive maintenance, display techniques, and attempts to breed tailed frogs over a two year period (April 1982 - April 1984) at the Washington Park Zoo, Portland, Oregon.

MATERIALS AND METHODS

Collecting. Adults and larvae were collected in the Oregon Cascade Mountains and the Oregon Columbia River Gorge. Specimens were located during all four seasons though they were more easily found during late spring and early summer. Animals were obtained during both daylight and nighttime hours (See Tables 1 and 2 for dates of capture). Frogs were captured by hand; a small mesh net proved useful for collecting larvae.

Plastic collecting vessels were cushioned against one another inside an ice-filled styrofoam container. Stream water from the collection sites was used as a transport medium for the tadpoles; moss was supplied to the frogs. Rocks and fallen branches were also taken to make the cages appear as natural as possible and to minimize the stresses of capture and captivity (Nace 1977).

Exhibit tank. The exhibit tank (75 x 25 x 45 cm) held approximately 8 l (6 cm) of untreated city tap water. Water for aquaria housing larvae was dechlorinated by aging.

A water pump was connected to 7.6 m of clear plastic tubing coiled inside an insulated, water filled, plastic bucket. This bucket was attached to the refrigeration unit of a commercial liquid cooler. To further cool the water, cube ice was added to the bucket sporadically in the winter and more often during warmer weather. Exposed plastic tubing was wrapped with 15.9 mm water pipe insulation. This cooling system kept the exhibit water temperature within the preferred range of 5° C to 12° C (Claussen 1975).

The filtration system consisted of a mechanical filter, which removed suspended material from the water, and a chemical (activated charcoal) filter, which removed dissolved gases, chlorine, and other chemicals. This system maintained a high quality, aquatic habitat for the animals. The filters were installed between the water pump and the chiller.

Smooth stones, with a diameter of 25 to 75 mm (Altig and Brodie 1972), were layered on the floor of the enclosure. A few larger stones, Douglas fir branches, and small ferns (Filicophyta) were added. The larger stones were angled against the front of the aquarium glass. An aerator was hidden under the stones.

The outside of the back and sides of the tank was covered with a neutral gray plastic. The cover of the exhibit tank was 6.4 mm hardware cloth framed in wood with cutouts for the outlet and pickup tubes. Clear plexiglass was placed over the screening. On top of the plexiglass, a 30 cm 20 watt fluorescent full spectrum lamp connected to an electrical timer provided lighting with the day/night cycle set to duplicate the natural photoperiod for Multnomah county, Oregon.

The exhibit tank was positioned near the entrance of the Cascades Stream and Pond Building and was therefore influenced by natural light, outdoor temperatures, and noise from the public hallway. Disturbances from these sources were believed to be minimal. A 75 x 45 x 0.95 cm piece of clear glass was placed between the front of the tank and the viewing area. The back of the tank projected into an animal keeper work area which had low noise levels but was heated to 15.6° C at night and 17.8° C during the day. The back and sides of the tank were enclosed in 25.4 mm styrofoam sheet insulation to minimize temperature influences from the work area.

Holding tanks. The off-exhibit holding area, the Herptile Quarantine Cold Room, was a small room, 2.7 x 2.1 x 2.7 m, inside a cement block building. An 11,000 BTU/hr window mount air conditioner maintained the temperature within the range of 5° C to 17° C with a mean of 11° C. Timed lighting, set to duplicate natural day/night cycles, was provided by a ceiling-mounted 1.2 m standard double fluorescent fixture with a white full spectrum lamp and a red lamp. Tailed frogs were housed in various sized aquaria ranging in capacity from 7.6 to 113.6 l. These holding tanks were furnished similarly to the exhibit tank.

Subjects and maintenance. A total of five male, four female, and 25 larvae of *A. truei* were captured for use in the study (Tables 1 and 2). A few tadpoles and 3-4 males were the primary exhibit subjects.

Female *Ascaphus* were introduced into the exhibit when adult males developed seasonal sexual characteristics as described by Gaige (1920), Noble and Putnam (1931), Metter (1964a), and Daugherty and Sheldon (1982a). The female frogs were removed after amplexus had been broken or after two days if amplexus had not occurred, then reintroduced at a later date.

Diet consisted of purchased or captive-reared 2-10 week old house cricket nymphs *(Achete domestica)*, flesh fly larvae *(Sarcophage bullata)*, mealworm larvae *(Tenebrio molitor)*, wax moth larvae *(Galleria mellonella)*, and sow bugs *(Oniscus asellus)*. Frogs were occasionally offered small local spiders: The long-bodied cellar spider *(Pholcus phalangioides)* and the American house spider *(Achaearanea tepidariorum)*. Frogs were fed up to three times per week *en masse*. Animals were occasionally fed individually in 3.8 l plastic or glass containers to be sure they were eating and to test food preferences (Fig. 1). Diet records were kept for individual animals and for groups. Each frog was examined and weighed monthly on a triple beam balance. Feces, uneaten and dead food items, and dirty water were removed from the tanks every few days. Complete water changes and tank cleanings were done once per month.

Exhibit. The exhibit enclosure was designed to achieve four purposes: 1) to recreate the microhabitat of a tailed frog in a Cascade Mountain stream, 2) to house and maintain *A. truei*, 3) to allow zoo visitors to see the frogs, and 4) to research the captive husbandry of this species.

Frogs were given a wide choice of temperature and humidity gradients. Temperature extremes ranged from the coldest water temperature of 5° C to the warmest air temperature, directly beneath the exhibit lamp, of 16° C. The plexiglass top and daily mistings kept the humidity level high. Stones, branches, and vegetation were placed at different levels so frogs had a selection of perch sites.

The absence of larval external gills and the reduction of lung size and lung vascularity in adults indicate that these animals rely mostly on cutaneous respiration requiring a cold environment with high oxygen levels. This was provided by the cold moving water and by the stone aerator. The bubbling action of the aerator also helped keep material in suspension, increasing the efficiency of the filtration system. The reduced lung capacity results in an increase in specific gravity of *Ascaphus*, facilitating submergence.

Tailed frogs, though fed during the day, ate at night and were therefore rarely observed feeding. When *Ascaphus* were observed feeding they usually reacted opportunistically, lunging at active food items. Frogs were rarely observed actively pursuing a live food item.

The frogs displayed a clear preference for spiders and crickets (Fig. 1). Test for significance of differences between two proportions was $Z = 2.24$, when $p < .05$.

Monthly weighings during the two year study period resulted in weight ranges, for male frogs, of 5.2 to 6.0 g (n=4) with an average of 5.7 g. Female weights ranged from 8.0 to 9.4 g (n=4) with an average of 8.8 g.

Because it was important that visitors see the frogs, several exhibit modifications were made to improve viewing. In an attempt to reverse the light cycle to show the frogs when they were most active, a one way mirror was substituted for the clear glass fronting the exhibit. This proved too dark for proper viewing. A red fluorescent lamp was substituted for the white lamp, but this also proved too

Table 1. Date frogs entered the collection, time in captivity, and disposition.

Animal #	Arrival date	Time in captivity	Disposition
82-1♂	18 March 1982	25 months	Alive in exhibit
82-2♂	7 July 1982	21½ months	Alive in exhibit
82-5♂	15 Sept. 1982	7 weeks	Died 8 Nov. 1982
82-6♂	30 Dec. 1982	2½ months	Died 13 Mar. 1982
83-1♀	5 May 1983	11½ months	Alive in HQCR[a]
83-2♀	5 May 1983	11½ months	Alive in HQCR
83-7♂	15 May 1983	11 months	Alive in exhibit
83-5♀	1 June 1983	10½ months	Alive in HQCR
83-6♀	1 June 1983	10½ months	Alive in HQCR

[a]Herptile Quarantine Cold Room

Table 2. Arrival date, metamorphosis date, time in captivity, and disposition.

Arrival date	# of animals	Metamorphosis date	Time in captivity	Disposition
14 June 1982	1	6 July 1982	22 months	82-3♂ alive in exhibit
14 June 1982	6	dnm[a]	10 months	Died 10 Mar. 1983
29 June 1982	1	13 Aug. 1982	4 months	Died 29 Oct. 1982
29 June 1982	3	dnm	9½ months	Died 10 Mar. 1983
12 Sept. 1982	3	dnm	2 months	Died 8 Nov. 1982
12 Sept. 1982	6	dnm	6 months	Died 10 Mar. 1983
17 April 1983	1	25 June 1983	12 months	83-3♂ alive[b] in HQCR
17 April 1983	1	25 June 1983	12 months	83-4♀ alive in HQCR
17 April 1983	3	dnm	12 months	Alive in exhibit

[a]Did not complete metamorphosis.
[b]Herptile Quarantine Cold Room

dark for viewing. A more successful strategy was to arrange the enclosure substrate materials so that the frogs were visible even when they were hiding. *A. truei* concealed themselves by pushing between stones on the bottom of the tank, where they appeared squashed. Frogs hidden under the large stones angled against the front glass were thus visible. Branches, leaves, and moss were positioned in similar ways to provide hiding places visible to the public.

Despite these modifications, at times the frogs were difficult to see. Their brown, gray, and orange coloration provided excellent camouflage among the similarly colored stones. The zoo staff eventually agreed that careful scanning of the exhibit was part of the visitor's educational experience.

Because of their sympatric relationship in the wild (Stebbins 1954) an adult female *Rhyacotriton olympicus* shared the exhibit with *A. truei* frogs and tadpoles for more than a year.

Mortality. No adult frogs died during the study period. Two juvenile males died two months after capture without having eaten. Three larvae also succumbed within two months of capture. A two-month-old frog that metamorphosed from a captive larva died without having eaten. Almost a year after their capture, 15 larvae died after algae-covered rocks from a migratory waterfowl pond and from a zoo exhibit housing North American river otter *(Lutra canadensis)* were introduced into the larval holding tank. All died within 24 hours. Cause of death was not clinically determined.

Breeding. *A. truei* are typical anurans in that they are solitary most of the year. However, males and females may be found together during the fall breeding season (Wernz 1969), and Brown (1975) reports finding aggregations of females in July, at time of oviposition. Accordingly, males and females were housed separately.

When the adult males in the exhibit tank showed advanced development of transitory sexual characteristics, adult females were introduced. These characteristics included a series of small dark spines on the sides of the pectoral region, a rim of small dark tubercles on the edge of the lower jaw, the swelling of the forearm to two-to-three times its normal size and the appearance of large black horny pads on the inner palmar tubercle and the inner forearm (Gaige 1920; Noble and Putnam 1931; Metter 1964a; and Daugherty and Sheldon 1982a). Male and female frogs were introduced in the exhibit because it provided the best conditions for observation.

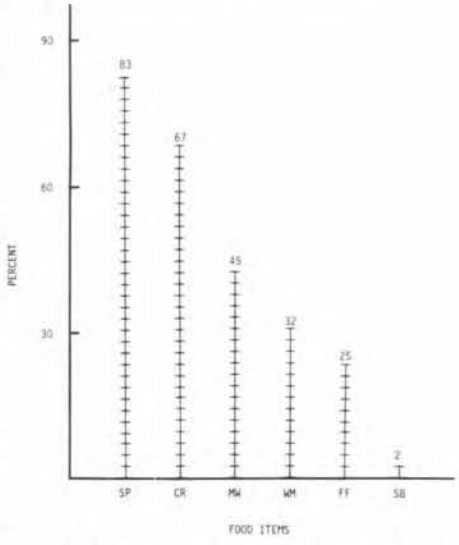


Figure 1. Percent of offered food items eaten by tailed frogs. Test for significance of differences between two proportions. Z = 2.24, when $p < .05$. SP, spiders; CR, crickets; MW, mealworms; WML, wax moth larvae; FF, flesh fly larvae; SB, sow bugs.

Three to four female *Ascaphus* were introduced into the enclosure at a time, and any of four behaviors resulted: 1) males and females ignored each other, 2) a male attempted to amplex a female but the female was not receptive, 3) a male inguinally amplexed a female but intromission did not occur, and 4) a male inguinally amplexed a female and intromission occurred. Females were never observed to initiate any contact behavior.

Mating occurred in accordance with recorded observations (Noble and Putnam 1931; Metter 1964b). At time of mating the external extension of the male's cloaca extended forward under the abdomen. The "tail" was maintained in this position by being engorged with blood, giving it a purplish appearance, and by two postpubal cartilages found in no other anuran (Noble 1931). When the male frog was successful in interlocking his arms around the female's pelvic region she assumed a sitting position with her legs drawn up. In this embrace the male was able to insert his cloacal appendage into the cloacal opening of the female.

Males with fully developed seasonal sexual characteristics were observed attempting to amplex juvenile and other adult male *Ascaphus* as well as the adult *Rhyacotriton* sharing the exhibit (Metter 1964b). An amplexed pair often attracted other males which attempted to amplex any part of the mating couple's bodies they could grab, sometimes holding on and dragging or being dragged around the tank for several hours before releasing their grips.

Pelvic amplexus with intromission was observed with three different pairs of frogs. These embraces were maintained for 28, 78, and at least 144 hours.

Mating pairs were occasionally handled to determine intromission and for photographic sessions to document these behaviors. The females often tried to jump away, dragging the amplexing males with them, but these disturbances did not cause the animals to break amplexus.

The first frog to metamorphose from a wild caught larva was a male which spent its entire captive life, 22 months, in the exhibit. This particular frog was more tolerant of light, noise, and other disturbances caused by captivity than wild caught adults. Also, it was often quite active in the daytime. The only time it was exposed to a female *A. truei* was when the latter were introduced into the tank for breeding. In the first year of its life, during these introductions, this frog hid and did not approach the females. It began to develop transitory sexual characteristics at 16 months. At 20 months it actively pursued adult female frogs and attempted amplexus with whichever part of the female's body was grabbed first. However, it has yet to be observed successfully amplexing an adult female.

Daugherty and Sheldon (1982a) stated that male *A. truei* do not show full development of skin tubercles (secondary sexual characteristics) until four years of age. It is well established that some mammals and reptiles can become sexually mature at an earlier age in captivity than in the wild (Hediger 1950; Kleiman 1975; Martin 1978). Although this phenomenon has not been proven for amphibians, our data suggest it may well exist for these animals as well.

CONCLUSIONS

This project resulted in the successful maintenance and exhibitry of *Ascaphus truei* in a zoological park. The husbandry techniques included clean, clear, cold, moving water; a relatively disturbance-free existence; varied food items providing adequate nutrition; a fairly constant forest-like environment; uncrowded housing conditions; a natural photoperiod; and the keeping of concise records.

Because of their propensity to hide and their lack of sustained activity, the uniqueness of *A. truei* is frequently not appreciated by the casual observer. Serious and interested zoo visitors, however, find the exhibit fascinating.

The production of eggs has not yet occurred, though several frogs bred readily. *Ascaphus* can be induced to ovulate by injection of amphibian pituitary gland extract or human chorionic gonadotropin (Noble and Putnam 1931; Wernz and Storm 1969; Brown 1975). It was hoped that by closely duplicating the frogs' natural habitat that eggs would be laid without the use of chemical stimulants. Though this has not happened as yet, further investigation is ongoing.

ACKNOWLEDGMENTS

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LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. Reports of clutch or litter size should include snout-vent and total lengths of females. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1982. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

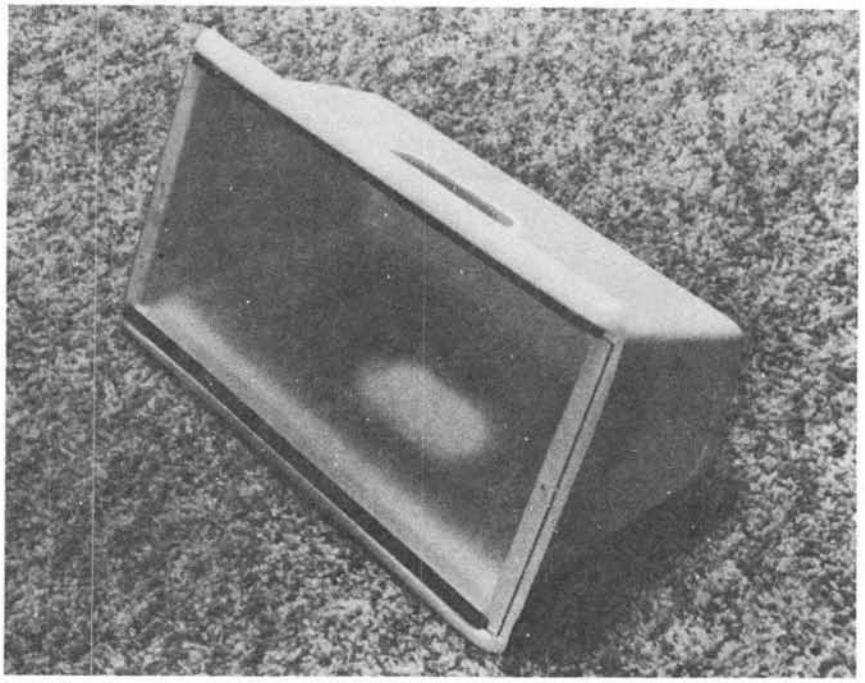
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CAUDATA

AMPHIUMA MEANS (Two-toed Amphiuma). **REPRODUCTION.** Salthe (1973. Cat. Amer. Amphib. Rept.:148.1-148.2) found few records regarding size of *Amphiuma means* at reproductive maturity and clutch size. Weber (1944, Copeia 1944:61-62) found a small (39 cm) *A. means* coiled around a clutch of 49 eggs, the smallest reproductive female and the smallest clutch recorded for this species.

A brooding female *A. means* and her eggs were accidentally dislodged from within a hollow log in Effingham Co., Georgia on 12 September 1983. The attended nest was located in a low place in a dry cypress-tupelo swamp which typically floods with the onset of winter rains and dries completely each summer. The amphiuma was coiled around 33 eggs, many of which ruptured when the log was opened. The extruded embryos closely resembled the newly hatched amphiumas described by Weber. Two of the intact eggs hatched in the laboratory two days later, after being immersed in tap water overnight;

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the embryos were therefore at hatching stage when discovered.

The adult (total length = 36.9 cm; snout-vent length = 28.9 cm) is the smallest reproductive female *A. means* on record. In addition, her clutch is the smallest recorded for the species.

The female amphiuma and nest contents were preserved and deposited in the Savannah Science Museum Herpetology Collection (SMM 10456).

Submitted by **CHARLES W. SEYLE, JR.,** Savannah Science Museum, 4405 Paulsen Street, Savannah, Georgia 31405, U.S.A. ●

NECTURUS MACULOSUS (Mudpuppy). **JUVENILE ECOLOGY.** During the course of a snorkel survey of chestnut lamprey, *Ichthyomyzon castaneus,* at the Larsen Road bridge crossing of the Namekagon River, Sawyer County, Wisconsin (T-42N,R-8W, Sec. 16) on 16 September 1982, we discovered a female *Necturus maculosus* (total length = 24.5 cm; snout-vent length = 16.5 cm) with approximately 30-40 juveniles (mean total length = 31 mm, range = 29-32 mm, n = 17). All were located beneath a partially embedded concrete block at a depth of approximately 0.3 m in an area generally characterized by swift current, low turbidity, and abundant rubble and boulders over a gravel and sand bottom. The adult made no effort to escape and was easily captured with a handnet. The juveniles lay motionless on the bottom next to pieces of debris, swimming only to avoid the net; light dorsolateral striping on a dark background made individuals difficult to distinguish from the substrate (see Bishop 1926 N.Y. State Mus. Bull. 268:5-60 for illustrations).

The juveniles' mean total length, dorsolateral striping, and lack of conspicuous yolk correspond to the stage of development attained by captive-reared specimens at least 25 days after hatching (Bishop op.cit.). Since Bishop observed hatching in mid-July, it is clear that the Namekagon specimens either hatched at a later date or grew more slowly than his New York specimens. Occurrence of juveniles in the presence of an adult female, which had an empty gastrointestinal tract, suggests the possibility of maternal guarding of offspring for some time subsequent to hatching. Our observations indicated that juveniles are subject to predation; specimens allowed to drift in the current were consumed readily by common shiners, *Notropis cornutus,* and hornyhead chubs, *Nocomis biguttatus.* Similarly, Shoop and Gunning (1967, Copeia 1967:732-737) reported predation by fish on juvenile *N. beyeri.*

The stomach contents of 16 juveniles preserved in formalin (Table 1) provide information on the first exogenous food of mudpuppies, since yolk is present in smaller individuals (Bishop op. cit.). All 16 individuals contained food, and all food items were of types expected in a benthic crevice microhabitat. Early instars of aquatic insect larvae were the most important food item in terms of relative size, frequency of occurrence among stomachs, and numbers. Some small sand grains and algal filaments were ingested incidentally (e.g., some were clutched in the claws of insect larvae), but the relative size of some larger particles was such that they probably were ingested intentionally (perhaps mistaken for living prey when moving in a current).

Table 1. Stomach contents of 16 juvenile *Necturus maculosus.* All stomachs contained food.

	Number	Number of stomachs
Chironomid larvae	8	6
Dipteran pupae	1	1
Hydropsychid larvae	7	7
Mayfly naiads	4	2
Unidentified insect fragments	—	11
Hydrocarinids	15	9
Algal filaments	—	3
Sand grains	—	11

The adult and 16 juveniles analyzed for stomach contents in this study have been deposited in the University of Wisconsin-Madison Zoological Museum (H22546).

Submitted by **PHILIP A COCHRAN,** Division of Natural Sciences, St. Norbert College, De Pere, Wisconsin 54115, and **JOHN D. LYONS,** Center for Limnology, University of Wisconsin, Madison, Wisconsin 53706, U.S.A. ●

SAURIA

HELODERMA SUSPECTUM CINCTUM (Banded Gila Monster). **PATTERN/COLORATION.** On 14 August 1982, a Banded gila monster *(Heloderma suspectum cinctum)* was captured near a black basaltic lava flow, 10 km northwest of St. George, Washington County, Utah (total length = 424 mm; SV = 290 mm; mass = 273 g). The pattern and coloration of this lizard differ from the original description of *H. s. cinctum* given by Bogert and del Campo (1956. The Gila monster and its allies. Bull. Amer. Mus. Nat. Hist. 109:1-238).

The dorsal pattern of *H. suspectum cinctum* typically includes four black chain-like double crossbands on a flesh-colored background; the pattern of the crossbands changes very little from hatchling to adult. The crossbands break up during maturation to form a reticulate pattern in the southern subspecies, *H. s. suspectum* (Bogert and del Campo 1956. op. cit.). In addition to the ontogenetic pattern changes noted by these authors, they also found a latitudinal gradient in color of the helodermatids wherein the lightest individuals were found in northernmost populations from Utah and Nevada.

In typical specimens from Utah the width of the black crossbands (hence the percentage of black color) is variable but flesh color, not black is the predominant color. In the specimen reported herein the pattern is reversed; black is the predominant color with some semblance of salmon colored bands on this black background (Figure 1). The color in this lizard is more "salmon color" than the "flesh color" of typical Utah gila monsters. (Colors 5 and 6 respectively in the Naturalist's Color Guide, Smithe 1975. Naturalist's Color Guide, Amer. Mus. Nat. Hist., New York).



Figure 1. Dark coloration in *Heloderma suspectum cinctum* from southwestern Utah (bottom) contrasted with typical pattern in this northern subspecies (top).

This specimen is being maintained at Utah State University as part of a current study on *H. suspectum cinctum* from Utah. As of November 1984 (total length = 425 mm; SV = 290; mass = 430 g) no changes in its pattern or coloration have been noted.

Black basaltic lava flows are a common geomorphic feature within the range of *H. suspectum cinctum* in Utah and these lizards often use the lava rocks for shelters (personal observation). Numerous desert reptiles are closely color-matched to their habitat background, including lava (Norris 1965. pp. 162-229. *In:* W. W. Milstead, ed. Lizard Ecology: A Symposium, Univ. of Missouri Press, Columbia, Missouri). A local former collector and Andrew Barnum of Dixie College, St. George, Utah have also infrequently observed this dark phase of *H. suspectum cinctum* in southwestern Utah.

The observations of Bogert and del Campo (1956. op. cit.) suggest that gila monsters from the northern extent of the species range, i.e., southwestern Utah, should show the lowest percentage of black color. Sightings of dark individuals from Utah suggest that in addition to the broad latitudinal trends discussed by these authors, other factors, e.g., selection to match background coloration of local habitat features, may also influence the pattern and coloration of this species.

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Submitted by **DANIEL BECK,** Department of Biology and Ecology Center, UMC 53 Utah State University, Logan, Utah 84322, U.S.A. ●

Table 1. Incidence of Cactus Spines on Red-lipped Lizards.

	Number of Lizards	Number with Spines	Percent with Spines	Spine Location on Venter		Spines per Individual Mean (Range)
				Anterior Half	Posterior Half	
Males	32	7	21.9	7	0	1.0
Females	28	4	14.3	9	5	3.5 (1-7)
Total	60	11	18.3	16	5	1.9 (1-7)

SCELOPORUS UNDULATUS ERYTHROCHEILUS (Red-lipped Lizard). **INJURIES.** Red-lipped lizards are common rock dwellers that inhabit the Black Mesa region of extreme northwestern Cimarron Co., Oklahoma. They are typically found on the sandstone formations and large pieces of lava surrounded by clumps of dense vegetation consisting of mesquite *(Prosopis glandulosa)*, hackberry *(Celtis reticulata)*, shrubby oaks *(Quercus* spp.), and prickly pear cactus *(Opuntia* spp.). Lizards spend a substantial portion of their time on the rocks basking, displaying, or resting in the shaded crevices, and are often observed on the ground under the vegetation during late morning hours.

During June 1983, sixty adult red-lipped lizards from the Black Mesa region were collected and examined. Eleven of the lizards had cactus spines in their forelimbs, particularly the toes. Twenty-one fresh wounds and scars were observed on the venter of the limbs and body. Cactus spines (2 mm to 16 mm in length) were removed from each of these injuries (Table 1). Fifteen of the cactus spines were embedded in or beneath the skin. Five spines penetrated muscle and were in the forelimbs, including a 6 mm spine that protruded completely through the brachium. In another lizard, a 16 mm spine was lodged in the abdomen. Scar tissue surrounded the exposed portion of this spine indicating that the lizard had been carrying it for an extended period. Despite this, the lizard looked healthy as did the other ten lizards carrying spines.

Cactus spine injuries could have occurred during aggressive interactions, escape from predators, or while feeding. The first two explanations seem unlikely. First, female red-lipped lizards do not exhibit the aggressive behavior of males (Ferner 1976, Am. Midl. Nat. 96:291-302). Therefore, injuries should be more prevalent on males if acquired while fighting, but this was not observed ($X^2 = 0.82$, $df = 1$, $p > .10$). Second, lizards climbing over cacti while escaping predators should have cactus spines randomly located in the anterior and posterior halves of the venter. Spines were found significantly more often in the anterior ($X^2 = 5.64$, $df = 1$, $p > .05$). Thus, cactus spine injuries probably occur while lizards are picking food items off the cacti. This is further supported because 14 of the 16 anterior spines were in the chin and distal regions of the forelimbs.

Submitted by **JAMES J. KRUPA,** Department of Zoology, University of Oklahoma, Norman, Oklahoma 73019, U.S.A. ●



SERPENTES

ATRACTASPIS ENGADDENSIS ('En Gedi Mole Viper). **OPHIOPHAGY.** Feeding habits of Israeli reptiles are poorly known because local herpetologists seldom examine the stomach contents of freshly captured specimens. In captivity *Atractaspis engaddensis* Haas readily eats skinks and juvenile rodents (Kochva pers. comm.; Mendelssohn pers. comm.).

A live specimen of *A. engaddensis* caught at Tequa', southern Judean Hills, on 31 May 1984 by two soldiers (who were bitten) was sent for identification to the Department of Zoology from the Hadassa Hospital on Mt. Scopus (Drs. D. Gilon and E. Raz). After being removed from the transportation container the specimen (328 mm TL) regurgitated a little-digested colubrine snake, *Eirensis coronelloides* (Jan) (239 mm TL; 73% of the predator's length). Both specimens are preserved in the Zoological Museum of the Department of Zoology, Hebrew University of Jerusalem (HUJ-R 16391 and 16392) (Figure 1).

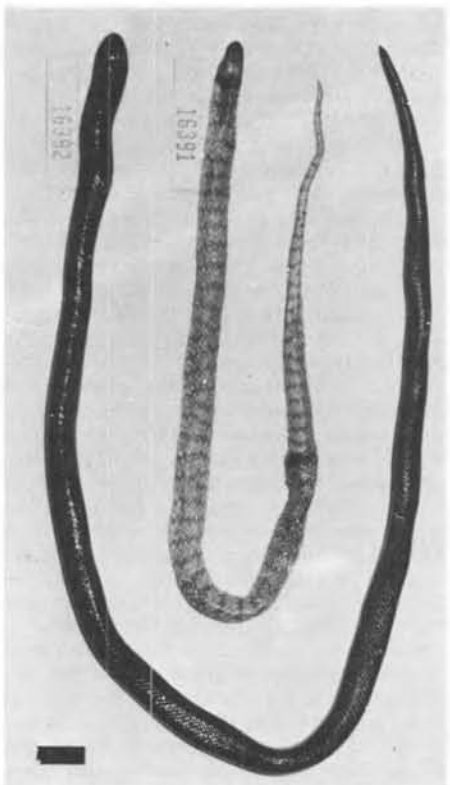


Figure 1. *Atractaspis engaddensis* (HUJ-R 16392) and the *Eirensis coronelloides* (HUJ-R 16391) which it regurgitated (photographed on 8 June 1984 before preservation, after having been frozen, by A. Niv and the submittor). Scale bar, 1 cm.

African species of *Atractaspis* are known to eat snakes in addition to skinks and rodents (FitzSimons 1962, Snakes of Southern Africa, Purnell, Cape Town; Pitman 1974, A Guide to the Snakes of Uganda, Wheldon & Wesley, Codicote). Interestingly the prey species in the present case, *E. coronelloides*, is suspected of possessing ophiophagous inclinations (pers. obs.).

Submitted by **YEHUDAH L. WERNER,** Department of Zoology, Hebrew University of Jerusalem, 91904 Jerusalem, Israel. ●



CANDOIA CARINATA (Solomon Island Boa). **OPHIOPHAGY.** *Candoia carinata* feeds on small lizards, frogs, birds, and rodents. Ophiophagy has not been reported to occur in the genus *Candoia*. J. Fauci (pers. comm.) informed me that a captive *Candoia carinata paulsoni* consumed a juvenile Madagascan boa *(Acrantophis dumerili)*. A similar incident of ophiophagy in another captive *C. carinata* is of interest.

A juvenile (ca 20.0 cm), captive-born female *C. carinata* was acquired on 13 April 1972. The specimen fed aggressively on new-born mice initially, and larger mice were consumed as growth occurred.

In the summer of 1976 the specimen (then ca 45 cm) and an adult (51 cm) Pacific rubber boa *(Charina bottae bottae)* were transferred to a 10 gallon aquarium. Continued observation showed no agonistic behavior between these specimens.

During the early morning of 8 July 1979, the *C. carinata* killed and ate the *C. bottae*. At the time, the former was about 62 cm, and the latter approximately 53 cm in length.

Submitted by **SCOTT J. MICHAELS,** College of Veterinary Medicine, University of Illinois, Urbana, Illinois 61801, U.S.A. ●

HYPSIGLENA TORQUATA OCHRORHYNCHA (Spotted Night Snake). **BEHAVIOR.** Snakes display a variety of antipredator behaviors including body inflation, tail displays, balling and others (Greene 1973. J. Herpetol. 7:143-161; Carpenter and Ferguson 1977. pp. 335-554, Biology of the Reptilia, Academic Press, NY). *Hypsiglena torquata* is a rear-fanged colubrid known to flatten the head and posterior body in response to predators (Carpenter and Ferguson 1977; Dundee 1950. Herpetologica 6:28-30). The notes presented here describe predator defensive behavior unreported for this species.

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An adult male (249 mm SVL) was found 24 April 1976 under a piece of cardboard in a desert flatland creosote bush community, 11 km NE Scottsdale, Maricopa County, Arizona. When uncovered, he exhibited flattening of the head as previously reported (Dundee 1950). In addition, he attempted to escape by fleeing, but, when restrained by holding the posterior body, he coiled and writhed in a rhythmic manner, moved the tail in exaggerated lateral movements and attempted to hide his head under a body coil. This behavior continued as long as he was disturbed, but, if left unmolested for more than one minute, he uncoiled and crawled away. This sequence of behavior was observed several times. When picked up, the snake discharged the contents of his cloaca. At no time did he attempt to bite. These observations correspond to the stereotyped actions numbered 24, 49, 58, 98 and 102 listed for snakes by Carpenter and Ferguson (1977). I interpret these behaviors as attempts to divert the predator attack to the tail where the predator may receive a cloacal discharge or cause tail autotomy.

Submitted by **JOSEPH C. MITCHELL,** Department of Biology, University of Richmond, Richmond, Virginia 23173, U.S.A. ●

LAMPROPELTIS ALTERNA (Gray-banded Kingsnake). **AN UNUSUAL SLOUGH.** On 10 July 1983, a captive-born and raised male *Lampropeltis alterna* (864 mm total length, 22 months old) shed his skin after a normal opaque cycle. While removing the freshly molted skin from this animal's enclosure and inspecting the shed, one of us (MWH) observed that the shed skin had attached to it what looked like replicas of both the snake's hemipenes. The hemipenis "copies" were firmly attached to the vent and were in the normal position for these organs. While the molted skin was still moist the replicas were pliable. The base of each measured approximately 3 mm in girth and tapered out to a pointed end 16 mm long with no barbs or other visible protrusions. After several days of drying, the two replicas decreased in circumference and in length and were 10 mm for the left and 13 mm for the right. The total length of the dry molted skin was 914 mm. After observing hundreds of molted skins over the years we have never before seen a molted skin with abnormal attachments such as these, nor have we read any literature reporting such an occurrence. Fred B. Antonio of Gainesville, Florida inspected the skin and suggested that the two attachments could be from the anal glands, but this he had also never previously observed. The molted skin was destroyed by ants before other observations could be made to more completely describe these structures. Photographs were made of the shed before its loss (Figure 1).

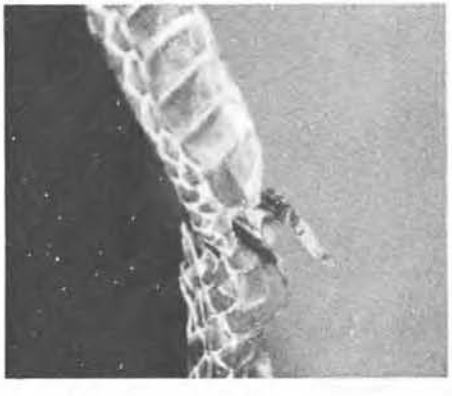


Figure 1. The everted hemipenal coverings on the shed skin of a male *Lampropeltis alterna*.

Submitted by **MICHAEL W. HAMMOCK,** Rt. #1, Wallace Road, Luttrell, Tennessee 37779 and **GORDON M. BURGHARDT,** Departments of Psychology and Zoology, University of Tennessee, Knoxville, Tennessee 37996, U.S.A. ●

NERODIA RHOMBIFERA (Diamondback Water Snake). **COLORATION.** Although instances of albinism in snakes are abundant and have been summarized by Dyrkacz (1981. Recent instances of albinism in North American amphibians and reptiles. SSAR Herp. Circular #11. pp. 1-32), records of other color aberrations without pattern changes are more rare. Hudson and Carl (1983. *Coluber constrictor flaviventris* Eastern Yellowbelly Racer. Coloration. SSAR Herp. Review 14(1):19) described specimens with yellow-orange ground color and orange markings. French (1981. Albinistic northern water snake in Alabama. SSAR Herp. Review 12(1):7) and Freed (1983. *Nerodia erythrogaster flavigaster* Yellowbelly Water Snake. Coloration. SSAR Herp. Review 14(3):75) described amelanistic water snakes *(Nerodia sipedon pleuralis* and *N. erythrogaster flavigaster*, respectively, both of which had pink to red eyes and flesh tone to tan for ground color and blotches.

On 20 August 1984 a litter of 23 *N. rhombifera* born in captivity to a normal mother captured in the St. Francis River bottoms, E. Paragould, Greene Co., Arkansas, by Mr. Ralph Routon, included five amelanistic neonates. Measurements made on 28 September were: male - 235 mm snout-vent/77 mm tail; females - 220/68, 230/68, 250/68, and 232/67. All snakes shed between 27 and 31 October. The pattern of all five neonates was normal, but color ranged from a yellowish-tan ground color with dark tan blotches to a tan ground color with brown blotches. The venters were light yellow with light brown triangular spots, except in one of the darker individuals, where it was almost uniformly yellowish-tan. Labials were almost totally yellow, and eyes were lightly pigmented, but slightly pink. Two snakes were of the lightest shade described, one was intermediate, and two were darker. The remaining littermates were of the normal dark gray to black coloration. Specimens are in the Memphis State University reptile and amphibian collection (Catalog numbers to be assigned).



Figure 1. Juvenile amelanistic *Nerodia rhombifera* from Greene Co., Arkansas. Photo by Ray Burkett.

Submitted by **RAY D. BURKETT** and **JAMES A. HUGGINS,** Department of Natural Sciences, Shelby State Community College, P.O. Box 40568, Memphis, Tennessee 38174-0568, U.S.A. ●

NERODIA RHOMBIFERA (Diamondback Water Snake). **TWINNING.** A Siamese twin *N. rhombifera* was born on 24 August 1984 to a female captured by Mr. Ralph Routon, in the St. Francis River bottoms, E. Paragould, Greene Co., Arkansas. The snakes were joined ventrally from just inferior to the heart of the smaller individual and just superior to the heart of the larger individual to just superior to the ovaries of the larger individual. Deterioration of soft parts of the smaller individual, which was dead at birth, made determination of the inferior point of separation impossible. The snakes measured approximately 145/48 mm (snout-vent/tail) and 100/32. The position of each can be seen in Figure 1.

Twinning and anomalous births are not uncommon in snakes; one recent report on a *Python* (Clark and Tytle 1983. *Python molurus bivittatus* (Burmese Python). Morphology. SSAR Herp. Review 14(4):121) included both twinning and a dicephalic individual. Belfit and Nienaber (1983. A dicephalic kingsnake *(Lampropeltis getulus yumensis)* from Arizona. SSAR Herp. Review 14(1):9) reported on a dicephalic kingsnake and reviewed the literature on other instances of dicephaly. This is the first instance known to us of Siamese twinning in *N. rhombifera*. The specimen is in the reptile and amphibian collection at Memphis State University (Catalog No. will be assigned). We wish to thank Dr. Laverne Gurley for her time and effort in producing radiographs of the specimen.

Submitted by **RAY D. BURKETT** and **JAMES A. HUGGINS,** Department of Natural Sciences, Shelby State Community College, P.O. Box 40568, Memphis, Tennessee 38174-0568, U.S.A. ●



Figure 1. Negative print of a radiograph of Siamese twin *Nerodia rhombifera*, from Paragould, Greene Co., Arkansas. Photo by Ray Burkett.

NOTECHIS SCUTATUS (Australian Tiger Snake). **FEEDING BEHAVIOR.** Shine and Covacevich (1983. J. Herpetol. 17:60-69) reported "unlike other Australian elapids, *O.* [*Oxyuranus*] *scutellatus* do not retain their initial hold on the prey until struggling ceases: the prey is released instantly after the strike." They then suggest that this "strike and release" feeding behavior is an adaptation to mammalian prey. Observations on captive tiger snakes support this suggestion.

Tiger snakes normally feed on both mammalian and amphibian prey (Shine 1977. Can. J. Zool. 55:1118-1128). During 1968-69 large numbers of tiger snakes (up to 30) were maintained in captivity at the University of New England, on a diet of live laboratory mice. Several hundred feeding episodes were observed over that period, involving about 50 individual animals. All snakes fed by "strike and release" behavior, and then, usually after a delay of about five minutes, followed the scent trail of the bitten mouse.

During 1971 a litter of 16 tiger snakes was maintained for three months on a diet of frogs. These animals did not release after striking the prey. An individual adult *Notechis* fed frogs in captivity fed in the same way. A wild tiger snake observed eating a frog similarly did not release the frog after capture (Heatwole et al. 1973. Hiss News-J 1:113).

These observations are consistent with the theory that tiger snakes employ "strike and release" feeding behavior for mammalian prey, and the more common "strike and hold" behavior for frogs. The former behavior "may be an adaptation to the retaliatory ability of mammalian prey" (Shine and Covacevich op. cit.). The high metabolic rate of mammals apparently allows the "strike and release" behavior to be successful (mice bitten by captive tiger snakes usually travelled less than a metre), whereas the lower metabolic rate of amphibians may allow prey to move further before death. That frogs presumably leave a discontinuous scent trail may also be a factor in the development of different feeding strategies for different prey.

Submitted by **GEOFFREY J. WITTEN,** Department of Anatomy and Physiology, Phillip Institute of Technology, Plenty Road, Bundoora, Victoria, 3083, Australia. ●

PYTHON MOLURUS BIVITTATUS (Burmese python). **COLORATION.** Albinism is a commonly reported anomaly among reptiles (Gilboa and Dowling 1974. HISS Publ. Herp. 6:1-11). Dyrkacz (1981. SSAR Herp. Circ. No. 11) described captive albino specimens that recovered normal pigmentation, indicating a metabolic rather than genetic etiology. However, he did not report the reverse, where normally pigmented specimens became albinistic. This note describes a normal *Python molurus bivittatus* that became leukistic at two years of age.

A normally colored hatchling female *Python molurus bivittatus* was purchased from a breeder in 1977. The snake remained normal for between 1-2 years. Then over the relatively short period of 1-2 months the skin pigment faded until the snake was almost pure white with no trace of a pattern. A few remaining dark spots along the body were noticed to fade with each ecdysis. In 1985, the snake is still leukistic (Figure 1). The only remaining pigment is in the dark eyes, an incomplete spearpoint pattern covering the top of the head (Figure 2) and scattered over the tongue. Small dark flecks have recently begun to appear caudal to the head on the dorsum where the snake had previously been pure white. The snake is now 2.5 m long and is being maintained in a private collection for breeding purposes.

The examination of skin biopsies failed to reveal any significant abnormalities other than the lack of pigment. Possible etiologies include an acquired or hereditary metabolic defect and idiopathic causes. Nutritional deficiencies are unlikely to be a factor due to the snake being fed whole prey animals. Inflammatory disease involving the basal cell layer which contains the chromatophores could cause pigment loss, but no evidence of inflammation was seen in the skin biopsies. Pope (1965. The Giant Snakes, Alfred A. Knopf, New York) shows a photograph of a leukistic *Python molurus molurus* that is white with dark eyes and no trace of a pattern, but gives no data concerning that snake.

Submitted by **STEVE BARTEN,** 216 W. Tower Drive, Barrington, Illinois 60010, **FREDRIC FRYE,** 741 Plum Lane, Davis, California 95616, **RICHARD EVANS,** Ralston Purina, Checkerboard Square, St. Louis, Missouri 63164 and **PETER IHRKE,** University of California, School of Veterinary Medicine, Davis, California 95616, U.S.A. ●

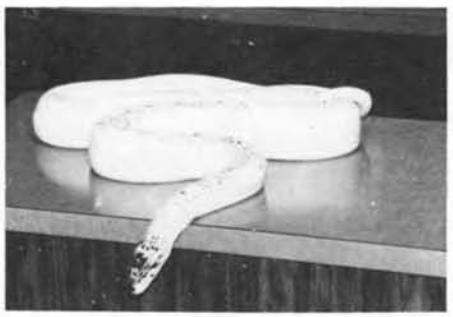


Figure 1. An almost completely leukistic *Python molurus bivittatus.*

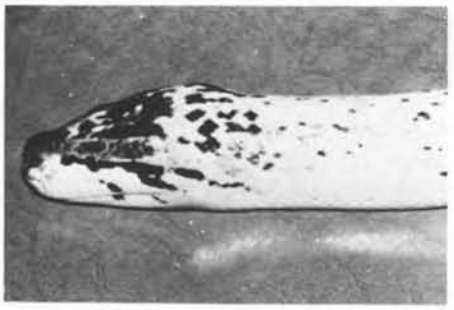


Figure 2. The same snake showing the remaining pigment on the head and neck.



SISTRURUS CATENATUS CATENATUS (Eastern Massasauga). **PATTERN.** An aberrantly patterned *Sistrurus c. catenatus* was captured on 9 July 1979 just north of the mouth of Twelve Mile Bay, Parry Sound District, Ontario, Canada (45° 06' N. Lat., 80° 04' W. Long.). Probably in its second summer, the snake was closely examined but escaped before being sexed and measured. Scutellation appeared normal, however the specimen was atypical in having several dorsal blotches merged together to form longitudinal stripes (Figure 1).

Gloyd (1935. Pap. Mich. Acad. Sci., Arts Lett. 20:661-668 and 1958. Bull. Chi. Acad. Sci. 10(12):185-195) and Nickerson and Mays (1968, Wasmann J. Biol. 26(1):125-131) discuss color and pattern aberrancies in crotalid snakes, including a number of examples of striping in normally blotched species. The first report of a striped example of the genus *Sistrurus* was by Irwin (1979. Herp. Review 10(3):85) who described a striped *S. c. tergeminus* from Kansas. This is the first report of a striped *S. c. catenatus.* Color slides of the specimen have been deposited at the National Museum of Natural Sciences in Ottawa.

Submitted by **MICHAEL J. OLDHAM,** Essex Region Conservation Authority, 360 Fairview Avenue West, Essex, Ontario N8M 1Y6, Canada. ●

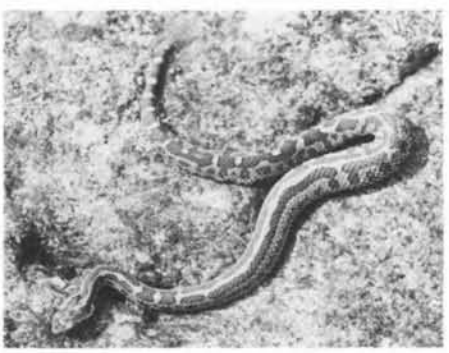
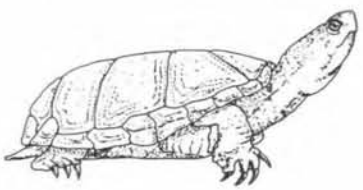


Figure 1. Partially striped *Sistrurus c. catenatus.*



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TROPIDOCLONION LINEATUM LINEATUM (Northern Lined Snake). **SIZE.** The largest specimen recorded for Illinois was 314 mm in total length (Smith 1961. The Amphibians and Reptiles of Illinois. Ill. Natur. Hist. Surv. Bull. 28, 1-298).

A female specimen was collected near the foundation of a house on South Pasfield Street, Springfield, Sangamon County, Illinois, 8 September 1968. The total length was 432 mm, and the snout-vent length was 378 mm. This exceeds the record for Illinois by 118 mm. With the exception of the large size, the color, pattern, and scale counts are within the accepted range of variation for *T. l. lineatum* (Conant 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton-Mifflin).

This specimen was collected by Fred Kincaid, Modesto, Illinois, and is deposited in the herpetology collection of the Zoology Department at the Illinois State Museum, Springfield, Illinois (ISM 622123).

Submitted by **EVERETT D. CASHATT** and **WILLIAM J. WEBB,** Zoology section, Illinois State Museum, Springfield, Illinois 62706, U.S.A. ●

TESTUDINES

CHRYSEMYS PICTA MARGINATA (Midland Painted Turtle). **SIZE.** The largest documented specimen of this subspecies for the Eastern and Central United States had a carapace length of 18.7 cm (Conant 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton-Mifflin). The record for the state of Illinois was 16.6 cm (Smith 1961. The Amphibians and Reptiles of Illinois. Ill. Natur. Hist. Surv. Bull. 28, 1-298).

A female specimen was collected while crossing Illinois Route 29, approximately 400 m north of the Springfield city limits near Spring Creek, Sangamon County, Illinois, 27 May 1981, by Ken Pennington of Springfield. The carapace is 19.5 cm (straight-line carapace measurement), therefore, it is the largest recorded specimen for the East and Central United States by 8 mm, and for Illinois by 29 mm. The other measurements are: carapace width, 14.3 cm; plastron length, 17.8 cm; plastron width, 11 cm; shell height, 6.8 cm. Except for the large size, the specimen was within the range of variation for pattern, color and scutation for *C. p. marginata* (Carr 1966. Handbook of Turtles. Cornell Univ. Press). The specimen is deposited in the herpetology collection of the Zoology Department at the Illinois State Museum, Springfield, Illinois (ISM 622398).

Submitted by **WILLIAM J. WEBB** and **EVERETT D. CASHATT,** Zoology section, Illinois State Museum, Springfield, Illinois 62706, U.S.A. ●

CLEMMYS MARMORATA (Western Pond Turtle). **SIZE.** The maximum straight-line carapace length of the Western pond turtle has been noted as 180 mm (Ernst & Barbour 1972. Turtles of the United States) and 178 mm (Stebbins 1966. A Field Guide to Western Reptiles and Amphibians). Herein we report on an unusually large male taken by Denise Brown on 2 July 1984 in the vicinity of Huron, Fresno Co., California. Measurements are: Straight-line carapace length - 182.20 mm, Over the curve carapace length - 179.90 mm, Carapace width @ #8 marginals - 145.80 mm, Plastron length - 154.74 mm, Mass - 854 g.

Of 515 turtles of this species measured by Holland, only a single specimen exceeds this one in size - a female from Klamath Lake, California (CAS 44273), with a straight-line carapace length of 190.80 mm. Of over 450 live animals weighed, this turtle exceeds the previous maximum recorded mass by 40 g. Additionally, this animal has an unusually patterned and colored carapace, bearing a strong resemblance to that seen in old *Chrysemys scripta elegans*. This pattern was noted in less than 1% of the specimens examined, and is present only in large males. This animal is being retained alive in the Roeding Park Zoo reptile collection.

Submitted by **SEAN MCKEOWN,** Roeding Park Zoo, 894 W. Belmont Avenue, Fresno, California 93728 and **DAN C. HOLLAND,** Department of Biology, University of Utah, Salt Lake City, Utah 84112, U.S.A. ●



GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

ANURA

ASCAPHUS TRUEI (Tailed Frog). USA: CALIFORNIA: Mendocino Co: 3.2 km (by air) SE confluence of Elder Creek and south fork Eel River on Misery Creek fork of Elder Creek, 610 m, T22 N, R16 W, Sec 34. 6 July 1984. Hartwell H. Welsh, Jr. and Linda LeClaire. Verified by Hartwell H. Welsh, Jr. Redwood Sciences Laboratory (RSL 1029-33). Dark Gulch, 1.2 km N. Albion, Mendocino Co., (MVZ 62214) is the southernmost locality for the species, and Bury (1968, Herpetologica 24:39-46) provided an additional Mendocino Co. record: both are from Redwood forest within 1 km of the coast. The Elder Creek population extends the range 19.2 km east and confirms the presence of the species in the mixed Douglas Fir - hardwood forest. This locality is on the North Coast Forest Preserve of the Nature Conservancy; they are gratefully acknowledged. Contribution No. 30 of the Old-growth Forest Wildlife Habitats Program, USDA Forest Service.

Submitted by **HARTWELL H. WELSH, JR.,** Redwood Sciences Laboratory, Pacific Southwest Forest and Range Experiment Station, USDA Forest Service. 1700 Bayview Dr. Arcata, California 95521, U.S.A. ●

CENTROLENELLA EUKNEMOS (Cascade Glass Frog). COSTA RICA: PUNTARENAS PROVINCE: San Luis Valley, small stream at 840 m flowing S into Rió San Luis, 10° 16'25" N, 85° 48'24" W. 19 September 1982. M. P. Hayes. Verified by J. M. Savage. University of Miami Costa Rican Expeditions (CRE 4638-4640). Known only from three localities in Costa Rica and Panama (Savage and Starrett. 1967. Copeia 1967(3):604-609) and one in Colombia (Hayes and Starrett. 1980. Bull. So. California Acad. Sci. 79:89-96). Extends the range ca 95 km ENE of the Alto La Palma locality reported by Savage and Starrett (1967).

Submitted by **MARC P. HAYES,** Department of Biology, P.O. Box 249118, University of Miami, Coral Gables, Florida 33124, U.S.A. ●

CAUDATA

AMBYSTOMA TALPOIDEUM (Mole Salamander). USA: GEORGIA: Bartow Co: 4.5 km E-ESE Adairsville, Hwy I-40. 11 October 1980. C. W. Seyle, Jr., J. Godwin and L. Bozeman. Savannah Science Museum (SSM 9203). Glynn Co: St. Simons Island, Couper Road, 9.0 km N-NNE Harrington. 10-14 May 1980. D. Hamilton and members of SSM Herpetology Club. (SSM 8748). Both verified by C. W. Seyle, Jr. The Bartow County record is the

first for the Ridge and Valley province in Georgia and lies ca 125 km NW of other state records above the Fall Line (Wharton and Howard. 1971. SSAR Herp. Review 3(4):73-74), and confirms populations in limesinks (sagponds) of NW Georgia (Wharton. 1977. Natural Environments of Georgia. Georgia Dept. Nat. Resources, Atlanta). The Glynn County record is the first for a Georgia barrier island (Johnson and Hillestad. 1974. Nat'l. Park Service Sci. Monogr. Ser. No. 3, Wash. D.C.).

Submitted by **CHARLES W. SEYLE, JR.,** Savannah Science Museum, 4405 Paulsen Street, Savannah, Georgia 31405, U.S.A. ●

ANEIDES AENEUS (Green Salamander). USA: PENNSYLVANIA: Fayette Co: 5.1 km WNW town of Mill Run, Morgan Run, 472 m (USGS South Connellsville quadrangle, 1973), 12 July 1984; 3.2 km ENE of Fairchance, White Rock Run Hollow, 552 m (USGS Brownfield quadrangle, 1973), 28 October 1984. Collected by Charles Bier. Verified by C. J. McCoy. Carnegie Museum of Natural History (CM 109010-109011). Extends northern range limit 32.5 km NE along Chestnut Ridge from the only previous Pennsylvania locality (Richmond. 1952. Ann. Carn. Mus. 32:313-318.)

Submitted by **CHARLES W. BIER,** Western Pennsylvania Conservancy, 316 Fourth Avenue, Pittsburgh, Pennsylvania 15222, U.S.A. ●

NECTURUS PUNCTATUS (Dwarf Waterdog). USA: GEORGIA: Effingham Co: Ogeechee River backwater at SCL RR bridge, 2.3 km W Meldrin. 5 September 1983. C. W. Seyle. Verified by G. K. Williamson. Savannah Science Museum (SSM 10407). Extends range approximately 130 km to the S-SW (Gibbons and Patterson. 1978. SRO-NERP-2). This is the first Georgia record outside the Fall Line Red Hills and Fall Line Sandhills regions, the first from the Ogeechee drainage, and confirms presence of the species in northern coastal Georgia (Conant. 1975. A field guide to reptiles and amphibians of eastern and central North America, Houghton Mifflin Co., 429 pp.).

Submitted by **CHARLES W. SEYLE, JR.,** Savannah Science Museum, 4405 Paulsen Street, Savannah, Georgia 31405, U.S.A. ●

SAURIA

CNEMIDOPHORUS LAREDOENSIS (Laredo Striped Whiptail). USA: TEXAS: Starr Co: Rio Grande City. 27 October 1929. E. H. Taylor. Museum of Natural History, University of Kansas (KU 15457, 15462, 15463); 13-15 July 1930 (KU 13086); 14 July 1930. (KU 6773). E. H. Taylor and J. S. Wright. 23 August 1931. (KU 15454). Arroyo El Salado, Rio Grande City. 16 July 1930. E. H. Taylor. (KU 8980). Webb Co: 8 mi from Laredo, Arroyo El Salado. 15 July 1930. E. H. Taylor. (KU 9000-9002, 9008, 9010, 9011), (possibly in error; locality has not been verified and is probably a *lapsus* for 8 mi S Rio Grande City, Arroyo El Salado, Starr Co.). All verified by John W. Wright. Previously known only from Laredo, Webb Co. (Wright, Spolsky and Brown. 1983. Herpetologica 39(4):410-416). Localities extend known range ca 170 km (air line) southeast in the Rio Grande Valley. The collection dates indicate that this parthenogenetic species is at least 55 years old.

Submitted by **LINDA S. DRYDEN,** Museum of Natural History and Department of Systematics and Ecology, The University of Kansas, Lawrence, Kansas 66045, U.S.A. ●

CNEMIDOPHORUS TESSELATUS (Colorado Checkered Whiptail). USA: TEXAS: Oldham Co: 32.5 km NW Vega (along Canadian River and tributaries on Mansfield Ranch). 19, 24, 26-27 and 29 June 1974. James F. Scudday. Verified by J. F. Scudday. Sul Ross State University (SRSU 3401-3406, 3392, 3395-3397). New county record, extends range westward from Potter County (Raun and Gehlbach. 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2). The specimens are of pattern class "C" (Scudday. 1973. J. Herp. 7:363-371).

Submitted by **CHRIS T. MCALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, U.S.A. ●

SERPENTES

CLONOPHIS KIRTLANDI (Kirtland's Snake). USA: ILLINOIS: Christian Co: Lake Sangchris, east boat dock. 22 February 1985. Everett D. Cashatt. Illinois State Museum (ISM 691223). Sangamon Co: Lake Springfield. 14 May 1968. Tracy Logan. (ISM 622267). September 1967. Don Kother. (ISM 622096). 9.5 km S Springfield, East Lake Drive. 22 June 1965. Patrice Parmalee. (ISM 621866). All verified by E. D. Cashatt. New county records, extend range ca 62 km southwest (Smith. 1961. Illinois Nat. Hist. Surv. Bull. 28, 1-298).

Submitted by **WILLIAM J. WEBB,** Zoology/Herpetology Section, Illinois State Museum, Springfield, Illinois 62706, U.S.A. ●

HETERODON NASICUS NASICUS (Plains Hognose Snake). USA: WYOMING: Fremont Co: 2.6 mi W Shoshoni on US 26. 16 August 1984. C. J. McCoy and E. J. Censky. Verified by C. J. McCoy. Carnegie Museum of Natural History (CM 105619). First record from Wind River Basin, extends range ca 320 km west (Baxter and Stone, 1980. Amphibians and Reptiles of Wyoming. Wyoming Game and Fish Dept. Bull. No. 16. 1-137 pp.).

Submitted by **ELLEN J. CENSKY** and **C. J. MCCOY,** Section of Amphibians and Reptiles, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania 15213, U.S.A. ●

MEHELYA CAPENSIS UNICOLOR (Unicolor Cape File-Snake). TANZANIA: Kigoma Region: Kibondo (3 degrees 35 minutes South, 30 degrees 41 minutes East). March 1950. R. Risley. Verified by D. G. Broadley. Natural History Museum of Zimbabwe (NMZB 227). Arusha Region: Arusha (3 degrees 21 minutes South, 36 degrees 40 minutes East). 12 January 1959. G. Swynnerton. Verified by D. G. Broadley. (NMZB 3186). First records for Tanzania. Loveridge (1957. Bull. Mus. Comp. Zool. Harv. 117:254) only listed the nominate subspecies from Tanzania. The subspecies *unicolor* (Boulenger) was revived from the synonymy of *M. c. savorgnani* (Mocquard) by Laurent 1956. (Ann. Mus. roy. Congo Belge, ser. 8vo, Sci. zool., 48:104).

Submitted by **D. G. BROADLEY,** Natural History Museum of Zimbabwe, P.O. Box 240, Bulawayo, Zimbabwe. ●

SEMINATRIX PYGAEA (Black Swamp Snake). USA: FLORIDA: Walton Co: 9.6 air km SE Freeport, T2S, R18W Sec 5. 7 May 1984. University of Florida, Florida State Museum (FMS 56131). Santa Rosa Co: 3.5 air km NNE Munson, T5N R26W Sec 32. 4 March 1985. (UFS 57755). P. Moler and B. Mansell. Verified by P. Moler. First records for each county, extends Florida range ca. 150 km west (Ashton and Ashton. 1981. Handbook of Reptiles and Amphibians of Florida, Part I: The Snakes. Windward Publ., Inc., Miami. 1-176) and total range 37 km SW nearest Alabama locality (Mount. 1975. The Reptiles and Amphibians of Alabama. Agr. Exp. Sta., Auburn, AL, i-vii, 1-347).

Submitted by **PAUL E. MOLER,** Florida Game and Fresh Water Fish Commission, 4005 South Main Street, Gainesville, Florida 32601, U.S.A. and **BARRY W. MANSELL,** 2826 Rosselle Street, Jacksonville, Florida 32205, U.S.A. ●

TANTILLA NIGRICEPS (Plains Blackhead Snake). USA: WYOMING: Platte Co: Glendo Dam. 12 August 1984. C. J. McCoy and E. J. Censky. Verified by C. J. McCoy. Carnegie Museum of Natural History (CM 105606). First record of species in Wyoming, extends range westward in Platte River Valley from SW Nebraska (Conant. 1975. A field guide to reptiles and amphibians of eastern and central North America. Houghton Mifflin Co. Boston. i-xviii, 427p.)

Submitted by **ELLEN J. CENSKY** and **C. J. MCCOY,** Section of Amphibians and Reptiles, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania 15213, U.S.A. ●

TESTUDINES

CLEMMYS GUTTATA (Spotted Turtle). USA: INDIANA: Tippecanoe Co: Americus Fen, ca 1.5 km NE Americus, off St Rt 25. 9 May 1984. M. J. Lodato. Verified by Sherman A. Minton, Jr. Carnegie Museum of Natural History (CM ACC. 32704.1-32704.2 photographs). First record for Tippecanoe County and southwesternmost record for Indiana (Minton. 1972. Amphibians and Reptiles of Indiana. Indiana Acad. Sci. Mono. No. 3; Minton, List and Lodato. 1983. Proc. Indiana Acad. Sci. 92:489-498).

Submitted by **MICHAEL J. LODATO,** 925 Park Plaza Drive, Evansville, Indiana 47715, U.S.A. ●

BOOK REVIEWS

The Venomous Snakes of the Near and Middle East, by Ulrich Joger. Ludwig Reichert Verlag, Wiesbaden (West Germany). 1984. 115 pp., 21 line drawings, 20 maps.

This publication, a part of the Tübinger Atlas of the Near East, states its purpose is to summarize contemporary knowledge of the taxonomy and distribution of the venomous snakes of the Near and Middle East. In this, it succeeds admirably. The region covered extends from Turkey, Egypt, and the Arabian peninsula to Pakistan and the southern states of Soviet central Asia. All species of elapids, viperids, and hydrophids are included. *Atractaspis* is considered a colubrid genus; rear-fanged venomous colubrids such as *Psamnophis* and *Malpolon* are omitted. A checklist and key are followed by the major section of the book consisting of accounts dealing with species or occasionally groups of related species. Each account has sections treating taxonomy, diagnostic characters, habitat, and distribution. These represent a critical review of the existing literature plus the author's study of major European collections in an effort to confirm identifications and locality records. Particularly well written and helpful are the sections treating the genus *Vipera* which has undergone extensive evolutionary radiation in this region and *Echis,* the genus of greatest medical importance, whose taxonomy has been in flux for two decades. One need not necessarily subscribe to the author's conclusions, but his reasoning is clear and supported by numerous primary literature references.

There are four appendices that deal with food, reproductive biology, venoms, and antivenins. The author's knowledge of literature on venoms and antivenins is less complete and critical than his knowledge of the taxonomic and zoogeographic literature. There are several errors or misleading statements, e.g. a much too small venom yield for *Naja haje*, failure to list necrosis as a manifestation of cobra envenomation, recommendation of *Deinagkistrodon acutus* and *Calloselasma rhodostoma* antivenins for treatment of bites by *Agkistrodon* of the Middle East. The line drawings of head shields and other features of lepidosis are accurate for the most part, however Figure 7 does not depict correctly the elongate, splinter-like mental of *Enhydrina*. Photographs of the animals and their habitats would have been helpful but would doubtless have increased the cost of publication. The maps are carefully done and show physiographic and ecologic features that influence species distribution. However, they omit political boundaries that, while largely ignored by snakes, are helpful to human users of maps.

But these are trifling objections to an excellent piece of work. Any herpetologist interested in systematics or zoogeography of snakes should have this publication on his shelves. Individuals with a broad interest in regional faunas and medical personnel concerned with snakebite will also find it useful. And I suspect it may well be consulted by a variety of persons with financial or military concerns in this critical and troubled sector of the globe.

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The Snake's Advocate, by Arthur Carl Stimson. Edited and compiled by Dorothy E. Justman. 1982. 104 pages. 10 photos and 45 figures, soft cover (5½ x 8⅜ in.). $6.95. Eakin Publications, Inc., P.O. Box 23066, Austin, TX 78735.

Arthur Carl Stimson (1892-1968) was a Houston surveyor-civil engineer with an intense interest in snakes and snakebite. He served as lay-consultant to more than 800 snakebite victims from 1948 to 1968. In the 1950s, he was Honorary Curator of Reptiles of the Museum of Natural History of Houston and the Houston Zoo. This snake book has been published by Mrs. Dorothy E. Justman, to preserve her father's notes for posterity.

The larger part of this book is devoted to snake habits and behavior and correcting the folklore and myths surrounding them. The style is colorful and interesting and is written in a popular way typical of books on reptiles written for lay and young readers 40 years ago. I found Stimson's ideas, for the most part, accurate and his style highly entertaining. He deals at length with milk snakes, "hoop" snakes, "charming" by snakes, sea serpents and many other "tall tales." A list of 68 "facts and fiction" was interesting because it indicates the prevalence of myths and lack of general knowledge by the public, at least at that time and region of the country. I was surprised it was necessary to correct the notion that "each and every bone of a snake's body is a poisonous dart."

Three chapters deal with the prevention, first aid and medical management of snakebite. Stimson's ideas reflect the 1927-1955 era in Texas and the work of Dudley Jackson and others of San Antonio. It is unfortunate that excerpts from Stimson's two articles of 1958 and 1960 have been combined with those from other papers by Herbert L. Stahnke and Henry M. Parrish. The average reader, without basic knowledge of the literature, will be left confused and misguided. Although some of these concepts have met the test of time, many others have not and are controversial at best. Stimson's ideas will be of definite value to those interested in the history of snakebite management since, for his time, Stimson was accurate about medical teaching in Texas. To judge his ideas in the light of current knowledge would, of course, be unfair but an introduction to the controversies of that period would have increased the reader's insight as to how far we have and have not come since then. I would have preferred to have found Stimson's original articles reprinted in the book. Although the back cover states, "Premed students will use this book as a basic primer," they would be better off with more current literature.

No credit is given for the figure in the preface, "Texas — Snakebite Case Reports" (Parrish, H. M. 1960. Texas Medicine 60:592-598) nor the year (1958-1959).

Although students of herpetology will find little new in "The Snake's Advocate," I recommend it for pleasurable reading and historical value. Any profit from book sales will be donated to the Reptile House, Houston Zoological Gardens.

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The Reptiles of British Columbia, by Patrick T. Gregory and R. Wayne Campbell. 1984. Handbook No. 44, British Columbia Provincial Museum, Victoria, British Columbia V8V 1X4. viii + 103 pp., illus. + maps. paper. $3.00.

This small (18.3 x 13.2 cm) handbook is the 44th in the fine series of handbooks published by the British Columbia Provincial Museum and dealing with the natural history of Canada's most westerly province. Two other recent publications of this museum also deal with British Columbia herpetology ("A Bibliography of Pacific Northwest Herpetology," by R. Wayne Campbell, et al. 1982, and "The Amphibians of British Columbia," by David M. Green and R. Wayne Campbell 1984). These three volumes are part of a recent resurgence in published books dealing with the Canadian herpetofauna, including "Amphibians of Canada" (Barbara Froom 1982), "The Amphibians and Reptiles of Manitoba" (William B. Preston 1982), "Amphibians and Reptiles of the Pacific Northwest" (Ronald A. Nussbuam et al. 1983), "Introduction to Canadian Amphibians and Reptiles" (Francis R. Cook 1984), and "Amphibians and Reptiles of Nova Scotia" (John Gilhen 1984). It is gratifying to see this interest in Canada's amphibians and reptiles, and I hope it bodes well for the future of Canadian herpetology.

Persons interested in British Columbia herpetology have eagerly awaited the new edition of G. Clifford Carl's THE REPTILES OF BRITISH COLUMBIA (Handbook No. 2, British Columbia Provincial Museum; 1944), which has long been out-of-print. Gregory and Campbell have added substantially to the earlier edition in bringing this work up-to-date. Introductory chapters on Learning more about British Columbia reptiles, Systematics and the use of keys, General biology, and Adaptations to northern environments, preface the main text which deals with the 6 turtle, 3 lizard, and 9 snake species recorded from the province. I was pleased to see more than 3 pages devoted to northern adaptations, an area frequently neglected in studies of the Canadian herpetofauna. There is an introductory section and key for each major group of reptiles (i.e. turtles, lizards, and snakes); for snakes both a field and laboratory key are presented. Useful figures illustrate turtle plate nomenclature, lizard head scutellation, and snake head and body scutellation.

Under each species account are sections on Description, Habits and habitat, Subspecies, Range and distribution, an illustration (drawing), and British Columbia dot distribution map. For some species there are additional headings, such as Feeding and growth, Reproduction, and Mortality, but for other

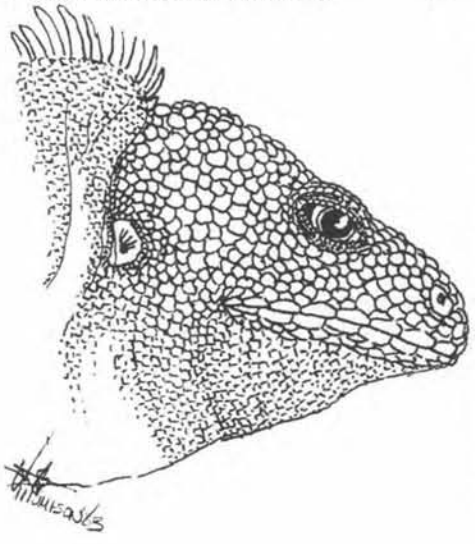
species these topics are covered under Habits and habitat. The attractive illustrations were provided by Keith Taylor and Brigitta M. VanDerRaay. There is no indication of what type of records the distribution dots are based on. Are they just based on museum specimens, or do they include sight and literature records? Subspecies are not separated by the keys provided, nor are they separately illustrated. When more than one subspecies occurs in the province, it would have been helpful to have separate maps for each subspecies, or at least differentiate between subspecies on the map. For example, three subspecies of *Thamnophis sirtalis* occur in British Columbia, but on the range map provided it is impossible to differentiate between them. Those unfamiliar with British Columbia geography may have trouble finding some of the locations mentioned, as many are not indicated on the introductory map on page viii.

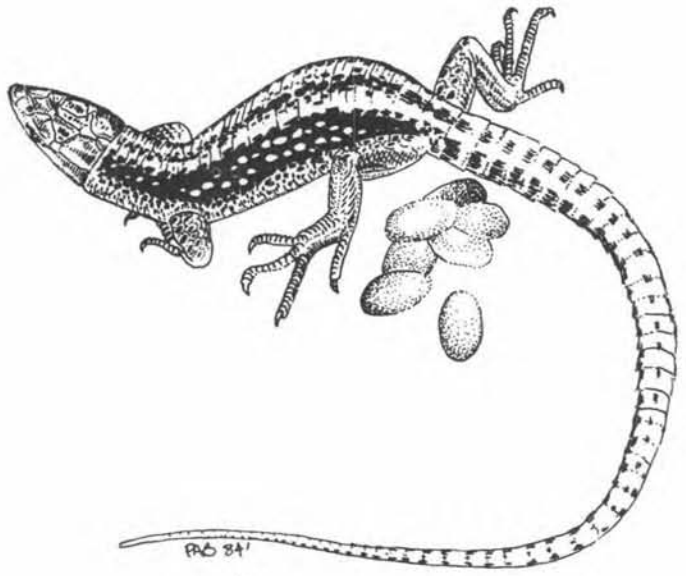
As with some other recent handbooks in the series, THE REPTILES OF BRITISH COLUMBIA contains a number of typographical and other errors which seem to have slipped through the editing process. For example, the distribution map for the Northern Alligator Lizard is labelled *Gerrhonotus coeruleus*, while the text correctly uses *Elgaria coerulea*. Other errors I noticed included the misspelling of *C. m. marmorata* on page 17, postnasal on page 59, *Crotalus* on page 92, *Sceloporus occidentalis* on page 95 and *Phrynosoma douglassi* on page 101.

THE REPTILES OF BRITISH COLUMBIA is aimed at the general public and the interested amateur, and should do much to educate and interest this audience. Readers wishing a more technical and detailed treatment of British Columbia's reptiles would do well to consult Nussbaum, Brodie, and Storm's (1983) book on "Amphibians and Reptiles of the Pacific Northwest" (see review in *Herp. Review* (15(2):44-45).

Despite the minor criticisms mentioned in this review, THE REPTILES OF BRITISH COLUMBIA is an attractive, informative, and well written book which is a welcome addition to the literature on Canada's herpetofauna.

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The Turtles of Venezuela, by P.C.H. Pritchard and P. Trebbau. 1984. Society for the Study of Amphibians and Reptiles. i-x, 1-403, 47 pls., 16 maps, 54 figs., Price $45.00, clothbound.

It should first be said that this handsome volume, dedicated to the late and lamented Federico Medem, should be purchased by everyone seriously interested in turtles. The color paintings by Giorgio Voltolina - 25 in all - are glorious, comparable to the best 19th century animal illustrations and are by themselves a reason for owning the book. The text also is packed with fact and opinion to an extent far beyond the promises of the title. In addition, two new taxa are described - a new species *(Phrynops zuliae)* and a new subspecies *(Pseudemys scripta chichiriviche).*

This book is primarily Pritchard's. As is carefully explained, the text's first person singular is always Pritchard, and the book has some of his peculiarities and philosophy. A Spanish edition is hoped for "at a later date" under the senior authorship of Trebbau. The present volume as the second of the series "Contributions to Herpetology" of the SSAR was carefully edited by Kraig Adler and Alan Savitzky and sections of the manuscript were reviewed by a number of colleagues. Publication was sponsored by the Fundación de Internados Rurales (Venezuela).

The inclusion of much more than is strictly relevant to "The Turtles of Venezuela" reflects the lofty aspirations of the authors: "We have, in short, endeavored to produce a book that will go a great deal further than a field guide but which stops short of a holistic review of turtle evolution." Their aim here is a bit beyond their reach; they are well short of the proposed holistic review. However, they can justifiably claim that they have provided more and more various detail than any previous single volume on the systematics of turtles. Most of the detail is referenced, but, as a matter of Pritchard's personal preference, the book also includes statements for which there are no voucher specimens, no statements of sample sizes or many of the other desiderata on which more academic herpetologists tend to insist. Personal observations, data from private collections and the pet trade are utilized without apology — although in the introduction Pritchard's grounds for their use are clearly stated.

In fact, in this group for which museum collections are in general inadequate, Pritchard's procedures are more defensible than in most cases in herpetology — except, perhaps, large snakes, crocodiles or monitor lizards. Turtles have a special problem: they are incompressible and do not fit well in jars. Workers, like myself, who would like to see large series, tend to move on to other groups. (Only John Legler has attempted to solve the problem of large turtle collections.) As Pritchard mentions also, some species are rare or endangered. (I have myself written a paper on a species — *Pseudemydura umbrina* — that I have never seen and that, unless I go to Western Australia — or to Vienna — I can never hope to see.)

The approach the authors have chosen — a hybrid of Pritchard's own Encyclopedia of Turtles and Carr's Handbook of Turtles — is the more readily excused because the book deals with a South American faunal segment. First, only those who work with South American groups know how incomplete our knowledge of that fauna is. Second, political borders are at least as artificial in South America as elsewhere, and context can only be given to a national fauna by going well beyond national boundaries. I do not fault these two authors for going beyond conventional expectations. To do literally "The Turtles of Venezuela" might have produced a relatively unimportant guide book.

The cliche "mine of information" is here wholly justified. There has been a strenuous effort to be up to date, to the extent of frequent citation of "personal communciation" of unpublished data and opinion. The information is, of course, of unequal value, but this is true of all attempts at encyclopedic coverage. There will be lapses in citation but, more important, there are necessarily very great inequalities in the accuracy and gaps in the content of the data summarized — and, of

course, of the summaries — whether or not it has been previously documented in publication.

What follows is a straightforward account of the book's contents. This will best give a sense of the expansive or, some will say, self-indulgent flavor of the book.

There is an introduction that begins with a general description of studies on the South American herpetofauna, then lamenting, quite correctly, that "knowledge of the biology of most South American turtles is very deficient," lauds the few who have contributed to that knowledge. A "Summary" follows, flanked by its Spanish translation: This is little more than a listing of the Venezuelan genera and species. The following chapter shifts the focus to the distribution and zoogeography of all South American turtles. There is a table of the distribution, down to the subspecies, of all the living taxa. The discussion ranges widely; Gondwana, Madagascar, the Antilles and the Galápagos come into the account.

Three pages on shell nomenclature (with a good figure) introduce the systematic sections. Usage is conservative. There follows a key to Venezuelan turtles, flanked again by its Spanish translation. Emphasis is on external morphology, color and size.

The sections on families, genera and species follow a standard format. A diagnosis is given at each level. For families a table of all living and fossil genera is provided. The South American genera in each family are then characterized (with extralimital discussions where appropriate). The synonymy of all extant species in any genus is given in a table (for Venezuelan genera only).

The species chapters all include, in addition to the diagnosis, a description primarily of externals, with in each case a page figure containing three views of the skull (good, but the bones are unlabelled) plus dorsal and ventral views of the shell showing both scute and bone boundaries (the nomenclature in this case was summarized in an earlier section). (These figures are standardized and quite useful.) "Size" is then reported. "Distribution" follows with a map of the total South American range, and "Geographic Variation" also includes the extra-Venezuelan populations of the species. Further sections are on "Habitat," "Feeding," "Reproduction," "Economic Importance" and "Vernacular Names." If there is a "Notes" section, it is concerned with nomenclature.

Following the systematic sections is a 23-page bibliography.

A first appendix gives the locality records. They again include the entire South American range of each species, reporting not only museum specimens but also specimens in private collections, personal communications, Pritchard's own sight records and, for non-Venezuelan localities, literature citations.

A second appendix lists Venezuela's regulations regarding turtles. Sea turtles, *Podocnemis* and tortoises are protected to a greater or lesser degree.

Concluding the book are the plates and maps. Following the 25 superlative color paintings by Voltolina are 22 plates of photographs (166 individual photographs). These are not of the same quality as the paintings, particularly as to color, since the blue tints are slightly exaggerated. Many, however, illustrate points not fully covered in the text. All Venezuelan taxa are illustrated by at least one painting and multiple photographs.

The first of the maps is a color relief map of Venezuela, the second labels states, territories and major localities. The remainder plot Venezuelan records for each taxon, one, two or three taxa to a page.

There is no index.

The practice of citing personal communications and sight records is employed for the two new taxa as well as for earlier known species. The list of type specimens for each of the novelties is less unconventional but still has its peculiarities.

For *Phrynops (Batrachemys) zuliae* the holotype and two paratypes are in the Florida State Museum. One paratype is a skeleton, the other a preserved female without exact locality. Four additional specimens, one still alive, from the type locality — these cited under the rubric "Hypodigm" — are in Pritchard's personal collection. Three additional localities are given on the authority of local informants.

For *Pseudemys scripta chichiriviche* the holotype is in the collections of the Florida State Museum, as is a skeletal paratype. The "Hypodigm" is varied. It includes the MCZ specimen (miscited as 49005 instead of 49055) which was misidentified by me and is the first known specimen of the population and the only juvenile. Two additional preserved specimens are in the collection of the Estación Biologia de Rancho Grande. The remainder are 13 shells and one skeleton in Pritchard's collection and four skulls with jaws in the Rancho Grande collection.

It is clearly unfortunate that a subspecies based partly on color should have only four preserved specimens out of a type series of 24. More specimens were indeed seen: an undetermined number of live specimens were released in a park pool — at least 14. Some of these are apparently those showing ventral pattern variation in Plate 38A. It is incidentally to be noted that Pritchard mentions (legend to Plate 36D) that a specimen from Maracaibo of *P. s. callirostris* "may exhibit a degree of intergradation" with *P. s. chichiriviche*.

It is no flattery of any taxonomic publication to say that it will be frequently reread and cited in the future. There are, however, degrees of value. This volume — despite occasional caveats and hesitations, which will differ with each reader — belongs among the worthy, those that will be consulted because of quality, not despite it.

I acclaim the intention of the authors to make the relevant turtle literature known to South American readers. The latter will justly claim that much of that literature is still not readily accessible to them. The authors have, however, made a great deal of that information available in short compass and clarified much. This is another kilometer stone in the knowledge of the South American herpetofauna.

With regard to Pritchard's use of unconventional data and material, this reviewer has mixed feelings. I sympathize with the effort to get on the record all information and recognize, as I have said above, that the problem is greater for turtles than for most other groups. However, as regards the pet trade and private collections, I have a mostly negative viewpoint. To overmuch rely on anonymous pet trade data is to appear to acquiesce in a traffic that unquestionably has its very dark side. In the matter of private collections, it is not the greediness of large institutions alone that makes them denigrate individual and impermanent collections, it is also recognition of the danger (and often the fact) of the loss or diminished value of material of genuine scientific importance when there exists neither the staff nor the tradition that can ensure its safety nor its availability to the scientific community in general. And, in the matter of documentation, I will always favor more, rather than less, detail about specific specimens to *ex cathedra* generalization. But this would have made the book longer and more expensive. As it is, it is a bargain.

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The Turtles of Venezuela, by Peter C. H. Pritchard and Pedro Trebbau. 1984. Society for the Study of Amphibians and Reptiles. i-x, 1-403, 47 pls., 16 maps, 54 figs., Price $45.00, clothbound.

The herpetofauna of South America presents an interesting mix of archaic and derived groups that mirror a complex geological and biological history. The appearance of *The Turtles of Venezuela*, by Peter Pritchard and Pedro Trebbau, provides a detailed treatment of a part of this fauna. With the support of the Fundación de Internados Rurales, this attractively bound edition, including 25 outstanding paintings (by Giorgio Volatino), is available at a reasonable price. The book is printed entirely on acid free paper ensuring the long life of each copy and is sturdily bound in the colors of the Venezuelan flag (yellow, blue and red).

From a physical standpoint, the book is phenomenally well produced. The plates and the Venezuelan distribution maps are outstanding, and worth the price of the book by themselves. The Venezuelan base map does not include many place-names mentioned in the text. Readers unfamiliar with Venezuelan geography will find it useful to read with a more detailed map in hand. The unlabeled text figures are better than average. I only found two figures that were in error and in both cases sutures (Fig. 38) or sulci (Fig. 12) were omitted. Most of the illustrated shell and skull material came from the senior author's personal collection. I prefer that illustrated material be from established collections, so that other students of turtles could have easier access. There is no statement concerning the eventual fate of the senior author's collection. Thus, future students may not be able to locate the material illustrated by these authors. The text is clear, well laid out and I found no typos. Judging from the editor's note on inside front cover, which lists the numerous reviewers, this volume has been

subjected to close scrutiny.

The book is arranged by family groups, preceded by an Introduction, Summary and Keys (in both Spanish and English), and chapters on Distribution and Zoogeography, and Shell Nomenclature. After all the taxa have been discussed, there are two appendices (Localities and Conservation Regulations), a Literature Cited section, the superlative color plates, and the Venezuelan distribution maps. Each family chapter begins with a summary of the entire family including a "diagnosis" (often characterizations that rely mostly on external features, rather than true diagnoses), a tabular list of the genera recognized by the authors (but not necessarily of wide acceptance), a brief discussion of the South American genera, and occasionally a section on some miscellaneous subject (e.g. "Evolution of Terrestriality Among Turtles" p. 202; "Extinct Families of Sea Turtles" p. 275). These miscellaneous sections are simplified summaries of complex issues in turtle biology. Following the "family" chapters, there are separate chapters for each species. Included in each of these chapters is a synonymy, a diagnosis, a description, comments on size and growth, distribution, geographic variation, habitat, feeding, reproduction, economic importance, vernacular names, and where necessary nomenclature notes or an etymology section. The authors describe two new taxa: *Phrynops zuliae* (on page 135) and *Pseudemys scripta chichiriviche* (on page 191). Their use of paratypes and of the hypodigm concept of Simpson (1961) is likely to cause confusion. Are specimens from the hypodigm part of the type series? From Simpson's definition of the hypodigm concept, I would have to say yes. However, strict application of the ICZN rules would exclude Pritchard & Trebbau's hypodigm from the type series — in direct contradiction of Simpson's original intention for the hypodigm concept.

Pritchard & Trebbau (1984) is a long book considering that its title portends only a treatment of the turtle fauna of Venezuela. However, this title understates the intention of the book which goes far beyond a simple survey of what is known of the natural history of the 24 Venezuelan turtle species. A good attempt has been made to collate and summarize all information that might be pertinent to these 24 species, even if this information comes from populations outside Venezuela. A great deal of information has been included that has very little to do with Venezuelan turtles and the authors provide a justification for adopting this practice throughout the text. Thus, there are discussions of Galápagos tortoises and of meiolaniids, in the introductory zoogeography chapter. These discussions would be better if the interpretation or analysis was original or if earlier work was critiqued.

The authors have produced a volume intended for specialists, and it must be judged by the standards applied to monographic works. Certainly, some of these standards are demanding and the authors contend that these standards would inhibit the free flow of information, especially regarding locality data. Consequently, Pritchard & Trebbau have chosen to accept locality records that many zoologists would exclude. Of course, many of their records may be valid, but it will be impossible for future students to independently verify their information, since it relies on heresay and interpretation.

The "Distribution and Zoogeography" chapter is old fashioned and is a description, not an analysis. The results of Holden & Dietz (1972) were misquoted, when the age of the Galápagos was discussed. Pritchard & Trebbau (1984) said that Holden & Dietz showed that the Galápagos Islands originated about 40 mybp. Holden & Dietz showed that the Galápagos rift, which they believe created the Cocos plate, originated 40 mybp.

Pritchard & Trebbau sometimes cite inappropriate papers to support their contentions. For example, they cite Pritchard (1979) as support for the position that *Geochelone elephantopus becki* is one of the most variable races of Galápagos tortoises. However, this citation does not provide detailed enough information on variability. The authors employ the same strategy when elevating *Rhinoclemmys punctularia diademata* to specific rank. Sometimes citations are absent where they should have been included. For example, the diagnosis of the Testudinidae is an almost verbatim repeat of the diagnosis of Loveridge & Williams (1957), but no citation is provided.

Pritchard & Trebbau are not shy about speculating with very little data. Weakly substantiated hypotheses include: a model for the origin of the hinge in *Pelusios*; a functional explanation for the appearance of hexagonal neural bones (p. 166); adaptive scenarios for certain peculiarities of tortoises (p. 200-201); flat-topped carapaces for tortoises so they can wedge their bodies between saplings (p. 216); and the dispersal of *Kinosternon scorpioides* by bird transport (p. 243-244).

Occasionally, Pritchard & Trebbau make a statement whose significance they do not discuss, but whose implications are far reaching. For example, they refer to the postorbital bone of a testudinid as the postfrontal (p. 210). The only known turtle that may have a postfrontal is *Proganochelys* (see Gaffney 1979).

It would have been nice if the authors had included a list of specimens they had personally examined and measured; and there is no statement about how shell measurements were taken (i.e. curved or straight carapace length).

Other nit-picks come to mind, but over-all the book is a success. Its fact-filled pages, excellent illustrations, and reasonable price make it a good buy. Most herpetologists will benefit from having it.

LITERATURE CITED

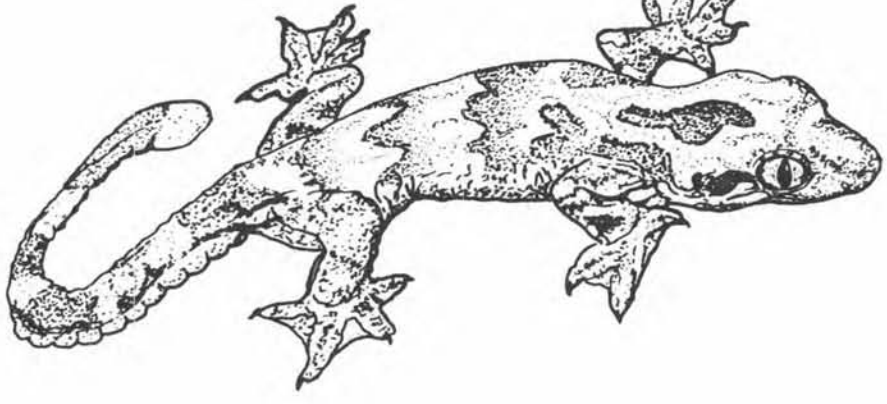
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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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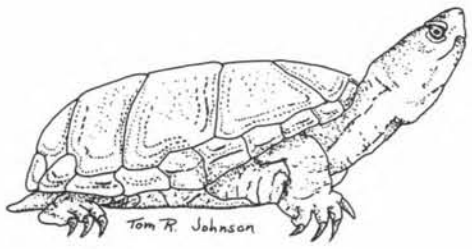
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Herpetological Review

Volume 16 **March 1985** **Number 1**

1985 JOINT ANNUAL MEETING
SOCIETY FOR THE STUDY OF THE AMPHIBIANS AND REPTILES
28th Annual Meeting
HERPETOLOGISTS' LEAGUE
33rd Annual Meeting
UNIVERSITY OF SOUTH FLORIDA TAMPA, FLORIDA
4-9 August 1985

DISTINGUISHED HERPETOLOGIST LECTURE
Carl Gans, The University of Michigan, Immediate Past President of SSAR, will present the HL Distinguished Herpetologist Lecture.

TECHNICAL PAPER PRESENTATIONS
Research reports will be given in two formats: oral presentations (with several concurrent sessions) and poster sessions.

SPECIAL HERPETOLOGICAL EVENTS
1. Florida Focus: National Diversity and Progress: Amphibians and Reptiles in Florida. Steven P. Christman.
2. Herpetology Exam: test your knowledge of the field of herpetology. Coordinated by Marty Crump. (SSAR)
3. Herpetologists, Past and Present: an updated version of the very popular slide show prepared by D. Dennis and J. E. Juterbock. (SSAR)
4. Busch Gardens Zoological tour.
5. Special closing night dinner featuring alligator and turtle sauce piquant, coordinated by Ernie Liner.
6. 9th Annual Conference of the Regional Herpetological Societies.

SOCIAL EVENTS
1. Sunday night social with local entertainment.
2. Monday night bar-b-que at the Museum of Science and Industry.
3. Wednesday night auction and social. (SSAR) Saleable items, *particularly herpetological mementos,* are being actively solicited for the auction. Please forward same to Henry R. Mushinsky or bring them to the meeting.

DISPLAYS AND WORKSHOPS
1. Workshop on the status of *Gopherus* spp. coordinated by Richard Franz and Ren Loehefner.
2. Live amphibians and reptiles of Florida, organized by Paul Moler.
3. Numerous artists and exhibitors will be displaying their work, coordinated by Ruth Zantzinger.

FIELD TRIP
An all day field trip is scheduled to Archbold Biological Station. Glen Woolfenden will be the guide.

ADDITIONAL INFORMATION
A detailed Program and Call for Papers will be mailed separately. For further details write or call Henry R. Mushinsky, Biology Department, University of South Florida, Tampa, Florida 33620, U.S.A. (813-974-2878).

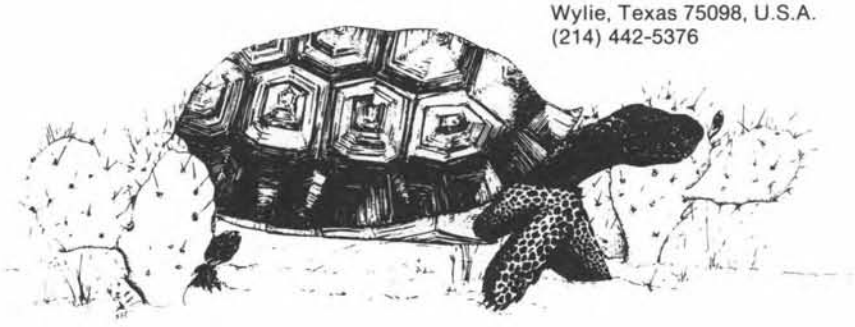
All interested persons are welcome to attend. ●

SSAR REGIONAL HERPETOLOGICAL SOCIETY 9TH ANNUAL CONFERENCE, TAMPA, FLORIDA

The Ninth Annual Conference of the Regional Herpetological Societies will be held during the 1985 joint meeting of the SSAR and HL at the University of South Florida in Tampa, 4-9 August. The title of the conference is "Methods to Enhance the Regional Herpetological Society." Tentative topics are: improving newsletters and journals; personal relations; preparing slide programs; auctions; mall shows; and membership involvement.

There will also be tables available for Regional Societies to distribute information about their society. Each society should provide approximately 100 brochures to be distributed at the conference. The brochure should include purpose, history, activities, membership categories, dues, and contact person for additional information.

Inquiries may be directed to:
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SSAR BUSINESS

SSAR ELECTION RESULTS

The results of the 1984 SSAR Election are as follows:

President-elect: Sherman Minton
Secretary: James S. Jacob
Treasurer: Henri Seibert
Board - Regular: Harold Dundee
Board - Regional Societies: John Behler

The Society extends its gratitude to the Nominating Committee (Diane M. Secoy, Chair) and to the SSAR Elector (Darrel Frost) for their hard work, and to the outgoing President and Board Members for their service during their terms. ●

LETTER FROM THE PRESIDENT

Dear Member:

I am writing this letter in the hope that it, and perhaps subsequent ones, will stimulate increased exchange between you, the body of our Society, and those whom you have elected to run SSAR on a day-to-day basis. Presently, I feel that few members give much thought to what SSAR does or could do, preferring to trust in the decisions of the elected Board. This is not bad and indeed is how our entire country is run, but I was frankly stunned upon becoming President to note how small a percent of our membership actually voted in the 1985 election — less than 25%. I expected a far greater return for a mail ballot to a rather cohesive group.

SSAR's success has been linked to its innovativeness, and that in turn has come from its membership as actual ideas and as financial support for programs and publications. Some new ideas have blossomed into very successful entities: *Facsimile Reprints* and the Grants-in-Herpetology program. Others have had rough going: last June *Recent Herpetological Literature* lost the entire free computer resource which was so crucial to its success; no alternative free sources are available and while *RHL* is not certified dead, it is certainly on the critical list.

Is SSAR measuring up to the expectations you had when you sent in your dues (you have sent them, haven't you)? If not, I'd like to know since if common patterns surface the Board can address them. Do you use all of the benefits of your current membership (the *Journal, Herp. Review,* voting rights, publications discounts, etc.)? Would you, or friends and associates, like to see us initiate a new class of membership costing less and receiving fewer benefits? Do our Annual Meetings sponsor the activities of greatest interest to you? What do you like most and also least about them?

I close this letter by asking your continued support of SSAR. Try to build the Society by encouraging prospective members to join. Dues go to support all the valuable features of the Society. Grants-in-Herpetology depends heavily on private contributions for its growth. Do you know of businesses which donate to non-profit organizations? Participate in running your Society by corresponding with officers and/or attending the Business Meeting at the Annual Meeting.

Thanks, and I look forward to hearing from you.

Sincerely,
George Pisani ●



LEFT TO RIGHT: Professor Kuang Yang Lue, Professor Kraig Adler, and Professor Ermi Zhao.

HERPETOLOGY OF CHINA PRESENTED AT 1984 SSAR MEETING

Herpetologists in attendance at the 1984 SSAR meeting at the University of Oklahoma were given the unique opportunity to view slides of many amphibians and reptiles native to China and learn about some aspects of their biology. Professor Ermi Zhao (Chengdu Institute of Biology, Chengdu, Sichuan, China) and Professor Kuang Yang Lue (National Taiwan Normal University, Taipei, Taiwan, China) presented special lectures on the amphibians and reptiles of China. A great deal of new information about the habitats and ecology of many rarely seen animals was provided to a large, appreciative audience. Professor Kraig Adler (Cornell University) arranged and moderated the special session. ●

LATE FEE FOR MEMBERSHIPS TO START SOON

Late renewals of SSAR memberships are very costly to the Society. Postage to send back copies of publications is in itself considerable since they cannot be mailed at bulk rate. In view of this, a $5.00 fee will be levied on all late renewals after 1 June 1985. This date will change to 1 April in 1986 and thereafter. ●

SSAR TRANSLATIONS PROJECT

The object of this project is to make available to SSAR members accurate translations of foreign language research articles. Since SSAR has not budgeted money for translation of articles, we must rely on contributions from members. If you have an article that has been translated, please send a copy (or reprint) of the original and the translation to the editor. A few people have volunteered to translate articles and we are interested in hearing from any others who are willing to contribute their time.

If you have an article for translation that you feel would appeal to a large segment of the herpetological community, send a copy or reprint to the editor and we will try to have it translated.

We now have a total of 68 translations available through the Translations Project. The titles of 34 are listed below. Previous titles appeared in *Herpetological Review* 10(3):82-83, 1979; and 13(4):111-112, 1982. Copies of these are available (.06/page) through the Translations Project Editor, Robert D. Aldridge, Department of Biology, Saint Louis University, 3507 Laclede Ave., St. Louis, Missouri 63103, U.S.A.

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OVERSEAS PUBLICATION EXCHANGE PROGRAM

The Society has a program which can coordinate the exchange of SSAR memberships, journals, and other herpetological publications between Society members and scientists in countries that face difficulties with exchange of foreign currency. This program provides an opportunity for herpetologists in these countries to receive an SSAR membership in return for publications (an arrangement which is best worked out between participating individuals). We encourage your participation in this program. Interested members should contact our Treasurer, Dr. Henri C. Seibert. ●

ERRATUM

The photograph below was inadvertently omitted from the article "Aggression Between Two *Drymarchon corais melanurus* in Campeche, Mexico" by Robert B. Waide and Richard Thomas, which appeared on page 10 of the March 1984 issue of *HR*. The photograph demonstrates the severity of the aggressive encounter between the two snakes. The editor apologizes to the authors for this omission.



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SSAR CONTRIBUTORS

Once again it is our pleasure to acknowledge our Sustaining and Contributing Members and those who have donated to Grants-in-Herpetology Fund for the year 1984. Although individual contributions may not have been large, the sum total was $1586, a not insignificant part of the SSAR budget.

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LETTERS TO THE EDITOR

EDITOR:

We write this unsolicited review (*A Synopsis of the Class Reptilia in Australia* by Richard W. Wells and C. Ross Wellington. Australian Journal of Herpetology 1 (3-4):73-129) because of our deep concern of the possible effects that this publication might have, both on the status of taxonomy in Australia, and on our understanding of Australia's reptilian fauna in general. Being past members of the editorial board of this journal we feel that it is our responsibility to alert the herpetological community to the history of this publication and to the means by which it was published.

First, it should be noted that the authors R. W. Wells and C. R. Wellington (the managing editor and advertising sales manager respectively [front cover]), own and publish this journal themselves. Second, this paper was not submitted for review to any of the three members of the editorial board (Prof. H. Heatwole and Dr. J. Miller, University of New

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England, N.S.W., and Dr. M. King, Australian National University, A.C.T.). Third, all manuscripts which had been refereed and accepted by the editorial board and which were to be published in order of receipt were set to one side by Wells and Wellington so that their unrefereed manuscript would be published with first priority. In fact, to our knowledge no paper processed by the editorial board has been published and distributed. Fourth, because of the actions taken by the authors in overriding the function of the editorial board and in manipulating the order of publication to their own advantage, the three members of the editorial board resigned. As a result, the statement which appears on page 129 of this publication "Accepted: 20 December, 1983," is misleading and should not be interpreted as meaning accepted by the editorial board.

The seriousness with which the Australian herpetological community regards this publication may be gathered from a resolution adopted at the annual general meeting of the Australian Society of Herpetologists. A unanimous vote declared that the above mentioned society would lodge an appeal with The International Commission on Zoological Nomenclature for the suppression of this article.

It is clear to us that this opinion results from the very poor quality of the article. This major revision of Australian reptiles suffers from a series of substantial taxonomic mistakes which include the following:

1. Fundamental omissions and duplications of species listed.
2. Significant errors in taxonomic procedure.
3. Subdivision of species on imprecise and unspecified criteria.
4. Allocation of species to genera without describing diagnostic characteristics.
5. Use of nomenclature which trivializes taxonomy and herpetology.

To substantiate these allegations we do not intend to list all of the numerous mistakes found in this synopsis; space and time prevent this. The families Gekkonidae and Varanidae provide an adequate source of examples, although more blatant instances will be drawn from other areas.

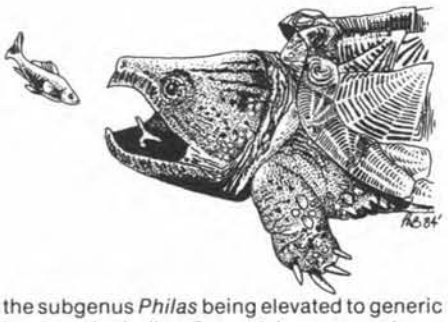
The careless compilation of this synopsis is highlighted by both duplication and omission of recognized species. Thus, in the Agamidae we see *Amphibolurus reticulatus* (Gray 1845) listed as *Ctenophorus reticulatus* (Gray 1845), and also placed in a new genus *Licentia*, where it is both listed as *reticulatus* and *Licentia reticulata* (Gray 1845). One has to go no further than *Gehyra minuta* King 1982, in the Gekkonidae, and *Tropidechis carinatus* (Krefft 1863), in the Elapidae to find examples of omission.

There are numerous errors in taxonomic procedure. Subspecies in all reptilian families are elevated to specific status without any form of justification; they are simply listed. Clearly, the authors who initially described the many subspecies didn't think that they deserved full species status, presumably because they could find no consistent distinguishing characteristics. Species from the Gekkonidae which have been elevated in this manner include *Crenadactylus naso, Crenadactylus rostralis, Nephrurus cinctus, Nephrurus occidentalis, Nephrurus pilbarensis, Pseudothecadactylus cavaticus.* More disturbing are the numerous populations of species which have been given formal species status on a regional basis, and again without any morphological characteristic demarcating them. Thus, *Phyllodactylus marmoratus* (now *Christinus*) is subdivided into eastern and western forms (one as yet unnamed). *Cyrtodactylus tuberculatus* is resurrected and confined to Cape York. *Diplodactylus furcosus* is resurrected to accommodate "the distinctive eastern form of the *D. vittatus* complex" even though there are two eastern forms (King 1977). *Diplodactylus hillii* is resurrected from *D. conspicillatus* and confined to the Torresian subregion of the N.T. Here too the list appears endless, and in the Gekkonidae populations which have been given specific status include *Heteronotia anomalus, Heteronotia australis, Heteronotia derbianus, Nactus eboracensis, Diplodactylus platyurus, Oedura cincta, Strophorus aberrans, Underwoodisaurus husbandi* and *Dactylopertus grayi.* All of these names have been resurrected to cover specimens in broad geographic areas, and not a single diagnostic character is described. The danger of this approach is seen with *Dactyloperus grayi* (Steindachner 1867); here the eastern populations of *Gehyra variegata* (small gekkos with a snout vent length never greater than 57 mm) have been grouped under a holotype which has a snout vent length of 65 mm and overall length of 132 mm, and appears to be a member of the *G. australis* species complex on all its external characteristics. More damning is the fact that *D. grayi* has been placed in a separate genus to *Gehyra australis.*

The case of *Gehyra grayi* highlights the scattergun approach to generic divisions made by the authors. Genera have been resurrected without any explanation as to what characters should be used to categorize species allocated to them. The genus *Gehyra* Gray 1834 has been split into four *Gehyra* species and thirteen *Dactyloporus.* No reasons or characteristics are given. On closer examination the groupings are completely unsupportable. One of the species, *Gehyra pamela*, recently separated from *Gehyra australis*, its sister species, by a series of subtle morphological differences has now been placed in a separate genus.

In the Varanidae, subgenera are similarly elevated to generic status without explanation. Thus, *Odatria* is now a genus and *Pantherosaurus* Fitzinger 1843 has been resurrected, and a group of species previously in the subgenus *Varanus* are included in this. For some unknown and unexplained reason, *V. glebopalma* has made the transition from *Odatria* to *Phantherosaurus.* Moreover, *Varanus timorensis scalaris* and *V. timorensis similis* were "formally elevated to species status," however, Storr (1980) had already restricted the Australian form to *V. timorensis scalaris* because of inconsistency in diagnostic characteristics for *V. timorensis similis.* A new genus *Worrellisaurus* was created, the description of this is so general as to include most small varanids of diverse groupings.

As one might by now have expected, the two Australian crocodilians have been placed in separate genera; *Crocodylus* and *Philas*,



the subgenus *Philas* being elevated to generic level and including *Crocodylus novaeguineae* and *C. johnstoni*, whereas, *porosus* remains in *Crocodylus.* Once again, no grounds are given for the distinction between these genera even though these crocodiles are acknowledged on morphometrics, electrophoretic similarities, microcomplement fixation, and chromosomal grounds as being very closely related forms (Densmore 1982; Cohen and Gans 1970).

The trivialization of the science of taxonomy is not only illustrated by the wholesale and reckless nature of the changes made by Wells and Wellington, but is reinforced by their pointed choice of names:

Licentia gen. nov.
"Etymology: Licentia means 'freedom to do as one pleases'."
Phthanodon gen. nov.
"Etymology: Phthanodon means 'to anticipate' or 'do first'."
Anepischetos gen. nov.
"Etymology: Anepischetos means 'unrestrained' and alludes to the 'ideal intellectual state'."
Solvonemesis gen. nov.
"Etymology: Solvonemesis means to set free the goddess of retributive justice."
Vaderscincus gen. nov.
"Etymology: named for Mr. Darth Vader."

The authors tell us that their publication should be seen "not as anarchistic taxonomic vandalism, but as a decisive step intended to stir others into action." In our opinion, the reverse of this statement is true.

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EDITOR:

The recent and unfortunate publication of "A Synopsis of the Class Reptilia in Australia" by R. W. Wells and C. R. Wellington in the Australian Journal of Herpetology (Vol. 1, pp. 73-129) requires additional comment. Max King and Jeffrey Miller have reviewed this article and pointed out some of the features of it which are to be deplored. Inasmuch as this article has received widespread disapproval by the Australian herpetological community, and various Australian herpetologists feel that their professionalism has been compromised by this article, some clarification regarding the status and affiliation of the Australian Journal of Herpetology is desirable. The Managing Editor and the Advertising Sales Manager for the journal publish and distribute the journal themselves. Although the address listed in the cover of the journal might imply that the journal has some official connection with the University of New England, such is not the case. During the time Mr. Wells was a 1st year biology student at the University of New England, the Department of Zoology provided him with a postal box for the receipt of manuscripts and correspondence relating to the journal. He did not complete that year of study (and has not furthered his formal training in biology since) and that postal privilege lapsed. He then moved to Sydney but for some reason rented a postal box at the University branch of the local post office to handle journal correspondence. All mail received at that address was merely forwarded to Sydney and had no official connection with the University of New England. Any person can rent such a post office box. Although the University of New England has never had any official connection with the journal, two staff members (H. Heatwole and J. Miller) had urged that manuscripts for the journal be reviewed before publication and offered to be members of an Editorial Board to process such reviews. A number of manuscripts were received by members of the Editorial Board and were sent out to referees, edited, and returned to Mr. Wells. None of the papers which went through this process has ever been published, or if so, they have not been distributed. Attempts to ascertain the status of those papers has been unsuccessful. As a consequence of the dissatisfaction the Editorial Board felt with the handling of the journal, all three members resigned. The purpose of this brief note is twofold:

(1) To indicate the lack of any official connection of the University of New England with the Australian Journal of Herpetology, and

(2) To indicate to those herpetologists from various countries whose papers went through the reviewing process, that the status of their publications are now uncertain and that they may wish to make other plans for their manuscripts.

Finally, I would like to point out that despite the similarity in names, The Australian Journal of Herpetology has no connection at all with the Australian Society of Herpetologists.

HAROLD HEATWOLE
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AUSTRALIA

COMMENT ON TWO CHECKLISTS

EDITOR:

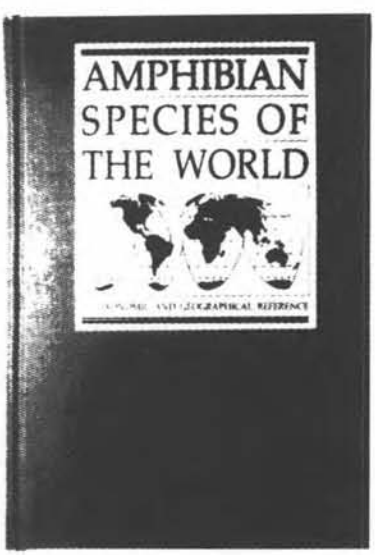
Perhaps it is the advent of computers that has recently provided us with an increasing number of checklists which deal with portions of the reptilian and amphibian fauna of the world. The need and opportunity to summarize a portion of our knowledge has led to the development of some very large projects. I here use the advent of two recent checklists of the Australian herpetofauna as an opportunity to evaluate the purposes of checklists and to note some problems that they may generate.

Checklists are presumably mechanisms of organizing information. Taxonomic checklists then provide us with the list of currently recognized units, an overview of forms that belong to a group or occur in a region. Presumably, they are designed to aid those working with the material or in the region; their

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Edited by
Darrel Frost

value then depends on the utility to the user community.

Whereas checklists were once documents of interest to a limited number of the cognoscenti or to those amateurs and professionals interested in a particular group, they now serve as a basis for legislation and environmental decisions, changing their usage and potentially their legal status. This makes it ever more important that their nature be defined. To what extent is a particular list documented by systematic review, i.e. does it represent an individual or a consensus opinion? To what extent does it represent undocumented opinions which have not previously appeared in the reviewed literature? The new pattern of usage makes it obviously desirable that checklists include statements giving the bases for inclusion and omission and that these be documented by reference to the primary literature and to reviews therein.

The difficulties generated when much unpublished material was included in a checklist were documented by the Sixth edition of the Check List of North American Amphibians and Reptiles (Schmidt 1953). This included many name changes deriving from the author's extensive information of work in progress in numerous institutions. Unfortunately, much of the work accepted in the list ultimately remained unpublished and other aspects included therein were not accepted by the community. More important is that the basis of Dr. Schmidt's vast knowledge of herpetology was not documented, so that the list soon became a historical document of little practical value.

Perhaps the greatest difficulty likely to be encountered in checklists reflects the temptation to make major taxonomic decisions in this format. A shorthand presentation is then possible and the extensive documentation otherwise deemed desirable seems to be obviated. The International Rules of Zoological Nomenclature have established minimum standards for the publication and acceptance of names and name changes. However, the standards there prescribed are indeed minimal and additional information (diagnosis, range of the new taxon, other specimens available, comparative basis) is certainly desirable. This amplification belongs in a separate place distinct from a checklist. It may be that the next revision of the International Rules should take this into account.

In this frame, ideal checklists should list the primary names and the synonyms with information about type locality (best in "original spelling"), the types (including numbers and information, whether they were indeed re-examined recently), the authors who provided revisions, and a distribution documented by literature references and occasionally by mention of museum specimens (with number). Finally there should be clear citation of the source of all information referred to, at least to the last revision, and information about its scope. The assemblage of such information presents a useful aid to colleagues. However, although preparation of a checklist may involve a tremendous effort, it should not be mistaken for an original, creative project. Indeed, the magnitude of the creative component is likely to be correlated with the magnitude of error and hence of uncertainty. In contrast, reviews and revisions likely represent sources of original information. Their authors are likely to contribute much more to our understanding than those who merely generate new names. As checklists are entirely derivative documents, rules should be developed discouraging copyright protection for them, even though this allows an occasional republication with little more than a change of the original "authorship" (cf. Gans 1966; Murthy 1974).

Two checklists at hand offer a useful contrast within this framework. Cogger's checklist of the amphibians and reptiles of Australia (Cogger et al. 1983) can presumably be faulted for appearing quite late. Many of the nomenclatorial assignments there documented have long been available in his monumental "Reptiles and Amphibians of Australia," a volume which appeared eight years earlier and is now in its third edition (Cogger 1975, 1983).

The second checklist was apparently published by the editors of the journal in which it appears. It claims to be derivative of the former list and in a way provides a commentary thereupon. However, it introduces many new generic and specific designations, all with adequate but minimal documentation, for instance lacking diagnoses rather than descriptions. Some of the new names are patronymics, recognizing herpetologists and friends of the authors; other names refer to odd words of no obvious connection to the attributes of the organisms (note *Eroticoscincus*) and one celebrates Darth Vader (see King and Miller this issue). There is at least a faint suspicion that a number of the taxa here added are subjects of revisionary efforts by other specialists (some of whom may have been less than diligent in rushing their conclusions to the press). The list provides further comments indicating that its authors consider many yet-unnamed additional forms worthy of specific distinction. The basis of these decisions seems often to be geographic; i.e. forms occupying ecologically discrete regions should be considered distinct.

News items in the local press (e.g. Illiwara Mercury, 11 May 1984; Blue Mountain Gazette, 23 May 1984; Sydney Morning Herald, 20 October 1984) suggest that Wellington and Wells published the checklist to document their objection to practices of the Australian Museum (at which Dr. Cogger is the Associate Director). These authors also seem to have noted that they described these forms to document that these names had for too long been kept unpublished by other workers, thus precluding protection of the forms. Such a set of claims by itself is likely to hinder rather than help the understanding of the Australian herpetofauna.

The unfortunate thing is that all of the individually questionable practices have occurred before and indeed some in the publications of highly "respectable" systematists. In the present document, we see a regrettable assembly of gestures ranging from the tasteless, to the legal but inappropriate. The names proposed clearly have legal status. However, it may well be good to use them with caution as a number of individuals are apparently preparing a petition asking the International Commission to take action on this case.

It seems that suppression of this and similar projects under the plenary powers would be a highly appropriate action. At the very least, this affair raises some disturbing questions whether the rules governing the process of taxonomic study in the last century are adequate for circumstances likely to arise in the age of electronic word processing. Unless, the International Commission for Zoological Nomenclature chooses to come to grips with this series of issues, we may face a return to the pattern of the early Nineteenth Century, with individual taxonomists able to decide which names they chose to recognize. The resulting chaos is hardly likely to facilitate biological research.

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CARL GANS
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NEWSNOTES

ZIMBABWE HERPETOLOGISTS SEEK EXCHANGE

A group of about 20 individuals in Zimbabwe has been meeting for the past four years to share their herpetological interests, which mostly concern snakes. This group is interested in obtaining films and publications concerning American reptiles but is unable to send currency out of the country. Individuals interested in establishing an exchange program are invited to contact:

Mr. Ben Vermeulen
P.O. Box 797
Harare
Zimbabwe ●

SECOND CARIBBEAN GREEN TURTLE TAGGING TRIP

The New York Zoological Society will sponsor its second green turtle tagging trip at Tortuguero, Costa Rica, during July, August and September 1985. This program augments and supports on-going sea turtle research sponsored by the Caribbean Conservation Corporation. Teams will be escorted by a NYZS staff person and will be supervised by a core staff of CCC personnel.

Additional information and applications are available from:

John Behler
Curator, Department of Herpetology
New York Zoological Society
Bronx Zoo
Bronx, New York 10460, U.S.A. ●

HERPETOLOGISTS' LEAGUE— HONORARY MEMBERS

The Herpetologists' League invites recommendations of "recognized leaders in the field of herpetology" to be considered for nomination as Honorary Members. Names of individuals recommended, *accompanied by supporting documentation,* must be received by 1 July 1985. The Executive Council will review the recommendations and present a slate of nominees to Members present at the General Business Meeting, during the Annual Meeting at the University of South Florida, 4-9 August 1985. Names should be submitted to:

C. J. McCoy
Vice-President *(HL)*
Carnegie Museum of Natural History
4400 Forbes Avenue
Pittsburgh, Pennsylvania 15213, U.S.A. ●

WORKSHOP ON LARVAL AMPHIBIAN BIOLOGY

An intensive one-week workshop on larval amphibians will be offered at the Highlands Biological Station June 3-7, 1985. Topics to be covered include systematics, morphology, behavior, physiology, and ecology of frog tadpoles and salamander larvae. Primary emphasis will be on the identification, gross morphology, behavior, and ecology of these organisms. The course will include lectures, laboratory studies, and field investigations. Credit (2 semester hours) is available through either Western Carolina University or the University of North Carolina at Chapel Hill. Instructors: Richard J. Wassersug, Dalhousie University and Richard C. Bruce, Western Carolina University.

The Highlands Biological Station is located in the southern Blue Ridge Mountains, within an area of high amphibian diversity. The Station provides superb laboratory and field facilities for instruction and research, and comfortable living accommodations for students and visiting researchers.

Costs — Tuition: $100; Housing Fee: $20.

University Credit (workshop may be taken without credit) — Western Carolina University: $40 registration fee, $15 application fee. UNC-Chapel Hill: $50 registration fee.

For further information and application forms contact:

Executive Director
Highlands Biological Station
P.O. Box 580
Highlands, North Carolina 28741, U.S.A.
(704) 526-2602 ●

TORTOISE INFORMATION SOUGHT

The Knoxville Zoological Park currently holds two male spider tortoises *(Pyxis arachnoides)* and one male kapadola tortoise *(Acinixys planicauda).* These specimens are long-term captives (10+ years) that have not been in a reproductive situation for a number of years.

For the purpose of establishing a reproductive program for these species, anyone with female specimens or information as to the whereabouts of captive females of either species is urged to contact Bern W. Tryon, Department of Herpetology, Knoxville Zoological Park, P.O. Box 6040, Knoxville, Tennessee 37914, U.S.A. ●

MADRAS SNAKE PARK NEWSLETTER

Hamadryad, the Newsletter of the Madras Snake Park, is issued three times a year and welcomes contributions from herpetologists working in India and elsewhere in south Asia. The newsletter is edited by Zahida Whitaker and features articles on the activities and events at the Madras Snake Park, the Madras Crocodile Bank, and the Irula Tribal Snake Venom Cooperative. In addition, Romulus Whitaker and the MSP and MCB staff regularly report the results of fieldwork and surveys on herpetofauna throughout the Indian subcontinent and south Asia. Recent issues have featured sea turtles, freshwater turtles, crocodilians, and snakes. A sampling of the contents of *Hamadryad,* Volume 9, No. 3 (September 1984) included articles and notes on: the viper *Hypnale hypnale,* sea snakes, snakebite, oral antivenom, the Irula Snakecatchers Cooperative Society, king cobras hatched at the MSP, a freshwater turtle status report, olive ridley turtle rookeries in Orissa, and notes on *Hardella thurga* and *Trionyx nigracans.* An annual (3 issues) subscription is US $5 (sent airmail). Remittance in US dollars for subscriptions and requests for back issues may be sent to:

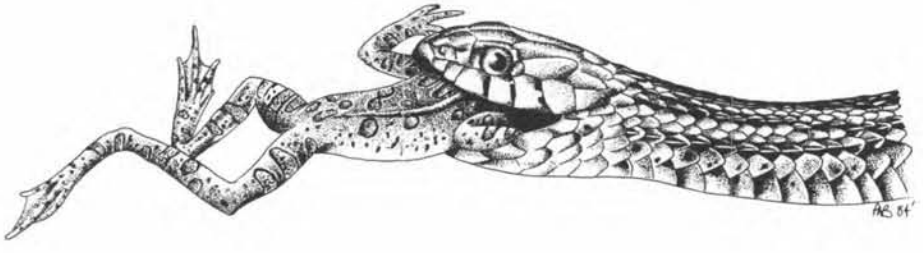
Dr. Jeffrey W. Lang
Department of Biology
University of North Dakota
Grank Forks, North Dakota 58202, U.S.A. ●

DEDICATION OF PLYMOUTH REDBELLY TURTLE REFUGE

On 22 October 1984 ceremonies were held in Plymouth, Massachusetts marking the establishment of the Massasoit National Wildlife Refuge to protect critical habitat for the Plymouth redbelly turtle *(Pseudemys rubriventris bangsi).* The refuge protects a 184-acre parcel of the turtles' limited habitat, and is the first federal refuge established for a freshwater turtle. The Plymouth redbelly turtle was designated a Federal Endangered Species in 1980, and the U.S. Fish and Wildlife Service has designated 3,269 acres in Plymouth as "critical habitat." The population is currently estimated at less than 300 individuals, restricted to approximately 15 Coastal Plain ponds.

The land that comprises the new refuge was initially purchased by The Nature Conservancy, a private conservation organization. In 1983 the U.S. Fish and Wildlife Service bought the parcel from the Conservancy and designated it a National Wildlife Refuge. The Fish and Wildlife Service has now entered into a cooperative agreement with the Massachusetts Division of Fisheries and Wildlife giving responsibility for managing and protecting the turtle population and habitat on the refuge to the Division's Nongame and Endangered Species Program. This is the first National Wildlife Refuge to be managed jointly by the U.S. Fish and Wildlife Service and a state wildlife management agency.

The Plymouth redbelly turtle is found nowhere in the world but Massachusetts, although a closely-related subspecies occurs in scattered colonies from southern New Jersey to North Carolina. The turtle was probably never abundant, although its current low population is attributed in part to loss of habitat to residential development. High rates of mammalian predation on nests are believed responsible for poor recruitment into the adult population. Research and management efforts for the Plymouth redbelly turtle are financed in part by the Massachusetts Non-



game Wildlife Fund created in 1983 to support nongame and endangered species conservation.

Further information about this refuge may be obtained from:

Dr. Thomas French
Nongame and Endangered Species Program
Division of Fisheries and Wildlife
100 Cambridge Street
Boston, Massachusetts 02202, U.S.A. ●

ACTA ZOOLOGICA MEXICANA

Acta Zoologica Mexicana publishes papers on behavior, ecology, systematics and zoogeography of American fauna. It accepts papers in Spanish, Portuguese, English and French and includes abstracts in Spanish and English.

Annual subscription to A.Z.M. is $20 U.S. For further information, contact:

Ma. Eugenia Maury
Apdo Post. 18-845
Delegación Miguel Hidalgo
11800 México D.F. Mexico ●

Uromastix INFORMATION SOUGHT

The Oklahoma City Zoo is planning to establish a breeding program with *Uromastix acanthinurus*, beginning with 0.0.4 *U. acanthinurus* currently in the collection. We are looking for information on the natural history of this species, particularly on the reproductive cycle. Individuals who have such information are invited to contact:

Scott Wheeler
Oklahoma City Zoo
2101 N.E. 50th
Oklahoma City, Oklahoma 73111, U.S.A.●

SOCIETIES

BRITISH HERPETOLOGICAL SOCIETY MEETINGS 1985

The meetings are held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1 and start at 7:00 pm unless indicated otherwise. For further details, please write to BHS, c/o Zoological Society of London, Regent's Park, London NW1 4RY, England. As always, *SSAR members* and other North American herpetologists passing through or visiting London *are most welcome.*

February 28th The Earl of Cranbrook (President, BHS): The herpetofauna of Vanuatu (Pacific Ocean).

March 19th Annual General Meeting followed by a report by Professor Kraig Adler (Cornell University, U.S.A., and Pembroke College, Cambridge), Secretary-General: Progress in planning the first World Congress of Herpetology, and Dr. M.R.K. Lambert (Chairman, BHS): A few herpetofauna in the Commonwealth (Australia, Seychelles, Malawi, Zimbabwe).

April 25th Mr. Brian Banks (Biological Sciences, University of Sussex): Breeding ecology of the natterjack in Britain in relation to conservation. *Cancelled in 1984.*

May 15th Professor Kraig Adler (Section of Neurobiology and Behavior, Cornell University, New York and Department of Zoology, University of Cambridge): Sensory basis of amphibian orientation and navigation. Illustrated by North American species.

June 19th *Amphibians and reptiles worldwide. A discussion on care and breeding organized by the Captive Breeding Committee.

September 26th Meeting topic to be arranged by the Captive Breeding Committee.

October 23rd Dr. Alan Charig (Chief Curator of Fossil Amphibians, Reptiles and Birds, Department of Palaeontology, British Museum (Natural History), London): Dinosaurs: myths and misconceptions. *Carried over from 1984.*

November 19th Dr. Andrew Laurie (Department of Zoology, University of Cambridge): Marine iguanas on the Galapagos Islands (Pacific Ocean) and El Niño. *Date to be confirmed.*

*Members are encouraged to bring live animals, preserved specimens and 35 mm slides for display and to illustrate discussions. ●

TEXAS HERPETOLOGICAL SOCIETY

The plan to organize a Texas Herpetological Society was conceived in November, 1938, during a meeting of the Texas Academy of Science. Four members, prompted by the inconvenience of sitting through a long session of formal papers, thought of a new type gathering. The first field meet was held at San Marcos, Texas, April 15-16, 1939. The atmosphere of informality present at the first field meet has become a tradition with the Society.

Field meets have been held each year since 1939, except for the war years of 1943 to 1945. In 1941 a constitution was adopted embodying the plan of the group. Attendance at meetings has varied from 28 to over 100 interested persons. Members include amateur and professional herpetologists, young and old. In 1973 the Society instituted an annual Fall Meeting and banquet.

The Society is proud that many of its present and former members have contributed to the advancement of herpetology in Texas and elsewhere. These contributions include the introduction of college courses on the subject, herpetological research in universities, museums and zoos, and scholarly publications dealing with amphibians and reptiles and the science of herpetology.

The activities of the Texas Herpetological Society include:

(1) An annual Spring Field Meet on a weekend, usually mid-April or early May; includes collecting, identifying, exhibiting and inventorying herpetological species, camping out, campfire meals, a business meeting and fellowship among herpetologists.

(2) An annual Fall Meeting usually in November, featuring distinguished speakers, seminars, workshops, panel discussions, exhibits, tours of zoos, museums and research facilities, a business meeting and a banquet.

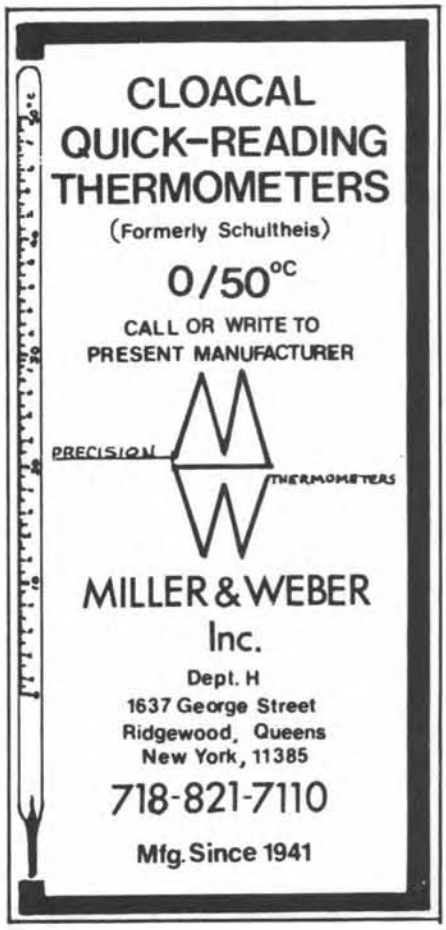
(3) An informal Newsletter distributed twice a year to inform membership of research activities, collection records, general information on members, and scheduled meetings of the Society.

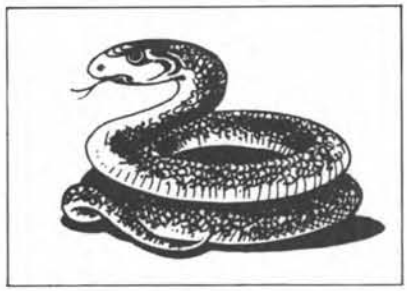
The purpose of the Society is to promote the discovery and dissemination of knowledge of amphibians and reptiles, to encourage specifically the study of amphibians and reptiles in Texas, to encourage conservation of wildlife in general and of amphibians and reptiles in Texas in particular, and to stimulate fellowship among herpetologists of Texas and the Southwest.

There are three membership categories. Active membership is open to those who adhere to the purposes of the Society. Subscriber membership is available to any person or group who wishes to receive the Society's Newsletter. Honorary membership is conferred on any person who has made significant contributions to Texas herpetology. An Honorary member is nominated by a member, screened by the executive board, and elected by 2/3 vote of members present at a business meeting.

Dues are $6.00 for regular Active Member, $3.00 for student Active Member, and $3.00 for Subscriber Member. For additional information about the Texas Herpetological Society contact:

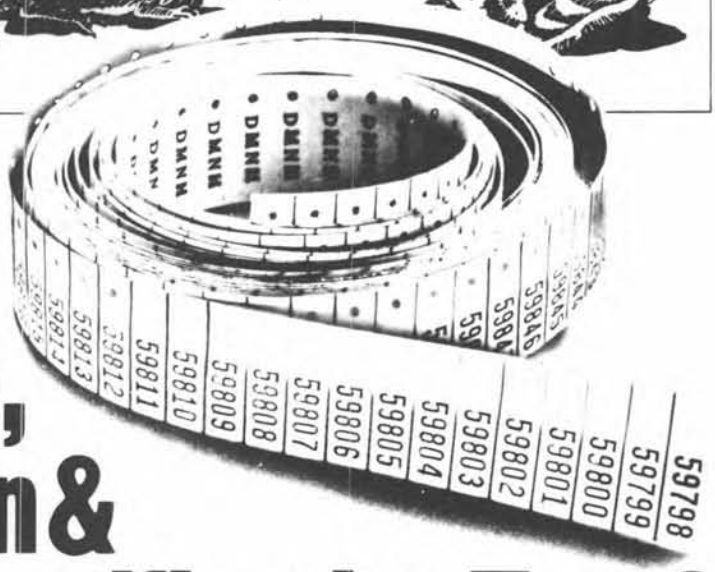
Terry Hibbitts, Secretary-Treasurer
Texas Herpetological Society
309 South 4th Street
Wylie, Texas 75098, U.S.A. ●











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HERPETOLOGICAL ACTIVITIES IN EUROPE 1983 — A REPORT

Apart from ongoing herpetological research work in Universities, Museums and other organizations, which will be published in due course in the Old and New Worlds' recognized scientific journals, several meetings were organized by the Societies during 1983. The most significant were probably the 2nd Ordinary General Meeting of multinational Societas Europaea Herpetologica (SEH) in León, Spain; the 1983 meeting of the Deutsche Gesellschaft für Herpetologie und Terrarienkunde e.V. (DGHT) in Zürich, Switzerland, also in September; the annual meeting of the Société herpétologique de France (SHF) in Montpellier, France, earlier in the year, in May, and the two-day international symposium on reptile biology (reported on separately: *Herp. Review 15*(1):6, also held in May by the Zoological Society of London and organized jointly with the Anatomical Society of Great Britain and Ireland and the British Herpetological Society (BHS). Further details of these and other activities will be given under the countries in which they were held, based on reports in the form of bulletins, newsletters and journals that have been received. The compiler at this preliminary stage has attempted completeness and accuracy, but regrets any omissions or errors, at the same time taking this opportunity to request that herpetological societies and other organizations in Europe forward him details for consideration and inclusion in a 1984 and future reports. Information is particularly lacking for northern Europe (perhaps where the least number of species occurs!), especially Scandinavia, the Netherlands and the Eastern European Block. Countries for which information is to hand are considered alphabetically, but commencing with societies of multinational involvement.

Europe

The 2nd SEH O.G.M. was held in León, Spain, 12-16th September. There were 82 registrants from Spain (35), the Netherlands (12), F.R. of Germany (11), France (8), Sweden (4), Poland (2), UK (2), Austria (1), Czechoslovakia (1), Italy (1), Norway (1), Portugal (1), USA (2) and Australia (1). The meeting was organized by Prof. Alfredo Salvador (SEH Vice-Secretary) and held in the Faculty of Biology, University of León. A total of 38 papers on a wide range of subjects was read at the meeting, which included a symposium on Biogeography of the Western Mediterranean and as a special topic, Biochemical Methods in Systematics. As the Society's official language, most papers were read in English, but some were delivered in French, Spanish and German with abstracts in English circulated with the programme beforehand. A full report will appear in due course in SEH's journal, *Amphibia-Reptilia*, the new publisher now being E. J. Brill —Leiden, the Netherlands and another in the *BHS Bulletin* with an informal account of the two excellent field excursions into the Cordillera-Cantabrica range and Sierra Cabrera of NW Spain.

The SEH Conservation Committee, chaired by Keith Corbett (London), is also initiating ecological investigations into the status of the rarest species of European herpetofauna as the result of successfully presenting to the Council of Europe in Strasbourg a three-phase strategy for the establishment of 'biogenetic reserves' and obtaining agreement that the herpetofauna (as indicator species) should be the first faunal grouping to benefit from them. With funds made available, the contract started in 1983.

The first phase is a written report and proposals based on knowledge already available on e.g. marine turtles, island endemics, species of restricted range etc. The second phase is a field assessment of the status of the most threatened species: *Vipera u. ursinii, V. u. rakosiensis, Proteus anguinus, Gallotia simonyi, Rana latastei* and *Pelobates fuscus insubricus*. The third phase (and most expensive) involves placing two researchers from the University of Nijmegen (the Netherlands), each for a season, into chosen areas of Europe where a number of threatened and typical endemics exist. Sardinia and southern Greece have been selected as prime target areas. The SEH, through the aegis of the Muséum national d'Histoire naturelle, Paris, are also proceeding with the comparative mapping of the herpetofauna of Europe for regional and national conservation measures.

Implementation of the 1981 Berne Convention on the Conservation of European Wildlife and Natural Habitats has been good in Switzerland; in the Netherlands, all species have been protected and special projects for *Alytes obstetricans, Bombina variegata* and *Podarcis muralis*, and one for 1000 ponds (in line with the 1983 European Year of the Water's Edge) have been initiated. In the UK, there was the 'save the toad' campaign, organized by the Conservation Officer of the BHS; in addition, the Nature Conservancy Council instigated an enquiry into the status of the great crested newt *(Triturus cristatus)*, now listed as endangered in Britain. Italy and other countries no longer gave licenses to export *Lacerta viridis* and *Triturus carnifex*, which were formally involved in the pet trade. The Ramsar Convention (1975 Convention on Wetlands of International Importance especially as Waterfowl Habitat) has been extended to include the herpetofauna and other groups. But on a more serious note; of a total of 400 projects submitted to the EEC (European Community) for funding, 80 have been approved, but none included any herpetological work when some was of international priority.

Eastern Europe

The 1983 Herpetological Conference of the Socialist Countries was held in the D.R. of Germany (the first was held in 1981 in Budapest, Hungary). Through correspondence between Drs. Josef Eiselt, President of SEH, and Ilya Darevsky of the Soviet Union, and as the result of a decision in 1983 by members of SEH at their meeting in León, it has been decided that a meeting in 1985 will be held in Prague, Czechoslovakia, 19-23rd August, at Charles University, which is presently being organized by Dr. Zbynek Roček of the Department of Palaeontology in the Faculty of Natural Sciences.

Countries

Belgium: The recent build-up in an interest in conservation of amphibians and reptiles, and other wildlife, in Belgium (parts of the country suffer particularly seriously from industrial pollution) was reflected by the publication especially of the book by Prof. G.-H. Parent: *Protégeons nos batraciens et reptiles* as one of a series with birds, mammals and fish of *Animaux menacées en Wallonie*. This is a useful, nicely produced little book, the main aim of which is to outline the status of the herpetofauna in the southern (French-speaking) part of Belgium. It is a pity that the coverage is not for the whole of Belgium, although another, more general publication, including a section on the herpetofauna, has been separately produced for Flanders (northern, Flemish-speaking Belgium).

A proposal has also been made in Belgium to set up a group to prepare an inventory and to study and protect *R*eptiles and *A*mphibians in *N*ature (RANA). The name RANA has been chosen because this abbreviation is the same in all European languages and because the 'real frog' (*Rana*, F. Ranidae) is usually popular and quite well known to the public at large. It is intended to improve the image of amphibians and reptiles and to make them better known and more popular, and at the same time to save the most endangered species. The RANA frog symbol is to figure on a sticker, a poster and on a guide for all of the species and will be in several languages. A poster will be produced initially for the amphibia of Benelux (Belgium-Netherlands-Luxembourg); later a guide on the amphibia will also be published , in English, by a publisher in the UK (David & Charles, Newton Abbot) written by Donato Ballasina (Tervuren). RANA groups have also been set up in France and Italy.

France: The *Bulletin de la Société herpétologique de France* reflected an active year in 1983 for herpetology in France. Number 26 (the second issue) reported on the 1982 annual meeting of the SHF at Clermont-Ferrand in the Auvergne in which ten papers were presented on the special theme: the viviparous lizard and viviparity, in addition to a further seven on a wider range of subjects including one (as one might expect) on the reptiles and amphibians of the Auvergne, and totalled 58 pages. A trimestrial publication, numbers 25, 27 and 28 included eight (71 pp.), five (70 pp.) and three papers (70 pp.), respectively. The 1983 annual meeting was held in Montpellier, 30th June to 2nd July, and was organized by the SHF Secretary, Cl. P. Guillaume, with assistance from colleagues at the Laboratoire de Biogéographie des Vertebrés, Ecole Pratiques des Hautes Etudes of the University of Montpellier. Papers were presented on the general theme: the systematics and biogeography of the amphibians and reptiles of France, and the meeting was attended by a record 104 participants and deemed a great success. Dr. Edward Elkan (London), an authority on the pathology of the lower vertebrates (BHS Honorary Member 1982), was elected an Honorary Member of the SHF. Sadly he died (4th July 1983) only two days after this honour was bestowed upon him and an Obituary by G. Matz was

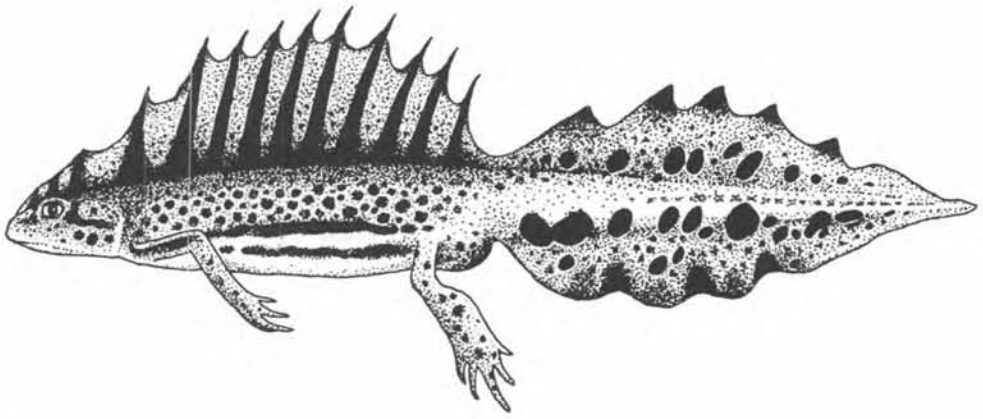
published in *Bulletin SHF* No. 28. Dr. Elkan was to have been the guest of honour at the First International Colloquium of the Pathology of Reptiles and Amphibians held at Angers, France, in September 1982, but regrettably ill health prevented his attendance. At the Montpellier meeting, a new 'Commission' of the SHF was approved under the Chair of Miss L. Bodson (University of Liège, Belgium) on ethnoherpetology and the history of herpetology. It was agreed that the 1984 annual meeting would be held at the University of Rennes, 28th June to 1st July, with the principal theme: reproduction; the sexual cycle of amphibians and reptiles.

Two further meetings were held later in the year in France and involved an herpetological interest. An International Conference on the Terrestrial and Freshwater Vertebrates of the Mediterranean Islands (origin, status, human influence and conservation) was held at Evisa on Corsica, 10-16th October, and was organized by Profs. C. Blanc and J.-N. Lheritier of the Zoogeography Laboratory, Paul Valéry University, Montpellier. The First International Symposium on Fossil Turtles was held by the Institute of Palaeontology, Paris, 12-14th October, and was attended by established specialists in the field.

The Société batrachologique de France (founded 1981) has continued to publish *Alytes*, edited by Dr. Alain Dubois of the Muséum national d'Histoire naturelle, Paris. With 1983, one issue (no. 3, September) of its second volume addressed the important question of frogs' legs as a culinary delicacy in France and its impact on the natural populations from whence the animals are collected. Dr. Dubois discussed the whole issue ('A propos de cuisses de grenouilles') and ended with some general proposals on the part of the Society. It would be useful if this article could be translated into English and published in a journal of wider circulation, not necessarily just of herpetological interest.

Finally, the Secretariat of Fauna and Flora at the Muséum national d'Histoire naturelle, Paris, established a code of practice relating to the preparation of an inventory of animals and plants and their habitats, and on the collection and collation of data for the preparation of distribution atlases. This is of importance to herpetology in Europe, for it was agreed at the 1983 SEH meeting in León that the preparation of a European amphibian and reptile atlas would be undertaken in France in collaboration with members of the SEH Conservation Committee. Distribution data collection sheets have already been published in France by the Secretariat at the Museum in Paris.

Germany, Democratic Republic (DDR): The Zentraler Fachausschuss (ZFA) Terraristik of the Kulturbund der Deutsche Democratische Republik publish *Elaphe* quarterly. This is the 'Arbeitsmateriel des ZFA Tarraristik' in which the Zentralen Arbeitsgruppen (ZAG) publishes articles. ZAG (working groups) exist for lizards, snakes, tortoises/turtles, amphibia and small mammals. The journal consists of short articles on different species, stressing their rearing and breeding in vivaria, and book reviews. The first issue of *Elaphe* included a 1983 programme. Two business meetings were each held at Berlin and Halle, the specialist group business seminar at Dresden in March and the fifth joint meeting at Schwein, 28-30th October. The Lizard and Snake working groups also reported on their quite extensive activities in breeding during 1983 and a display of exotic amphibians, reptiles and small mammals, and insects, was held in the Botanic Garden of Halle (Saale), 18th June to 3rd July.



Germany, Federal Republic (BRD): The big German society, the DGHT, held its 1983 meeting in Zürich, Switzerland, 7-11th September. Unfortunately, this was just before the SEH meeting in León, Spain, 12-16th September. Twenty papers were read on a wide range of herpetological subjects including one on a revision of the *Tarentola* geckos by U. Joger (Marburg), who also managed to attend the SEH meeting and read his paper there too! A discussion on the distribution and mapping of central Europe was lead by Richard Podloucky (Hannover).

The Rundbrief (DGHT newsletter) numbers 76, 77, 78 and 79 (a total of 125 pages) were circulated during 1983 and gave information on the financial state of the Society, current policy, items of conservation interest (a deep concern plainly being expressed in this subject), listing of new members and their addresses, address changes, members resigning, indication of meetings, news of state and country groups and members' offers-requests-exchanges relating to a general herpetological interest and species in vivaria. The more formal publication of the DGHT, *Salamandra,* includes specialist papers on a wide range of subjects from rearing and breeding species in captivity to ecology and distribution. Volume 18(1/2, pages 1-120) appeared during 1982, but volume 18(3/4, pages 121-368) December 1982 did not appear until February 1984 and, as an international journal for herpetology, included papers in English and summaries in French. It was, however, announced in Rundbrief no. 76 (February 1983) that as an organ of the DGHT, the publication of papers in English and French summaries would be discontinued. Volume 19 (1/2 and 3/4) was published in 1983 and included an Obituary by Dr. Konrad Klemmer (Past President of DGHT) on Dr. Hans-Günter Petzold of Leipzig Zoo, who died on 19 November 1982.

The publication *Herpetofauna* is another journal produced in F.R. of Germany primarily for vivarium keepers. Six issues are produced annually and during 1983, volume 5, numbers 22-27 were published, each number totalling about 30 pages.

Israel: During 1983, the Israel Herpetological Information Center (IHIC), based in Jerusalem, published a journal *Hardun*. The first issue (no. 1) appeared in February and contained articles in English (pages 68-57) and others in Hebrew (pages 1-56).

Italy: A red list of the herpetofauna of Italy was published in 1983 by Dr. Silvio Bruno (Pescasseroli) and as a result of several years work under the auspices of the Centro di Studio per la Faunistica ed Ecologia Tropicali (Consiglio Nazionale delle Ricerche, Florence), Prof. B. Lanza submitted his check list of the amphibians and reptiles of Somalia for publication.

Netherlands: The oldest European society (founded 1942), Lacerta (Nederlandse Vereniging voor Herpetologie en Terrarienkunde) publishes a journal of that name monthly, together with an information sheet, which, with reports from the eleven local branches in Holland, outlines the day-to-day activities of the Society and events of herpetological interest. *Lacerta* includes semi-popular articles in the Dutch language mainly on keeping species in vivaria and on herpetological observations made on excursions to various parts of the World. Several articles on different species of terrapin were published during 1983 and the last three numbers of the year (42nd volume, numbers 1-3, pages 1-60) each included short accounts of the herpetofauna of Costa Rica.

Spain: The newly formed Societat Catalana d'Ictiologia i Herpetologia publishes a small Bulletin quarterly, which contains short articles in Catalan on the lower vertebrates mainly of Catalonia (NE Spain). Under the Presidency of Dr. J. Maluquer i Nicolai (Barcelona), the members totalled 34 by June 1983. An effort is being made to catalogue the

lower vertebrate fauna of Catalonia and printed cards have been prepared to complete details on the species, habitat and localities.

Co-edited by Prof. H. Hemmer (Mainz, F.R. of Germany) and J. A. Alcover (Barcelona), a multiauthored monograph on the living fossil, the Mallorcan midwife toad (*Alytes (Baleaphryne) muletensis*), was in preparation during 1983 and is to be published by Editorial Moll, Palma de Mallorca as Monografias Cientifiques no. 3.

The bimestrial *Vida Silvestre*, a periodical published by ICONA, Madrid, and beautifully illustrated with high quality coloured photographs, frequently includes articles on the herpetofuana of Spain. Number 45 (March 1983) included an article on *Triturus marmoratus* (Triton Jaspeada) by Javier Andrada with magnificient photographs in full colour.

But probably of greatest importance herpetologically in Spain during 1983 was the 2nd O.G.M. of SEH in León (NW Spain), 12-16th September (see earlier). Thirty-five of the 82 registrants were from Spain and the meeting plainly gave the opportunity for Spanish herpetologists to present papers on their work and to meet other European researchers. Several papers on Spanish work had previously been published in SEH's *Amphibia-Reptilia*, including a note on the 'rediscovered' *Alytes (Baleaphryne) muletensis* on Mallorca, 8th September 1978, in volume 1 (3/4):343-345 (April 1981), and a paper on *Gallotia simonyi*, believed to be extinct until 1975, from the Canary Islands in volume 1 (2):369-380 (March 1982).

Sweden: The Sveriges Herpetologiska Riksförening, an association of six local herpetological societies in Sweden, publishes *Snoken* five times annually. In 1983, most of the articles were on snakes, as perhaps the name of the journal would imply, but others included one on an expedition to the Sahara Desert and another to Mount Ararat, E Turkey, and an account of giant tortoises in the Galapagos, Pacific Ocean. A symposium was held in Uppsala, 24-25th September.

Switzerland: The major herpetological event in Switzerland in 1983 was undoubtedly the meeting of the German DGHT in Zürich, 7-11th September (see earlier), under the patronage of the Zoological Museum and Zürich University. In consequence of this meeting immediately beforehand, no Swiss herpetologist attended the SEH meeting in León, Spain. Eight of the 20 papers presented were by Swiss workers. The meeting was organized by Henri L. Kratzer. The excursions included visits to the Zoological and Botanic Gardens.

Elapsoidea: fondation culturelle in Geneva also offered a programme of herpetological events during 1983, including an exhibition and talks ranging from the snake fauna of the Geneva valley to snakebite and reptile pathology.

United Kingdom: The unusual amount of herpetological activity in 1982 in the UK continued into 1983. The BHS held its 36th Annual General Meeting in London on 22nd March. Membership totalling 766 at the end of 1983 (c. 700 in 1982) included 98 from overseas (79 in 1982). Three new Honorary Members were announced: Prof. J. L. Cloudsley-Thompson (London), Prof. R. Conant (Albuquerque, New Mexico) and Dr. D. G. Broadley (Bulawayo, Zimbabwe); Mr. J. D. Romer (Hon. Member 1958) died in 1982. The business matters were followed by a talk by Lionel Kelleway (Swansea): Control of reproductive behaviour in the adder, *Vipera berus*, and included a 16-mm research film on sparring. Three further evening lectures were given on a range of subjects and members attended a meeting of the Linnean Society of London on the chromosomes of European crested newts by Prof. H. C. MacGregor and co-researchers at the University of Leicester in April. Besides the two discussions on New and Old World species and the July visit to the London Zoo during a Zoo Members' Open Evening, the Captive Breeding Committee jointly held a successful Saturday meeting with the British Veterinary Zoological Society in October for which Proceedings will be published. A joint meeting was also held with ASRA (Association for the Study of Reptilia and Amphibia, Oxfordshire) at the Cotswold Wild Life Park.

An undoubted highlight of the year, however, was the most successful two-day symposium on reptile biology held at the Zoological Society of London in honour of Prof. Angus Bellairs (BHS Hon. Member 1982) on the occasion of his retirement and organized jointly with the Zoological Society and Anatomical Society of Great Britain and Ireland by Prof. Mark Ferguson (Belfast, Northern Ireland; now of the University of Manchester). A Festschrift volume as no. 52 of the *Symposia of the Zoological Society of London* (published by Academic Press) appeared in 1984 (September). An enjoyable social occasion shortly before Christmas (16th December) was provided by the first Malcolm Smith Dinner, hosted by the President of the Society, the Earl of Cranbrook, and held in the Peers' Dining Room, House of Lords, Westminster (reported on separately: *Herp. Review* 15(1):12). The President gave a speech (published later in the *BHS Bulletin* no. 9:2-5, June 1984), which was replied to by Dr. R. F. Inger, then President of the Herpetologists' League, USA. Miss A.G.C. Grandison of the Amphibian Section of the British Museum (Natural History), London, was also an invited guest.

BHS Council members represented the Society's interests at meetings of the UK Committee for IUCN, the Wildlife Link and the 2nd O.G.M. of the SEH at León, Spain. An account of the BHS's work was read in August on behalf of M.R.K. Lambert by Kraig Adler at the SSAR's 7th Annual Conference of the Regional Herpetological Societies at Salt Lake City, Utah.

1983 also saw as a special publication of the BHS (organized by the Captive Breeding Committee) Nicholas Mrosovsky's book *Conserving sea turtles*, which was widely reviewed; that of Peter Pritchard in the American Society of Ichthyologists and Herpetologists' journal *Copeia* 1983 (4):1108-1111 being of particular note. The BHS past President until 1981, Dr. J.F.D. (Deryk) Frazer, published his rewrite of the BHS founding President, Dr. Malcolm Smith's book (1951, revised 1954) on the British herpetofauna under the title *Reptiles and amphibians in Britain* (Collins' New Naturalist Series no. 69). As a breakthrough in the field of herpetofaunal conservation in Britain, the Nature Conservancy Council (NCC) finally published their report *The ecology and conservation of amphibian and reptile species endangered in Britain* (93 pp) as promised six years earlier at a meeting with members of the BHS Conservation Committee in January 1977. The report covers three (*Bufo calamita, Lacerta agilis* and *Coronella austriaca*) of the four rare and endangered species in Britain; *Triturus cristatus* was protected later with the 1981 Wildlife and Countryside Act, the NCC now having initiated work on this species too. The NCC have agreed (16th March 1983) to use this report as the basis for their policies and programmes for the species covered and commended land managers and decision-makers to use it likewise. However, when considering proposals for translocations, they would normally intend to exercise their powers and duties in ways that would seek to minimize the mixing of genetic material from the various populations of each species. As a contribution to the discussion on the relocation of the herpetofauna in Britain in light of this, the BHS Conservation Committee have issued a statement (*British Journal of Herpetology* 6 (8):314-316), which has been submitted to NCC for comment. Britain and Ireland are biogeographically offshore NW European islands, and the hard experience gained in conserving the British species is being put to use on the continental mainland. Keith Corbett, as a founding member of the BHS Conservation Committee (1969), has become chairman of the SEH Conservation Committee (founded 1981), and during 1983 (after meetings in 1982 in Hannover, Strasbourg and Genoa) visited Hardwijk (Netherlands), Nijmegen and Paris, the last, in October, to discuss the mapping of the European herpetofauna and their habitats in relation to future conservation.

The *British Journal of Herpetology* published 17 papers and three notes in volume 6 (8 and 9), pages 281-350, on a wide range of subjects during 1983, including work on the gharial (*Gavialis gangeticus*) in India by H. R. Bustard, a description of a new species of *Psammophis* from northern Ghana by S. Spawls and on the endangered British species and their habitats by several authors. The *BHS Bulletin*, pages totalling 140 in 1983, included a list of the herpetological societies of Europe and the Commonwealth and an outline of research work in some of the British Universities (no. 7, June), and an article on the future role of the BHS in the Commonwealth and two on herpetology in New Zealand and India (no. 8, December).

ASRA, Oxfordshire, has decided to publish the papers on captive husbandry and breeding, and general herpetology, read at the International Herpetological Congress held at Oxford, October 1981, in *ASRA Journal* 2 (1-4). Volume 2, numbers 1 and 2, totalling 153 pages, were published in 1983 and comprised fourteen papers including T. Joanen and L. McNease on captive propagation of alligators in Louisiana, Ch.P. Blanc on the Iguanidae of Madagascar: VIII. Stages and factors involved in their evolution, R. C. Bruce on larval salamander communities in the

southern Appalachians and W. R. Branch on the captive breeding of pythons from work in South Africa.

At the end of 1983, the British Chelonia Group, Bristol, published the Proceedings B of the 2nd European Chelonian Symposium, Oxford 1981, in their journal *Testudo*. Volume 2 (2), pages 1-32, included the papers of more general interest and titles of those presented which were or have been published elsewhere, other than in Proceedings A, which were published by SEH's *Amphibia-Reptilia* (December 1984).

As a final word, the compiler apologizes for the UK bias in this report and reiterates his request for information from herpetological societies and other organizations elsewhere in Europe to redress the imbalance for any future report. Thanks are due to Dr. Marinus S. Hoogmoed (Rijksmuseum van Natuurlijke Historie, Leiden, the Netherlands), SEH General Secretary, for reading a draft of this manuscript and briefly commenting helpfully on it.

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Selective Use of Pitfall Traps by Southern Leopard Frogs

Pitfall traps have been widely used to sample reptile and amphibian populations (e.g. Storm and Pimentel 1954; Pearson 1955; Nelson and Gibbons 1972; Gibbons and Bennett 1974; Bennett et al. 1980; Semlitsch et al. 1981; Semlitsch 1983), but few researchers have quantified, or even acknowledged, biases of the trapping technique. Factors such as body size, home range size and trap avoidance behavior influence the rate and patterns of capture of herpetofauna (Gibbons and Semlitsch 1982). For example, Gibbons and Semlitsch (1982) noted that eastern box turtles *(Terrapene carolina)* actively avoided pitfalls; only three specimens were captured during a year of sampling despite the abundance of this turtle on their study area. In this note I describe another behavior-related bias: the selective use of pitfall traps by southern leopard frogs *(Rana utricularia)*.

From 2 May to 5 December 1983 I conducted a study of the diversity and activity patterns of the herpetofauna of a hardwood forest in Scotts Hill, Pender County, North Carolina. Herpetofauna were sampled using pitfall traps consisting of 15.5 cm diameter X 16.5 cm deep aluminum cans placed in holes with their rims flush with the soil surface. One-hundred pitfalls were placed at 10 m intervals in a 10 X 10 grid. Traps were checked weekly and all specimens were individually marked by toe-clipping, measured, and released at the site of capture. The pitfalls did not have drain holes in the bottom and nearly always contained several centimeters of water from precipitation. Traps containing > 5 cm of water were bailed out on each visit.

On three occasions during October and November 1983 I observed southern leopard frogs jumping into pitfalls upon my approach. This behavior suggests that frogs may have been using pitfalls as a refuge from predators while foraging terrestrially. Brimley (1943) stated that southern leopard frogs readily plunge into water when alarmed. The fact that frogs were sitting near the pitfalls before I approached further suggests that they may have been using the traps for other purposes, such as maintenance of water balance while traveling over land.

On 12 November a total of 19 southern leopard frogs was captured, the largest number trapped at one time during the study. Four pitfalls contained two frogs each and one trap held three frogs. Only one other instance of multiple captures was recorded during this study. While removing frogs from the traps, I noted that water in the traps felt noticeably warmer than the air. Temperature data obtained from the National Weather Service office in Wilmington, North Carolina, 15 km southwest of the study site, indicated that temperatures on the 12th were below normal. The early morning low temperature was 2° C and the average daily temperature was 8° C, 6 degrees cooler than normal. The high reached only 13° C. The average temperature for the previous day was 15° C, with a high of 20° C. Water temperature does not change as rapidly as air temperature, owing to the greater specific heat and high latent heat of evaporation of water (Wetzel 1975). Presumably, water in the traps warmed on 11 November remained relatively warm while air temperature on the 12th dropped to 2° C. Because traps were checked weekly, the number of frogs entering the pitfalls on the night of 11-12 November was unknown. However, the large number of frogs found in pitfalls on 12 November suggests that when the air temperature dropped, frogs actively sought out the warm water in the pitfalls for thermoregulatory purposes. In the laboratory, the closely related northern leopard frog *(R. pipiens)* generally seeks shelter under objects in the bottom of an aquarium when temperatures drop below 8° C (Porter 1972). In the wild, northern leopard frogs are usually found in water on nights when the air is cooler than the water (Brattstrom 1963).

Southern leopard frogs breed in ponds, river swamps, ditches and other wetlands (Wright and Wright 1949), but scatter throughout uplands after the spring and summer breeding season (Brandt 1936). While traveling on land these frogs are subject to desiccation, predation and fluctuating air temperatures. Pitfall traps containing water may provide a refuge from dry conditions, terrestrial predators and cold nighttime temperatures.

Preferential use of pitfalls by southern leopard frogs during this study resulted in a trapping bias that increased the number of frogs captured. This potential source of bias should be recognized by other researchers using pitfalls that may hold water. Individual marking of animals is essential to detect such biases, which may be decreased by placing holes in the bottom of pitfall traps to drain the water.

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USES OF SOME REPTILES BY THE YORUBA PEOPLE OF NIGERIA

The purpose of this essay is to inform the herpetological community of reptile use by the Yoruba, a West African tribe, and to relate some anecdotes concerning folklore of these animals. This information has never been reported in the literature and was obtained through a series of opportunistic interviews with a Yoruba woman named Rachel Falade from the village of Ifon, Ondo State, Nigeria in the latter part of 1981. Some readers may feel that the account lacks validity since only one interviewee is involved. But much of the information concerns the practice of traditional medicine, witchcraft, and religious practice which Africans are not often disposed to discuss with outsiders.

The Yoruba, located principally in the Southwest quarter of Nigeria and extending into Benin and Togo, are one of the three major tribal factions of Nigeria along with the Northern Hausas, and the Southeastern Ibos. The culture had organized kingdoms in the cities of Oyo and Benin by the 15th century according to Portuguese accounts (Lloyd 1965). They are world renowned for their brass and terra-cotta art treasures. Though most now profess Christianity and to a lesser extent Islam, traditional beliefs are much a part of everyday life for the Yoruba.

Several authors have discussed witchcraft and religion among the Yoruba (Bascom 1944; Morton-Williams 1954; Prince 1961). Others have considered various medical practices of Yoruba native doctors (Prince 1962; Soyanwo 1962; Maclean 1965; Odebiyi 1976; Oyebola 1980). But no one, to my knowledge, has approached these topics from the perspective of the uses of a particular group of animals in such practices.

The list of ingredients for the concoctions as reported herein are assumed to apply to this village only, since the recipes are likely to vary from village to village and certainly from tribe to tribe over all of West Africa. It is also not the purpose of the authors to scrutinize the physiologic efficacy or the psychological advantages of the medicines although in some cases comments of this nature are included.

Information concerning the use of skins is presented from personal observations by the authors and is not intended to single out usage by any particular tribe.

Python regius - Royal or Ball Python

During my inquiries I (JAB) referred to this python as the smaller of the two Nigerian species and was informed that the Yoruba call it "oka." They attribute its shyness (balling behavior) to the idea that the snake is attempting to hide its tail because this is the source of its power. According to myth, if one were to step on the head of a royal python no harm would come, but to step on the tail would mean certain death. It is unclear whether myths concerning this snake's tail originate from the presence of vestigial limbs or the harmless horny tip—or neither. Vague myths concerning tails of other snakes are prevalent in Nigeria, as evidenced by the fact that when handling any species of snake I was continually warned by Africans about controlling the tail. Also, most if not all snakes are used as food by the Yoruba, and it is common practice to bury the snake's head with the tail in the mouth before cooking the body. I have been unable to determine the origin of this practice.

The head of a royal python can be used for evil purposes by the Yoruba through their native diviners ("juju men"). If one does not want an enemy to progress in life, he goes to the diviner—called Babalawo—with the complaint. The Babalawo mixes the dried head of the python with other unidentified objects into a solution. While mixing, various incantations are said and the victim's name is spoken. The victim is then tricked into drinking some of the solution, and from that point on he will be impeded from progressing further in life.

The royal python can also be used to bring good fortune, such as finding a wife or getting a better job. All one needs to do in this regard is to bring a part of the snake — usually the tail — to the Babalawo. This is dried and then burned to ash. Cuts are then made in the skin of the solicitor, and the ashes rubbed into the cuts. The ashes enter the blood and confer the individual's wishes.

Python sebae - African Rock Python

The rock python, as well as most other snakes in West Africa, can be used as food. They are called "ere" in Yoruba. The fat of the abdominal cavity is also used as a rubbing ointment said to soothe muscle aches and sprains, arthritis, and rheumatism.

Probably the most common use of the rock python in West Africa is the collection and sale of its skin. A skin from a 5-6 meter snake can fetch one hundred naira (about $150) or more. Python skins are sold openly by tradesmen at beaches or hotels frequented by expatriates, in all major cities.

Chamaeleo sp. - Chamaeleon

There are seven species of chamaeleon (Yoruba = "oga") in Nigeria and the Yoruba may normally encounter three: *C. gracilis, C. basiliscus,* and *C. senegalensis.* These three species are quite similar, differing most obviously in the size of their occipital lobes. When I asked if the Yoruba differentiate among the species, I was told that it was similar to the situation of black and white humans; we differ so very little that essentially we are the same.

A color change from brown to green which occurred in an adult *C. gracilis* as we spoke was attributed to a breeze from an open window entering the room through a green curtain. The Yoruba believe that the chamaeleon can see both the future and the past, since the eyes move independently. They also recognize that it can see in two fields of vision.

The origin of another Yoruba belief concerning chamaeleons is more difficult to ascertain. It is presumed that if one steps in the excreta of a chamaeleon he will develop elephantiasis. This idea is perplexing since the disease is usually caused by a filarial worm, *Wuchereria bancrofti,* the immature form of which is passed to humans only through the bite of several mosquito vectors.

The entire body of a chamaelon may be substituted for the royal python head by the Babalawo in the mixture which obstructs an enemy's goals. The chamaeleon is also used in a beneficial concoction said to cure convulsions in children.The only explanation of the cause of these convulsions was that they were associated with high body temperatures. Convulsions, of course, would be expected with high fever, and the fevers could be the result of a myriad of illnesses.

This medicine is prepared by mashing any part of the dried chamaeleon with the anal scent gland of a civet *(Viverra civetta)* and 5 to 10 fruits or seed pods of the spice *Xylopia aethiopica* (Yorba = "eru"). This is then mixed with sponge-like fibers, most likely from *Momordica angustisepala* (Yoruba = "okofe"). This mixture is added to the oil extract of the palm kernel, *Elaeis guineensis,* and is then rubbed on the body to stop convulsions. The physiologic efficacy of such treatment is suspect. It is interesting that this remedy is not used for adults since it is believed that adult convulsions are caused only by epilepsy, against which no native medicine is effective.

Varanus niloticus - Nile monitor lizard

This lizard is called "awonriwon" by the Yoruba. It is used as food and I have seen numerous dried specimens for sale at the open Dugbe market in Ibadan. Monitor skins are identifiable in shoes and handbags sold by craftsmen throughout Nigeria. The skin of the monitor is also used for the head of a drum which can only be used by a Babalawo for calling the god of the future, called "Osayin." The skin is attached to the drum, scale-side down, and is used because it is said to be very tough.

Kinixys sp. - Hinged tortoise

The several species of hinged tortoise are collectively called bush turtles or "igapa igbo" by the Yoruba. Their parts are used in a variety of remedies, and because they are important medicines, the head and intestines can never be eaten. The rest may be used as a protein source.

It is believed that this tortoise was the first animal on earth, that it is the most intelligent of all animals, and that it may even lie cleverly on occasion.

There are three major remedies which incorporate tortoise parts. The first is for cholera (Yoruba = "onigba meji"). The emetic is a combination of the head and intestines of the tortoise combined with an unidentified leaf (Yoruba = "erjin olubi onsowo") and the seed of the pepper, *Piper guineense* (Yoruba = "iyere"). These ingredients are individually burned to ash and then ground together. This mixture is stored in a small gourd having resealable openings in both the narrow top and wide bottom. When needed the ashes are mixed with a corn starch pap and given to the cholera victim orally. If the patient has symptoms of diarrhea, the ashes are removed from the opening in the bottom of the gourd. If vomiting is occurring, ashes are taken from the top opening of the gourd.

Turtle parts are also used to treat burns. The carapace is removed and broken into

pieces which are placed in a clay pot and heated to ash. These ashes are saved and sprinkled on burns, which are then said to heal within three days.

A third use of the turtle is as a preventative against the death of "evil children." If a child is born of parents for whom infant death is frequent, it can be taken to the Babalawo and diagnosed. If it is said to be an "evil child," this means the child would die within a week. The child is apparently "evil" since its death will be costly to the parents. As a preventative the claws and head of a tortoise are burned together with a leaf. (Yoruba for the leaf is "ayo," but depending on the emphasis 'ayo' is *Holoptelea grandis*, and ayo' is *Caesalpinia bonduc*.)

Crocodilus sp. and *Osteolaemus tetraspis* are apparently not used in medical practices, but skins are used for handbags and other leather goods. *Trionyx* sp. is used for food.

There are virtually no data concerning the population status of any of the reptiles discussed here; therefore no attempt to assess the impact of their usage can be made. It is impractical to expect that these uses could be controlled in the near future, and indeed, attempts to institute control border on the inhumane, since these animals are an important source of protein. In view of Nigeria's expanding human population, it seems imperative that more effort be exerted to ascertain the population status of these and other reptiles and that the impact of human activities on these animals be determined.

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COMMENT: SEXUALLY DIMORPHIC PLASTRAL KINESIS — THE FORGOTTEN PAPERS

The June 1984 issue of *Herp. Review* carried an article by G. N. Waagen describing sexually dimorphic plastral kinesis in *Heosemys spinosa*. Over the last two decades at least two significant papers (McDowell 1964; Bramble 1974) had reported that the plastron of *Heosemys* was akinetic. Bramble further reported, however, that the *Heosemys* examined by him had reduced plastral buttresses and at least a degree of the muscle specialization found in the kinetic *Cyclemys* group. None of these authors appear to have been aware of two earlier papers by the late Robert Mertens (1942, 1971) on the subject

It was Mertens (1942) who first described the post-maturational development of a partial hinge and the erosion of the bony connection between hypoplastron and carapace in female *H. spinosa*. Mertens (1971) reviewed the development of plastral kinesis in this species and used the characteristic to support his contention that the genera *Cyclemys* and *Heosemys* should be lumped (excluding *leytensis* and *silvatica*). At least one recent author has followed this recommendation (Lorenz 1984).

In turn Mertens (1942) appeared unaware of a still earlier report of sexual dimorphic kinesis. Anderson (1878) observed that females of *Melanochelys tricarinata* (but not males) have a ligamentous rather than bony connection between the hypoplastron and carapace. Smith (1931) repeated Anderson's observation and mentioned that in one old female examined, the hyo-hypoplastral union was clearly visible externally. While in India recently, I had the opportunity to verify Anderson's observations on living *M. tricarinata* and to add still another example of sexual dimorphic kinesis. Female cane turtles *(H. silvatica)* of southwestern India similarly develop a ligamentous connection between hypoplastron and carapace at maturity whereas in males the connection remains a bony suture. Since species showing this phenomenon lay large brittle-shelled eggs, the adaptive significance of a kinetic plastron is most likely to allow their passage from the cloaca (Mertens 1941; Waagen 1984) with only minimal reduction of the shell's protective function.

Inasmuch as a ligamentous connection between plastron and carapace may not be overtly obvious and only occurs in one sex, it is quite possible that the phenomenon is still more widespread. Persons having access to collections of batagurines should examine the small terrestrial-to-semiaquatic species with this in mind.

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A NORTHERN NESTING RECORD FOR THE HAWKSBILL TURTLE

The hawksbill turtle *(Eretmochelys imbricata)* is a tropical coral reef/rocky shore-associating species that nests rarely on Florida beaches. Two nesting records are documented for Palm Beach County (Carr, Hirth, and Ogren 1966; Lund 1978), and additional unpublished nesting records exist for Martin County and elsewhere in extreme southern Florida (P. C. H. Pritchard, pers. comm.). This note reports an adult female hawksbill photographed at 0400 hr, 16 August 1982, while laying eggs at Canaveral National Seashore (CNS), Volusia County, Florida, thereby establishing a new northern limit for the hawksbill nesting range in the continental United States.

The previously untagged CNS animal was given two yellow Rototags (FL1951, FL1953) and a monel tag (AAK973) on the trailing edge of the front flippers. Over-the-curve carapace length was 84 cm. The clutch of 125 eggs was partially depredated (25% loss) by raccoons at the time of laying. Protective screening placed over the nest cavity prevented further predation, but the remaining eggs did not develop. The propensity for sea turtle eggs from raccoon-depredated nests to fail has been shown for loggerheads (McMurtray 1983) and may account for the hawksbill clutch failure.

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THE DISTRIBUTION AND STATUS OF *Cryptobranchus Alleganiensis* IN MARYLAND

Cryptobranchus alleganiensis is listed as endangered in Maryland and is declining throughout its range (Williams et al. 1981a; Gates et al. in press). In Maryland, it is known from: 1) the lower Youghiogheny River, 2) the Casselman River, and 3) the Susquehanna River and its tributaries (Fowler 1915; McCauley and East 1940; Meszoely 1966; Harris 1975). There are unsubstantiated accounts from fishermen of *C. alleganiensis* in the Potomac River and tributaries, where it may have dispersed from the Youghiogheny via stream capture (Hendricks et al. 1983). An extinct Pleistocene form of *Cryptobranchus* is known from the Potomac River watershed (Holman 1977). This study's objective was to determine the present distribution and status of *C. alleganiensis* in Maryland.

From 30 September 1979 through 21 November 1981, approximately six days per month (range = 1-18) were spent surveying the Youghiogheny, Susquehanna, and Potomac rivers and tributaries, depending on weather and stream conditions. Several rivers emptying into the northern Chesapeake Bay were also included, as well as the mouths of tributaries of the Potomac River in nearby West Virginia and Virginia (Fig. 1). No surveys were done from December through March. Most survey days (92.6%) occurred from May through October. Although several different techniques were employed in stream surveys (see Williams et al. 1981b), electrofishing with dip nets was the one method used most often by the survey crew. A two-to-four man crew spent 308.5 in-stream hours (905.5 man-hours) sampling for *C. alleganiensis*. Two hundred and fifty-nine individual sites were sampled: 91 in the Youghiogheny River system, 44 in the Susquehanna River system and other streams emptying into the northern Chesapeake Bay, and 124 in the Potomac River system (Fig. 1). Multiple samples were often made where habitat appeared good. Twenty-four percent of the sites were sampled both day and night. Night sampling usually began about 0.5 hour after sunset. We spent an average of 54 (± 2.3 SE, range = 15-300) minutes per sample. All captured individuals were returned alive to the stream.

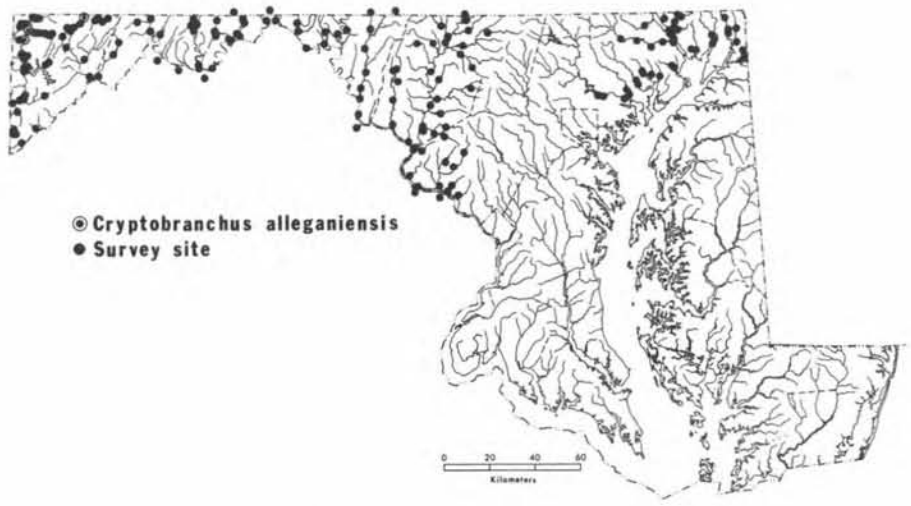


Figure 1. Location of sites surveyed for *C. alleganiensis* in Maryland.

Additionally, 200 "hellbender wanted" posters were posted along the Youghiogheny and Susquehanna river drainages, Gunpowder Falls, and Little Gunpowder Falls between 31 March and 7 May 1982. On 1-2 May 1983, 42 additional posters were placed along the Susquehanna River and its tributaries. No posters were placed along the Potomac River drainage.

Between 29 May 1980 and 30 September 1982, seven *C. alleganiensis* were captured within a one kilometer section of the Casselman River from 1.6 km north of Crab Run Road to 0.8 km south of the Pennsylvania state line (Fig. 1). Individuals ranged from 298-438 mm total length (212-270mm snout-vent length) and weighed from 245-530 g. Our stream surveys were unsuccessful in locating *C. alleganiensis* elsewhere in the Youghiogheny River system, or in the Susquehanna and Potomac River drainages.

We received ten responses to our "hellbender wanted" posters. Three resulted in documentation of *C. alleganiensis* in Maryland streams. One fisherman hooked and caught a *C. alleganiensis* in the Casselman River on 13 April 1982 near the sites already identified by our stream surveys. Another fisherman caught and photographed a *C. alleganiensis* in the Youghiogheny River at Friendsville, Maryland, on 15 April 1982 approximately 274-366 m upstream of the confluence with Bear Creek (Fig. 1). This was the first record we had of *C. alleganiensis* in the Youghiogheny River system, other than the Casselman River, since we began our study. On 22 August 1982, another *C. alleganiensis* was captured, photographed, and released by Drew Ferrier, a biologist with Garrett Community College, McHenry, Maryland, while electrofishing 2.4 km south of Friendsville (Fig. 1). These two records from the Youghiogheny River document the continued presence of *C. alleganiensis* in a 4.0 km section. No response was received from fishermen along the Susquehanna River or any of its tributaries.

Compared with our previous work in Pennsylvania (Williams et al. 1981b), *C. alleganiensis* populations in the Youghiogheny River system in Maryland are sparse. The Casselman River probably has a more dense population than the Youghiogheny River. *Cryptobranchus alleganiensis* is highly susceptible to pollution and the submergence of swift water riffles by artificial impoundments (Gentry 1955; Nickerson and Mays 1973). The Youghiogheny River Reservoir just north of Friendsville eliminated much *C. alleganiensis* habitat and is a definite barrier to dispersal. Acid mine drainage, municipal sewage, industrial effluents, agricultural runoff, and siltation resulting from forestry practices, mining, and construction are the major pollutants in the Youghiogheny River system. The most limiting pollutants to aquatic organisms in this system are acid mine drainage and siltation (Hendricks et al. 1983). The river was considered almost lifeless in 1950 (Reppert 1964). The decrease in coal production and the increase in water quality law enforcement and mine drainage abatement projects since then have improved water quality considerably.

The lack of recent information from the Maryland portion of the Susquehanna River system leaves the continued existence of *C.*

alleganiensis there in doubt. The Conowingo Reservoir eliminated much habitat and is a definite barrier to dispersal. The same pollutants found in the Youghiogheny River system, excluding possibly acid mine drainage, are factors that may have affected populations here. Low dissolved oxygen concentrations and nutrient enrichment are two of the concerns in the Susquehanna below Conowingo Dam (Rudisill 1979). However, several tributaries of the Susquehanna, especially Deer and Octoraro creeks, appear to be suitable habitat. Even in these two streams, elevated nutrient concentrations and siltation are problems (Rudisill 1979).

There is no evidence of the occurrence of *C. alleganiensis* in the Potomac River system. Water quality in the Potomac River basin ranges from poor in the North Branch, where acid mine drainage restricts most aquatic life, to good from the confluence of the North and South branches downstream to Little Falls Dam, Maryland. Nutrients, bacteria, and sediment from inadequately treated municipal sewage discharges and street and farmland runoff are the major forms of pollution in most of the Potomac River basin (Mason et al. 1976).

Cryptobranchus alleganiensis in Maryland is rightfully categorized as endangered. Where it is found, populations appear to be low. We found no evidence of successful reproduction though we sampled during the late summer-fall breeding season. Besides different forms of pollution, fishing could have an impact on populations. Many fishermen believe that *C. alleganiensis* is poisonous and attempt to kill captured individuals before removing them from the hook. Or, they may merely cut their line and release them with the hook imbedded inside their digestive tract (Nickerson and Mays 1973). Mortality from this impact is difficult to document, but could be considerable in certain areas. Better education of the fishing public would be an important means of reducing this source of mortality.

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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Knoxville Zoo, Box 6040, Knoxville, Tennessee 37914, U.S.A.

EGGS AND HATCHLINGS OF THE YELLOW GIANT CHUCKWALLA AND THE BLACK GIANT CHUCKWALLA IN CAPTIVITY

Iguanid lizards of the genus *Sauromalus* (chuckwallas) are found only in the Southwestern United States, and in Northern Mexico. They are thought to have originated from *Ctenosaura* (spiny-tailed iguana) stock (Etheridge 1964; Hotton 1955; Smith 1946; Mittleman 1942). There are eleven subspecies, six belonging to the fine scaled "*obesus* group," and five belonging to the rough scaled, "*atar* group" (Robinson 1972). Three subspecies are in the United States, one on Baja California, one on the Mexican mainland, and six on the islands in the Gulf of California, Mexico (Shaw 1945).

Gigantism has evolved in two of the insular species. *S. varius* belongs to the "fine scaled group" while *S. hispidus*, belongs to the "rough scaled group." Both species are confined to the Midriff islands and are allopatric except for a small population on Isla Alcatraz. This island has both yellow and black giant chuckwallas. They have been introduced by Mexican fishermen and Seri Indians, respectively (Moser, per. com.). Natural hybridization has occurred there between the two giant forms, and betwen the giant and mainland species. Fertile hybrids have been produced from these crosses (Lowe et al. unpub. ms.).

From 1974 through 1983 I witnessed the gradual deterioration of the flora and fauna of the Gulf of California. Recently some effort has been made to prevent this trend from affecting giant chuckwalla populations.

In the past these rare lizards have been removed for sale to the pet industry, and in the process much destruction has been done to their native habitat. This destruction is a direct result of the careless use of crowbars, picks, and shovels as the collectors chased the lizards down and dug them out of their caves and burrows. On 19 April 1980, *S. varius* was placed on the endangered species list (U.S. Fish and Wildlife Service 1980). While helpful, enforcement of this decree is not an easy task and is not likely to completely resolve the problem. Additional management of giant chuckwallas, especially *S. varius*, will be imperative if these animals are to survive.

Chuckwallas raised in captivity could be used to satisfy the demands of the pet industry, and at the same time be introduced as hatchlings, juveniles, or adults, to sustain declining island populations, or to develop new populations outside of their native island habitat.

This study focused on the eggs and hatchlings of the two insular giant forms. The eggs and hatchlings of *S. varius* are described for the first time. Eggs and hatchlings from a cross of a yellow giant female and a black giant male were successfully hatched and reared.

METHODS

In November of 1974, two male and two female *S. varius* were brought from San Esteban Island, Gulf of California, Mexico (Mexican Permit No. 203274-9 Series), to an outdoor enclosure in Tucson, Arizona. One year later a male and female *S. hispidus* were added to the enclosure. The elevation of the study area is 823 m, which is well within the elevation of their island habitat (maximum elevation 1316 m). The humidity, however, is usually much lower in Arizona; and the temperature extremes ranged from -1° C to +45° C during the study period vs. +8° C to +43° C on the islands (based on data from 1974 to 1980).

The natural clay soil in the enclosure was covered with 46 cm of desert wash sand. The enclosure size was (6.7 x 5.8 x 1.2 m), with plastered walls so that the lizards could not climb out. At the center of the enclosure was a black, artificial rock (2.5 x 1.8 x 1 m). It was constructed from concrete reinforcing rods, wire mesh, and black pigmented cement. The rock's surface was slanted toward the south so that it could absorb a maximum amount of sunlight throughout the day.

Trenches 50 cm and 30 cm deep were dug along the inside of the west and south walls of the enclosure and were covered with 7 mm thick plastic sheets. The plastic sheets were elevated from the ground by using concrete topping blocks (2.5 cm thick). The space between the sheets and the sand made it possible for the lizards to move in and out of the trenches at will. The translucent nature of the sheets also made it possible to grow sunflower seedlings (greenhouse fashion) in the trench soil. These seedlings provided a source of water and nutrition throughout the year. In addition, this system allowed most light rays, excluding ultraviolet, to reach lizards basking under the plastic sheets.

Outside the enclosure walls was a 15 cm thick, 5 m wide concrete skirt. The skirt provided a solid, escape-proof ceiling, that allowed the lizards to dig under the walls and hollow out deep dens. This was one of their preferred places to congregate during both summer and winter seasons. The plastic sheets protected the den areas from wind, rain, and predators.

The artificial rock and trenches were heated in the winter by electric forced air heaters (1000 watts) with plastic casings that prevented the lizards from burning themselves; the artificial rock was sprayed with water from a drip hose during the hottest part of the summer days (1300 to 1500 hr.) to avoid temperatures beyond the tolerance of these lizards. The summer temperature extremes in the non-irrigated parts of the enclosure reached 45° C, while in the winter the outside temperature dropped to -1° C. The temperatures were recorded in the shade within the enclosure. This low temperature never reached the lizards in the artificial rock or trenches, (monitored by maximum-minimum thermometers) which maintained a minimum temperature of 21° C. This system was vital in order to maintain proper soil moisture for egg incubation, to prevent extreme temperature build-ups during the hot summer months, and as a guard against freezing temperatures during the winter.

Hatchlings from the outdoor enclosure were raised indoors in terrariums (2 x 1 x 0.7 m), with 10 hatchlings per terrarium. They were given two hours of sunlamp exposure every other day. The sunlamp was mounted 1.5 m above the terrarium's surface. The terrariums were provided with a 250 watt, infrared light and two heating pads maintained at 30° C. The infrared light was mounted 46 cm above two concrete blocks that were set on end. This provided a natural basking site with a temperature of 38° C. The room was maintained at 25° C. Thus, the hatchlings had three temperatures that they could choose from: 25° C, 30° C, and 38° C. The photoperiod was from 0700 to 1900 hr.

Food Regime

Adult chuckwallas were offered fresh carrot slices, chopped lettuce and several genera of native plants that were known to be eaten by *S. obesus* (Hansen 1974; Nagy 1973; Sanborn 1972) and giant chuckwallas (personal observation). Some of these plants are as follows: *Sphaeralcea ambigua, Baileya multiradiata, Erodium cicutarium,* and the fruit of *Opuntia engelmannii.*

Hatchlings were fed flats of fresh sunflower seedlings and a mixture containing 90 g of shredded carrots (fresh weight) and 10 g of finely ground chick starter (air dry weight). This mixture is readily eaten by the hatchlings, and is excellent nutritionally, providing 20% protein, 3% fat, 6% fiber, and Vitamin D_3 for bone growth.

Hatchlings were always fed on a clean, non-sandy surface. Failure to do so resulted in hatchling deaths due to the ingestion of small rocks. Adult chuckwallas normally ingest and pass small rocks through their digestive tract and for this reason, less care was needed during their feeding times.

RESULTS AND DISCUSSION

On 12 September 1977, 23 *S. varius* hatchlings were discovered in the outdoor enclosure. They had crawled through the drain hole of a metal sink that had been turned upside down on the sand surface of the enclosure. The sink had been checked three days prior to finding them, and was empty at that time, so they must have entered the sink between September 9th and 12th. The average mass and SVL of the hatchlings were 14 g (s = 0.44) and 71 mm (s = 1.3), respectively. Before reaching adult size, giant chuckwalla hatchlings increase their mass by a factor of at least 60 (14 g to 900 g), and their SVL by a factor of at least four (71 mm to 300 mm). Four days later a second group of hatchlings was found in the enclosure (average mass = 13 g, s = 0.17; SVL = 71 mm, s = 1.3). The mass and SVL of the second group was not significantly different from those of the first group (P = 0.01). A search was made of the enclosure, but no egg clutches were found.

On 26 September 1977 a tunnel was found in the enclosure. The female had entered the artificial rock and had dug beneath the sand in an easterly direction. The tunnel continued east for approximately 61 cm and then branched into two tunnels, one going south and the other going north. The branched tunnels were equal in length and extended for 30 cm beyond the fork. The eggs were buried approximately 38 cm beneath the surface. The north branch contained 18 unbroken shrunken and wrinkled egg shells. The eggs appeared old and were riddled with dozens of small holes (about 1 mm in diameter) that appeared to have been made by insects. From these observations I concluded that the eggs had been laid the previous year. The south branch contained 19 eggs, four of them empty and their hatchlings alive in the tunnel, attached to their egg sacs. The remaining 15 eggs were incubated indoors, in the dark, within a styrofoam ice chest. The eggs were placed on a wire screen that was mounted above the water. The eggs were incubated at 32° C using an aquarium water heater with thermostatic control; but none of them hatched. When opened they were found to contain embryos at different stages of development. The clay soil in this part of the enclosure was very hard and may have had a below normal oxygen tension that prevented all but the

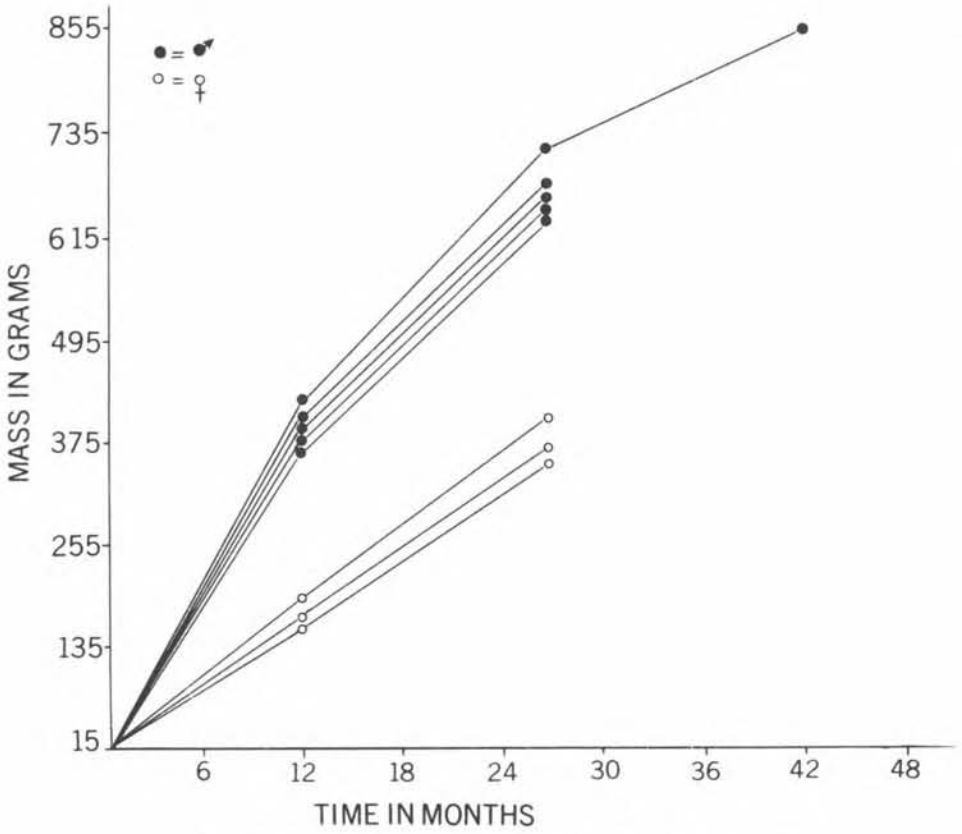


Figure 1. Increase in mass of 8 *Sauromalus varius* hatchlings.

hardiest embryos from hatching. It is also possible that the egg clutch became partially submerged in water at some time during the incubation period, although no evidence of water was present at the time the egg clutch was discovered.

The four hatchlings that were found alive in the south branch of the tunnel did not have the 1 mm spots that are characteristic of *S. varius* hatchlings, but instead had a mosaic pattern and banding of the body and tail which was similar to Schmidt's description of *S. hispidus* hatchlings (Schmidt 1922). The identity of the hatchlings was confirmed when, at the end of three months, the bands disappeared and the ground color turned from the mosaic pattern to solid black, a transition found only in *S. hispidus*.

In the spring of 1978 a portion of the enclosure was partitioned off and a yellow female giant chuckwalla introduced along with a black male giant chuckwalla. On 8 September 1978, 12 hatchlings were found in that part of the enclosure. They had sand and clay stuck to their snouts and were either dragging their egg sacs or had just broken free from them, as evidenced by the trailing abdominal cords. The appearance of these hatchlings was very similar to those of *S. hispidus*. It was not until 3 months later, when the mosaic pattern and rings faded, that the hatchlings could be positively identified as hybrids (Lowe et al. unpub. ms.). Instead of the mosaic pattern and rings being replaced by a solid black ground color, as is the case with *S. hispidus*, the ground color remained light brown and the typical black, irregular blotches of *S. varius* began to appear. The scalation of the hybrid is similar to the coarse scalation of *S. hispidus*.

From 12 September 1977 to 13 September 1979, 90 hatchlings were raised in captivity (Table 1). Ten of the 23 hatchlings from the September 12th clutch were selected at random, and their masses and SVLs monitored for a period of 27 months (two of the hatchlings died within 10 days so eight were actually used). Three of the remaining lizards were females, and grew at a slower rate than the five male lizards (Fig. 1). The hatchlings were kept in a large terrarium (2 x 1 x 0.7 m) and were measured at 12 and 27 months. On the average the males outgrew the females by a ratio of 1.9 to 1 when their masses were compared, and 1.7 to 1 when SVLs were compared. When the means of these classes were compared at 12 and 27 months the male and female lizards were found to be significantly different in both their mass and SVL growth patterns. (Table 2). One of the hatchlings, the tyrant, was followed to full adult size (mass = 900 g; SVL = 300 mm). He reached this limit at 42 months. When the mean growth of the tyrant was compared to that of the subordinate males and females, a significant difference was observed ($t = 3.24$, $P = 0.05$; $t = 13.98$, $P = 0.01$, respectively). Their masses and SVLs at hatching were compared and found not to be significantly different (Mendenhall 1975; Snedecor and Cochran 1976). The exact time that a significant difference between male and female growth occurred was not determined, but sexing of males and females may be possible as early as two months after the hatchlings emerge from their eggs.

During the three seasons from 1977 to 1979, 37 *S. varius* eggs and 19 *S. hispidus* eggs were collected and measured. The mean size of the yellow giant chuckwalla eggs was 35 mm (s = 0.82) x 50 mm (s = 1.01). The black giant chuckwalla eggs were not found to be significantly different in size from those of the yellow subspecies ($P = 0.01$). Using the formula $V = 4/3\ \pi\ ab^2$ (Oberg et al. 1975) the mean volume of the *S. varius* and *S. hispidus* eggs was determined to be 32 ml ($n = 25$; $s = 2.16$). No significant difference was found between the volume of yellow and black giant chuckwalla eggs ($P = 0.01$). This compares to 11 ml for *S. obesus* eggs (Prieto and Sorenson 1977; $n = 24$). The fact that giant chuckwalla eggs are nearly three times the volume of *S. obesus* eggs, should allow them to survive more extreme temperature variations than those of *S. obesus*, due to the smaller surface to volume ratio of their egg surfaces (Gordon 1977). This larger ratio would allow giant chuckwalla eggs to survive short periods of unfavorable temperature changes to a greater extent than eggs of smaller species. (Muth 1980). At the same time, the larger egg has a slower metabolic rate and will require a longer incubation period, which increases the chances for exposure to extremes of soil temperatures (Gordon 1977).

Muth (1980) described an incubation period of 40 to 90 days for the eggs of the desert iguana *(Dipsosaurus dorsalis)*. He proposed successful incubation temperatures between 28° C and 36° C. Eggs incubated at 28° C took 86 days to hatch, while those at 36° C required only 44 days to hatch. Water potentials between -50 and -1500 kPa did not significantly affect incubation time, but he also reported that water potentials at -1500 kPa

Table 1. Statistical data on clutches and hatchlings of *Sauromalus varius, Sauromalus hispidus,* and the hybrid cross.

Hatching Date	Number of Hatchlings	Clutch Size	Species	Mean Mass g ± s	Mean Snout to Vent mm ± s
Sept. 12, 1977	23	*	*varius*	14 ± 0.44	71 ± 1.3
Sept. 16, 1977	14	*	*varius*	13 ± 0.17	71 ± 1.3
Sept. 26, 1977	5	19	*hispidus*	14 ± 0.32	71 ± 1.3
Sept. 8, 1978	16	21	*varius*	13 ± 0.29	71 ± 0.8
Sept. 8, 1978	12	*	hybrid	14 ± 0.38	70 ± 0.5
Sept. 13, 1979 **	6	22	*varius*	11 ± 0.63	69 ± 1.0
Sept. 13, 1979	14	*	*varius*	14 ± 0.37	71 ± 0.9

* Clutch not found.

** The eggs were laid beneath the sand, in clay, and were partially submerged in water. This resulted in the death of 16 of the 22 embryos, presumably by drowning or asphyxiation.

Table 2. Mean mass and mean SVL for male and female *Sauromalus varius* hatchlings after 12 and 27 months in captivity; means compared using unpaired Student t test.

Sex	Age Mo.	Mean Mass g	SD	Range	N	t stat.	Mean SVL	SD	Range	N	t stat.
M	12	389.00	24.08	370-430	5	t=13.24 P<0.001	164.80	23.83	140-204	5	t=4.82 P<0.01
F	12	185.00	13.23	175-200	3		94.33	8.14	85-100	3	
M	27	669.80	29.89	642-720	5	t=15.12 P<0.001	227.40	23.83	200-265	5	t=5.88 P<0.01
F	27	383.33	15.28	370-400	3		141.67	7.64	135-150	3	

caused 20% of the hatchlings to be deformed, and at -2000 kPa, 50% of the hatchlings were deformed. These two parameters are no doubt responsible for incubation time differences in the chuckwalla eggs.

Carl and Jones (1979) incubated black giant chuckwalla eggs in a sealed aquarium and maintained a temperature between 29° C and 31° C. This was at the lower temperature tolerance of egg incubation (Muth 1980) and resulted in an incubation period between 94 and 99 days. The shorter incubation period required for my eggs in the enclosure probably reflects soil temperature levels that were higher (34° C to 36° C) and represents a temperature profile that is near the optimum required for egg incubation (Muth 1980).

Carl and Jones (1979) found their black giant chuckwalla eggs to be considerably smaller than mine, having a mean size of 29 x 44 mm and a volume of 19 ml. The discrepancy between the two egg volumes may be due to the use of smaller females by Carl and Jones (Vitt 1977). Another possibility may have been the differential absorption of water under different soil moisture conditions.

Description of Hatchlings

Sauromalus varius: The ground color on both the dorsal and ventral surfaces was tan, peppered with black, 1 mm spots found on all parts of the body, including the legs, arms, and tail. Only the head was free of these spots. On the dorsal surface the ground color and spots were interrupted by a yellow stripe that ran about 15 mm down the middorsal line on the nape of the neck. The posterior end of this stripe faded back into the tan ground color. As the middorsal line was followed to the tail, the ground color was interrupted by four to five yellow patches. No bands were present in this species. At approximately three months the 1 mm spots merged into black patches and the nape stripe began to fade.

Sauromalus hispidus: My description of *S. hispidus* hatchlings is in general agreement with that of Carl and Jones (1979). The dorsal ground color was brown but the mosaic pattern of the scales that divide the ground color appeared to be white in my hatchlings (they use the term reticulum rather than mosaic). The head was gray. Four transverse bands crossed the dorsum and a fifth was found at the nape. The tail usually had four bands, but occasionally five or six bands were observed.

Near the middorsal line the ground color was tinged with yellow and orange scales that formed a narrow stripe that began at the posterior edge of the nape band and ended at the proximal edge of the fourth dorsal band. As in yellow giant hatchlings, there were distinct color changes at the end of three months: the ground color became much darker, the mosaic pattern disappeared, and the yellow-orange middorsal line began to fade. I also observed the black bars that extend from the eyes to the tympanic cavity; these bars tended to give the lizards a raccoon-like appearance when viewed from the side. *S. hispidus* hatchlings exhibited an ability to change color under high light intensities and temperature elevation that was not as apparent in *S. varius* hatchlings. In bright sunlight the hatchlings turned almost black, and completely lost their mosaic pattern. After 20 minutes in the shade the mosaic pattern returned. The parietal eye, which is thought to function in thermoregulation and in reproductive activities (Ralph 1975; Ralph et al. 1979) was clearly seen in both *S. hispidus* and *S. varius* hatchlings.

ACKNOWLEDGMENTS

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ADDITIONAL NOTES ON THE BREEDING AND CAPTIVE MANAGEMENT OF THE PREHENSILE-TAILED SKINK *(Corucia zebrata)*

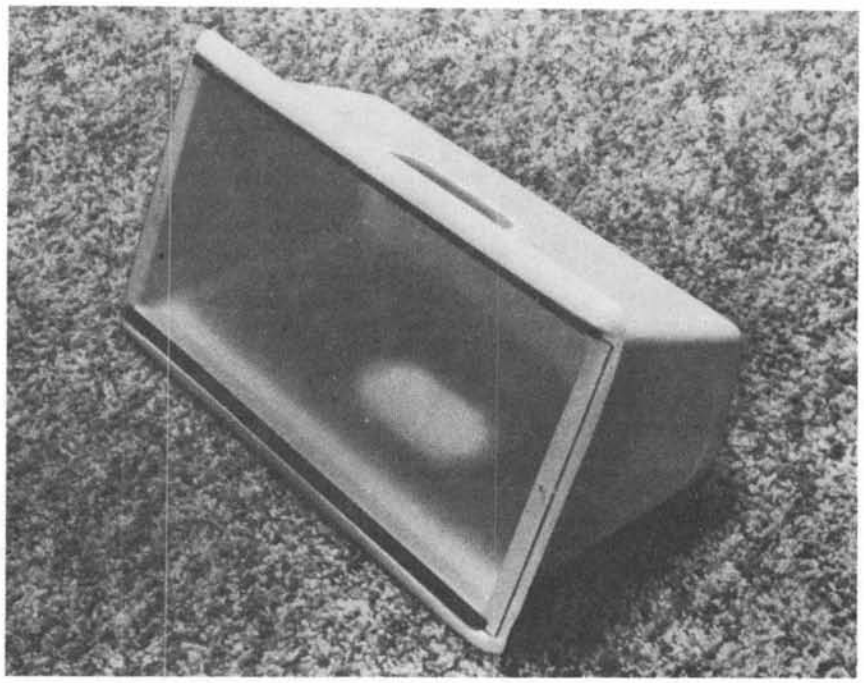
In 1975 I summarized observations on a group of captive *Corucia zebrata* (Honegger 1975). Since then, knowledge of this arboreal skink from the Solomon Islands (McCoy 1980) has increased considerably.

Origin of the specimens

The first specimens arrived in 1973 from the Bougainville Islands. In 1975 another shipment was received from the Island of Guadalcanal, also within the Solomon Islands. The largest female from Bougainville measured

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720 mm (SVL = 325, Tail = 395 mm) and weighed 758 g at its death after four years and one month in captivity. Our longevity record for imported specimens is seven years and 11 months for a female from Guadalcanal.

With the birth of twins on 23 December 1983 by the female (ZZ207) born 26 August 1978, [possibly mated with male (ZZ214) born 7 January 1981] we probably have a good F_1 generation of *C. zebrata* at Zurich Zoo.

Reproduction

Reproductive behavior was observed only once due to the crepuscular and nocturnal activity of the skinks.

After re-introduction of female ZZ207 four months after giving birth to ZZ219 and ZZ220 on 5 May 1984, copulation with male ZZ214 was observed at approximately 1200 hr.

The male followed the female on the ground for about three meters in the terrarium without tail movements. He approached the female when she was about to climb on a log, touching her with his tongue and licking her dorsally. Then the male started biting her on the left side of the neck while holding her on the trunk with his left front leg. The male then began to stroke the back and the pelvic region of the female with his left hind foot.

After a few moments, the female started raising her pelvic region and arched the tail slightly (Fig. 1). The male began twisting his pelvic region and cloaca, slid his tail slightly and achieved copulatory position. Copulation lasted for about seven and one half minutes. The female then started dragging away and began climbing the log. During copulation the prehensile tails were bent only slightly but not anchored.



Figure 1. *Corucia zebrata* in copulation (Foto Honegger)

From scars on the necks and pelvic regions of the females, we assume that reproductive activity always involves biting of the neck and stroking of the pelvic area by the male.

From close observation of individual females, we estimate a gestation period of approximately six months.

Since we lost two neonates by adult cannibalism, we now separate gravid females into medium sized terraria (100 x 50 x 90 cm) with adequate cover (leaves, peat moss, branches, bark, hollow logs, etc.). To determine the status of gravid individuals, the specimens are x-rayed (Fig. 2).



Figure 2. X-ray of female *Corucia zebrata* ZZ207 nine days prior to parturition. (X-ray and foto Zoo Zurich)

Between August 1973 and April 1984, 21 *Corucia zebrata* were born at Zurich Zoo. All but three births occurred during the night. Nine births were single, six were twin specimens, and seven specimens were stillborn. In each case, the birth membranes were eaten, probably by the females. Hitz (1983) made similar observations with *Trachydosaurus rugosus*.

Management

Immediately after birth, the neonates tended to hide within leaves, bark, or in hollow logs. The females and young were then very aggressive, as both followed and bit the intruder trying to separate them. The young were raised in separate terraria with adequate cover. After shedding their skin within 9-11 days, the young began feeding.

The females were also kept separately from the group for several weeks, allowing sufficient time to recover. After parturition, the females received an injection of vitamins A, D, E and Voren®, according to their weight. This precaution, applied to all female reptiles in the zoo after giving birth or egg laying, proved to be very successful to avoid unnecessary loss due to exhaustion.

The food consisted of fresh vegetables, including beans, carrots, fresh fruits (including kiwis), and minced meat, offered three times a week. It was supplemented with calcium, vitamins (Vionate®) and crushed dry shrimps. Bay mice were never and locusts rarely accepted. As mentioned in the earlier paper (Honegger 1975), leaves and branches of *Monstera* and *Scindapsus* were immediately accepted by the skinks. Coprophagy and keratophagy were normal behavior in adults and young.

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LIFE HISTORY NOTES

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ANURA

BUFO MARINUS (Marine Toad). **ANOMALY.** *Bufo marinus* was found dead on 13 April 1983 in the Komohana Gardens Subdivision bordering Waiakea Stream in Hilo, on the Island of Hawaii. The toad was a young male, measuring 85 mm body length and appeared emaciated. It lacked its left hind leg. The stomach and cloaca contained a single long-legged ant, *Anoplolepsis longipes*, and a

large amount of ingested soil. Other toads caught in the area had a greater variety of insects in their gut and little, if any, ingested soil. These observations suggest that our specimen was handicapped in feeding and had taken advantage of the most abundant food item available. We surmise that the toad had been foraging the previous night and was caught in the morning heat unable to return to shelter. The site of the find was a concrete sidewalk bordered by a long stonewall and a broad roadway. The nearest vegetation which might have provided shelter was about 7.5 m away.

Initial examination showed no obvious wound or scar tissue at the site of the missing leg (Figure 1). Radiographs showed no remnant of a femur attached to the acetabulum (Figure 2). The pelvic girdle and lower vertebral column was noticeably rotated to the left.



There appeared to be a healed fracture of the right femur. The distorted pelvic girdle and bone fracture were probably the result of the stress brought on by moving about with a single hind leg. The evidence suggests that the leg loss was a longstanding condition and may have been due to a congenital defect or injury at an early stage of larval development.

This specimen is in the University of Hawaii at Hilo's vertebrate collection and will be deposited with the Bishop Museum, Honolulu, Hawaii.



Submitted by **JOHN G. CHAN,** Biology Discipline, University of Hawaii at Hilo, Hilo, Hawaii 96720, and **LAURA L. YOUNG,** Minority Biomedical Research Support Program, University of Hawaii at Hilo, Hilo, Hawaii 96720, U.S.A. ●

PSEUDACRIS TRISERIATA TRISERIATA (Western Chorus Frog). **REPRODUCTION.** Reproduction in the western chorus frog has not been intensively studied and data thus far consist of casual observations. Collins (1982. Amphibians and Reptiles in Kansas 2nd edition) stated that females of this species may lay from 100 to 1500 eggs in small clutches of 20 to 30 on submerged plant stems and hatching occurs in about two weeks. The following observations serve to augment the reproductive data of this species and were made while conducting a herpetofaunal survey on Konza Prairie Research Natural Area (KPRNA) south of Manhattan in the Flint Hills region of Kansas.

On the morning of 14 March 1983 a male (1.5 g, 25 mm SVL) and female (1.5 g, 24 mm SVL) *P. t. triseriata* were collected from a temporary KPRNA spring-fed, grassland stream and placed along with water and dead grass into a glass jar. Upon returning to the lab that afternoon, the frogs were in amplexus and the female was in the process of laying eggs. A total of 294 eggs was deposited on the grass substrate in four masses of 5, 22, 110, and 157. The female weighed 1.0 g after laying the eggs. The eggs along with grass substrate were placed in a 38 l (10 gal) aquarium containing approximately 9 cm of water. Lettuce was also placed in the aquarium as a feeding substrate for tadpoles. The water was aerated and ranged in temperature from 17° to 25°C with a mean of 21°C. Tadpoles hatched from 19-22 March. Twenty tadpoles hatched; the remaining eggs appeared infertile and soon deteriorated. On 14 April 15 tadpoles were yet alive and three of those were preserved on 20 April. On 29 April small appendages were apparent on tadpoles. By 25 May, four had completely metamorphosed and others were in the last stages of metamorphosis. All were preserved on 26 May.

On 25 May 1983 at 1350 hr an amplexing pair of *P. t. triseriata* was found in a woodland KPRNA stream. No eggs were around the pair so it was assumed that deposition of eggs had not occurred. The frogs were placed in a damp cloth bag and 8 hours later upon removal from the bag the frogs were still in amplexus. They were placed in a glass bowl with grass substrate and the female laid four clumps of eggs containing nine, 25, 46 and 143 eggs for a total clutch size of 223. These eggs were promptly preserved after deposition.

Submitted by **MARK L. HEINRICH,** Division of Biology, Kansas State University, Manhattan, Kansas 66506, U.S.A. ●

SCAPHIOPUS INTERMONTANUS (Great Basin Spadefoot Toad). **MORTALITY.** Larvae were found in a shallow pond 9 km SW Barriere, British Columbia, Canada on 7 July 1984. Growth and development of the larvae were monitored over the following three weeks (Table 1). Samples of larvae were collected and preserved in 10% formalin.

During hot dry weather the pond began to dry and larvae were surfacing for air and then diving to the bottom. On 15 July common crows *(Corvus brachyrhynchos)* were observed catching and eating the larvae. An adult crow stood at the pond's edge, waited, then plunged its beak into the shallow water. In one 10 minute period it captured five larvae. The adult crow was accompanied by four young. They did not attempt to catch larvae although one young crow stood poised at the water's edge but did not strike. On several occasions the adult fed larvae to the begging young. After hunting and feeding on toad larvae for about 20 minutes the crows moved to a nearby pasture and fed on worms and insects. Crows visited the pond and captured larvae at various times until 21 July.

Most of the larvae were transformed by this date and had only remnants of their tails. It rained lightly in the late afternoon of 21 July, but heavily that night during a thunderstorm. By morning only a few larvae remained in the pond. These were less developed than the bulk of the larvae present the day before. Some had only begun to grow legs. This storm, the only precipitation in nine days, may have facilitated dispersal of the toads. Small toads were captured 110 m from the pond on 2, 4, and 7 August along a dry south-facing sidehill. If these small toads were among those that dispersed from the pond since 17 July, snout-vent length did not change, length of the hind leg increased and body weight decreased.

Submitted by **ALTON S. HARESTAD,** Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, Canada V6T 1W5. ●

Table 1. Growth of *Scaphiopus intermontanus* in south central British Columbia. S-V is snout-vent length. Measurements are mean±SE.

Date	N	Length (mm) S-V	Length (mm) Tail	Length (mm) Hind Leg	Preserved Wet Weight (g)	Proportion with Fore-Leg Exposed
7 July	13	25.5±.8	31.5±1.5	3.8±.4	3.8±.3	0/13
12 July	10	27.4±.4	34.0±1.0	18.5±.5	4.0±.1	0/10
14 July	19	25.9±.4	32.8±0.6	23.3±.8	3.5±.1	6/19
17 July	34	23.2±.5	25.6±1.2	22.8±.8	2.4±.1	21/34
2-7 August	3	25.3±.3	0.0	28.3±.3	1.8±.1	3/3

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CAUDATA

AMBYSTOMA GRACILE GRACILE (Brown Salamander). **WINTER ACTIVITY.** On 5 January 1984, at 2120 hr, an adult male *Ambystoma gracile* was collected as it crossed a road at the Wind River Experimental Forest, 8 km N Carson, Skamania Co., Washington. The air temperature at time of capture was 1° C. Ten measurements of snow depth were taken at 3 m intervals on both the W and E sides of the road. On the W side was a small residential area. A large silviculture field on the E side of the road was completely exposed. The mean snow depth was 35.8 cm. The late fall and early winter months prior to capture were abnormally cold, with temperatures down to -22° C, and maximum December temperatures near freezing. On 3 January, temperatures warmed up, and a small, shallow reservoir of Trout Creek (185 m away) known to harbor *A. gracile* larvae, partially thawed. On 5 January the maximum air temperature was 5° C.

Nussbaum et al. (1983. Amphibians and reptiles of the Pacific Northwest, University Press of Idaho) indicate that terrestrial adults of *A. gracile* tend to be active only during warm spring and fall rains, especially during the spring breeding season. In winter and summer, they reportedly reside in subterranean retreats. The new record indicates that this species may have a longer period of yearly activity and a greater tolerance of cold temperatures than previously thought. This observation is one of a few records for temperate non-plethodontid salamanders found at a temperature near freezing (Feder and Lynch. 1982. Ecology. 63:1657-1664).

I thank J. Buchanan, R. Lundquist and D. Zirjacks for assistance gathering data, and R. B. Bury for commenting on the text. The specimen will be deposited in the National Museum of Natural History (USNM). Contribution number 15 of the Old Growth Wildlife Habitat Program, U.S. Forest Service.

Submitted by **LAWRENCE L. C. JONES,** Denver Wildlife Research Center, 1300 Blue Spruce Drive, Fort Collins, Colorado 80524, U.S.A. ●

DICAMPTODON ENSATUS (Pacific Giant Salamander). **COLORATION.** On 4 September 1983, an albino Pacific giant salamander was collected in a tributary of Panther Creek, 12.8 km N Carson, Skamania County, Washington. The larva was found in 3 mm of water under a 50 x 38 mm rock on a small island between two riffles of the creek. The water temperature was 7.5° C at the time of capture (1620 h). The salamander measured 38 mm SVL and 67 mm TL, and weighed 1.7 g.

The specimen is yellowish, with no indication of pigment. The end of the tail, which is black in normally pigmented individuals, appears light grey, but lacks melanin. Other normally pigmented areas of the body also appear light grey, or are colorless. The cornified tips of the toes are black. The gills are light orange. The internal organs are visible through the white venter.

Nussbaum (1976, Misc. Publ. Mus. Zool. Univ. Michigan. 149:1-94) discussed three partial albinos from a single creek in Benton Co., Oregon. These specimens were not considered albinistic because they had dark eyes. Our specimen appears to have dark eyes in normal light, but the eyes appear deep red under bright light. Nussbaum et al. (1983, Amphibians and Reptiles of the Pacific Northwest, University Press of Idaho, 332 pp.) show a photograph of a *D. ensatus* larva also from Benton Co., Oregon. It is called an albino in the caption, but is not described in the text. We are unaware of any other reports of albino *D. ensatus* (Dyrkacz 1981. SSAR Herpetol. Circ. 11:1-32; Hensley 1959. Publ. Mus., Mich. St. Univ. 1:133-159).

The salamander is being raised to a larger size in captivity. (Contribution number 14 of the Old Growth Wildlife Habitat Program, USDA Forest Service.)

Submitted by **LAWRENCE L. C. JONES** and **R. BRUCE BURY,** U.S. Fish and Wildlife Service, Denver Wildlife Research Center, 1300 Blue Spruce Drive, Fort Collins, Colorado 80524, U.S.A. ●

ENSATINA ESCHSCHOLTZII OREGONENSIS (Oregon ensatina). **REPRODUCTION.** Much of what is known about the reproductive biology of western plethodontid salamanders is based on preserved specimens or laboratory observations. Although the ensatina *(Ensatina eschscholtzii)* is the most widespread, and often most abundant, western plethodontid, only a few descriptions of egg masses in nature are available (review by Stebbins. 1954. Univ. Calif. Publ. Zool. 54:47-124; Norman and Norman. 1980. Bull. Chicago Herp. Soc. 15:99-100). Oviposition has only been observed twice, and both were laboratory records (Stebbins, 1954). Stebbins (1954) indicates that female ensatinas are capable of moving the egg mass after it has been deposited, and thus the locations where eggs have been found are not necessarily the sites where egg deposition occurred. Here, we describe the first observation of oviposition by *E. eschscholtzii* under natural conditions.

On 1 May 1984, a large female *E. eschscholtzii oregonensis* (109 mm TL, 63 mm SVL) was found in the central Cascade Mountains of Washington (5.6 km S, 1.5 km W of Packwood, Lewis County, T12N, R9E, Sec. 4, SW 1/4; elev. 700 m) in the act of egg deposition. Ten eggs had been laid in a gelatinous grape-like cluster as described by Stebbins (1954). The last egg protruded from her vent, but was still attached by a strand of jelly. No remaining eggs were visible in her abdomen. The salamander was observed for about 10 min, and remained motionless throughout this period in a twisted, prone position (Fig. 1). Her position was similar to that described and illustrated by Stebbins (1954, p. 93) for *E. e. picta-oregonensis* intergrades under laboratory conditions, but differed in several ways. She was lying on her left side, rather than her right, exposing the lower right portion of her abdomen. Because of this, her right front foot was stretched back, whereas her left front foot rested on the surface of the cavity. Her hind feet were spread widely apart, not pressed against the egg mass, and her tail was outstretched rather than curled. As was noted by Stebbins (1954), the gular region pulsated intermittently.

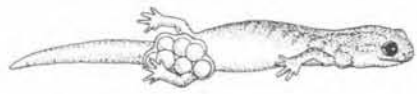


Figure 1. Position of female *Ensatina eschscholtzii oregonensis* during oviposition.

The salamander was found inside a downed red cedar *(Thuja plicata)* log, measuring 36 cm in diameter and 10 m in length. The log still retained its original shape, but the bark was gone and the sapwood had begun to decompose (= decay class 3; Maser et al. 1979. *In* Thomas. Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. USDA For. Serv., Agric. Hndbk. No. 553, pp. 78-95). The ensatina was in a small cavity 8 cm beneath the surface of the log. The surrounding vegetation consisted of a dense stand of second growth coniferous forest resulting from a fire about 65 years ago. Dominant species were Douglas-fir *(Pseudotsuga menziesii),* western hemlock *(Tsuga heterophylla),* and red cedar, with little understory. It was raining lightly at the time of capture (1527 hr) and the air temperature was 5° C. The log was located on a fairly steep (41%) slope, facing northeast (44°). *E. eschscholtzii* was the only species of salamander found during a four person-hour search of the stand. Ten individuals were collected, including five adult males, four adult females, and one juvenile.

Two eggs measuring 6.2 mm in diameter were collected as vouchers and deposited in the Museum of Vertebrate Zoology at the University of California, Berkeley (MVZ 190828).

We thank Barbara Schrader for assistance in the field, and R. Bruce Bury for reviewing an early draft of the manuscript. This note is contribution No. 24 of the Old-growth Forest Wildlife Habitats Program, USDA Forest Service.

Submitted by **LAWRENCE L. C. JONES**[1] and **KEITH B. AUBRY,** College of Forest Resources, AR-10, University of Washington, Seattle, Washington 98195, U.S.A.

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CROCODILIA

CROCODYLUS ACUTUS (American crocodile). **AGGRESSIVE BEHAVIOR.** During a night survey in the dam of Pueblo Viejo, 30 km west of Maracaibo Lake, State of Zulia, Venezuela, on 13 June 1984, we tried to catch by hand a juvenile American crocodile *(Crocodylus acutus).* The first attempt was unsuccessful, but we observed that this animal was gripping in its jaws a hatchling of *C. acutus.* The disturbance apparently caused the juvenile to release the hatchling, which showed some injuries on the neck and lower jaw and died a few minutes later. After three further attempts we were able to capture the juvenile, which was 628 mm total length (324 mm

snout-vent length) and weighed 580 g. The hatchling was 267 mm total length (130 mm snout-vent length) and weighed 40 g. Both animals, especially the hatchling, seemed to be very lean. We had the same impression with five other hatchlings of *C. acutus* and two juveniles of *Caiman crocodilus* that were caught in the same dam. We suspect that this aggressive behavior of the juvenile (probably a two year old) may have been cannibalism. Cannibalism has been reported for many species of crocodilians, but in most instances has been reported for adults against juveniles or hatchlings (Staton and Dixon 1975. Mem. Soc. Cienc. Nat. La Salle 101(35):237-265; Medem 1981. Los Crocodylia de Sur América Vol. 1. Los Crocodylia de Colombia. Ed. Carrera, Bogota. pp. 140 and 175).

This behavior of *C. acutus* might be considered as exceptional and provoked by the scarcity of food in the dam, the borders of which had lost their marginal aquatic plants because of a severe drought in the area. It could also have been aggravated by the ecological disturbance created by the introduction of a fish, *Cichla ocellaris* (Pisces:Cichlidae), in the reservoir.

Submitted by **ANDRÉS E. SEIJAS, DAVID G. CORDERO** and **RAMÓN RIVERO,** Servicio Nacional de Fauna Silvestre, MARNR, Apartado 184, Maracay, Venezuela. ●

PALEOSUCHUS PALPEBROSUS (Dwarf Caiman). **MIGRATION.** From 1976 to the present the authors have been accumulating field data for evidence of terrestrial migrations in the crocodilian *Paleosuchus palpebrosus.* Previous references regarding aquatic or terrestrial, and passive or active migrations for other alligatorid genera in South America were summarized by Medem (1981, 1983. Los Crocodylia de Sur América, Vols. I-II, Colciencias, Bogotá, Colombia).

Details of our six records in the Guayana region of Venezuela are as follows: (1) Guri Airstrip, near the Río Tocomita, Estado Bolívar (07°46'N-63°06'W); a juvenile found on the airstrip in 1976, with a 220 mm snout-vent length (SVL). (2) Puerto Ordaz, Estado Bolívar (08°18'N-62°49'W); a juvenile found in a partially constructed drainage ditch on the job-site of an aluminum factory, adjacent to the Orinoco River, on 11 July 1976, with a 310 mm SVL. (3) El Manteco, Estado Bolívar (07°21'N-62°32'W); a juvenile found on a road beside the airstrip in 1978, with a 155 mm SVL. (4) Hato El Diamante, 16 km SE of El Manteco, Estado Bolívar (07°15'N-62°27'W); a male found on a savanna track on 15 July 1980, with a 595 mm SVL. (5) Gavilán, 40 km SSE of Puerto Ayacucho, Territorio Federal Amazonas (05°34'N-63°22'W); a juvenile (EBRG 1795) found in a small puddle on a forest road in November 1980, with a 340 mm SVL. (6) Granja Santa Bárbara, 4 km E of San Félix, Estado Bolívar (08°23'N-62°37'W); a male found in the swimming pool of a farmhouse on 3 February 1981, with a 560 mm SVL.

The recorded sites were as far as 4 km to the nearest evident bodies of water and the encounters with crocodilians were made both during the day and at night. The preferred habitats of *P. palpebrosus* in Venezuela are rivers and "morichales" (palm swamps), but it is probable that they also occupy seasonal lagoons flooded by large rivers, even though we have never found this species in such circumstances.

Terrestrial migrations were observed in both tropical seasons (dry and rainy), suggesting that such behavior in these crocodilians occurs throughout the year. This type of migration seems not to be related to age, since both young and adult crocodilians were recorded migrating. The relationships of the terrestrial migration with ecological factors remain unknown at the present time in *P. palpebrosus,* but they could be partially associated with occasional searching for food, as evidenced in the alligatorid *Caiman crocodilus* (Gorzula 1978. Oecologia(Berl.) 35:21-34) from the northern savannas of the Venezuelan Guayana.

Submitted by **ALFREDO PAOLILLO O.,** Instituto de Zoología Tropical, Universidad Central de Venezuela, Apartado 47599, Chaguaramos 1041-A, Caracas, Venezuela and **STEFAN GORZULA,** División de Cuencas e Hidrología, C.V.G. Electrificación del Caroní C.A., Apartado 62413, Caracas, Venezuela. ●

SAURIA

CNEMIDOPHORUS SEXLINEATUS VIRIDIS (Prairie-lined Racerunner). **ARBOREALITY.** On 17 May 1984 we witnessed an unusual escape behavior of a female prairie-lined racerunner at a sandy open area bordered by a woodlot 5.5 miles N of Lake Texoma on U.S. Hwy 377, Marshall county, Oklahoma. At 1830 CDT we dug the lizard out of its overnight burrow in the sandy area and chased it approximately 12 m to the edge of the woodlot. It ran another 3 m to the base of a post oak tree (diam. approx. 15 cm). As BCH approached, the lizard climbed the trunk of the tree using a wriggling motion similar to that of a skink. It moved from the south to the north side of the tree as it climbed and reached a height of 2 m before it was captured.

This behavior is unusual because this species is strictly terrestrial and typically escapes danger by dashing into a burrow or a clump of vegetation (Fitch 1958. Univ. Ks. Publ. Mus. Nat. Hist. 11:11-62; Hardy 1962. Univ. Ks. Sci. Bull. 43:1-73) although it has been reported to dive into water when threatened (Stille 1947. Copeia 1947:143). Young racerunners commonly climb to heights of nearly 1 m in bushes to forage (MAP, pers. obs.) but this type of climbing has never been noted as an escape behavior. Tree-climbing probably represents an escape method that racerunners use when other means of escape are unavailable.

The lizard (SVL 72 mm, total 170 mm) is presently housed at the Animal Behavior Lab, University of Oklahoma.

Submitted by **MARK A. PAULISSEN** and **BRET C. HARVEY,** Department of Zoology, University of Oklahoma, Norman, Oklahoma 73019, U.S.A. ●

EUMECES CALLICEPHALUS (Mountain Skink). **REPRODUCTION.** The mountain skink, *Eumeces callicephalus,* barely ranges into the United States. In Arizona, it is known from the Pajarito, Baboquivari, Santa Rita and Huachuca Mountains (Stebbins. 1966. A field guide to Western reptiles and amphibians; Smith and Brodie. 1982. Reptiles of North America). Little is known concerning reproduction in this species. However, it is reported to be oviparous (Fitch. 1970. Misc. Publ. Univ. Kansas Mus. Nat. Hist. 52.).

On 2 June 1983, an adult female (15 cm total length) was collected by Pete Mayne at Pena Blanca Canyon, Santa Cruz County, Arizona at 1649 hr. The specimen was kept in a 19 l aquarium with leaf litter as a substrate. After several weeks it was apparent that the specimen was gravid, as indicated by increased girth. At this time it was placed in a plastic shoe box with damp mulch and flat rocks. The box was checked daily, and on 13 August, one neonate was found in the box. On 14 August, a second, dead neonate was seen protruding from the female's cloaca. This specimen was born tail-first.

The neonates were vividly colored but similar in pattern to the adult. They measured approximately 1.5 cm total length. The first neonate died after a few days. Both are preserved in the collection of Arizona State University (ASU 22808, 09).

Additional females will have to be collected to determine if this is an isolated occurrence or if all northern populations of *E. callicephalus* are ovoviviparous.

Submitted by **TOM TAYLOR,** 1433 West Huntington Drive, Tempe, Arizona 85282, U.S.A. ●

SCINCELLA LATERALIS (Ground Skink). **PREDATION.** On 9 April and 23 April 1983 the senior author (MK) collected 16 and 19 eastern meadowlarks *(Sturnella magna),* respectively, in tallgrass prairie habitat in Pawnee County, Oklahoma. All birds were collected between 0930 and 1030 hr. Esophageal and gizzard contents were removed and preserved in 70% isopropyl alcohol. Food samples from one adult male and two adult females (8.6% of the birds sampled) contained lizard remains; two contained unidentifiable skink tails while the third sample contained one *Scincella lateralis* (SVL = ca 46 mm).

Previous meadowlark food habit studies have not shown lizards to be a component of meadowlark diets (Beal 1926. Some common birds useful to the farmer. U.S.D.A. Farmer's Bull. 630 (rev.). 27 pp.; Beal, McAtee and Kalbach. 1927. Common birds of southeastern United States in relation to agriculture. U.S.D.A. Farmer's Bull. 755. 39 pp.; Bent 1958. Life history of blackbirds, tanagers, and orioles. U.S. Nat. Mus. Bull. 211:67-70; Martin, Zim and Nelson. 1951. American wildlife and plants: A guide to wildlife food habits. Dover Press, New York, pp. 167-168). Our findings are not surprising in light of the fact that Terres (1956. Auk 73:289-290) reported a meadowlark feeding on a road-killed tufted titmouse *(Parus bicolor)* and Redelfs (pers. comm.) reported that a meadowlark killed and ate a house sparrow *(Passer domesticus).* Since *S. lateralis* is a relatively small

lizard we feel that meadowlarks may prey heavily on small individuals of larger species such as sub-adult and hatchlings if available. Meadowlarks should be considered potential lizard predators in future ecological studies.

Submitted by **MICHAEL R. KEMMERER,** Oklahoma Cooperative Wildlife Research Unit, Oklahoma State University and **GEORGE R. CLINE,** Department of Zoology, Oklahoma State University, Stillwater, Oklahoma 74078, U.S.A. ●

UROSAURUS ORNATUS (Tree Lizard) **REPRODUCTION.** Numerous reports on the clutch size of tree lizards have revealed considerable variation both within and between populations. The maximum clutch size previously reported appears to be 16 from a population in Animas, Hidalgo, Co., New Mexico (Michel 1976. Southwest. Nat. 21:281-299), whereas most populations tend to have maximum clutch sizes of 12 or less (van Loben Sels 1976. MS Thesis. Arizona State University). We report here on a female which was carrying 17 oviductal eggs.

The female was collected from the eastern slope of the Organ Mountains at Aguirre Springs, 25 air km east of Las Cruces, Dona Ana Co., New Mexico on 20 June 1984 and kept isolated from males in an indoor tank. When killed and dissected on 19 July 1984, nine eggs and nine corpora lutea were found on the right side; eight of each on the left side. Mean egg wet weight was approximately 155 mg. The intact female weighed 7.6 g. Eggs contained well-developed embryos (Hubert and Dufaure stage 25-26) and complete egg shell membranes. Thus, this species represents an egg retainer as defined by Shine (1983. Herpetologica 39:1-8).

Van Loben Sels (1976, MS Thesis. Arizona State University) suggested that clutch size in this species is lower in arid regions than in mesic riparian areas. The largest reported clutch sizes to date, however, have been recorded from saxicolous populations in arid regions of southern New Mexico. This suggests that the shorter reproductive activity season in New Mexico, when compared with that of Arizona and central Texas, may result in larger clutch sizes which compensate for the reduced number of clutches being produced in a year (Michel 1976. Southwest. Nat. 21:281-299).

Thanks are due Ms. Rita Lawlor for help in collecting the specimen.

Submitted by **NAIDA ZUKER,** Department of Biology, New Mexico State University, Las Cruces, New Mexico 88003-0032, U.S.A., and **LOUIS J. GUILLETTE JR.,** Department of Biological Sciences, Wichita State University, Wichita, Kansas 67208, U.S.A. ●

SERPENTES

BOTHROPS ASPER (Terciopelo). **CAUDAL LURING.** Two gravid *Bothrops asper* were collected in early June 1984 in Cartago province, Costa Rica. Broods of 34 (with two stillborn) and 37 were recorded on 14 July and 18 August 1984. Neonate sexing was accomplished by noting the presence (male) or absence (female) of yellow tail coloration and later verified by probing in some individuals. In a total of 69 living offspring, there were 30 males and 39 females. Reproductive data are given elsewhere (Tryon. 1985. Life History Notes. Herp. Review 16(1)).

Neonates were housed in various sized enclosures with newspaper substrate. The number of specimens in each varied but always consisted of two or more. Newborn mice were offered at weekly intervals once initial sheddings were completed. These were eventually accepted by approximately fifty percent of the snakes over a several month period. Between rodent feedings, eight instances of cannibalism occurred at night but were never observed.

Caudal luring was noted on several occasions in male and female snakes from both broods. These snakes assumed a tight coil with the distal 5-10 mm of the tail exposed from between coils and close to the head (behind or to one side). In each instance, the exposed tail tip was undulated gradually from side to side. The rate of motion was so slow that luring activity would probably not have been noted had changed tail position been overlooked in an otherwise motionless snake. Luring activity did not seem to be associated with the presence or absence of food items and occurred at various times throughout the day.

Burger and Smith (1950. Science 112:431-433) reported the occurence of sexual dimorphism in tail coloration of neonate *B. asper* from certain locales. They noted that the young snakes accepted a diet comprised of small frogs and several varieties of snakes (including littermates), and speculated that this variation in diet might be associated with the failure to develop brightly colored tail tips in both sexes. During their observations, the snakes' tails were often held up to a degree but actual luring behavior was not seen.

It has been generally accepted that snakes which employ caudal luring are those with a conspicuously colored or patterned tail tip (see Neill. 1960. Quart. J. Florida Acad. Sci. 23:173-200, for a review). It seems reasonable to assume, however, that in a species such as *B. asper,* luring behavior *per se* would not be restricted according to sex or to a sexually dimorphic caudal coloration. Investigations into feeding strategies and behavior, and food preferences of neonatal *B. asper* under natural conditions or controlled captive conditions may be necessary before the relative effectiveness of luring between sexes can be demonstrated, and a plausible explanation for sexually dimorphic caudal coloration can be presented.

For various courtesies I thank R. A. Nichols and J. Whitehead.

Submitted by **BERN W. TRYON,** Department of Herpetology, Knoxville Zoological Park, P. O. Box 6040, Knoxville, Tennessee 37914, U.S.A. ●

BOTHROPS ASPER (Terciopelo). **REPRODUCTION.** *Bothrops asper* is a large (exceeding 240 cm), prolific pit viper found from southern Veracruz south through Central America to northern Colombia (Wilson and Meyer. 1982. The snakes of Honduras. Milwaukee Pub. Mus. Publ. Biol. Geol. 6:1-159). Broods of up to 71 have been reported (March. 1928. Bull. Antiv. Inst. Amer. 1(4):92-97) from females of maximum size. Reproductive records are available from several localities throughout the range, but few have been taken from Costa Rican specimens (see Fitch. 1970. Univ. Kansas Mus. Nat. Hist. Misc. Publ. 52:1-247, for a review).

Two gravid females (KSP-CR-37, 38; total length approximately 1.5 m) were taken in early June 1984 at an elevation of 600 m at Fincada Celolosa, Pavones de Turrialba, Cartago province, Costa Rica. Birth occurred on 14 July (CR-37) and 18 August 1984 (CR-38). Brood sizes were 34 (including two stillborn) and 37 respectively. Sexing was accomplished by the presence (male) or absence (female) of yellow tail coloration (see Burger and Smith. 1950. Science 112:431-433) and later verified by probing in some specimens.

Brood one was comprised of 10 males and 22 females, and brood two of 20 males and 17 females. Measurements of brood two were as follows: males, TL 305-327 mm ($\bar{X}$=314.2), weight 8.1-9.7 g ($\bar{X}$=9.3 g); females TL 300-325 mm ($\bar{X}$=309.4) and weight 8.1-9.7 g ($\bar{X}$=9.1). Grand means (N = 37) were TL 312.0 mm and weight 9.2 g. Shedding occurred 8-12 days after birth in both broods.

For various courtesies I thank J. A. Campbell, R. Hudson and M. R. Hernandez. Appreciation is extended to G. C. Mora of the Departamento de Vida Silvestre, de la Dirreccion General Forestal, San Jose, Costa Rica, for granting permits. Some specimens have been placed in the vertebrate collection of the University of Texas at Arlington.

Submitted by **BERN W. TRYON,** Department of Herpetology, Knoxville Zoological Park, P.O. Box 6040, Knoxville, Tennessee 37914, U.S.A. ●

CROTALUS HORRIDUS (Timber Rattlesnake). **COLORATION;** On 1 May 1983 an amelanistic partial albino *Crotalus horridus* was collected 7 miles north of Bogata, Texas near Cuthand Creek in Red River County by Fred Wissinger. The specimen, a female, was ca. 450 mm total length when captured and was probably in its second or third year of life.

The specimen is completely lacking in melanin and has a ground color that is creamy white with a pinkish-yellow tinge. The body pattern consists of a series of pale orange blotches which are fused dorsally to form a continuous pattern at the anterior portion of the body. There is also a series of unconnected lateral blotches located anteriorly. The dorsal blotches become progressively narrower and eventually fuse with the lateral markings to form chevronlike crossbands that are connected mid-dorsally by a pale orange stripe. There is a considerable amount of yellow pigment suffused with the orange posteriorly. The tail is solid white and patternless. The head is pale orange to faint pink with an orange postocular stripe and the iris is pale pink with a red pupil.

Color anomalies in *C. horridus* from northern populations have been documented.

Hensley (1959, Pub. Mus. Mich. State Univ., Vol. 1, No. 4) reports albinistic specimens from Massachusetts, New York, Pennsylvania and North Carolina. In a review of albinism, Dyrkacz (1981, SSAR Herp. Circular No. 11) provided additional accounts of aberrant *C. horridus* from Iowa and Pennsylvania, however, both of these specimens possess black tails and cannot be considered amelanistic. Until this time, there have been no reports of amelanism in *C. horridus* from a southern population which exhibits the pattern characteristics of the formerly recognized Canebrake *(atricaudatus)* morph. The previous southernmost locality was given as Yancey County, North Carolina and the specimen was simply described as being xanthic with a faint pattern (Hensley, op. cit.).



Figure 1. Sub-adult amelanistic partial albino *Crotalus horridus* collected in Red River County, Texas.

The specimen has been maintained in the reptile collection at the Fort Worth Zoological Park since its capture and at the time of this writing (November 1984) is 1115 mm total length. Upon death, the specimen will be deposited in the Vertebrate Collection of the University of Texas at Arlington.

Submitted by **RICHARD HUDSON,** Department of Herpetology, Fort Worth Zoological Park, 2727 Zoological Park Drive, Fort Worth, Texas 76110, and **GARY CARL,** 4312 Merida, Fort Worth, Texas 76115, U.S.A. ●

CROTALUS VIRIDIS VIRIDIS (Prairie Rattlesnake). **COLORATION.** On 2 July 1984, an aberrantly patterned prairie rattlesnake *(Crotalus viridis viridis)* was collected by SLR approximately 5 miles S of Shawmut (NE1/4, section 8, T6N, R18E) Wheatland County, Montana. The male specimen has a snout-vent length of 79 cm, a tail length of 6 cm, and a mass of 230 g. The usual (brown-bordered-by-white) middorsal and lateral blotches are absent. The dorsum is light brown, apparently a normal ground color. Small black spots are scattered anteriorly on the middorsum. Rows of similar black spots are found on either side of the body at the junctures of the ventral and dorsal scales. The usual head coloration is absent, being a uniform light brown color with a subtle diffusion of black pigment on top. The iris of the left eye is darkened to the point that the pupil is difficult to discern. Most distinctive of all aberrant features is an irregularly shaped black dorsal blotch approximately 10 cm in length centered directly over the vent. This blotch is cut in the middle by two white triangles (one on either side). These triangles appear to be unpigmented skin. The venter is a uniform cream except on the tail where there exist several unpigmented patches similar to those described above. Head scalation conforms to the normal range of variation with one exception: the scales between the supraoculars and the top of the rostral failed to form. Instead, there exists a keratinized patch of skin. The tongue is pink, grading to white at the tips.

The snake described here does not conform to the more commonly described types of pattern and color aberration (e.g., stripes, albinos, melanos, patternless). It is similar, however, to three prairie rattlesnakes described by Gloyd (1958. Chicago Acad. Sci. 10(12):185-195. CA13357, CA6165, CA11058).

Submitted by **JOSEPH B. SLOWINSKI,** Department of Biology, P.O. Box 249118, University of Miami, Coral Gables, Florida 33124 and **STANLEY L. RASMUSSEN,** 950 Lafayette, Apt. 303, Denver, Colorado 80128, U.S.A. ●

LEPTODEIRA ANNULATA ASHMEADI (Trinidad Garden Snake). **EGGS.** Here we report the presence of *L. annulata* eggs in the nests of leaf-cutter ants *(Acromyrmex octospinosus)* in the area around the Simla Research Station, Arima Valley, Trinidad, W.I. The central fungus chamber of a small nest (approximately 25 x 40 cm) from a cocoa plantation above Simla (elevation approximately 250 m), excavated 25 April 1983, yielded three elongate (33 x 10 mm) eggs of *L. annulata.* One egg, dissected and fixed immediately contained a 46 mm long embryo. The remaining two, placed in the fungus garden of a captive leaf-cutter ant colony *(Atta cephalotes)* and maintained at 25° C, were dissected and fixed on 10 June 1983. One of these embryos measured 163 mm in length. The central fungus chamber of another *Acromyrmex* nest situated at the bottom of the Simla road (elevation 200 m) excavated 4 May 1983 contained three elongate eggs. Two were fixed in alcohol immediately; one was ruptured and the other measured 35.5 x 10.1 mm. The correspondence in size between these and the *L. annulata* eggs (above) suggests that they are the same species although the embryos are not sufficiently developed for specific diagnosis. In both nests, the eggs were buried deep in the living fungus garden.

Emsley (1977, Md. Herp. Soc. Bull. pp. 201-304.) reports that the eggs of *L. annulata* "are laid between June and November in forest floor litter or other decomposing vegetation about two months after mating," but Emsley (pers. comm.) has no record of the source of this information and our findings of two clutches from *Acromyrmex* nests may cast doubt on this claim.

We are grateful to Mr. A. F. Stimson for identifying the snakes.

All the specimens are deposited in the British Museum (Natural History): (Registration numbers BMNH 1983: 1135, 1136, 1137; BMNH 1983: 298). This work was supported by NERC Grant No. GR3/5016.

Submitted by **JOHN RILEY** and **JUDITH M. WINCH,** Department of Biological Sciences, University of Dundee, Dundee DD1 4HN, Scotland. ●

TRIPANURGOS COMPRESSUS (Trinidad Pseudofalse Coral Snake). **EGGS.** An excavation of a large nest of the leaf-cutter ant *Atta cephalotes* above the Simla Research Station (Arima Valley, Trinidad, W.I.) on 1 May 1983 yielded 12 eggs of the colubrid *Tripanurgos compressus.* Since the excavation was carried out by a bulldozer, neither the exact location of the eggs in the nest nor the total number of eggs present could be precisely determined.

There were two distinct size categories of oval eggs: six measured 27 x 15 mm and six were 29.5 x 15 mm. One of the larger eggs was preserved and the remaining five, placed in damp sawdust and incubated at room temperature (28° C), hatched from 6-8 May. Hatchlings were kept alive for two weeks before being killed and preserved. Their mean length was 289 mm. Hatchlings did not feed while maintained alive.

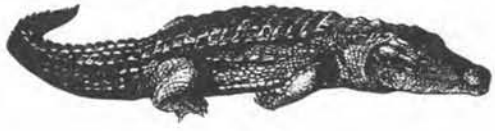
Four of the smaller eggs were damaged and two of these were preserved immediately, two were discarded and the remaining two intact eggs were incubated in the fungus chamber of a small captive colony of *Atta cephalotes* maintained at 25° C. They were dissected and the embryos preserved on 10 June 1983. These embryos were 177 and 118 mm long.

The two distinct size categories of eggs, destined to hatch at very different times, suggest that two or more females oviposited in the same nest. Snakes are well known for their considerable intraspecific variation in egg size and several factors are known to influence this, for example, the size of the mother and the amount of food available to the mother. Thus the discovery of two egg clutches of *T. compressus* in a single nest is significant inasmuch as it provides stronger evidence that this species seeks out ant nests as egg-laying sites.

T. compressus is a nocturnal, terrestrial, locally common snake in forested areas where it feeds on lizards and probably arthropods (Emsley 1977, Md. Herpet. Soc. Bull. 201-304) and this is the only record of its life history. The utilization of leaf-cutter ant nests for brood provision is well known in a number of snakes on the mainland of South America (see Vaz-Ferreira et al. 1970, Physis, B. Aires 29:431-459; Vaz-Ferreira et al. 1973, Trab. V Congr. latinoam. Zool., 1:232-244).

All the specimens are deposited in the British Museum (Natural History): Registration numbers BMNH 1983.292-296, 297, 299, 300-301; 1983.1138). This work was supported by NERC Grant No. GR3/5016.

Submitted by **JOHN RILEY** and **JUDITH M. WINCH,** Department of Biological Sciences, University of Dundee, Dundee DD1 4HN, Scotland. ●



TESTUDINES

CLEMMYS INSCULPTA (Wood Turtle). **PREDATION-MUTILATION.** A fifteen year mark-recapture study in northern Michigan revealed that 12.5% (42/337) of marked wood turtles *(Clemmys insculpta)* had mutilated or amputated limbs (amputation defined as loss of at least one-half of one limb). Most of these injuries were sustained after the specimens reached adult size (carapace length at least 160 mm). Direct observation and circumstantial evidence point to the raccoon *(Procyon lotor)* as the cause of most limb mutilation.

To test the hypothesis that limb loss would compromise a turtle's long-term survival, a statistical comparison was made of recapture rates (minimum 10 month interval) for specimens with intact limbs (n=250) versus those with at least one amputated limb (n=38). The recapture rate for injured turtles was significantly lower than for intact animals ($p<.04$; details on request). However, multiple recaptures of several limb-mutilated female turtles on nesting beaches indicates that some individuals can overcome any disadvantage posed by limb loss as long as sufficient mobility is retained.

A different form of injury noted in several specimens was extensive damage to the shell caused by rodent gnawing activity, possibly beaver *(Castor canadensis)* or porcupine *(Erethizon dorsatum)* judging from incisor grooves in the bone. It is clear that the rodents are interested in the bony shell, perhaps as a source of calcium, and not in the turtles' flesh, which is often rendered exposed and accessible. Such shell damage is not immediately life-threatening, but might make the turtle more vulnerable to future predation.

Submitted by **JAMES H. HARDING,** Cranbrook Institute of Science, Box 801, Bloomfield Hills, Michigan 48013, U.S.A. ●

KINOSTERNON SUBRUBRUM STEINDACHNERI (Florida Mud Turtle). **PATHOLOGY.** The occurrence of cystic calculi has been reported in captive-raised tortoises and attributed to dietary calcium/vitamin D imbalances. Frye (1972. J. Amer. Vet. Med. Assoc. 161: 600-602) surgically removed a large magnesium urate calculus from a 40 year captive *Gopherus agassizii.* Wallach (1969. J. Amer. Vet. Med. Assoc. 155:1017-1034; 1971. J. Amer. Vet. Med. Assoc. 159:1632-1643) noted the occurrence of cystic calculi in a captive *Geochelone elephantopus* and captive lizards and noted that calculi vary in composition from 98% calcium phosphate to mixed assemblages. Marcus (1981. Veterinary Biology and Medicine of Captive Amphibians and Reptiles. Philadelphia, Lea and Febiger) felt the altered captive diet was a probable cause of calculus formation. Cystic calculi have apparently never been reported from either wild or aquatic turtles, nor previously noted as a cause of mortality.

On 4 April 1984 I collected a mature male *Kinosternon subrubrum steindachneri* in Lutz, Hillsborough County, Florida (carapace length 95 mm, body weight 190 gm) in a relatively shallow permanent body of water. The base of the tail was slightly swollen and the perianal skin somewhat hypertrophied and erythematous. The animal appeared healthy. It occasionally attempted to unsuccessfully expel a firm mass from the cloaca. On 15 April the animal died suddenly, appearing listless for only about one or two days prior to death. A radiograph obtained immediately postmortem demonstrated a round calcific mass with concentric lamellae apparently lodged in the cloaca. At necropsy, a round calcific calculus measuring 15 x 12 mm was found impacted in the cystic neck (mouth of the urinary bladder) at its entry into the cloaca. The calculus was adherent to the cloacal walls with a surrounding area of chronic inflammatory response with necrotic debris and destruction of a large portion of the penis and cloacal wall. No gross perforatioan of the cloacal wall or cystic neck was noted. There was mild enlargement of the distal colon, suggestive of a low-grade chronic partial obstruction, but evidently colonic contents had been able to bypass the adherent calculus. Massive distension of the urinary bladder was present, without evidence of cystitis or perforation, suggestive of a high-grade chronic partial obstruction. The kidneys were of normal appearance and size. The rest of the necropsy was unremarkable. A cross-section of the calculus revealed distinct peripheral, hard, yellowish-brown concentric lamellae, with a chalky white dry powder without lamellae in the center. Identification of the calculus components by polarization microscopy supplemented by X-ray diffraction and infrared spectroscopy revealed 100% carbonate apatite, a form of calcium phosphate. The cause of death of the animal was felt to be septicemia from the cloacal infection secondary to the impacted cystic calculus.

The specimen is deposited in my personal collection, AGJR 304. I wish to thank Robert McAuley of the Department of Pathology, Burbank Hospital, Fitchburg, and Edwin Prien of the Laboratory for Stone Research, Newton, for their assistance in these investigations.

Submitted by **ANDERS G.J. RHODIN,** Orthopaedic Associates, P.C., Nichols Rd., Fitchburg, Massachusetts 01420, U.S.A. ●

TRIONYX TRIUNGUIS (Nile Softshell Turtle). **HABITAT.** Some members of the softshell turtle family Trionychidae are known to tolerate high levels of salinity. *Pelochelys bibrani* has been found in coastal waters over a wide area in the Indo-Australian Archipelago and Asia (De Rooij 1915. Reptiles of the Indo-Australian Archipelago. I., Lacertilia, Chelonia, Emydosauria. Leiden, 384 pp) and *Trionyx spiniferus emoryi* occurs in brackish inland water (238.0 meq/liter) in the United States (Seidel 1975. Copeia 1:124-128). *Trionyx triunguis* often enters salt water in the Mediterranean (Geldiay et al. 1982, *In* K. A. Bjorndal, ed., Biology and Conservation of Sea Turtles, Smithsonian Institution Press, Washington, D.C., pp. 425-434; Sella 1982, *In* ibid., pp. 417-423), and two specimens were recorded by Villiers (1958. Initiatious Africaines, 15. Dakar) from the sea near Dakar. These last appear to be the only records for the West Coast of Africa.

During a recent survey of sea turtles made in Angola, West Africa, in September and October, 1983, we encountered the Nile softshell turtle, *Trionyx triunguis,* in salt water, and found evidence that it nests on ocean beaches. In Luanda we identified a "sea turtle" being kept in a fountain after having been caught in the sea off Luanda. It was a Nile softshell. At Barra Do Bengo, north of Luanda, a local fisherman informed us that softshell turtles frequently nested on the beach, near the river mouth. At Cabo Ledo, a small settlement in Kissama Park, south of Luanda, over 40 km from any fresh water, beachside residents told us that "river turtles nest here on the beach." At Barra Do Dande, we found the fresh shell of a *Trionyx* which had been butchered and eaten after drowning in a gill net that had been set in the sea, off the river mouth.

Sea turtle fishermen in Baia Do Mussulo, a salt bay just south of Luanda and 70 km from the nearest fresh water source, told us that local people had recently captured a Nile softshell. They said that this was a kind of sea turtle, and that it was commonly found in the salt bay the year around. While making an aerial beach survey in the Province of Cabinda we found the tracks of a softshell that had come ashore 200 meters upstream from the mouth of the Rio Chiloango estuary, travelled over intervening ground to the beach, nested, and then gone on into the ocean surf. Throughout our interviews, wherever the subject of softshell turtles came up, the name most commonly used for them was *Mundo.*

Submitted by **THOMAS CARR** and **NICOLE CARR,** Florida State Museum, Gainesville, Florida 32611, U.S.A. ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

ANURA

CENTROLENELLA VIREOVITTATA. COSTA RICA: PROVINCIA DE ALAJUELA: Canton de San Carlos: Upper Peñas Blancas river drainage, 0.5 km E Dos Aces, 1100 m (10° 17' 56" N, 84° 45' 30" W). 20 August 1983. Marc P. Hayes and Michael L. Fogden. University of Miami, Costa Rican collections (CRE 4633). Upper Peñas Blancas river, along main river, 980 m or 0.8 km E CRE 4633 locality (10° 18' 03" N, 84° 45' 04" W). 28 June 1982. Dana M. Krempels. University of Miami, osteological collection — cleared and stained specimen (JMS 1826). Verified by Jay M. Savage. *C. vireovittata* was known only from the type locality, (Starrett and Savage. 1973. Bull. So. Calif. Acad. Sci. 72:66). These records are located *ca.* 150 km NW of the type-locality.

Submitted by **MARC P. HAYES** and **DANA M. KREMPELS,** Department of Biology, P.O. Box 249118, University of Miami, Coral Gables, Florida 33124, U.S.A. ●

RANA AREOLATA SEVOSA (Dusky Crawfish Frog). USA: ALABAMA: Shelby Co: 0.7 km W of I-65 on Co Rt 22 (T22S, R2W, Sec. 5). 22 April 1983. R. Guthrie. Verified by W. A. Cox. University of Alabama in Birmingham Vertebrate Museum (UAB-VM 0384). Confirms the existence of a population nearly 200 miles north and northwest of other populations in Alabama (Mount. 1975. The Reptiles and Amphibians of Alabama. Al. Agr. Exp. Sta. i-vii, 347 p.).

Submitted by **R. F. GUTHRIE,** 2820 Surrey Road, Mountain Brook, Alabama 35223, U.S.A. ●

SCAPHIOPUS INTERMONTANUS (Great Basin Spadefoot). CANADA: BRITISH COLUMBIA: 9 km SW Barriere, near North Thompson River. 17 July 1984. Alton S. Harestad. Verified by R. W. Campbell. British Columbia Provincial Museum (Amphibian and Reptile Cat. No. 1609). 40 km north of previous records at Kamloops. Extends range north along the North Thompson River to about the same latitude as records near 70 Mile House in the Cariboo region (Green and Campbell 1984. British Columbia Provincial Museum Handbook No. 45. 100 p.).

Submitted by **ALTON S. HARESTAD,** Department of Biological Sciences, Simon Fraser University, Burnaby, British Columbia, Canada V5A 1S6. ●

CAUDATA

AMBYSTOMA TALPOIDEUM (Mole Salamander). USA: NORTH CAROLINA: Henderson Co: 1.2 km SSE Tuxedo. 19 December 1980. J. K. Williams and A. L. Braswell. Verified by A. L. Braswell. North Carolina State Museum of Natural History (NCSM 21115-21119). The only recorded locality in the Broad River drainage, and the first precise locality for Henderson County: a prior record (Fowler and Dunn. 1917. Proc. Acad. Nat. Sci. Philadelphia *69*:7-28) gave no specific locality. The nearest documented site is 34 km NNW in Buncombe County (Braswell and Murdock. 1979. Brimleyana 1:135-139).

Special thanks to Joseph K. Williams for pointing out the Henderson Co. site.

Submitted by **ALVIN L. BRASWELL,** N. C. State Museum of Natural History, Box 27647, Raleigh, North Carolina 27611, U.S.A. ●

AMPHIUMA PHOLETER (One-toed Amphiuma). USA: ALABAMA: Mobile Co: Mobile College Campus. 9 May 1972. Joseph Becton, Eldrige Blecher and William C. LeSueur. Verified by S. D. Carey. University of South Alabama Museum (USA 2407). First record for Mobile County and second from Alabama (Carey. 1984. SSAR Herp. Review 15(3):77).

Submitted by **STEVEN D. CAREY,** Division of Natural Sciences, Mobile College, P.O. Box 13220, Mobile, Alabama 36613, U.S.A. ●

AMBYSTOMA TALPOIDEUM (Mole Salamander). USA: SOUTH CAROLINA: Greenville Co: 8 km NNW Greenville. 14 December 1983. N. A. Murdock and Douglas A. Rayner. Verified by A. L. Braswell. North Carolina State Museum of Natural History (NCSM 25204). First record from the Piedmont of South Carolina, and bridges the gap between Columbia SC (Shoop. 1964. Cat. Amer. Amphib. Rept. 8.1-8.2), and Henderson Co. North Carolina. (Braswell. 1985 SSAR Herp. Review 16(1)).

Submitted by **NORA A. MURDOCK,** U.S. Fish and Wildlife Service, 100 Otis Street, Room 224, Asheville, North Carolina 28801 and **ALVIN L. BRASWELL,** N. C. State Museum of Natural History, Box 27647. Raleigh, North Carolina 27611, U.S.A. ●

PLETHODON WEHRLEI (Wehrle's Salamander). USA: TENNESSEE: Campbell Co: cliff face along No Business Branch, 1.9 km (airline) W of Morley Community. 2 May 1980. Robert L. Jones. University of Tennessee Vertebrate Zoology Collection, Knoxville (UTKVZC 06250). 27 September 1984. Beth Fields. (UTKVZC 06985). Verified by Paul V. Cupp. Ground color dark brown with irregularly shaped yellow spots on dorsum. New state record. Extends range approximately 111 km SW of nearest locality (Letcher Co, Kentucky) and represents third reported locality for yellow-spotted morph (Cupp and Towles. 1983. Trans. Kentucky Acad. Sci. 44:157-158).

Submitted by **WILLIAM H. REDMOND,** Tennessee Valley Authority, Norris, Tennessee 37828 and **ROBERT L. JONES,** Mississippi Museum of Natural Science, Jackson, Mississippi 39202, U.S.A. ●

SAURIA

OPHISAURUS ATTENUATUS ATTENUATUS (Western Slender Glass Lizard). USA: ARKANSAS: Montgomery Co: Junction of Ark Hwy 240 and Ark Hwy 8. 10 June 1970. D. Brooks and R. McKown. Verified by R. McKown. West Texas State University Museum of Nat. Hist. (WTSU 636). New county record. Fills gap between published localities (Dellinger and Black. 1938. Occas. Papers Univ. Arkansas Mus. 1, 47p.; Dowling. 1957. Occas. Papers Univ. Arkansas Mus. 3, 51p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016, U.S.A. ●

SCELOPORUS UNDULATUS HYACINTHINUS (Northern Fence Lizard). USA: ARKANSAS: Stone Co: Allison creek at Ark Hwy 14. 5 and 6 June 1970. D. Stout and D. Bailey. Verified by R. McKown. West Texas State University Museum of Nat. Hist. (WTSU 589 and 612). Baxter Co: Norfolk Lake near Mountain Home. 6 June 1970. A. White. Verified by R. McKown. WTSU 652). New county records, fill gap between localities in Fulton and Sharp cos. and Carroll and Newton cos. (Dellinger and Black. 1938. Occas. Papers Univ. Arkansas Mus. 1, 47p.; Dowling. 1957. Occas. Papers Univ. of Arkansas Mus. 3, 51p.). Grant Co: 1 Km W Sheridan on Ark Hwy 275. 21 June 1983. J. McKinney. Verified by F. C. Killebrew. (WTSU 9278). New county record, fills gap between records for surrounding counties (Schwardt. 1938. Arkansas Exper. Sta. Bull. 357, 47p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016, U.S.A. ●

TRETIOSCINCUS AGILIS. VENEZUELA: TERRITORIO FEDERAL AMAZONAS: Simarawoche. April 1973. W. Perez. Verified by A. Paolillo O. Museo de Biologia, Universidad Central de Venezuela (MBUCV 617). Mavaca, Rio Mavaca. 21 September 1981. J. Finkers. Verified by A. Paolillo O. (MBUCV 2059). First record for Venezuela. The prefrontal scales in the Venezuelan specimens are completely in contact, separating the frontonasal from the frontal, a condition not found in Brazilian (Vanzolini and Rebouças-Spieker. 1969. Pap. Avul. Zool. 22(13):123-144) and Suriname specimens (Hoogmoed. 1973. Notes on the Herpetofauna of Suriname. IV. The lizards and amphisbaenians of Suriname. Dr. W. Junk Publishers, The Hague. 419 p.). I consider that contact of prefrontals in Venezuelan specimens completes the variation found by Vanzolini and Rebouças-Spieker (op. cit.). Hoogmoed (op. cit.) suggested that the Oriximiná (Brazil) population is a distinct subspecies from that of Suriname, but the Venezuelan specimens exhibit common characteris-

tics with both the Suriname specimens (except for the 29 transverse dorsal scales against the 23-26 found in Suriname) and the Brazilian specimens in those details that Hoogmoed considered as indicative of subspecific differences. *Tretioscincus agilis* (Ruthven) occurs in Guyana (Ruthven. 1916. Oc. Pap. Mus. Zool. Univ. Michigan (22):1-4), Amazonia of Brazil (Vanzolini and Rebouças-Spieker, op. cit.; Vanzolini. 1972. Pap. Avul. Zool. 26(8):83-115), Suriname (Hoogmoed, op. cit.) and French Guiana (Hoogmoed and Lescure, 1975. Zool. Meded. 49(13):141-171). I express my acknowledgement to J. Finkers for sending me one of the specimens. P. E. Vanzolini and S. Ayala kindly read the manuscript and gave valuable suggestions.

Submitted by **ALFREDO PAOLILLO O.,** Instituto de Zoología Tropical, Universidad Central de Venezuela, Apartado 47599, Chaguaramos 1041-A, Caracas, Venezuela. ●

UROCOTYLEDON WOLTERSTORFFI (Tornier). AFRICA: TANZANIA: Morogoro Region and District: Uluguru Mts, Bunduki, Uluguru Fly Fishing Association rest house. 7°01'S, 37°38'E. Ca. 1250 m. 20 December 1979. K. M. Howell. British Museum (Natural History) (BMNH 1980.288). According to Loveridge (1957. Bull. Mus. Comp. Zool. 117:189-190), the species was previously known only from "Tanga"; however three of the syntypes bear the locality "Hinterland von Tanga," and likely originated in the East Usambara Mts., possibly from Amani (55 km W of Tanga).

Wederkinch and others have collected specimens (Zoological Museum of Copenhagen, ZMUC R34492-501) in intermediate rain forest at Amani and Kwamkoro Forest Reserve (8 km SW Amani).

Van Eyslen (1962. Lacerta 20:30) reported on specimens purchased from a dealer and said to have come from Arusha (330 km northwest of Tanga). Two of these (TCWC 51832-3 Texas A & M University) were examined and identity confirmed, but their origin remains uncertain.

The specimen from Bunduki extends the range 250 km southwest of Tanga and Amani to the Uluguru Mts. and removes it from the list of species endemic to the Usambara Mts. (Wederkinch, *In* Rodgers and Homewood. 1982. Biol. J. Linn. Soc. 18:237-238).

We gratefully acknowledge the cooperation of Dr. J. M. Dixon, Texas A. & M. University, Dr. W. Peters, Zoologisches Museum Berlin, and Dr. P. Alberch, Museum of Comparative Zoology, Harvard, who kindly lent specimens for examination.

Submitted by **K. M. HOWELL,** Box 35064, Department of Zoology, University of Dar es Salaam, Dar es Salaam, Tanzania; **A. F. STIMSON,** Department of Zoology, British Museum (Natural History), Cromwell Road, London 8W7 5BD, England; and **E. WEDERKINCH,** Zool. Mus. 1 afd, Universitetsparken 15, DK-2100 Copenhagen, Denmark. ●

SERPENTES

FARANCIA ABACURA REINWARDTII (Western Mud Snake). USA: ARKANSAS: Garland Co: Ark Hwy 270 at Crystal Springs. 6 June 1983. F. C. Killebrew. Verified by F. C. Killebrew. West Texas State University Museum of Nat. Hist. (WTSU 8897). New county record. Extends range west and north of previously recorded localities (Dellinger and Black. 1938. Occas. Papers Univ. Arkansas Mus. 1, 47p.; Dowling. 1957. Occas. Papers Univ. Arkansas Mus. 3, 51p. and McDaniel and Karges. 1983. Cat. Amer. Amphib. Rept. 314.1-314.4).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016, U.S.A. ●

NERODIA FASCIATA CONFLUENS (Broadbanded Water Snake). USA: ARKANSAS: Columbia Co: 1 km S of Magnolia on US Hwy 79. 13 June 1983. L. Bonds. Verified by F. C. Killebrew. West Texas State University Museum of Nat. Hist. (WTSU 8896). New county record. Fills gap between previous county records (Dellinger and Black. 1938. Occas. Papers Univ. Arkansas Mus. 1, 47p.; Hurter and Strecker. 1909. Trans. Acad. Sci. St. Louis 18, 11-27; Dowling. 1957. Occas. Papers Univ. Arkansas Mus. 3, 51p.).

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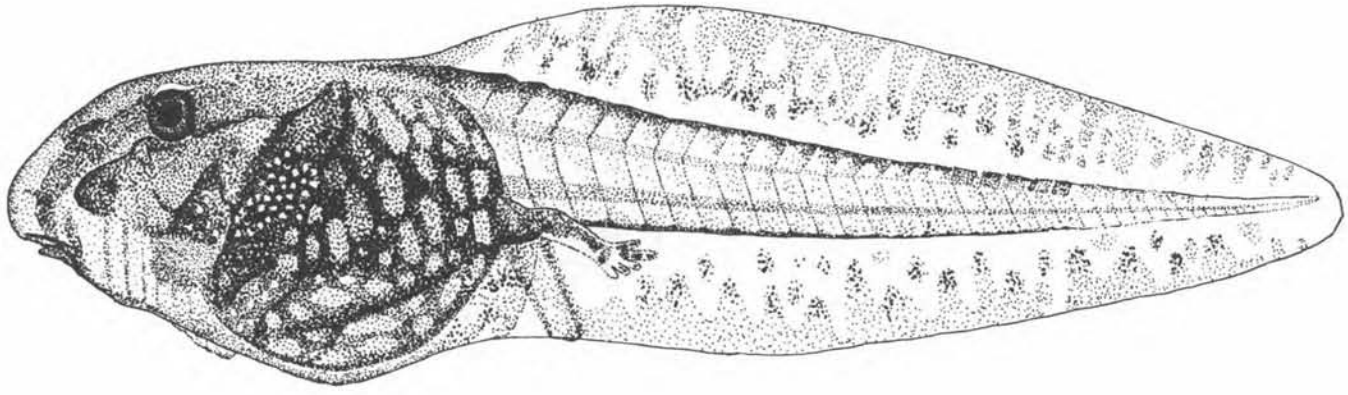
TESTUDINES

CLEMMYS MUHLENBERGII (Bog Turtle). USA: MASSACHUSETTS: Berkshire Co: Sheffield. 26 May 1984 (2 females marked and released); 16 June 1984 (1 female marked and released); 16 September 1984 (1 juvenile marked and released. M. W. Klemens, P. G. Mirick, et al. Photographs deposited in the American Museum of Natural History. These turtles were collected in habitat ecologically similar to sites in northwestern Connecticut reported by Klemens and Warner (1983 *Herp. Review* 14(4):124-125).

We consider this the first documented record of this species in Massachusetts. Blanchard ("Richard" [*sic*] 1970 *Massachusetts Audubon* 55[1]:34-37) collected a specimen (subsequently lost, M. Flor, pers. comm.) at Pittsfield, Berkshire County, but we have no evidence confirming Blanchard's report of bog turtles in the Pittsfield area.

A grant to MWK from the Massachusetts Nature Conservancy supported field work, and the Massachusetts Division of Fisheries and Wildlife provided assistance.

Submitted by **MICHAEL W. KLEMENS,** Department of Herpetology, American Museum of Natural History, Central Park West at 79th Street, New York, New York 10024 and **PETER G. MIRICK,** Nongame Section, Massachusetts Division of Fisheries and Wildlife, Field Headquarters, Westboro, Massachusetts 01581, U.S.A. ●



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[1] Joint committee with the Herpetologists' League

[2] Joint committee with the American Society of Ichthyologists and Herpetologists

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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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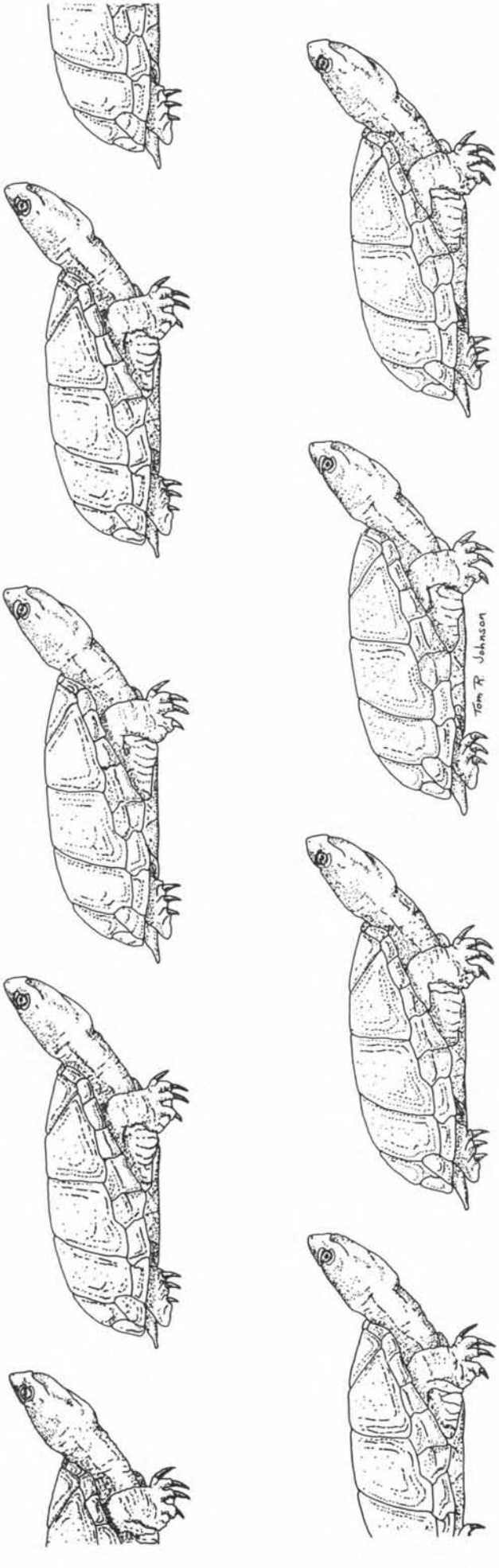
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SSAR BUSINESS

SSAR GRANTS-IN-HERPETOLOGY

The Society for the Study of Amphibians and Reptiles is pleased to announce that proposals are now being accepted for the 1985 Grants-In-Herpetology Program. This Program is designed to provide financial support to deserving individuals or organizations engaged in research on or conservation of amphibians and reptiles. All applicants (or their advisor or sponsor) must be a member of SSAR. Grant proposals will be considered in the following areas.

1. GRADUATE STUDENT HERPETOLOGICAL RESEARCH. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only, with a letter of support from the student's major advisor or committee chairperson.
2. HERPETOLOGY-ORIENTED CONSERVATION. Proposals should address research on endangered or threatened species at the state, national or international levels, or address research on critical herpetological habitats. Proposals may be received from individuals only.
3. REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS. Proposals may address any herpetological research endeavor or project, provided said endeavor or project concerns herpetology within the implied geographic limits of the regional society. Proposals may be submitted by regional herpetological societies or by individual members of the society. If the latter, a sponsoring letter from the current societal president or an advisor should accompany the proposal.
4. HERPETOLOGICAL RESEARCH IN ZOOS. Proposals may address any herpetological research endeavor which is conducted at a zoo. A letter from the represented zoo or supporting institution should accompany the proposal.
5. FIELD WORK (Auto mileage). Proposals may address any area of herpetological research and may be submitted by any member of SSAR. Funding will only be granted for expenses associated with auto travel for collecting (or observing) study animals.

Each proposal must include the following information: A) *Abstract*, B) *Background & Objectives* of the proposed project, in terms of its relevance to herpetology, C) *Methods* of carrying out the research or conducting the project, D) *Budget* for the project, which should not exceed $430 in each category, and E) *Curriculum Vitae* and *Letter of Support* (if applicable). The proposal must be typed double spaced and must *not* exceed five pages, excluding cover page, abstract, budget, curriculum vitae, and bibliography.

Successful applicants will be expected to submit to SSAR a written report of their research or project within a reasonable time after the project year is completed. They are also encouraged to submit for publication the results of their research or project, preferably to *The Journal of Herpetology* or *Herpetological Review*.

Individuals submitting proposals must designate to which of the five areas their proposals applies. All proposals must be typewritten, submitted in duplicate, and postmarked no later than **12 APRIL 1985.** Failure to meet the deadline or follow the guidelines may result in rejection of the proposal. Submit proposals to:

Dr. James Bacon
Department of Herpetology
Zoological Society of San Diego
P.O. Box 551
San Diego, California 92112, U.S.A.

If you are employed by an organization which will match donations made to non-profit educational organizations, please notify your employer that you have made a donation to the Grants-In-Herpetology program.

●

1985 SSAR-HL MEETING

The March issue of *HR* will contain a detailed outline of the events scheduled for the Annual Meeting of the Herpetologists' League/Society for the Study of Amphibians and Reptiles, 4-9 August 1985, University of South Florida, Tampa, Florida, U.S.A. In addition to the HL Distinguished Speaker, concurrent paper sessions and poster sessions, and the annual auction, the following special events have been planned: A tour of Busch Gardens Zoological Park, a B-B-Q dinner at the Museum of Science and Industry in Tampa, and a trip to Archbold Biological Station. There will be a symposium presented by the Regional Herpetological Societies Committee, an updated slide show of "Herpetologists Past and Present," and an outstanding collection of the Florida herpetofauna available for viewing and photographing. The paper sessions will include numerous papers on Caribbean herptiles.

For further information contact meeting chairman:

Henry R. Mushinsky
Department of Biology
University of South Florida
Tampa, Florida 33620, U.S.A. ●

EXHIBITORS WANTED FOR 1985 JOINT SSAR-HL MEETING

The local committee for the 1985 SSAR-HL meeting is in the process of locating and contacting possible exhibitors for the meeting. Any individual or organization is welcome to display herpetologically-oriented material (except live animals). The following information may be useful in the design of exhibits or the recruitment of exhibitors.

Registrants: Biologists, college professors, zoo and museum personnel, state and federal wildlife officials, graduate students in biology and serious lay persons with interests in amphibians and reptiles.

Previous Exhibitors: Publishers, used book companies, biological supply companies, manufacturers of animal collecting and housing equipment, artists (with animal themes), tee-shirt sellers, and travel services.

Cost: $100 for each table (approx. 4x6 feet). Artists who sell materials created by themselves will be charged $100 or the equivalent in donated art or crafts; such persons are expected to be engaged actively in their work at the exhibit area.

Shipment and Care of Exhibits: Exhibits may be shipped (prepaid) in returnable containers to HL/SSAR, c/o H. R. Mushinsky, Department of Biology, University of South Florida, Tampa, Florida 33620 U.S.A. Exhibitors are encouraged to have their exhibits attended by an employee who can bring the materials with them. Exhibitors in attendance will be charged a much reduced registration fee; meals and social events will cost extra.

For exhibit application, or further information, contact:

Ruth Zantzinger
Box 1
Devault, Pennsylvania 19432, U.S.A.
(215) 933-0561 ●

ERRATUM

In the December 1983 issue of *HR* [14(4):99] T. R. Jones was listed as the author of the paper "Factors Affecting Home Range Size in the Iguanid Lizard *Sceloporus undulatus*," presented at the 1983 SSAR/HL meeting at the University of Utah. Although Mr. Jones presented the paper at the meeting, the project was conceived and conducted by, and the paper written by, Craig Levy in partial fulfillment of a master's degree at Arizona State University. ●

THANKS TO REVIEWERS

The Editor would like to acknowledge the following individuals who reviewed manuscripts for *HR* during the past year. Their service to the Society is greatly appreciated.

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NEW *HR* MANAGING EDITOR

Herpetological Review is pleased to welcome John E. Simmons as the new Managing Editor, replacing George Pisani who resigned to assume his duties as President of the Society. John is Collections Manager of the Division of Herpetology, Museum of Natural History, University of Kansas in Lawrence. He has worked closely with the *HR* staff over the past several months and formally assumed his position on 1 January 1985. We appreciate John's willingness to assume this onerous task, pointing out that the quarterly rewards are more-than-adequate compensation for the unholy burden.

The Editor also expresses his gratitude to George Pisani, former Editor and Managing Editor of *HR*, for his assistance and counsel during the past two years. We wish him well during his year as President of the Society.

●

TREASURER URGES EARLY RENEWAL

Your Treasurer would like to remind everyone that a delay in renewing SSAR membership dues causes increased work for him and for the Publications Secretary as well as incurs additional expense to the Society. Delays in the delivery of publications can be as long as two to three months, for late renewals. At the recent SSAR Annual Meeting, the Board voted to assess $5.00 additional for renewals after the first issue of the Journal has been mailed. So please don't delay!

Our second class mailing privileges apply only to the U.S. Postal Zone. A typical issue of the Journal costs us 12¢ postage within the U.S. but 55¢ (minimum) for any non-U.S. address. That is the reason we impose a mail surcharge to all our non-U.S. colleagues.

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ABSTRACTS OF 1984 GRANTS-IN-HERPETOLOGY WINNERS

The SSAR Grants-In-Herpetology Committee receives, evaluates and prioritizes grant proposals from members in good standing in the SSAR. The Committee awards small grants (up to roughly $450) to the best proposals in five categories. In order to stimulate additional interest in these grants we are publishing the abstracts of the winning proposals for 1984.

GRADUATE STUDENT RESEARCH

1. Trip Lamb, Department of Zoology, University of Georgia. "An investigation of introgressive hybridization between the barking treefrog *(Hyla gratiosa)* and the green treefrog *(Hyla cinerea)* using mitochondrial DNA analysis."

Natural interspecific hybridization between *Hyla cinerea* and *H. gratiosa* has been observed and documented near Auburn, Alabama. Studies over 20 years have indicated that the basis of the hybridization has been the result of mismatings between male *H. cinerea* and female *H. gratiosa*.

While both morphometrics and electrophoresis have been important tools in the analysis of hybridization and introgression in the past, both have limitations. The use of mitochondrial DNA analysis is well suited to the evaluation of hybridization. The purpose of this study is to use mtDNA methods to delineate the direction and extent of hybridization between *H. cinerea* and *H. gratiosa* and to compare the results with those derived with conventional techniques.

2. Martha K. Pancak, Department of EPO Biology, University of Colorado. "Endocrine regulation of oocyte development in the Bidder's Organ, a remnant ovary in male toads."

Sequential hermaphroditism or sex reversal is a reproductive pattern exhibited by a number of vertebrates, for example, teleost fishes. Evolutionary and ecological models for the existence of sex reversal have been developed, but the regulatory mechanisms involved remain poorly known, particularly with respect to the role of hormones in this process. Male toads of the family Bufonidae provide excellent models for studying the hormonal interactions that occur during the transformation from male to female. Male toads possess a remnant ovary called the Bidder's organ which can become functional upon removal of the testes. The Bidder's organ consists of previtellogenic oocytes (premature egg cells) which yolk and mature only if the testes are removed. It is thought that the testes produce a factor which inhibits the Bidder's organ from growing, however, little is known about the inhibition of this remnant ovary. The following study comprises an investigation of the endocrinological basis for inhibition of oocyte development in the Bidder's organ. The project includes experiments which focus on pituitary involvement in sex reversal, inhibition of oocyte growth and maturation, as well as the interaction of gonadal steroids in regulating the process of vitellogenesis in bufonid toads. Results from the proposed experiments should provide useful information regarding mechanisms underlying sex reversal, as well as mechanisms of follicular arrest in the vertebrate ovary.

REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS

1. Joseph C. Mitchell, Department of Biology, University of Richmond. "Reptiles and Amphibians of southwestern Virginia: a biogeographical and ecological survey."

Although anecdotal notes exist on the composition of the herpetofauna of far southwestern Virginia, verification of the faunal elements has not been provided. Virtually no information exists on the natural history and ecology of these animals. A collection made in 1958 contained several state records and other important biogeographical records. This collection cannot be found and is presumed lost. The Virginia Herpetological Society proposes to conduct an intensive ten-day survey in this area to provide the much needed verification of the faunal elements and information on their natural history and ecological relationships. The latter information will be included in a forthcoming book on the herpetology of Virginia. If funded, the grant would help defray expenses of Virginia Herpetological Society members for travel, camping fees and food. Supplies, collecting equipment, and the expenses of the team leaders would be covered by another grant.

2. Yehudah L. Werner, Department of Zoology, Hebrew University of Jerusalem. "A gecko research facility."

The applicant's facility for holding and rearing geckos and other reptiles, in its 30th year, faces liquidation for fiscal reasons. The facility, on which most past research has been based, notably on vocalizations and physiological longevity, currently holds numerous *Ptyodactylus hasselquistii hasselquistii*, whose population is, within Israel, restricted to a small area. Support is sought for one year's feeding, caretaking and emergency repairs, in the hope of meanwhile obtaining a more substantial grant elsewhere.

HERPETOLOGICAL CONSERVATION

Robert E. Herrington, Department of Zoology, Washington State University. "The ecology, distribution, and habitat requirements of the Larch Mountain Salamander, Plethodon larselli."

The Larch Mountain salamander *(Plethodon larselli)*, is a rare, regional endemic species that occurs along a narrow 60 km section of the Columbia River gorge between the states of Washington and Oregon. This species is currently listed as threatened in both states; however, lack of information concerning this salamander's basic biology has resulted in its status being listed as "under review" by the U.S. Fish and Wildlife Service and the International Union for the Conservation of Nature and Natural Resources. The primary objectives of this investigation include the collection of quantitative data on the range, habitat requirements, and population ecology of this poorly understood species of salamander.

HERPETOLOGICAL RESEARCH IN ZOOS

Michael K. Stoskopf, National Aquarium in Baltimore. "Aminoglycoside kinetics in three families of Anura."

Amphibians are not immune to microbial invasion. The management and veterinary care of amphibians is complicated by a lack of information on antibiotic dosimetry. In particular, small amphibians present a challenge because in vivo antibiotic analyses require considerable blood volumes.

The medical department laboratories of the National Aquarium in Baltimore have combined the use of labelled aminoglycoside antibiotics, gentamicin and tobramicin, which reduces the necessary sample volume to 25 microliters for analysis.

The study will 1) determine the half life of each antibiotic in samples of species representing three anuran families; 2) evaluate impact of delivery route on serum levels and; 3) determine dosage regimens for therapeutic use.

FIELD WORK

1. Calvin A. Porter, Department of Zoology, Brigham Young University. "Chromosomal variation in the iguanid lizard *Sceloporus grammicus* in central Mexico."

The concept of stasipatric speciation, the genetic isolation of populations by chromosomal rearrangements, is being studied in the iguanid lizard, *Sceloporus grammicus*. There are five chromosomal races in the species, each fixed for a different chromosomal rearrangement.

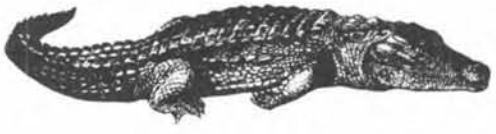
This study proposes to sample and analyze the cytotypes of selected populations. The objectives will be to karyotype a large number of lizards in order to determine more accurately the distribution and frequency of chromosomal polymorphisms, and to determine the frequency of aneuploid gamete formation in individuals heterozygous for centric fusions and other polymorphisms.

The study may help determine if chromosomal rearrangements are causally related to speciation or if the two phenomena occur independently of each other.

2. Mac F. Given, Biological Sciences Group, University of Connecticut. "Social behavior and acoustic interactions of the carpenter frog, *Rana virgatipes*."

Prolonged breeding anurans generally have more complex social interactions than explosive breeders. I plan to observe the behavior of marked males and carry out several experiments on acoustic interactions of the prolonged breeding carpenter frog, *Rana virgatipes*, of the New Jersey Pinelands. No behavioral work has been done on this species, although its population ecology is well understood (Standaert, W.F. 1967. Ph.D. Thesis. Rutgers Univ.). Last summer, preliminary work established that the breeding season is prolonged, males are territorial and defend calling sites, and the male vocal repertoire consists of at least five distinct calls. This summer, I plan to determine: 1. the response of males to calls of different intensities; 2. whether calls of large vs. small individuals can be discriminated by males; 3. the response elicited by advertisement calls with either more or fewer notes per call than those given by the subject before the stimulus is presented (this call ranges from one to nine notes per call); and 4. whether body size is correlated with intensity, dominant frequency, and repetition rate of male calls, and whether these are related to male mating success. The results will be compared with the behavior of other prolonged breeding ranid frogs.

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27th ANNUAL MEETING OF SSAR HELD AT THE UNIVERSITY OF OKLAHOMA

The 1984 Annual Meeting of the Society for the Study of Amphibians and Reptiles was held jointly with the Herpetologists' League and The American Society of Ichthyologists and Herpetologists in Norman, Oklahoma, during 28 July-4 August on the campus of the University of Oklahoma. Local Committee Chairman Victor H. Hutchison did a magnificent job of organizing the largest meeting of herpetologists and ichthyologists ever held. Excellent facilities were provided for the 963 members and guests attending from 20 countries. Paper sessions and exhibits were all held on campus and most attendees were housed nearby in comfortable dormitories.

SSAR Board of Directors Meeting

The annual meeting of the Board was held on Sunday, 29 July, under the chairmanship of President Carl Gans. All Board members, except Timothy Halliday, were present plus other officers, editors, committee chairs, and a number of visitors. The Board met for nine hours and discussed annual reports submitted by each Society officer, editor, committee chair, and coordinator plus a number of other topics.

In addition to the items announced at the business meeting on 30 July (see below), the Board also discussed the following topics: (1) a net increase in membership of 5.4% for 1983, (2) George Pisani's resignation as Managing Editor of *Herpetological Review* at the end of 1984, (3) John Simmons' appointment as Managing Editor of *Herpetological Review* effective 1 January 1985, (4) the possibility of holding the 1986 annual meeting at Old Dominion University, (5) a proposal to hold a symposium during the Tampa meeting on "Ecology and Behavior of West Indian Amphibians and Reptiles," (6) no presentation of Kennedy Student Paper Award for 1984, and (7) agreement by SSAR, HL, ASIH Liaison Committee to a policy addressing support of joint meetings.

Opening Ceremonies

The meeting began officially at 0900 hr on 30 July. On behalf of SSAR, HL and ASIH, Victor Hutchison welcomed members of the three organizations and introduced Dr. Kenneth Hoving, Dean of the Graduate College and Vice Provost for Research of The University of Oklahoma, who welcomed the societies on behalf of the University. Jay Savage introduced Marvalee Wake who presented the ASIH Presidential Address entitled "Caecilians and I—Our First Twenty Years." C. Richard Robins then introduced the ASIH Distinguished Fellow Lecture, "On the Importance of Marine Sanctuaries to Ichthyological Research," presented by John E. Randall. Ronald Brandon, President of Herpetologists' League, introduced the League's Distinguished Speaker, David Wake, who presented a special lecture entitled: "Species, Genes and Morphology—A Perspective on Evolution in Salamanders."

Symposia and Workshop

An NSF-sponsored symposium on "Predator-Prey Relationships in Lower Vertebrates" was organized by Martin E. Feder and George V. Lauder. The program consisted of 13 papers arranged in two sessions: I. Physiology and Morphology and II. Ecology and Behavior. The sessions were informative and very well attended.

A workshop on "Larval Amphibian Biology" was organized by Richard J. Wassersug and sponsored by SSAR, HL, and ASIH. Over 50 people attended the productive and successful half-day session.

A symposium on "Biology of *Cnemidophorus*" was organized by John W. Wright. The program consisted of 25 papers plus a eulogy of T. Paul Maslin given by C. J. McCoy.

The SSAR Zoo Liaison Committee sponsored a symposium on "Management of Endangered Reptiles and Amphibians in Captivity." The program was organized and chaired by Peter J. Tolson.

The 8th Regional Herpetological Societies Conference was sponsored by the SSAR Regional Herpetological Society Liaison Committee. The program, "Monitoring Reptile and Amphibian Populations: An Important Role for Regional Herpetological Societies," was organized and chaired by Jeffrey H. Black.

Special Lectures on Chinese Herpetology

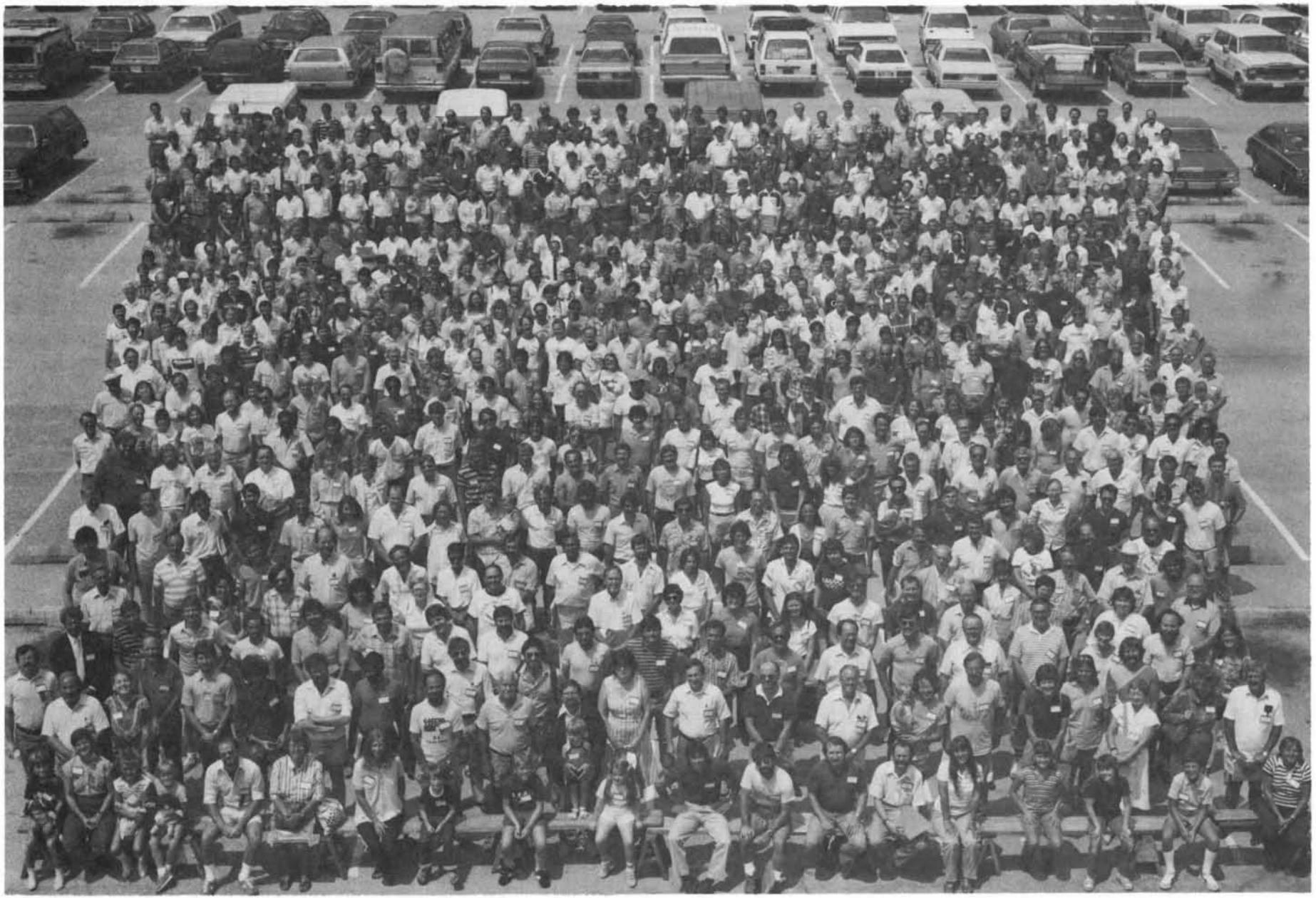
One of the highlights of the meeting, and an historic occasion for herpetology, was the presentation of lectures by the leading specialists from mainland China and from Taiwan, China. Over 200 people were in attendance for the special session arranged on behalf of SSAR by Kraig Adler (Cornell University). Professor Ermi Zhao (Chengdu Institute of Biology, Chengdu, Sichuan, China) presented "A brief review of the amphibians and reptiles of China." Professor Kuang Yang Lue (National Taiwan Normal University, Taipei, Taiwan, China) lectured on "The amphibians of Taiwan (Formosa), China."

Special Activities, Exhibits, Social Events, and Tours

Several excellent social events were held during the week-long meeting. They included a "start of meeting" social held Sunday evening, a barbecue and tour of the Oklahoma City Zoo on Monday, a picnic followed by an exhibit of Indian dancing on Wednesday, and a banquet on Thursday that featured roast bison. A number of family tours were also conducted, including a trip to Oklahoma City to visit the Cowboy Hall of Fame and Omniplex Science Center, and a guided tour to Anadarko to visit Indian City and the Museum of the Southwest Plains Indians.

One of the most popular events of the annual meeting, the SSAR auction, occurred on Wednesday night after the picnic with Joseph T. Collins continuing as auctioneer. The sale of herpetologically related art, publications, and other items raised money to help defray local meeting expenses.

SSAR sponsored the presentation of an updated version of "Herpetologists—Then and Now," a slide presentation set to music, which was prepared by David Dennis and Kraig Adler and first shown at the 1982 annual meeting in Raleigh, North Carolina. David



AMERICAN SOCIETY OF ICHTHYOLOGISTS AND HERPETOLOGISTS
SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES HERPETOLOGISTS' LEAGUE
UNIVERSITY OF OKLAHOMA 28 JULY - 3 AUGUST 1984

Dennis and Eric Juterbock presented their magnificent multimedia program on "Amphibians of the Appalachians" and held another informative "Nature Photography Workshop." A large, excellent display of live amphibians and reptiles from Oklahoma and surrounding states was also available for viewing and photography.

Business Meeting

The annual business meeting of SSAR was called to order by President Carl Gans at 1630 hr on 30 July. President Gans welcomed SSAR members and visitors.

Secretary James Jacob announced that the Society is engaged in a library subscription campaign that offers substantial discounts on subscriptions and back issues of the *Journal of Herpetology* and *Herpetological Review*. He asked members to encourage their librarians to take advantage of this offer to purchase missing back issues or to initiate a new subscription. The Secretary announced two new policies approved by the Board of Directors at their annual meeting: (1) "By Title Only" papers will no longer be accepted at the annual meeting and (2) individuals who submit a paper and then fail to attend the meeting and do not arrange for a substitute presentor will not be allowed to submit a paper at the following annual meeting.

Treasurer Henri Seibert announced that (1) the Society is healthy financially, (2) there will be no increase in the cost of dues or subscriptions during 1985, (3) the Society is establishing endowment funds to help operate programs such as Grants-in-Herpetology and encouraged members to make contributions, (4) a $5 late charge has been instituted for membership renewals received after 20 January of each year, and (5) the Board of Directors approved a 1985 budget of $90,058.

Journal of Herpetology Editor Rodolfo Ruibal reported that (1) the number of manuscripts submitted during 1983 increased to 184; (2) he is projecting receipt of 210 manuscripts during 1984; (3) the *Journal* has been rejecting approximately 50% of the manuscripts submitted; (4) 100 pages per issue are published currently, but there will be an increase to 125 pages per issue during 1985; (5) this increase in published pages will result in a decrease in turnaround time for manuscripts from the current 12 month period; and (6) the Editorial Board of the *Journal* is being expanded and Associate Editors are being added in an effort to speed the handling of manuscripts.

Kraig Adler, Editor of *Facsimile Reprints in Herpetology* and *Contributions to Herpetology*, announced that (1) John Anderson's "Herpetology of Arabia" is in press and will be available by the end of the year, (2) Daudin's books "Histoire Naturelle des Quadrupedes Ovipares" and "Histoire Naturelle des Rainettes, de Grenouilles et des Crapauds" will be published in 1985, (3) Pritchard and Trebbau's "Turtles of Venezuela" will be available in the next few months as volume number 2 in the *Contributions* series, and (4) Gloyd and Conant's "Snakes of the *Agkistrodon* Complex" will be the next publication in this series.

Linda Maxson, Chair of the Grants-in-Herpetology Committee, announced the names of the winners in each category for 1984 and the titles of their proposals (see *HR* 15(3):62).

President Gans announced the following nominees for SSAR office in 1985:

President-elect:
Sherman Minton and Linda Trueb
Secretary:
James Jacob (unopposed)
Treasurer:
Henri Seibert (unopposed)
Board of Directors:
John Behler, E. D. Brodie,
Harold Dundee, and Carl Lieb

President Gans opened the floor for additional nominations and Neil Ford nominated John Simmons as a candidate for the Board of Directors (regional society position). No additional nominations were received and President Gans declared the nominations closed. The ballot for 1985 appeared in the September issue of *Herpetological Review*.

President Gans announced that SSAR has approximately $250,000 worth of books and reprints in storage and the Board of Directors has approved a program to offer substantial discounts on this inventory to members of the Society. Purchases will be limited to one copy or set per member. Details will be announced in *Herpetological Review*. Proceeds from this sale will be placed in an endowment for the Grants-in-Herpetology program.

In the absence of Resolutions Committee Chair George Gorman, President Gans offered the following resolutions:

1. *Whereas*, the Society members who retired from service last year have proven their devotion to SSAR by promoting its aims, *Be It Resolved*, that we thank: Ralph Axtell for serving as President, Kraig Adler for serving as Immediate Past President; Marvalee Wake and Max Nickerson for serving as Directors; and John Behler, Gary Ferguson, John Groves, Jim Jacob, Janice Perry, Jim Vial, and Dan Wilhoft for their service as committee chairpersons.

2. *Whereas*, Doug Taylor has served as SSAR Publications Secretary since 1977, and *Whereas*, he has devoted countless hours and infinite amounts of energy to his Society duties,
Be It Resolved, that the Society for the Study of Amphibians and Reptiles extends its thanks to him for his many years of devoted service and offers him a token of its appreciation.

The resolutions were approved by resounding applause and President Gans presented Taylor with a copy of a book specially prepared to commemorate his dedicated service to the Society. President Gans announced that the joint resolutions would be presented at the banquet on Thursday night.

President Gans called President-elect George Pisani to the stage, wished him luck during the coming year, and presented him with the official gavel which is held by the President during his term of office. Pisani thanked Gans and then asked Henry Mushinsky to present a summary of activities planned for the next annual meeting.

Henry Mushinsky, Local Committee Chair for the 1985 Annual Meeting in Tampa, Florida, gave a brief presentation on the arrangements for next year's meeting. He noted that (1) the meeting will be held during 4-9 August on the campus of the University of South Florida and that dormitories will be open on 3 August; (2) 600 beds have been reserved at a cost of $12.50 per person per day for double occupancy and $25 per day for single occupancy; (3) special off-campus housing rates have been arranged with the Holiday Inn across the street from the campus at $40 per day for single occupancy and $45 per day for double occupancy; (4) preregistration fees will not exceed $45 for regular members, $35 for students, $15 for partners, and $5 for children.

President-elect Pisani thanked Mushinsky for the presentation. There being no further business, the meeting was adjourned at 1707 hr.

Joint Resolutions

The following resolutions were presented at the Thursday banquet by George Gorman, Chairman of the joint SSAR, HL, ASIH Resolutions Committee. He also extended thanks, on behalf of the three societies, to Professor Ermi Zhao, Chengdu Institute of Biology, Chengdu, Sichuan, China; and Professor Kuang Yang Lue, National Taiwan Normal University, Taipei, Taiwan, China, for their enlightening talks on the herpetology of China.

1. *Whereas*, the ASIH, HL, and SSAR have a long heritage of mutually beneficial participation in their scientific programs and their business affairs by scientists of the U.S. Department of the Interior, Fish and Wildlife Service, who serve or have served as members of the Board of Governors, officers, editors, and chairmen and members of important committees, and who wish to conduct Society business and present papers based on U.S. Fish and Wildlife Service research programs, and *Whereas*, official participation of these scientists has been severely curtailed at recent meetings because of lack of administrative support, a requirement for extensive documentation and review, granting of authorization only after review at the level of Fish and Wildlife Service Director or Assistant Secretary of the Interior, and official policy memoranda by the Director of the Fish and Wildlife Service discouraging such participation as of lowest travel priority, and
Whereas, the U.S. Fish and Wildlife Service is the federal agency most responsible for and deeply involved with research and management of vertebrate populations in the United States, and
Whereas, communication with government scientists at meetings provides a means of input from the scientific community to federal research and management policies, and
Whereas, meetings of professional and scientific societies promote an interchange of ideas that increases the quality of research and stimulates new approaches to solving problems, thus promoting greater efficiency in federal programs, and
Whereas, exchanges at meetings often lead to vastly increased cooperation between the private and public sectors of the research community that, in turn, can result in the avoidance of repetition, competition, and redundancy of effort by different parts of the research community, and

Whereas, the curtailment of attendance of the U.S. Fish and Wildlife Service scientists at meetings of the professional societies will ultimately result in the impoverishment of the quality and quantity of research and management accomplished by the federal government,
Therefore Be It Resolved that the American Society of Ichthyologists and Herpetologists, the Herpetologists' League, and the Society for the Study of Amphibians and Reptiles urge the Department of the Interior, U.S. Fish and Wildlife Service, to adopt a more enlightened view regarding scientific meetings and consequently assign a higher priority to attendance by the scientific staff.

2. *Whereas,* Alice G. C. Grandison, our esteemed herpetological colleague and Honorary Foreign Member of the American Society of Ichthyologists and Herpetologists, has recently retired from her curatorial duties at the British Museum (Natural History),
Now Therefore, the American Society of Ichthyologists and Herpetologists, the Herpetologists' League, and the Society for the Study of Amphibians and Reptiles join in extending best wishes upon her retirement.

3. *Whereas,* the members in attendance at the annual meeting of the ASIH, SSAR and HL met on the beautiful and green campus of the University of Oklahoma; and
Whereas, due to the excessively high consumption of beer, necessitated by the 3.2% alcoholic content, the campus was made even greener as the meetings progressed;
Now Therefore, be it resolved that the ASIH, SSAR, and HL thank the State of Oklahoma for permitting students of cold blooded vertebrates to broaden their perspectives by gaining data on mammalian renal physiology and sociological information on the greening of America.

4. *Whereas,* 963 registrants from three societies invaded a quiet university town; and
Whereas, these 963 registrants received incredibly efficient and courteous service, including but not limited to: arrangements for transportation to and from the airport; adequate dormitory housing; belly dancing; beer; ample, edible, and inexpensive cafeteria food; beer; exhibits of live animals; a lively auction fueled by beer; a superbly printed program with sessions carefully planned; coffee and donuts; more beer,
Now Therefore, be it resolved that these 963 registrants representing the American Society of Ichthyologists and Herpetologists, the Herpetologists' League, and the Society for the Study of Amphibians and Reptiles extend their thanks and appreciation to:

1. The University of Oklahoma, our host institution, and Dean Kenneth Hoving, Dean of the Graduate College and Vice Provost for Research, who opened our meetings;

2. The Oklahoma City Zoo and Director Lawrence Curtis for putting on a feast enjoyed by all;

3. The Norman Chamber of Commerce, The University of Oklahoma Foundation, the Oklahoma Herpetological Society, the Tulsa Zoo and the Zoology Department, Oklahoma State University—all of whom served as hosts;



WORKSHOP ON LARVAL AMPHIBIAN BIOLOGY From left to right: R. J. Wassersug, R. Inger, B. Shaffer, T. E. Hetherington.

4. The Local Committee comprised of the following subcommittees: (a) Program, Charles C. Carpenter, Chairperson; (b) Audio-Visual, Robert Richardson, Chairperson; (c) Signs and Graphics, Lynette Sievert, Chairperson; (d) Poster Sessions, Mark Paulissen, Chairperson; (e) Commercial Exhibits, Robert S. Rawding, Chairperson; (f) Live Exhibits, Stephen M. Secor, Chairperson; (g) Art Exhibit, Linda Trueb, Chairperson; (h) Family Tours and Child Care, Steve Kashuba, Chairperson; (i) Housing, David White and James H. Martin, Chairpersons; (j) Auction, Brian Paulson, Chairperson; (k) Social Functions, William Shelton, Chairperson; (l) Transportation, Wendal Porter, Chairperson; (m) T-Shirt Sales, Michael Lodes, Chairperson; (n) Registration-Information, Cindy Jolls, Chairperson; and (o) Zoo Barbecue and Open House, David Grow, Chairperson.

Whereas, Vic Hutchison chaired the largest gathering of Herpetologists and Ichthyologists in recorded history; and
Whereas, Vic Hutchison managed to continue to function throughout the meetings without once reaching his critical thermal maximum and without losing his righting response;
Now Therefore, be it resolved that all gathered at this banquet give Vic a standing ovation to thank him for the incredible organization at a most successful meeting.

Papers and Posters Presented:

A total of 337 papers and 74 posters were presented in 40 sessions during the five-day meeting. Papers and posters dealing with herpetology are presented below. Titles dealing with ichthyology appeared in *Copeia* 1984(4).

JOINT OPENING SESSION
CHAIRPERSON: VICTOR H. HUTCHISON

MARVALEE H. WAKE, University of California, Berkeley.
ASIH Presidential Address: **"Caecilians and I - Our First Twenty Years."**
JOHN E. RANDALL, Bishop Museum, Honolulu, Hawaii.
ASIH Distinguished Fellow Lecture: **"On the Importance of Marine Sanctuaries to Ichthyological Reseach."**
DAVID B. WAKE, University of California, Berkeley.
Herpetologists' League Distinguished Herpetologist Lecture: **"Species, Genes and Morphology - A Perspective on Evolution in Salamanders."**

CONTRIBUTED PAPER SESSIONS

(Papers and posters dealing strictly with ichthyological topics have been deleted. These titles appear in Copeia 1984(4).)

SYSTEMATICS I: AMPHIBIANS AND REPTILES
CHAIRPERSON: JAMES DIXON

DRYSDALE, T. A., University of Guelph.
Electrophoretic distinction of *Bombina variegata pachypus.*
WERMAN, S. D., University of Miami.
Biochemical systematics of neotropical pit vipers.
GUYER, C., University of Miami.
Phylogenetic relationships of anoline lizards: a reanalysis of osteological data.
JONES, T. R., Arizona State University.
An alternative hypothesis to explain the distribution of night lizards *(Xantusia)* based on plate tectonics.

POYNTON, J. C., University of Natal, South Africa.
Amphibian distribution in South Africa: some major features and research opportunities.
BAEZ, A. M., Universidad de Buenos Aires and Rice University.
Cretaceous and Early Tertiary pipid frogs from South America and their evolutionary significance.
IRISH, F. J., Harvard University.
Evolutionary implications of tooth replacement patterns in snakes.
LUKE, C., M. Hymen and H. Greene. University of California, Berkeley and Field Museum of Natural History.
Convergent evolution in sidewinding snakes.

SYSTEMATICS IV: AMPHIBIANS AND REPTILES
CHAIRPERSON: JOHN LYNCH

BUSACK, S. D., University of California, Berkeley.
Genetic differentiation in a Mediterranean herpetofauna: does paleogeography explain it all?
LOWCOCK, L. A., University of Guelph.
Genetic continuity in peripheral populations of salamanders of the *Ambystoma jeffersonianum* complex: a preliminary report.
ROMANO, M. A., D. B. Ralin, S. I. Guttman and J. H. Skillings, Miami University.
Parallel electromorph variation in the cryptic gray treefrog species *Hyla chrysocelis* and *Hyla versicolor*. Presented by Jack R. Layne.
MIYAMOTO, M. M., M. P. Hayes and M. R. Tennent, University of Miami.
Biochemical variation in the bark anole *(Anolis distichus)*: microgeographic differentiation among Floridian populations.
KING, R. B., Purdue University.
Enzyme and pattern polymorphism in Lake Erie water snakes.
GREEN, D. M., McMaster University.
Biochemical and cytogenetic evaluation of western North American frogs allied to *Rana aurora* and *R. boylei*.
JENNINGS, R. D., University of New Mexico.
Biochemical variation in the desert tortoise, *Gopherus agassizii*.
GAGE, R. D., University of California, Berkeley.
Genetic variation and relationships among South American iguanid lizards *(Liolaemus, Phymaturus* and *Diplolaemus)*.
FARRIS, J. S. and A. G. Kluge, State University of New York, Stony Brook and University of Michigan.
Genetic distance data: a critical review of published research on amphibian and reptile phylogenetic inference.
BUTH, D. G., University of California, Los Angeles.
Application of electrophoretic data in systematic studies of lower vertebrates: a critique and recommendations.
ROSE, F. L., Texas Technical University.
Lyophilization of tissue homogenates and hemolysates as a method for long-term storage of electrophoretic samples.

SYSTEMATICS VII: AMPHIBIANS AND REPTILES
CHAIRPERSON: WILLIAM E. DUELLMAN

SWEET, S. S., University of California, Santa Barbara.
Species groups within *Pituophis melanoleucus*: evidence from morphology.
MEYLAN, P. A., University of Florida and Florida State Museum.
Evolutionary relationships of Recent trionychid turtles: evidence from shell morphology.
CLARK, J. M., University of Chicago.
Fossil crocodiles of the Early Jurassic Moenave and Kayenta formations of Arizona.
CANNATELLA, D. C., University of Kansas.
Cladistic relationships of pelobatoid and pipoid frogs.
DUTTA, S. K., University of Kansas.
Systematic status of the genus *Tomopterna* (Anura: Ranidae) in Asia, Africa and Madagascar.
DUELLMAN, W. E. and P. M. Ruiz-C., University of Kansas.
Intrapopulation polychromatism in marsupial frogs: an ontogenetic phenomenon.
MOODY, S., Ohio University.
Standardized length measurements and scale counts for lizards: new and improved methods for systematic and population studies.
ETHERIDGE, R., San Diego State University.
The "Leiosaurs" (Reptilia: Iguanidae), and introduction to the group.
CROTHER, B. I., M. M. Miyamoto, and W. Presch, University of Miami and California State University, Fullerton.
A phylogenetic study of the lizard family Xantusiidae.

PHYSIOLOGY I: THERMAL BIOLOGY OF AMPHIBIANS AND REPTILES
CHAIRPERSON: RONALD GRATZ

LAYNE, J. R. JR., Miami University.
Time courses in thermal acclimation in plethodontid salamanders.
SMITH, E. N., N. C. Long, and J. Wood, Hansen Research Foundation, Oberlin College and Caymen Island Turtle Farm, Ltd.
Thermoregulation of sea turtles, *Chelonia mydas*.
SMITH, E. N., N. C. Long, and S. Robertson, Hansen Research Foundation and Oberlin College.
Heat exchange in lizards.
GATTEN, R. E., Jr., University of North Carolina, Greensboro.
Thermal acclimation of aerobic and anaerobic metabolism in lizards.
LANG, J. W., University of North Dakota.
Behavioral fever in the American alligator.
MANIS, M. L., Miami University.
Comparative thermal physiology in *Rana sylvatica*.
HERTZ, P. E. Barnard College, Columbia University.
The use of copper models to evaluate thermoregulation by three *Anolis* lizard species in Puerto Rico.
PAULISSEN, M. A. and C. C. Carpenter, University of Oklahoma.
Thermoregulatory strategy of the six-lined race runner, *Cnemidophorus sexlineatus*, in Oklahoma.
PAULSON, B. K. and V. H. Hutchison, University of Oklahoma.
Critical Thermal Maximum endpoint: the loss of righting response or onset of spasms?

PHYSIOLOGY II: GENERAL PHYSIOLOGY
CHAIRPERSON: LOUIS GUILLETTE, JR.

TAIGEN, T. L., K. D. Wells, and R. L. Marsh, University of Connecticut.
Enzymatic correlates of oxygen consumption in calling spring peepers.
DIAL, B. E., Texas A&M University.
Anaerobic metabolism during nest emergence and the hatchling frenzy in hatchling sea turtles *(Caretta caretta)*.
ADLER, K. and J. B. Phillips, Cornell University.
Orientation in desert lizards: time-compensated use of skylight polarization cues.
TAIGEN, T. L., and C. Busher, University of Connecticut.
Metabolic correlates of the intraspecific variation in toxicity, diet, and habitat of a dart-poison frog, *Dendrobates pumilio*.
FREDA, J., Pennsylvania State University.
Physiological effects of low pH on amphibians.
ROUNTREE, R. L., D. A. Baeyens and A. A. Karlin, University of Arkansas, Little Rock.
A comparative study of the diving biochemistry of reptiles.

PHYSIOLOGY III: GENERAL PHYSIOLOGY
CHAIRPERSON: I. Y. MAHMOUD

MAGNUSSON, W. E. and A. P. Lima, Instituto Nacional de Pesquisias da Amazonia.
Sources of heat for nests of *Paleosuchus trigonatus*.
DUNSON, W. A., Pennsylvania State University.
Estuarine populations of the turtle *Chelydra* as a model for the evolution of marine adaptations in reptiles.
BECK, J. W., Jr., University of Miami.
Aspects of osmoregulation in freshwater turtles.
SCHWENK, K., University of California, Berkeley.
Tongue morphology and prey prehension in iguanid lizards and *Sphenodon*.
GRAVES, B. M., D. Duvall, and M. B. King, University of Wyoming.
Aggregation and water loss among prairie rattlesnakes before and after shedding the proto-integument.
WILLIAMS, E. E., Harvard University.
Lizard skin mechanoreceptors.
FRITZSCH, B., University of Bielefeld, FDR.
The distribution and relevance of electroreception among amphibians.

ECOLOGY II: POPULATION ECOLOGY
CHAIRPERSON: ROYCE E. BALLINGER

BRUCE, R. C., Highlands Biological Station and Western Carolina University.
An ecological life table for the salamander, *Eurycea bislineata*.
VORIS, H. K., Field Museum of Natural History.
Population size estimates for a sea snake, *Enhydrina schistosa*.
NICKERSON, M. A., C. E. Mays, M. D. Tohulka and H. E. Barton, Milwaukee Public Museum, DePauw University, Max Allen Zoological Gardens and Arkansas State University.
Changing chelonian populations in a spring-fed Ozark river.
KNIGHT, J. L., Savannah River Ecology Laboratory.
A mark-recapture study of a tropical colubrid snake, *Tretanorhinus nigroluteus*.

ECOLOGY III: POPULATION & COMMUNITY ECOLOGY
CHAIRPERSON: GARY D. GROSSMAN

HOLOMUZKI, J. R., Arizona State University.
Influence of invertebrate predation on diel patterns of habitat use by larval salamanders.
GUTZKE, W. H. N., Colorado State University.
The influence of the hydric environment during the various periods of development on eggs and hatchlings of painted turtles *(Chrysemys picta).*
CHENG, H. Y., Tulane University.
Resource allocation strategies in *Sphaerodactylus* geckos: a colonizers versus specialists (confiners) selection.
GUYER, C., University of Miami.
Demographic responses of the anoline lizard, *Norops humilis,* to supplemental feedings.
WALTON, M., University of Chicago.
The influence of microclimate on the availability of prey of the salamander, *Plethodon cinerus.*

ECOLOGY IV: LIFE HISTORY OF AMPHIBIANS AND REPTILES
CHAIRPERSON: ROBERT F. CLARKE

WALKER, J. M., and S. E. Trauth, University of Arkansas and Southern Methodist University.
The parthenogenetic whiptail lizard, *Cnemidophorus laredoensis* (Teiidae) in Laredo, Texas.
MUSHINSKY, H. R., University of South Florida.
On the relationship between fire and autecology of *Cnemidophorus sexlineatus.*
MOLL, E. O., B. Groombridge, and J. Vijaya, Eastern Illinois University, IUCN Conservation Monitoring Centre, and Madras Crocodile Bank.
Notes on the natural history and relationships of the Cochin Forest cane turtle.
WOOD, R. C., Stockton State College.
Field studies of the mangrove terrapin *Malaclemys terrapin rhizophorarum* in the Florida Keys.
SAUGEY, D. A., U.S. Forest Service.
Observations on a population of slimy salamanders, *Plethodon glutinosus glutinosus* (Green) from the Ouachita Mountains of Arkansas.
STEWART, M. M., State University of New York, Albany.
The flying frogs of Puerto Rico.
LOHOEFENER, R., Mississippi State University Research Center.
The status of the gopher tortoise *(Gopherus polyphemus)* in Mississippi.
BERRY, K. H. and F. B. Turner, Bureau of Land Management and University of California, Los Angeles.
The behavior of juvenile desert tortoises *(Gopherus agassizii).*
ECHTERNACHT, A. C., University of Tennessee.
***Anolis carolinensis* (Sauria: Iguanidae) in east Tennessee at the northern margin of the range of the species and the genus.**

ECOLOGY V: FORAGING ECOLOGY
CHAIRPERSON: MICHAEL PLUMMER

FEDER, M. E. and P. L. Londos, University of Chicago.



PREDATOR-PREY RELATIONSHIPS IN LOWER VERTEBRATES SYMPOSIUM Back row, from left to right: G. Roth, G. V. Lauder, E. E. Werner, S. J. Arnold, J. A. Endler, P. W. Webb, M. E. Feder. Front row: R. B. Huey, C. Gans, G. S. Helfman, A. F. Bennett.

Hydric constraints upon foraging in a terrestrial salamander, *Desmognathus.*
JAEGER, R. G., University of Southwestern Louisiana.
Choice of diet by the salamander *Plethodon cinereus* in a natural habitat.
BART, H. L. and R. W. Holzenthal, University of Oklahoma and University of New Orleans.
Feeding of the Gulf Coast waterdog, *Necturus beyeri,* and its indications on the ecology of the species.
MILLER, D. E., University of South Florida.
Foraging of the mangrove water snake, *Nerodia fasciata compressicauda.*
GREENE, H. W. and M. A. Santana, University of California, Berkeley and Universidad de Costa Rica.
Diet and hunting behavior in free-living bushmasters *(Lachesis muta,* Viperidae).
CUNDALL, D., Lehigh University.
Feeding behavior in the primitive snake, *Cylindrophis rufus.*
WALDSCHMIDT, S. R. and S. M. Jones, University of Wisconsin.
The effect of body temperature and the rate of food consumption on the probability of feeding and passage rate in the lizard, *Sceloporus undulatus.*
JONES, S. M., University of Wisconsin.
Between-year variability in the reproduction of the iguanid lizard, *Sceloporus undulatus:* environmental sources of variation.
FLORES—VILLELA, O. A. and R. C. Vogt, Universidad Nacional Autonoma de Mexico.
Food habits and morphometrics of the "chopontil" *Claudius angustatus* in Veracruz, Mexico.

ECOLOGY VI: COMMUNITY ECOLOGY
CHAIRPERSON: MARY POWER

SOUTHERLAND, M. T., University of North Carolina.
Interspecific interactions among four species of *Desmognathus* salamanders.
NISHIKAWA, K. C., University of North Carolina and Dalhousie University.
The evolution of interspecific aggression among plethodontid salamanders.
TAYLOR, J., University of New Hampshire.
Do *Taricha granulosa* and paedomorphic *Ambystoma gracile* compete? Some problems with theory.

ECOLOGY VII: GENERAL ECOLOGY
CHAIRPERSON: RAY DRENNER

GILLINGHAM, J. C., Central Michigan University.
Snake predation and the cost of lizard territoriality.
JACKSON, D. R., Florida Natural Areas Inventory, The Nature Conservancy.
Predation on turtles by the American alligator: ecological and morphological correlates.
SNOW, J. E., University of Oklahoma.
Diets of juvenile turtles *(Chrysemys)* in experimental pond enclosures: Phylogenetic and ontogenetic variation.
GUZMAN GUZMAN, S. and R. C. Vogt, Universidad de Veracruz and Universidad Nacional Autonoma de Mexico.
Food partitioning in three species of neotropical freshwater turtles in southern Veracruz, Mexico.
KIND, M. B. and D. Duvall, University of Wyoming.
Foraging decisions by the prairie rattlesnakes in a patchy habitat: preliminary decisions.
SIEGEL, R. A., Savannah River Ecology Laboratory.
Seasonal variations in the foraging ecology of two species of garter snakes.
NOVAK, S. S., R. A. Siegel, S. W. Oliver and J. L. Knight, Savannah River Ecology Laboratory.
Movement responses of American alligators to thermal effluents.

ECOLOGY IX: ECOLOGY OF AMPHIBIANS & REPTILES
CHAIRPERSON: STANLEY F. FOX

BERGER, T. J., University of Kansas.
Patterns of tadpole biomass density in a permanent, temperate pond.
KRUPA, J. J. and J. E. Snow, University of Oklahoma.
Phylogenetic variation in spatial distributions of hatchling turtles *(Chrysemys)* in an experimental pond enclosure.
TURNER, F. B. and K. H. Berry, University of California, Los Angeles and Bureau of Land Management.
Population dynamics of the desert tortoise *(Gopherus agassizii)* in the eastern Mojave Desert.
MOLL, D. L., Southwest Missouri State University.
The status and distribution of *Dermatemys mawei* in Belize.
CHOO, B. L. and L. M. Chou, National University of Singapore.
Effect of photoperiod on the growth and survival of soft-shelled turtle, *Trionyx sinensis*, hatchlings.
SCUDDER, R. M. and G. M. Burghardt, Wabash College.
The effect of the feeding regimen on the growth of neonate broad-banded water snakes, *Nerodia fasciata confluens* (Colubridae), and its possible effect on reproduction.
McALLISTER, C. T., S. E. Trauth and J. Ubelaker, Veterans Administration Medical Center, Dallas and Southern Methodist University.
Food habits and endoparasites of *Crotophytus collaris collaris* (Sauria: Iguanidae), with a description of a new tapeworm species.

ZOOGEOGRAPHY
CHAIRPERSON: GLENN KLEMMER

WHITE, B., Los Angeles County Museum of Natural History.
Speciation and the environment: a new look at global diversity patterns.
HOCUTT, C. H., and R. L. Tilney, University of Maryland and Rhodes University, South Africa.
Drift of India: a vicariant event.
HENDRICKSON, D. A., Arizona State University.
Suspect terranes, suspicious salamanders and New World biogeography.

REPRODUCTIVE BIOLOGY I: SEX RATIOS & REPRODUCTIVE STRATEGIES
CHAIRPERSON: FRANKLIN SNELSON, JR.

BENABIB-NISENBAUM, M. and R. C. Vogt, Universidad Nacional Autonoma de Mexico.
Environmental sex determination in *Dermochelys coriacea* on natural nesting beaches—significance of nest position and laying date.
VOGT, R. C., Universidad Autonoma de Mexico.
Reproductive strategies of neotropical fresh water turtles: tropical endemics vs. temperate zone invaders.
HOWARD, R. D. and A. G. Kluge, Purdue University and University of Michigan.
Sexual selection and patterns of reproductive success (RS) in woodfrogs *Rana sylvatica*.
HOUCK, L. D., S. J. Arnold and R. A. Thisted, University of Chicago.
Variation in mating success in the plethodontid salamander, *Desmognathus ochrophaeus*.
GUTZKE, W. H. N., G. L Paukstis and L. L. McDaniel, Colorado State University.
Skewed sex ratios for adult and hatchling bullsnakes, *Pituophis melanoleucas*, in Nebraska.

LARVAL BIOLOGY I: AMPHIBIANS
CHAIRPERSON: ROBERT JAEGER

ALBERCH, P., Harvard University.
Cartilage remodeling during the metamorphosis of the plethodontid salamander, *Eurycea bislineata*.
WASSERSUG, R. J., K. Hoff, and K. C. Nishikawa, Dalhousie University.
Kinematics of swimming in *Rana* and *Xenopus* larvae.
HOFF, K., R. J. Wassersug and K. C. Nishikawa, Dalhousie University.
Gross morphology and passive mechanical properties of the tails of *Rana* and *Xenopus* larvae.
NISHIKAWA, K. C., K. Hoff, and R. J. Wassersug, Dalhousie University.
Neuromuscular control of swimming in *Rana* and *Xenopus* tadpoles.
SCHMIDT, F. and T. J. Berger, University of Kansas.
Sprint velocity and morphology of *Rana catesbelana* tadpoles.
TRAVIS, J., Florida State University.
Genetic analysis of growth and development patterns in larval anurans.
SEMLITSCH, R. D., Savannah River Ecology Laboratory.
Environmental and genetic components of metamorphosis and paedomorphosis in *Ambystoma talpoideum*.
LANNOO, M. J., Dalhousie University.
Systematic and ecological considerations of neuromast topography in *Ambystoma* larvae.
da ROCHA, C. F., W. E. Magnusson and A. P. Lima, Universidad de Rio de Janeiro, Brasil.
Palatability of tadpoles of Amazonian forest frogs.
KAPLAN, R. H., Reed College.
Factors that affect metamorphosis: embryo size and food level.
BEMIS, W. E., University of Chicago.
Developmental functional morphology of feeding in the salamander, *Taricha torosa*.

LARVAL BIOLOGY II: FISHES AND AMPHIBIANS
CHAIRPERSON: F. DOUGLAS MARTIN

COLLINS, J. P., Arizona State University.
Paedomorphosis and the evolution of morphological variation in *Ambystoma tigrinum*.
NELSON, C. E. and I. H. Jaafar, Indiana University.
Calorimetric analysis of eggs and metamorphs for seven amphibian species.

MORPHOLOGY I
CHAIRPERSON: THEODORE PAPENFUSS

MILLER, K., P. B. Pinto and L. F. Landis, Franklin and Marshall College.
Why big frogs jump farther than small frogs.
SESSIONS, S. K., University of California, Berkeley.
Mechanisms of morphogenesis in ontogeny and phylogeny: evidence from limb regeneration in plethodontid salamanders.
HANKEN, J. and B. K. Hall, University of Colorado and Dalhousie University.
Variation and timing of the cranial ossification sequence of the Oriental fire-bellied toad, *Bombina orientalis*.
PETERSON, C. R., S. J. Arnold and J. S. Tsuji, University of Chicago and University of Washington.
The effect of temperature on growth in *Thamnophis sirtalis*.
STEWART, J. R., University of Tulsa.
Structure of the fetal membranes of *Gerrhonotus multicarinatus* and *Gerrhonotus coeruleus*.

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BRAMBLE, D. M., University of Utah.
Engineering and evolutionary implications of chelonian shell architecture.
PETERSON, J. A. and R. L. Bezy, Los Angeles County Museum of Natural History.
Scale micro-architecture of xantusiid lizards.
PETERSON, J. A., Los Angeles County Museum of Natural History.
The micro-architecture of the scales of iguanid lizards.
TRAUTH, S. E., W. E. Cooper and L. J. Vitt, Southern Methodist University, Auburn University and University of California, Los Angeles.
Cloacal anatomy and glands of the broad-headed skink, *Eumeces laticeps*.

BEHAVIOR I: COMMUNICATION OF AMPHIBIANS & REPTILES
CHAIRPERSON: DAVID DUVALL

THORNHILL, G. M., Ohio University.
Hearing threshold and sound propagation in Fowler's toad.
FORESTER, D. C. and W. H. Harrison, Towson State University.
The significance of non-overlapping, synchronous vocalization by the spring peeper, *Hyla crucifer*.
WELLS, K. D. and T. L. Taigen, University of Connecticut.
Energetics of vocalization by an anuran amphibian *(Hyla versicolor)*.
SULLIVAN, B. K., Arizona State University.
Advertisement call variation and observations on breeding behavior of five anurans (*Scaphiopus* and *Bufo*) in southern Arizona.
SULLIVAN, B. K., Arizona State University.
Male calling behavior in response to playback of conspecific advertisement calls in two bufonids of Arizona.
BISHOP, P. J., University of Witwatersrand, South Africa.
Comparative analysis of chorus organization of some African anurans.
LOSOS, J. B., Harvard University.
The importance of dewlap color for species recognition in the sympatric sibling species, *Anolis marcanoi* and *Anolis cybotes*.
DUVALL, D., M. B. King, K. Gutzwiller and B. M. Graves, University of Wyoming.
Assessment and defensive escalation in prairie rattlesnakes: effects of social and habitat context.
VLIET, K. A., University of Florida.
Bellows and headslaps: social displays of the American alligator.
SECOR, S. M., University of Oklahoma.
An analysis of the reproductive behavior of the speckled kingsnake, *Lampropeltis getulus holbrooki*.
CARPENTER, G. C., University of Wyoming.
Behavioral ecology of the western banded gecko *(Coleonyx variegatus)* at defecation sites in southern California.
DAWLEY, E. M., University of Connecticut.
Olfactory communication in salamanders: identifying sex, species, and ploidy level through chemical cues.

BEHAVIOR II: AMPHIBIANS AND REPTILES
CHAIRPERSON: JAMES C. GILLINGHAM

RODDA, G. H., University of Tennessee.
Magnetic sensitivity in navigating alligators.
FERRIS, J. S. and H. Gucinski, Ecological-Analysts, Inc. and Anne Arundel Community College.
Role of measured light intensities in successful seaward orientation of hatchling loggerhead turtles *Caretta caretta*.
Dunham, A. E. and B. W. GRANT, University of Pennsylvania.
Biophysical constraints of the activity of the lizard *Sceloporus merriami*.
CRUMP, M. L., University of Florida.
Site fidelity and homing in *Atelopus varius*.
RUBY, D. E. and A. E. Dunham, Drexel University and University of Pennsylvania.
Alternate behavioral strategies in use of space in male lizards *Sceloporus merriami*.
FOX, S. F., N. R. Rachuk, and L. A. DeLay, Oklahoma State University.
The social cost of tail loss in the lizard *Uta stansburiana*: body injury vs. loss of length.
BOWKER, R. W., Arizona State University.
Agonistic and courtship behavior of the Arizona alligator lizard, *Gerrhonotus kingi*.
CLARK, D. L., Central Michigan University.
Sleep site fidelity in Puerto Rican anoline lizards.
JAYNE, B. C., Michigan State University.
A graphical approach for analyzing modes of snake locomotion.

REPRODUCTIVE BIOLOGY II
CHAIRPERSON: RONALD BRANDON

FRAZER, N. B. and J. I. Richardson, Woods Hole Oceanographic Institute and University of Georgia.
Reproductive variation in loggerhead turtles, *Caretta caretta*.
IVERSON, J. B., Earlham College.
Geographic variation in reproduction in the mud turtle *Kinosternon flavescens*.
FITCH, H. S., University of Kansas.
Geographic variation in clutch and litter size in American reptiles.
WALLS, S. C. and R. G. Altig, University of Southwestern Louisiana and Mississippi State University.
The female reproductive biology of the marbled salamander, *Ambystoma opacum*, in Mississippi.
HOWLAND, J. M., University of California, Los Angeles.
The reproductive biology of the iguanid lizard *Cophosaurus texanus* in Big Bend National Park, Texas.
ROBLE, S. M., University of Kansas and Carnegie Museum of Natural History.
The reproductive and population ecology of *Hyla chrysoscelis*.

REPRODUCTIVE BIOLOGY III: REPRODUCTIVE PHYSIOLOGY
CHAIRPERSON: JAMES R. STEWART

MITCHELL, J. C., University of Richmond.
Variation in male reproductive cycles in syntopic populations of *Chrysemys picta* and *Sternotherus odoratus* from Virginia.
SEVER, D., St. Mary's College.
Sexually dimorphic glands of *Eurycea nana*, *Eurycea neotenes* and *Typhlomolge rathbuni* (Amphibia).
GUILLETTE, L. J., Jr. and S. L. Fox, Wichita State University.
Effect of deluteinization on plasma progesterone concentration and gestation in the lizard, *Anolis carolinensis*.
FOX, S. L., Wichita State University.
Luteal histology and plasma progesterone concentration in two lizard species.
MENDONCA, M. T., University of California, Berkeley.
Hormone fluctuations and behavior in a field population of calling male bullfrogs.
LONG, D. R., Texas Technical University.
Fat body distribution in *Bufo cognatus*.



BIOLOGY OF *CNEMIDOPHORUS* SYMPOSIUM SPEAKERS Back row, left to right: D. Crews, M. C. Moore, F. H. Van Berkum, R. A. Anderson, C. J. Cole, B. E. Leuck, J. A. Moreno, K. Etheridge. Middle row: C. H. Lowe, H. C. Dessauer, S. E. Trauth, E. D. Parker Jr., L. J. Vitt, L. C. Wit, M. S. Rand, G. Casas-Andrew, J. M. Walker. Front row: R. G. Zweifel, T. Garland Jr., J. J. Schall, J. W. Wright, L. D. Densmore, A. H. Price, J. F. Scudday, R. G. Bowker, B. G. Hanks.

REPRODUCTIVE BIOLOGY IV:
CHAIRPERSON: HARRY W. GREENE

MASON, R. T., University of Texas.
Female mimicry in the garter snake, *Thamnophis sirtalis parietalis.*
SELCER, K. W., Texas Technical University.
Maternal investment in a lizard with a fixed clutch size.
PETOKAS, P. J., State University of New York, Binghamton.
Nesting ecology and reproductive effort in Blanding's turtle, *Emydoidea blandingii.*
HAYES, M. P., University of Miami.
The ecology of clutch attendance in the tropical frog, *Centrolenella fleischmanni.*
EWERT, W. A., Indiana University.
Relative clutch mass of turtles.
STEWART, J. R. and J. L. Vial, University of Tulsa.
Sexual dimorphism in a tropical gerrhonotine lizard.
WOOLBRIGHT, L. L., State University of New York, Albany.
Sex-specific energy budgets predict size dimorphism for *Eleutherodactylus coqui* (Anura: Leptodactylidae).
STAUB, N., University of California, Berkeley.
Sexual dimorphism in *Aneides hardii.*
GERHARDT, H. C., R. E. Daniel, and S. A. Perrill, University of Missouri and Butler University.
Male mating behavior in *Hyla cinerea.*
REAGAN, N. L., Western Carolina University.
Courtship behavior of the *Eurycea bislineata wilderae* complex.
VERRELL, P. A., The Open University, England.
Mating decisions of male red-spotted newts, *Notophthalmus viridescens.*
ROSTKER, M. A., U.S. Environmental Protection Agency.
Female mate choice in collared lizards: intrinsic quality or territory quality.

SPECIAL INVITED ADDRESSES
CHAIRPERSON: KRAIG ADLER

PROFESSOR ERMI ZHAO, Chengdu Institute of Biology, Chengdu, Sichuan, China.
A brief review of the amphibians and reptiles of China.
PROFESSOR KUANG YANG LUE, National Taiwan Normal University, Taipei, Taiwan, China.
The amphibians of Taiwan (Formosa).

SYMPOSIUM: PREDATOR-PREY RELATIONSHIPS IN LOWER VERTEBRATES I. PHYSIOLOGY & MORPHOLOGY
CHAIRPERSON: MARTIN E. FEDER

FEDER, M. E. and G. V. Lauder, University of Chicago.
INTRODUCTION: Predator-prey relationships in lower vertebrates: I. Physiology and morphology.
BENNETT, A. F., University of California, Irvine.
Measuring behavioral energetics.
ROTH, G., University of Bremen, FDR.
Sensory physiology and neuroethology of predator-prey relationships.
GANS, C., University of Michigan.
Functional morphology as a tool in the study of predator-prey interactions.
WEBB, P. W., University of Michigan.
Locomotion and predator-prey relationships.

SYMPOSIUM: PREDATOR-PREY RELATIONSHIPS IN LOWER VERTEBRATES II. ECOLOGY & BEHAVIOR
CHAIRPERSON: GEORGE V. LAUDER

LAUDER, G. V. and M. E. Feder, University of Chicago.
INTRODUCTION: Predator-prey relationships in lower vertebrates: II. Ecology and behavior.
HUEY, R. B., University of Washington.
Combined field and laboratory approaches to the study of predation.
HELFMAN, G. S., University of Georgia.
Behavioral interactions of predators and prey.
WERNER, E. E., Kellogg Biological Station.
Foraging theory and the prediction of predator choice in lower vertebrates.
ENDLER, J. A., University of Utah.
Anti-predator mechanisms.
ARNOLD, S. J., University of Chicago.
The population biology of predator-prey relationships.

SYMPOSIUM: BIOLOGY OF CNEMIDOPHORUS I.
CHAIRPERSON: JOHN W. WRIGHT

WRIGHT, J. W., Los Angeles County Museum of Natural History.
INTRODUCTION. (Includes eulogy of T. Paul Maslin given by C. J. McCoy, Carnegie Museum).
WRIGHT, J. W. and D. A. Good, Los Angeles County Museum of Natural History and University of California, Berkeley.
Allozymes and evolution in the genus *Cnemidophorus.*
PARKER, E. D., Jr., McNeese State University.
Biogeographic implications of clonal diversity in parthenogenetic species of *Cnemidophorus.*
GOOD, D. A. and J. W. Wright, University of California, Berkeley and Los Angeles County Museum of Natural History.
Allozymes and the origin of the parthenogenetic members of the *Cnemidophorus sexlineatus* species group.
COLE, C. J. and H. C. Dessauer, American Museum of Natural History and Louisiana State University Medical Center.
Clonal inheritance in parthenogenetic species of lizards.
BROWN, W. M., J. W. Wright and L. D. Densmore, University of Michigan and Los Angeles County Museum of Natural History.
Mitochondrial DNA and evolution in *Cnemidophorus.*
DENSMORE, L. D., J. W. Wright and W. M. Brown, University of Michigan and Los Angeles County Museum of Natural History.
Mitochondrial DNA and the evolution of a parthenogenetic complex of lizards *(Cnemidophorus).*
WALKER, J. M., University of Arkansas.
The species groups, and subspecies of *Cnemidophorus* (Teiidae): a critical inventory.

SYMPOSIUM: BIOLOGY OF *CNEMIDOPHORUS* II.
CHAIRPERSON: LAURIE J. VITT

LOWE, C. H., University of Arizona.
Cnemidophorology and cnemidophorologists—the genus *Cnemidophorus* 155, 55, and 33 years later.
HANKS, B. G. and J. F. Scudday, Texas A&M University and Sul Ross State University.
Allozyme electrophoresis in *Cnemidophorus gularis* S.L. from the Chihuahuan Desert region.
DESSAUER, H. C. and C. J. Cole, Louisiana State University Medical Center and American Museum of Natural History.
Genetics of *Cnemidophorus tigris* populations in a contact zone in New Mexico.
MORENO, J. A., University of Miami and Department of Natural Resources, Puerto Rico.
Morphological character variation, heterozygosity and genome coadaption in *Cnemidophorus* (Sauria: Teiidae).
TRAUTH, S. E. and W. R. Fagerberg, Southern Methodist University.
Morphometric analysis of eggshell structure in *Cnemidophorus laredoensis* and *C. sexlineatus.*
GARLAND, T., Jr., University of California, Irvine.
Locomotory performance and activity metabolism of *Cnemidophorus tigris* in relation to natural behaviors.
BOWKER, R. G., Alma College.
The thermoregulation of the lizards *Cnemidophorus velox* and *C. exsanquis:* some consequences of high body temperatures.
ETHERIDGE, K. and L. C. Wit, University of Florida and Auburn University.
Factors affecting activity in *Cnemidophorus.*
WIT, L. C. and J. C. Sellers, Auburn University.
Physiological regulation of hibernation in *Cnemidophorus sexlineatus:* possible role of the thyroid.
CREWS, D., J. Whittier, A. Billy and M. C. Moore, University of Texas and Arizona State University.
Male-like behavior in an all-female lizard: relationship to ovarian cycle.
MOORE, M. C., J. M. Whittier and D. Crews, Arizona State University and University of Texas.
Sex steroid hormones during the ovarian cycle of the parthenogenetic whiptail lizard, *Cnemidophorus uniparens:* relationship to male-like behavior.
VAN BERKUM, F. H., University of Washington.
Thermal sensitivity of locomotion in *Cnemidophorus* and *Ameiva.*

SYMPOSIUM: BIOLOGY OF *CNEMIDOPHORUS III.*
CHAIRPERSON: JOSEPH J. SCHALL

LEUCK, B. E., Centenary College of Louisiana.
Comparative social behavior of *Cnemidophorus:* the role of bisexuality, parthenogenesis and ploidy level.
ANDERSON, R. A., University of California, Los Angeles.
Foraging of *Cnemidophorus tigris* as a function of prey availability.

RAND, M. S., R. M. Storm and J. J. Beatty, Wichita State University and Oregon State University.
A population of parthenogenetic *Cnemidophorus* in central Oregon: in support of the weed hypothesis.
SCHALL, J. J., University of Vermont.
Plant secondary compounds and the diet of the herbivorous whiptail lizard, *Cnemidophorus arubensis.*
CASAS-ANDREAU, G. and M. A. Gurrola-Hidalgo, Universidad Nacional Autonoma de Mexico.
Aspects of the comparative ecology of two species of *Cnemidophorus* in coastal Jalisco, Mexico.
PRICE, A. H., New Mexico State University.
Competition and parthenogenesis in *Cnemidophorus:* ecological aspects and evolutionary implications.
VITT, L. J. and G. L. Breitenbach, University of California, Los Angeles.
Life histories and reproductive strategies among species within the genus *Cnemidophorus.*
WRIGHT, J. W.
SUMMARY.

SSAR ZOO LIAISON COMMITTEE SYMPOSIUM: MANAGEMENT OF ENDANGERED REPTILES AND AMPHIBIANS IN CAPTIVITY.

CHAIRPERSON: PETER J. TOLSON

HUDSON, R. D., Fort Worth Zoological Gardens.
The species survival plan and its application to reptiles.
QUINN, H., K. Peterson and A. Odum, Houston Zoological Gardens.
Genetic and demographic management of small, captive populations of endangered reptiles and amphibians with special emphasis on management of *Crotalus unicolor.*
DENSMORE, L. D. and H. C. Dessauer, University of Michigan and Louisiana State University Medical Center.
The "absence" of protein divergence in *Crocodylus*—a slowdown in the rate of molecular evolution or a recent radiation.
BELCHER, A. D. and H. E. Lawler, Rio Grande Zoological Garden and Arizona-Sonora Desert Museum.
A cooperative propagation project for the protected rattlesnakes of Arizona.
REYNOLDS, R. P., U.S. Fish and Wildlife Service and U.S. National Museum.
Status of the Galapagos tortoise *(Geochelone elephantopus)* and a review of the captive breeding program at the Charles Darwin Station.
LAWLER, H. E., Arizona-Sonora Desert Museum.
Captive management of the endangered Isla San Esteban chuckwalla, *Sauromalus varius* (Sauria: Iguanidae) at the Arizona-Sonora Desert Museum.

REGIONAL HERPETOLOGICAL SOCIETIES CONFERENCE. MONITORING REPTILE AND AMPHIBIAN POPULATIONS: AN IMPORTANT ROLE FOR REGIONAL HERPETOLOGICAL SOCIETIES.

CHAIRPERSON: JEFFREY H. BLACK

PLUMMER, M., Harding University.
Monitoring of reptile populations by mark-recapture.
SEMLITSCH, R., Savannah River Ecology Laboratory.
Monitoring amphibian populations: qualitative and quantitative approaches.
SECOR, S. M. and C. C. Carpenter, University of Oklahoma.
The DOKARRS system: a method to accumulate natural history and distribution accounts of Oklahoma amphibians and reptiles.
HAMMACK, S.
Description of reptiles and amphibians around Dallas, Texas.



SSAR ZOO LIAISON COMMITTEE SYMPOSIUM Back row, left to right: R. D. Hudson, H. Quinn, H. E. Lawler, A. D. Belcher, Front row: L. D. Densmore, P. J. Tolson, R. P. Reynolds.

POSTERS

NICOLLETO, P. F., Virginia Polytechnic Institute and State University.
The role of vision and olfaction in prey detection by *Scincella lateralis.*
WOOD, R. C., Stockton State College.
Field studies of the side-necked turtle *Pelusios adansonii* in Lake Turkana, Kenya.
HARDING, J. H., Cranbrook Institute of Science.
The wood turtle *(Clemmys insculpta)* and its predators: Comments on survival after mutilation.
EHRHART, L. M., University of Central Florida.
Structure and status of the loggerhead and green turtle populations in the central region of Indian River, Florida.
LORAINE, R. K., University of Kansas and Savannah River Ecology Laboratory.
Distribution and habitat preferences of the wood turtle, *Clemmys insculpta*, in Iowa.
PECHMANN, J. H. K. and R. L. Schneider, Savannah River Ecology Laboratory.
The spatial distribution of migrating amphibians around two breeding sites.
BOCK, B. C., A. S. Rand, and G. M. Burghardt, University of Tennessee, Knoxville and Smithsonian Tropical Research Institute.
Radio-telemetry investigations of nesting movements in green iguanas.
HERNANDEZ, J. O., G. Casas-Andreu and J. W. Wright, Unicoma, Mexico, Instituto de Biologia, UNAM, Mexico and Los Angeles County Museum of Natural History.
La herpetofauna de Mexico. (video)
MULVANY, P. S., Oklahoma Herpetological Society.
Possible climatic controls on the biogeography of blind snakes in the United States.
OSBORNE, S. T., Oklahoma City Zoo.
Some aspects of reproductive biology in the beaded lizard, *Heloderma suspectum.* (video)
CENSKY, E. J. and C. J. McCoy, Carnegie Museum of Natural History.
Reproduction in *Bothrops yucatanicus* (Crotalidae).
BEAUCHAT, C. A. and E. J. Braun, University of Arizona.
Renal morphology of a neonatal lizard, *Sceloporus jarrovi.*
STOVALL, R. H., Valencia Community College.
Pits, papillae, and scales: Light and scanning electron microscope observations of squamate skin.
JASLOW, A. P., R. E. Lombard and T. E. Hetherington, University of Chicago and Ohio State University.
Hearing and middle ear structure in anurans.
WILHOFT, D. C., Rutgers University.
Posthatching yolk components and utilization in the snapping turtle, *Chelydra serpentina.*
RAYMOND, P. W., University of Central Florida.
Sea turtle hatchling disorientation and artificial beachfront lighting: a review of the problem and potential solutions.
KREMPELS, D. M., University of Miami.
Near infrared reflectancy by coral snakes: aposematic coloration?



REGIONAL HERPETOLOGICAL SOCIETIES CONFERENCE Left to right: J. H. Black, R. Semlitsch, S. M. Secor, C. C. Carpenter, S. Hammack.

FRITTS, T. H. and R. D. Jennings, U.S. Fish & Wildlife Service and University of New Mexico.
Variation in the expression of maternal protection in the American alligator, *Alligator mississippiensis*.
COOPER, W. E. and L. J. Vitt, Auburn University at Montgomery and University of California, Los Angeles.
Interspecific odor discrimination by the broad-headed skink, *Eumeces laticeps*.
SMITH, E. N., N. C. Long and J. Wood, Hansen Research Foundation, Oberlin College and Caymen Island Turtle Farms, Ltd.
Evaporative water loss in the green sea turtle, *Chelonia mydas*.
COSTANZO, J. P., Michigan Technological University.
The bioenergetics of hibernation in the eastern garter snake, *Thamnophis s. sirtalis*.
DePARI, J. A., Rutgers University.
Overwintering of *Chrysemys picta* hatchlings in the nest chamber in northern New Jersey.
HOTALING, E. C., Rutgers University.
Fluctuating and constant incubation temperatures: their effect on sex ratios in *Chelydra* and *Malaclemys*.
HUTCHISON, V. H. and K. Spriestersbach, University of Oklahoma.
Diel and seasonal cycles in thermal selection in *Necturus maculosus*.
POWELL, G. L. and A. P. Russell, University of Calgary.
Growth and allometry in *Phrynosoma douglassi*.
GIBSON, A. R., D. A. Smucny and J. Kollar, Cleveland State University.
Thermal biology of young common garter snakes, *Thamnophis sirtalis*.
GRATZ, R. K., Michigan Technological University.
The effect of vagal input in the control of breathing in snakes, *Nerodia sipedon*.
MEADE, L., Morehead State University.
Kentucky snakes: Recent research concerning their systematics and distribution.
FITZGERALD, L. A., and N. J. Scott, Jr., University of New Mexico and U.S. Fish & Wildlife Service.
Taxonomic status of *Hyla sanborni* and *Hyla nana* (Hylidae: Anura).
SEIDEL, M. E., Marshall University.
Revision of the West Indian trachemyd turtles (Testudines: Emydidae).
SIMMONS, J. E., University of Kansas.
A method for preparation of anuran osteological material.
KEEN, W. H. and R. W. Reed, State University of New York College, Cortland.
Defense of cover sites and feeding sites by a plethodontid salamander.
EVANS, D., IUCN Conservation Monitoring Centre, Cambridge, United Kingdom.
Information for conservation.
BUSACK, S. D., University of California, Berkeley.
Biochemical divergence in a Mediterranean herpetofauna.
BAUER, A. M., University of California, Berkeley.
Studies on the functional morphology of gekkonid lizards.
WAKE, D. B. and K. P. Yanev, University of California, Berkeley.
Speciation in the salamander genus *Ensatina*.
SEIB, R. L., University of California, Berkeley.
Feeding ecology of tropical snakes.
WAKE, D. B., T. J. Papenfuss, J. F. Lynch and P. Elias, University of California, Berkeley.
Salamander transect studies in Mexico and Guatemala.
CAROTHERS, J. H., University of California, Berkeley.
Determinants of altitudinal zonation: assemblage structure of *Liolaemus* lizards in the Cordillero of Chile.
PAPENFUSS, T. J., University of California, Berkeley.
The two-legged mole lizards *(Bipes)* of Mexico.
LARSON, A. and D. B. Wake, University of California, Berkeley.
A molecular phylogenetic perspective on the morphological evolution in salamanders of the *Bolitoglossa* beta group.
de QUEIROZ, K., University of California, Berkeley.
Phylogenetic relationships among iguanine squamates.
RAINEY, W. E., University of California, Berkeley.
An ancient gene duplication in reptile serum albumins.
SCHWENK, K., University of California, Berkeley.
Comparative surface morphology of the lizard tongue.
GREENE, H. W., University of California, Berkeley.
Ecological correlates of venom types in snakes.
WAKE, M. H., University of California, Berkeley.
Comparative morphology of the eyes of caecilians.
SNOW, J. E., University of Oklahoma.
Energy acquisition by juvenile turtles *(Chrysemys)*: Test of a prey selection model.
MACEY, R., University of California, Santa Cruz.
The biogeography of a herpetofauna transition between the Great Basin and Mojave Deserts.
WADE, J. K., A. C. Echternacht and G. McCracken, Pennsylvania State University and University of Tennessee.
Genetic variation in *Anolis carolinensis* with red and gray dewlaps.
TELFORD, S. R., III., The Johns Hopkins University.
Why baby snakes aren't cute, or, a saltational origin of snakes.
CHANNING, A. and R. Boycott, University of the Western Cape and Transvaal Snake Park, South Africa.
Heleophryne tadpoles: evidence for paleoclimatic changes.



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SSAR COMMITTEES FOR 1984-1985:

Following the Norman meeting, President Gans appointed the following committees, coordinators and representatives to report to the Board of Directors at the Tampa meeting in August of 1985. Individuals with important matters pertaining to these activities should contact the relevant committee chair. Addresses for committee chairs are included on the inside rear cover of each issue of *Herpetological Review*.

Grants-in-Herpetology: James P. Bacon (Ch), Thomas H. Fritts, John B. Iverson, Robert W. Murphy, Diane Secoy, Harry Greene, Michael V. Plummer.

Conservation: Patricia Riexinger (Ch), John L. Behler, William S. Brown, C. Kenneth Dodd, Jr., Rene E. Honegger, Paul E. Moler.

Kennedy Student Award: J. Eric Juterbock (Ch), Robert E. Gatten, Jr., Ken R. Marion, John S. Mecham, Laurie J. Vitt.

Nominating: Douglas H. Taylor (Ch), Joseph C. Mitchell, James B. Murphy, Lynne Houck, Martin J. Rosenberg.

Regional Society Liaison: Terry Hibbitts (Ch), H. Bernard Bechtel, Harold DeLisle, James D. Fawcett, John Simmons, Tom Vermersch, George D. Whitney.

Zoo Liaison: Peter J. Tolson (Ch), Jonathan A. Campbell, David Barker, Joseph Laszlo, Ruth Zantzinger, Dale Belcher, James C. Gillingham, Hugh Quinn.

Long-range Planning: James L. Christiansen (Ch), Kraig Adler, Ralph W. Axtell, James S. Jacob, Linda Maxson, Henri C. Seibert.

Meetings (SSAR/HL): Max A. Nickerson (Ch), Ray E. Ashton, Jr., William Cooper, Jr., Victor H. Hutchison, James S. Jacob, C. J. McCoy.

Resolutions (SSAR/HL): Robert A. Thomas (Ch), Others to be appointed at Tampa meeting.

Ad Hoc Career Pamphlet Committee: Neil B. Ford, Martin J. Rosenberg, Henri C. Seibert.

Common and Scientific Names Coordinator: Joseph T. Collins.

Translations Coordinator: Robert D. Aldridge.

Representative to Association of Systematic Collections: Max A. Nickerson.

James S. Jacob
SSAR Secretary ●

LETTERS TO THE EDITOR

EDITOR:

If evolution is an ongoing, dynamic process, at what point in the study of herpetology are herpetologists going to evolve some compassion for the animals they study?

I have just read a paper in a recent issue (Vol. 40, No. 2) of **Herpetologica** that left me more infuriated than informed. I refer to the paper by Diller and Wallace (pp. 182-193) entitled "Reproductive Biology of the Northern Pacific Rattlesnake *(Crotalus viridis oreganus)* in Northern Idaho," in which they state that "All captured snakes [numbering 387] were taken to the laboratory and immediately frozen, except for 21 juvenile snakes that were marked and released." The brackets above are mine—the number, theirs.

The 387 rattlesnakes sacrificed in their study represent three hibernacula over a 4-year period. They further state that "Other hibernacula were visited during the course of the study, but they contributed only minor numbers of snakes." Since it is common knowledge among interested people that rattlesnakes are especially vulnerable at their hibernacula, it is reasonable to assume that *none* of those visited hibernacula will any longer produce many snakes. These two gentlemen may just have exterminated several more populations of rattlesnakes in the name of science and knowledge. It is quite likely that the data they accumulated have little relevance except as comparative material to other dwindling populations that still exist. Their study populations have almost certainly been decimated for generations to come, if not permanently.

This is 1984, not 1884, and it seems to me that it is long past time to develop a genuine conservation ethic in the herpetological community at large. Decimation of populations of any species should not be tolerated. It is a well established fact that nearly all populations of wildlife of all groups are under constant assault from numerous threats. In the past, callous field biologists have not been included among those threats, but quite probably should have been.

We may 'legitimize' the exploitation of wildlife around the world by hungry, Third-World peoples because of their condition, but there is no excuse for this type of destruction by educated people—especially scientists in the pursuit of knowledge. Biologists are some of the most outspoken voices when it comes to commercial trade in wildlife, yet they seem to condone mass slaughter if it's in the name of Science. I say bull to that. Dead is dead, regardless of motivation.

This is only the latest study of its type I've noticed in the literature in recent years and each time I read of such numbers sacrificed, I'm appalled. If biologists of this type don't care any more than that about the living, propagating organisms than to kill them in obscene numbers, they should study rocks, or canned-goods on a supermarket shelf. If not the *living* animal, why are they interested in zoology to begin with? It is never a fair exchange to trade populations of living animals for sets of statistics or data bases! If that's the price of knowledge, the price is too high!

In closing, I would like to add that I feel the SSAR Conservation Committee has been negligent in this area. I believe that this whole issue should have been seriously addressed by that group long ago. Assuming the members of that group are truly concerned with the preservation of herptile populations, it is certainly within the realm of their responsibility to develop such a position for the Society, to make it publicly known, and to *encourage* compliance with specified guidelines.

JOSEPH DINARDO
16 Idlewild Road
Levittown, Pennsylvania 19057, U.S.A. ●

REPLY TO DINARDO'S LETTER

We completely agree with Mr. Dinardo's assertion that a genuine conservation ethic is necessary in the herpetological community and that "decimation of populations of any species should not be tolerated." We do support conservation of rattlesnakes, and, indeed, of all amphibians and reptiles, even though it apparently does not appear that way to some.

Assuming that it is acceptable to sacrifice a portion of a viable population of organisms for scientific research, we would answer the objections to our study by stating that we did not threaten the existence of any local population of snakes by our collections. Although numerous hibernacula were visited initially, only three were selected as representative sites within the study area for extensive collections. These three hibernacula were well suited for removal sampling because they were accessible and vulnerable to rattlesnake hunting that is prevalent in our area.

The hibernacula sampled represent three of about twenty known to us in the study area. The number of hibernacula within our study area (about 500 km^2) that are unknown or inaccessible probably is in the hundreds. In addition, the number of hibernacula within our study area is not an unusual local phenomenon. The extensive river systems with their rugged steep canyons and abundant talus and scree slopes in remote regions of northern and central Idaho contain the same ideal rattlesnake habitat that is found in our study area.

Not only were we sampling a small fraction of the hibernacula in the study area, but the three hibernacula where we collected were not decimated as Mr. Dinardo has suggested. Each of these populations contained hundreds of snakes. Our collecting certainly decreased but did not decimate the populations. The three sites were visited during the summers of 1983 and 1984 after all collections had stopped. All sites still had viable populations of snakes including gravid females. Only one population is in any danger of extinction. This is due to the fact that it is within the growth zone of a small town, and there are diligent but so far unsuccessful efforts now being made to exterminate the snakes.

Mr. Dinardo's "reasonable assumption that none of those visited hibernacula will any longer produce many snakes" is completely invalid. In fact, in addition to the three main sites, we visited five other dens during our study and obtained a total of 21 rattlesnakes. One of those dens (one with a small population) is the site of our current studies where about 150 rattlesnakes have been marked and released over the past three years. Three of the remaining four hibernacula have been visited since 1981, and snakes were seen at all in about the same numbers as they were during our study.

The number and size of rattlesnake populations in northern and central Idaho may seem unbelievable to people not familiar with the area. Several factors make rattlesnake populations much larger and more stable here than they apparently are in many parts of the country. To begin with, there is a tremendous

amount of rattlesnake habitat, much of which is totally uninhabited by people. Human impacts on rattlesnake populations, therefore, are greatly reduced. Secondly, the hibernacula have all been found in steep talus or scree slopes (up to 100 m or more in width, 10 m or more from top to bottom) that are difficult and often hazardous to traverse. Snakes are frequently warned of an approaching person due to shifting and tumbling rocks. Even when one manages to reach the snakes undetected, they are seldom fully exposed on the surface and readily escape into the porous talus. The snakes in talus cannot be dug out because more rocks will continually slough from above. Rattlesnakes in talus also are not readily exterminated by shooting, burning, or dynamiting. We know ranchers who have been attempting to exterminate a population of snakes for years by these methods with no apparent success. Apparently enough rattlesnakes can always escape to maintain the population.

The overall objective of our study was not to simply generate some data for comparative purposes but to carry out a long-term study (10-20 years) to determine those population and reproductive parameters of snakes that are seldom attempted. However, in the first phase of our study, we felt it was necessary to get certain baseline reproductive data that could best be obtained by sacrificing snakes. In the second phase of our ongoing study, our efforts are concentrated on marking individuals from one of the "other" hibernacula and monitoring movements, growth, and reproductive success.

The final point we would like to address is whether such a study as ours is the work of "callous field biologists." Certainly a biologist that threatened a population of organisms in order to generate data would be callous and unworthy of being a part of the scientific community. However, sacrificing animals "in the name of science" when there is a considerable margin of safety does not automatically make one callous and uncompassionate toward the animals being studied. This long-term study was initiated out of a keen interest and respect for rattlesnakes and not a desire for "quick" data.

We conclude by applauding Mr. Dinardo's concern and willingness to speak out for responsible scientific studies. We hope he and others around the country are convinced that rattlesnake populations in northern Idaho are as large and healthy in 1984 as they were before the start of our study.

LOWELL V. DILLER
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and
RICHARD L. WALLACE
Department of Biological Sciences
University of Idaho
Moscow, Idaho 83843, U.S.A.

●

EDITOR:

In an age of heightened environmental awareness, concern in the scientific community for protection of biologically vulnerable species (whether or not they may be officially listed as threatened or endangered) clearly has gained prominence in recent years. Despite this favorable attitude, certain lapses in our vigilance may occur. Such a case, I believe, is shown by a recent paper published in a respected herpetological journal (L. V. Diller and R. L. Wallace, 1984, Herpetologica 40:182-193) on the reproductive biology of the northern Pacific rattlesnake *(Crotalus viridis oreganus)* in which an apparently large number of individuals (387) was taken from three denning populations in Idaho.

My purpose here is not to question the findings of the study but rather to comment on the general conservation issues it raises and how to deal with these issues. There are two central problems: (1) the degree of depletion of the populations in the dens, and (2) the impact of identifying the locations of the dens.

Almost all vertebrate field biologists, including herpetologists, are aware of similar conservation issues in their particular localities involving their particular species, so it is not novel to cite cases of seasonal habitat use or behaviors which make a species vulnerable. Winter aggregations of bats in caves,

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All institutions worldwide, holding live reptiles and/or amphibians are asked to submit inventories and breeding information current up to January 1st of each year. Private collectors are also welcomed to submit information, but emphasis is on those collections which have breeding potential, have had breeding success in the past, or hold species which are rare or difficult to obtain.

I am now preparing to receive information current as of January 1, 1985. If you keep live reptiles and/or amphibians in captivity, please respond with the information requested below.

(1) A complete inventory of all reptiles and amphibians held in your collection current as of January 1st. Sexes should be included and can be listed "male/female/unknown sex."

(2) A list of all species which bred and produced young during 1984, including numbers of young for each species.

(3) Any miscellaneous breeding information (use the information presented in the 1984 edition as a guide). Include detailed information for all species which you feel should be listed.

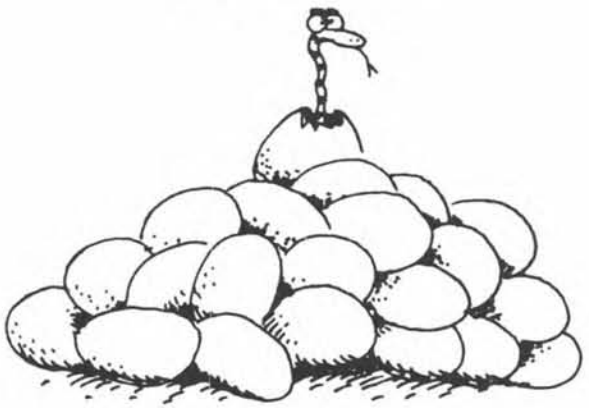
(4) Longevity records for any species which you think notable. Please include the number of years, months, days and indicate if the specimen is still living.

(5) A listing of any publications, including books, museum bulletins, journals, magazines, etc. with reference to reproduction in reptiles and amphibians. References pertaining to the care of individual species as well as more general articles relating to temperature, light cycle, hibernation, etc. are of interest.

Deadline for receipt of information is March 1st.

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concentrated nesting of sea turtles, and communal denning of rattlesnakes are but a few examples. Forty years ago in Utah, the well-known Woodbury den contained around five hundred Great Basin rattlesnakes but within twenty-five years the population had been reduced to a mere remnant of about two dozen snakes largely because the location of this den was revealed to numerous persons in the belief that such knowledge would promote conservation through education. After the word spread, however, it did not take long for human predation to virtually extinguish this once-spectacular aggregation.

As to the first problem raised by the Diller and Wallace study, it is difficult to assess the seriousness of removing 240 females (84 of which were sexually mature) over a four-year period because no information is available in the paper on the estimated total population sizes and the proportion of the female populations this number represents. On demographic grounds, a "take" of this magnitude may be detrimental in view of the late age of female maturity (4 to 6 years) and small mean litter size (5.5) of *C. v. oreganus* in Idaho. Nor do we know how likely it would be for immigration to help replenish the losses (i.e., how isolated these denning populations are from others). My impression, based on knowledge of the Utah *C. v. lutosus* den and current work on timber rattlesnake *(C. horridus)* dens, is that such a level of exploitation probably represents a significant depletion of the populations in these Idaho dens.

The second problem may well be the most serious for these denning colonies in the long run. Exact locations (distances and directions from towns, elevations), as well as publication of the local names of the dens, may ensure that these denning colonies will receive increased attention from snake hunters and unscrupulous collectors. It falls heavily upon those of us who serve as reviewers and editors of our journals to be aware of this problem and to urge deletion of information that may threaten the survival of vulnerable populations of amphibians and reptiles.

WILLIAM S. BROWN
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LEGISLATIVE ALERT

FEDERAL REGISTER NOTICES

Vol. 49, No. 67, pp. 13538-13540. April 5, 1984. 50 CFR Part 23 . . . Notice of Final Rule. Indian Snakes Added to Appendices of Endangered Species Convention. The rule became effective April 5, 1984.

The following species were submitted by the Government of the Republic of India for inclusion in Appendix III of CITES. A notice and request for comments was published in Vol. 49, No. 12, p. 2128 on January 18, 1984.

Family Colubridae:
Atretium schistosum (olive keelback water snake)
Cerberus rhynchops (dog-faced water snake)
Natrix piscator (checkered keelback water snake)
Ptyas mucosus (Indian rat snake)

Family Elapidae:
Naja naja (Indian cobra)
Ophiophagus hannah (King cobra)

Family Viperidae:
Vipera rullellii (Russell's viper)

Vol. 49, No. 98, pp. 21089-21090. May 18, 1984. 50 CFR Part 17. Notice of Findings on Petitions Involving the **Yacare Caiman** and **Harter's Water Snake.** Comments may be submitted until further notice.

A petition to delist the yacare *(Caiman crocodylus yacare)* was received by the U.S.F.W.S. on December 27, 1983. The species has been listed as endangered since 1970; it is native to Argentina, Brazil, Bolivia, and Paraguay. The Service has concluded that the petition does not present credible, substantial biological or commercial data to warrant a delisting at this time.

A petition to list the Harter's water snake *(Nerodia harteri)* as threatened with critical habitat was received by the Service on February 28, 1984. The finding states that the petition does contain substantial biological data that a listing may be warranted. The species is known only from central Texas. The Service is soliciting data on: Taxonomy, distribution, critical habitat, and threats.

Other Conservation Issues of Note:

The Secretariat of CITES issued a notice (No. 300) on 30 May 1984 that The Government of the Republic of Bolivia has established a total ban on export of live wild animals from all its territories, effective 1 May 1984 until 1 May 1985. The Secretariat reminded parties that Brazil and Paraguay has established an indefinite ban on the export of all wild animals. Peru has adopted stricter domestic measures and is authorizing the export of only a limited range of species of psittacidae.

The first draft of a Habitat Conservation Plan for the **Coachella Valley fringe-toed lizard** *(Uma inornata)* was completed in April as a cooperative venture between the U.S.F.W.S., the Nature Conservancy, and affected local governments. For further details, see Endangered Species Technical Bulletin IX(5):2.

The seventh season of protection and conservation for **Kemp's ridley sea turtles** *(Lepidochelys kempii)* at the Playa de Rancho Nuevo breeding beaches in Mexico began this year. As of April 26, 50 nests had been protected (Endangered Species Technical Bulletin IX(5):3).

The U.S.F.W.S. and NMFS have withdrawn their proposal to allow transshipment of certain **green sea turtle** *(Chelonia mydas)* products through the port of Miami, Florida. The European Economic Community on January 1, 1984, restricted trade in green sea turtle products with western European nations, thereby making the ruling unnecessary. (See FR 4/26/84, or End. Sp. Tech. Bull. IX(5):10).

U.S.F.W.S. "box scores" of listed species indicate that there are currently 96 species of reptiles and 16 species of amphibians currently listed as endangered or threatened either in the U.S. and/or in foreign countries. Recovery plans have been prepared for eight species (8.3%) of reptiles and three species (18.8%) of amphibians. By contrast, there are approved recovery plans for 19 (6.5%) of the 291 listed mammals, 41 (19.3%) of the 212 listed birds, 26 (45.6%) of the 57 listed fishes, 13 (26%) of the 50 listed invertebrates, and 21 (28.4%) of the 74 listed plants. Total: 795 listed species with 131 species (16.5%) having approved recovery plans.

(Although some of the notices printed in this column are "outdated," we feel it is important to call them to the attention of the herpetological community. We welcome contributions of significant—though outdated—notices from SSAR members.)

PATRICIA RIEXINGER
New York State Department
of Environmental Conservation
50 Wolf Road
Albany, New York 12233, U.S.A. ●

NEWSNOTES

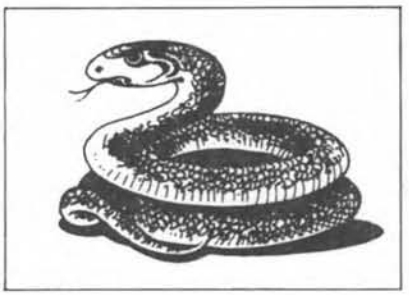
THIRD EDITION OF THE *CODE*

The International Commission on Zoological Nomenclature has indicated that the 3rd edition of the International Code of Zoological Nomenclature will soon be available. The book consists of parallel English and French texts, totaling about 320 pages (216 mm x 318 mm). It will be for sale for 15 pounds, plus 1.50 pound for postage and handling, through the Publications Sale, British Museum (Natural History), Cromwell Road, London SW7 5BD England. Individuals and organizations may also purchase it for $21.50, postage and handling included, by writing:

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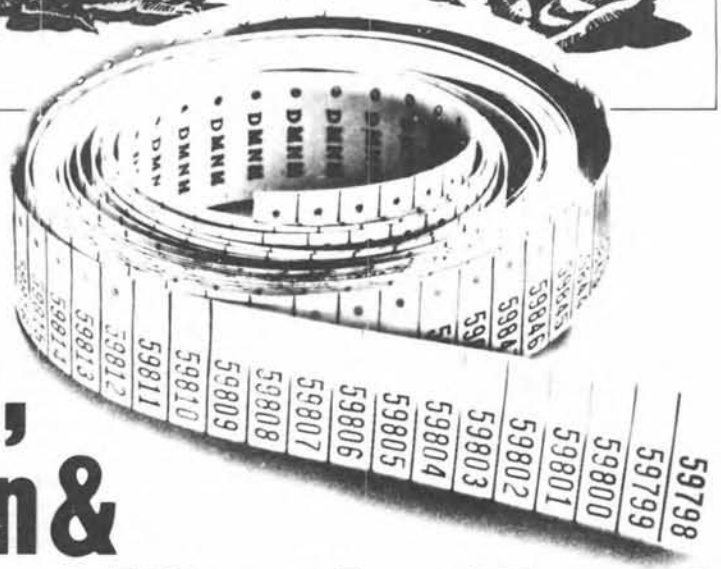
In order that the Code will be widely available, a prepublication price of $18.75, postage and handling included, for individuals is in effect until March 31, 1985. Delivery of the Code will be in Spring, 1985. Checks drawn on a United States bank or International Money Orders should accompany all U.S. orders! Please make checks payable to American Association for Zoological Nomenclature. ●











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PATRICIA RIEXINGER
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SOCIETIES

SPRING ESHL MEETING

The Spring meeting of the Eastern Seabord Herpetological League will be held on Saturday, 9 March 1985 at the Harvard University Science Center, Cambridge, Massachusetts. The meeting will be hosted by the Massachusetts Herpetological Society and will consist of a series of presentations on a variety of topics in herpetology. All interested individuals are invited to attend.

ESHL is a consortium of thirteen regional herpetological societies (Connecticut, Georgia, Lehigh Valley, Maryland, Massachusetts, New York, North Carolina, Philadelphia, Virginia and Washington Herpetological Societies, and The Association for the Conservation of Turtles and Tortoises, NOAH, and Turtle Trust) which meets each March and October for a series of paper presentations. All members of the constituent societies may attend the meetings, for which there is no registration fee.

Further information about the March 1985 meeting may be obtained from Joe Martinez (617) 846-8321 or Dorothy DeLisle (617) 698-2601.

Further information about the Eastern Seaboard Herpetological League may be obtained from:

Raymond Logue, ESHL Coordinator
3456 Aldine Street
Philadelphia, Pennsylvania 19136, U.S.A. ●

THE BOMBAY NATURAL HISTORY SOCIETY: SOME RECENT PUBLICATIONS

In the fall of 1983 the Bombay Natural History Society celebrated its one hundredth anniversary. Founded initially by an enthusiastic and devoted band of amateurs, both British and from the local community, it soon expanded its horizons. Today it is the preeminent privately funded research association in India with members in all states, as well as most foreign countries, and research projects proceeding across the subcontinent. The Society has published a number of books, most notably the extensive studies of Salim Ali and Dillon Ripley on birds of the subcontinent.

Its journal, the **JOURNAL OF THE BOMBAY NATURAL HISTORY SOCIETY,** is now in its 81st volume, each current volume including approximately 800 pages of technical papers per volume, whereas the more slickly presented **HORNBILL** presents popular articles on this or that animal or adventure.

During 1983, the Society published several items of interest to our membership. The first was an anniversary issue of the **HORNBILL,** marking the centenary and including some substantial and historical information regarding its activities and those of its scientific staff and associates. The next is **A CENTURY OF NATURAL HISTORY,** a collected series of articles excerpted from the **JOURNAL** and assembled by topics with historical vignettes of the authors. The 78 articles include coverage of herpetology, specifically three herpetological papers, namely Malcolm Smith on monitor lizards, Asana on *Calotes* and F. Wall on snakes. Beyond the directly zoological interest, the 755 page well-illustrated volume contains such nuggets of biological information as the amount of game killed by the Mogul emperors (documenting their interest in zoology!), detailed descriptions of elephant capture and specific instructions on mahseer fishing.

Of more specific interest to the herpetological audience is J. C. Daniel's **BOOK OF INDIAN REPTILES,** representing the first complete coverage of the topic since Malcolm Smith's volumes on the Fauna of British India on which the present treatment heavily relies. The volume includes accounts of the Indian genera of reptiles and for these summarizes many of the short notes published in the **JOURNAL.** The list is selective and for many genera, only a single species is described. It is illustrated with new photographs of turtles and crocodilians as well as of the more common species of lizards. For the snakes, the volume reprints the beautiful and well reproduced color drawings initially published in the **JOURNAL** by the late Frank Wall. Whereas this book does not represent a taxonomic advance over the earlier volume (for which, although reprinted several times, the snake account is again unavailable), it provides a useful, quick guide to the fauna.

It should be noted that the prices of both these volumes are most reasonable at $12.50 and $7.50 (substantial members discount to $9.00 and $6.00), respectively. As the annual membership dues including subscription to the **HORNBILL** and the **JOURNAL** are only $16.00 (plus a $2.50 entrance fee for the first year), this would seem to be a good way of adding to one's library while simultaneously supporting an extremely worthwhile organization. The address of the Society is Hornbill House, Shahid Bhagat Singh Road, 400023 Bombay, India.

CARL GANS
The University of Michigan
Division of Biological Sciences
Ann Arbor, Michigan 48109, U.S.A. ●



THE DELAWARE HERPETOLOGICAL SOCIETY

A new Herpetological society has formed in Delaware. Even though the society is just a few months old, we have a large number of interested people attending our meetings and hope to expand in the near future. A newsletter is published monthly—the first newsletter was issued in September 1984. Meetings are held monthly, upon notice, at the Ashland Nature Center, Hockessin, Delaware.

Membership includes newsletters, participation in and notification of trips, reptile and amphibian shows, and other events sponsored by the society. Anyone interested in reptiles and amphibians is invited to join.

Further information about the Society may be obtained by contacting John LaMedica, President, (302) 453-9754, or Susan Moreau, Treasurer, (302) 322-6827.

DHS would like to exchange with other herpetological societies. Our mailing address is:

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MEETINGS

REPORT ON THE 1984 AUSTRALASIAN HERPETOLOGICAL CONFERENCE, AND 1984 ANNUAL GENERAL MEETING OF THE AUSTRALIAN SOCIETY OF HERPETOLOGISTS HELD AT SYDNEY AND SPRINGWOOD, 28 AUGUST TO 2 SEPTEMBER 1984

Herpetology in Australia, New Zealand and the Pacific islands is a small but vigorous discipline. Its practitioners recently gathered in Sydney, on an unprecedented scale (approximately 180 participants), to discuss diverse aspects of their work.

The 1984 Australasian Herpetological Conference may best be appreciated in the light of its forerunners. For many years, the Aus-

tralian Society of Herpetologists (A.S.H.) has held general meetings at intervals of about 15 months. More recently (1980), Chris Banks organized a Herpetological Conference in Melbourne, to which interested amateurs as well as professional scientists were invited. The response was very encouraging: the papers were good, the discussion lively, and the Proceedings published (Banks and Martin 1982).

The success of the Melbourne meeting stimulated ideas of a second Conference, this time on a larger scale, to be held in association with the "annual" meeting of A.S.H. in the Sydney area in 1984. The Conference was jointly sponsored by the Royal Zoological Society of New South Wales, the Australian Museum, A.S.H., and Taronga Zoo. The Organizing Committee (Gordon Grigg, Rick Shine, Harry Ehmann) appointed chairmen for a series of symposia which formed the main part of the meeting. The symposium topics (and chairmen) were as follows:

Population Ecology (Hal Heatwole)
Physiological Ecology (Gordon Grigg)
Ecological Biogeography (Hal Cogger)
Reproduction and Development (Col Limpus)
Phylogeny of Elapid Snakes (Terry Schwaner)
Husbandry and Captive Breeding (Chris Banks, Terry Boylan)
Rare and Endangered Species (Mike Tyler)
Chromosomes and Evolution (Max King)

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Almost 100 papers were presented, and approximately 180 people registered for the Conference. Carl Gans delivered the keynote address "In Praise of Diversity," and showed erotic films of tuataras coupling. Several other American colleagues who have worked extensively on Australian animals (e.g. John Legler on chelid turtles, Sam McDowell on elapid snakes) also attended the meeting, but most participants came from Australia and New Zealand, with two from Fiji. All states of Australia were represented.

It is difficult to identify highlights of such a diverse meeting. The papers presented were generally of very high standard, and most of the symposia provided a comprehensive picture of recent developments in the field of interest, by the major Australian workers in those fields. In many cases, recent work has radically altered and expanded our understanding of the herpetofauna. Perhaps the most obvious example of this increase in knowledge, and diversification of methodologies, came from the most specialized symposium: that on the phylogenetic relationships of Australasian elapid snakes. The affinities of species within this group have proven difficult to resolve by use of conventional morphological data, but contributions from all of the major workers in this field showed strikingly concordant results from data on immunology, microcomplement fixation, electrophoresis, karyology, venom structure, internal anatomy, ecology, and the use of external morphological characters not previously considered. The conclusion that emerges is of a relatively recent adaptive radiation, with many of the viviparous genera sharing a very recent common origin.

The Conference was held primarily at the University of Sydney, but with some events at the Australian Museum and Taronga Zoo. The Conference Proceedings will be published in early 1985 by Surrey Beatty Ltd., and are being edited by Grigg, Shine and Ehmann. Following the end of the Conference on 31 August, approximately 80 of the participants travelled to Springwood, in the Blue Mountains west of Sydney, for the A.S.H. "annual" general meeting. The papers and festivities continued for another two days. Again, the standard of presentations was high, as was the enthusiasm of the audience—despite the scientific and social rigours of the previous week. Menna Jones, from the University of New England, won the Student Prize for her paper on water relations of agamid eggs. Brian Weavers, of the Australian National University, was awarded a book prize for his presentation on thermoregulation of varanid lizards.

The Business Meeting was a more torrid affair than is usual. Having disposed of routine business, planned for the next A.S.H. meeting (in Armidale in December 1985), and elected office-bearers for 1985 (President - Gordon Grigg; Vice-President - Rick Shine; Secretary-Treasurer - Gillie Courtice; Assistant Secretary-Treasurer - Arthur White; Public Officer and Editor - Ric Longmore; Councillor - John Coventry), the meeting turned to a more controversial issue: the recent publication of a checklist of Australian reptiles in a privately edited journal (Wells and Wellington, *Aust. J. Herp.* 1, numbers 3-4, 1983) which proposed massive nomenclatural changes. One of the authors of this article (Wells) also is the editor of the journal in which the article appeared. The three scientific members of the journal's editorial board present (Max King, Hal Heatwole, Jeff Miller) noted that they had not reviewed the article in question, and that they had now resigned from any involvement with the journal because of the publication of the checklist.

The meeting then passed a series of motions, summarized below:

1. that A.S.H., representing professional herpetologists in Australia, has no association with the "Australian Journal of Herpetology";
2. that the society reaffirms its commitment to peer review, and to adherence to the rules and recommendations of the International Code of Zoological Nomenclature;
3. that the society will apply to the International Commission to suppress the publication entitled "A synopsis of the Class Reptilia in Australia" in the "Australian Journal of Herpetology" Volume 1, Nos. 3-4.

The submission for suppression of this checklist is now being prepared by officers of the Society, who would be grateful for comments or advice from any members of the international herpetological community.

R. SHINE
Zoology A08
University of Sydney, N.S.W. 2006 ●

REVIEW OF BONN SYMPOSIUM ON AFRICAN VERTEBRATES

An International Symposium on Systematics, Phylogeny and Evolutionary Ecology of African Vertebrates was held May 15-18, 1984 in Bonn, Federal Republic of Germany, to commemorate the 50th anniversary of the opening of the public exhibits of the Zoologisches Forschungsinstitut and Museum Alexander Koenig. Forty contributors from 14 countries presented papers. The travel expenses of the invited participants were reimbursed in part by a grant from the German Science Foundation. Karl-L. Schuchmann, Ph.D., Assistant Curator of Ornithology organized the symposium. Herpetologists who participated in the symposium, and the titles of their presentations, were:

Ulrich Joger. The African Gekkonine radiation—preliminary results on evolution and historical biogeography. (Bonn, F. R. Germany)

Barry Hughes. A systematic review of African Green Snakes of the genus *Philthamnus*. (Accrah, Ghana)

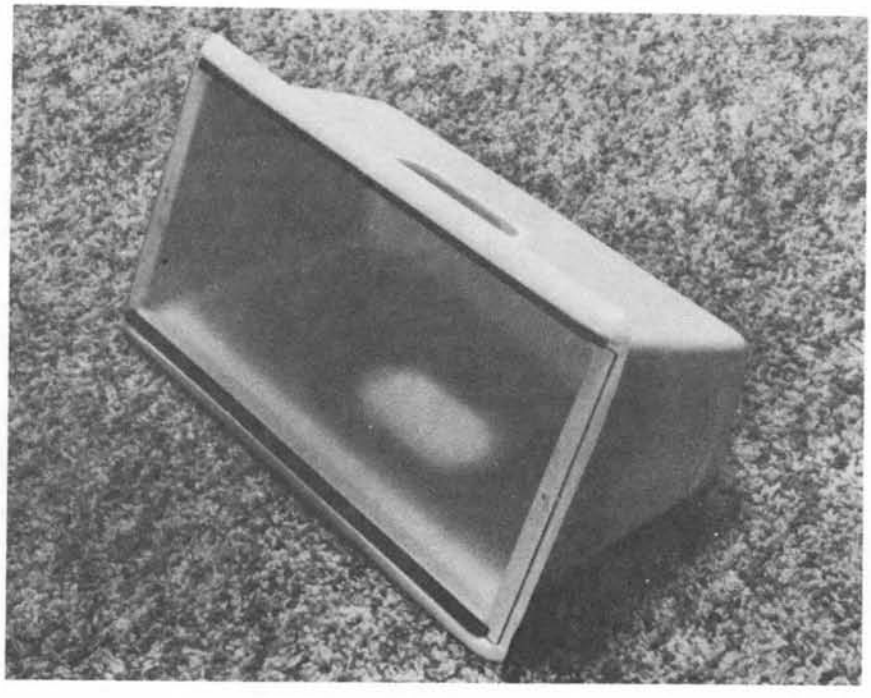
E. Buffetaut. Zoogeographic history of African crocodilians since the Triassic. (Paris, France)

Wolfgang Boehme. Zoogeographical patterns of the herpetofauna of the African Subsaharan savannah belt. (Bonn, F. R. Germany)

Hartwig Berger Dell'Mour. Transition from normal to serpentiform appearance in the South African genus *Tetradactylus* Merrem, Gerrhosauridae, Sauria. (Windhoek, Namibia)

Jens Rasmussen. The retinas of some boigine snakes including a discussion of some

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evolutionary trends in advanced snakes (Caenophidia). (Copenhagen, Denmark)

Mills Tandy. Geographic variation in *Bufo blanfordi* Boulenger (Amphibia: Anura: Bufonidae). (Austin, Texas, U.S.A.)

Benedetto Lanza. Systematics and biogeography of the Somali amphibians and reptiles. (Florence, Italy)

Scott Moody. The phylogenetic relationships and zoogeographic origins of the lizards of the infraorder Iguania (Agamidae, Chamaeleonidae and Iguanidae) inhabiting Africa and Madagascar. (Athens, Ohio, U.S.A.) ●

MASSASAUGA RATTLESNAKE SYMPOSIUM

Preliminary steps are underway to organize an Eastern States symposium on the massasauga rattlesnake. The scheduled dates are 15 & 16 August 1985. The location will be the Jennings Environmental Education Center in Butler County, Pennsylvania.

Anyone interested in presenting research, status reports, or other pertinent information should submit a brief proposal to the address below. Some stipend money will be available to defer speakers' costs.

Due to the sensitive nature of the data being reviewed, the acceptance of symposium participants will be made by a panel. Please include a brief resumé when sending for additional information to:

David E. Johnson
Pennsylvania Department
of Environmental Resources
Jennings Environmental Education Center
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Slippery Rock, Pennsylvania 16057,
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(412) 794-6011 ●

ANNOUNCING THE NINTH INTERNATIONAL HERPETOLOGICAL SYMPOSIUM on CAPTIVE PROPAGATION & HUSBANDRY at San Diego, California June 26-30, 1985

CALL FOR PAPERS

All herpetologists are invited to submit for consideration the titles of papers they wish to present at the 9th International Symposium on Captive Propagation and Husbandry to be held at the University of San Diego in San Diego, California. A pre-day to the conference will take place at the Roeding Park Zoo in Fresno, California on June 25, 1985. Paper lengths may range from 20-40 minutes. A preliminary program will be established by April, 1985 so a 100-150 word abstract of a presentation should be submitted by contributors prior to 1 April 1985. *Titles should be submitted as soon as possible.* Final manuscripts should be submitted prior to 15 June 1985. Submit all program information to: Sean McKeown, Curator of Reptiles, Program Chairperson, Roeding Park Zoo, 894 West Belmont Avenue, Fresno, California 93728; (209) 488-1096. ●

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HERPETOLOGY IN AUSTRALIA

Although the land area of Australia is similar to that of the U.S., with a correspondingly large and diverse herpetofauna, we have a much smaller population of scientists to study these animals. Hence, a great deal of Australian herpetology is concerned with taxonomy (many new taxa are described each year) and basic natural history. Increasingly, however, detailed studies on ecology, physiology, and other aspects of particular species are being carried out.

The major scientific society is the Australian Society of Herpetologists, with a membership of approximately 200. The A.S.H. holds annual general meetings, usually of two to three days duration, of the same format (but rather different scale) as the American meetings. A newsletter is produced on an irregular basis. Membership is open to all publishing herpetologists: information is available from the Secretary (Dr. G. Courtice, School of Physiology, University of New South Wales, Kensington, Sydney, N.S.W.).

The most recent A.S.H. meeting was held at the beginning of September 1984, in conjunction with the 1984 Australasian Herpetological Conference in Sydney. Overseas scientists are welcome at both meetings, and the Conferences provide an excellent opportunity to meet many of the herpetologists working in Australia. Proposed symposia included biogeography, physiological ecology, population ecology, conservation, reproduction, phylogeny and biochemical systematics.

Further information on the published proceedings of the conference is available from:

The Organizing Committee,
1984 Australasian
Herpetological Conference,
Zoology A08,
University of Sydney, N.S.W. 2006,
Australia

RICHARD SHINE
Zoology Department
University of Sydney
Sydney, N.S.W. 2006
Australia

PREHISTORIC OCCURRENCE OF THE REDBELLY TURTLE *(Pseudemys rubriventris)* AT CONCORD, MIDDLESEX COUNTY, MASSACHUSETTS

The current range of the redbelly turtle *(Pseudemys rubriventris)* in Massachusetts is extremely limited, encompassing a few ponds in Plymouth County and possibly Ipswich, Essex County (Graham 1982; U.S. Fish and Wildlife Service 1981). Statements that *rubriventris* may also exist on Naushon Island, Dukes County (Lazell 1976; U.S. Fish and Wildlife Service 1981) have been questioned by Graham (1982), who excludes Naushon from the present range. The prehistoric range of *rubriventris* also encompassed Ipswich as well as Martha's Vineyard, Dukes County, where finds have been made of Indian midden specimens (Bullen 1949; Waters 1962, 1966, 1969; Lazell 1976; Graham 1982).

Waters (1962) theorized that the Massachusetts population of *rubriventris* was an isolated remnant of a widely distributed coastal *rubriventris* population extending from Virginia in the south to Massachusetts in the north. He further theorized that the disjunct Massachusetts population had become increasingly restricted through prehistoric extirpation due to human predation. Based on the above evidence and theoretical considerations, Waters (1962), Lazell (1976), and U.S. Fish and Wildlife Service (1981) have concluded that *rubriventris* may have been widespread in eastern Massachusetts in prehistoric times. Further data to delineate the extent of this range are clearly needed.

We recently examined bone fragments from prehistoric Concord Shell Heap, an Indian midden located on the Sudbury River at Route 2, Concord, Middlesex County, Massachusetts. The site and its remains were originally described by Smith (1940) who reported finding 571 turtle fragments, which, however, he did not attempt to identify. Careful re-examination of Smith's material reveals the presence of 683 turtle fragments. Of these, 63 can readily be identified as representing *rubriventris*. The fragments reported on here are currently in the collection of the Concord Antiquarian Museum, number 19MD388 (M33-18).

Among the 63 fragments several can be pieced together to form series from individual animals. The most complete is a 5-bone set comprising neurals 3 through 6 with a portion of the right 6th costal. The midline length from N3 to N6 in this specimen is 104.8 mm, which corresponds to a large individual of approximately 300 mm carapace length (based on comparative measurements of 4 whole adult *rubriventris* shells from the Museum of Comparative Zoology, Harvard University). Also present are the right 8th through 10th marginals of a large individual as well as the left 11th marginal and pygal bones from 2 large individuals. Two pieces from a single large nuchal are present, as are 6 additional separate marginal bone fragments. In addition, there are two pieces each from the left 6th and 8th costals of two individuals, one large and one rather small, as well as 32 other costal fragments. Additionally, there are 2 fragments from the left xiphiplastron and one right xiphiplastron from 2 large individuals, as well as 4 other plastron fragments. Based on our analysis of these fragments, there were at least 3 individual *rubriventris* in the Concord Shell Heap (2 large and one smaller).

None of the fragments of *rubriventris* show signs of having been worked by prehistoric people, and many of them are fire-charred. In all probability, therefore, these animals were collected locally for consumption and were not obtained via inter-tribal trade (see Bleakney 1958; Adler 1968, 1970).

These findings establish the presence of *rubriventris* in Concord in prehistoric times, ca. 80 km to the northwest of Plymouth and ca. 55 km to the southwest of Ipswich. They also lend further support to the theory that *rubriventris* formerly inhabited a wider area in eastern Massachusetts and that it may have become extirpated at least partially through the activity of prehistoric man.

ACKNOWLEDGMENTS

We thank Dennis A. Fiori, Director of the Concord Antiquarian Museum for making the materials available to us for study. We also thank Shirley Blancke, Russell Barber, Richard Meadow, and Jose Rosado for assistance.

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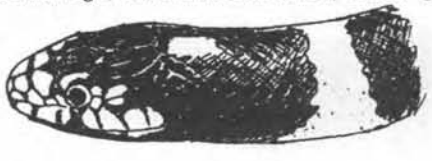
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NESTING AND EGG LAYING BEHAVIOUR OF THE GARDEN LIZARD *(Calotes versicolor)*

The common Indian garden lizard *Calotes versicolor* has drawn the attention of a number of workers (Asana 1931; McCann 1937; Mulherkar 1962; Singh and Thapliyal 1962; Thapliyal and Singh 1962; Pandha and Thapliyal 1964a, b, 1967; Minton 1966), who described different aspects of its natural history, but nesting and egg laying behaviour have not been reported. The present paper presents observations made on a nesting female in the village Sanbalisai, Midnapore, West Bengal, India in June 1980.

During a study of amphibious snails beside paddy fields the authors saw a female *Calotes versicolor* descending a nearby mango tree at 0515 hrs on 23 June 1980. The lizard started digging a hole on the ground about 40 cm away from the tree. The soil was moist due to a shower the preceding night. The lizard made a round hole containing no loose soil by removing soil with the forelimbs or, occasionally, with the hindlimbs. The digging operation lasted for 17 minutes. The lizard did not move for about 6 minutes but surveyed its surroundings continuously. At 0538 hrs, the lizard positioned itself with the genital aperture above the center of the hole, at which point it started laying eggs. After laying 5 eggs, the lizard moved and arranged the eggs in the hole using both fore and hind limbs. This was followed by a second and third laying after which the egg arranging was repeated. After the fourth laying the female did not arrange the eggs and started pushing the soil over them. The hole was filled up to the level of the surrounding ground. The number of eggs in the second, third and fourth laying could not be counted as close approach might scare away the lizard. The lizard remained motionless for some time and then quickly moved up the same tree. The whole operation took 26 minutes.

The covering soil was carefully removed from the nest with a brush. The eggs were 18 in number, white in colour, oval to elliptical in shape, soft shelled and measured 11.0 x 6.8 to 14.5 x 9.0 mm, the average being 13.1 x 7.9 mm. The diameter and the depth of the nest were 4.5 cm and 6.3 cm respectively.

It appears that in West Bengal *C. versicolor* lay eggs in rainy season, i.e. from late June to August as has been reported by Asana (1931), McCann (1937) and Pandha and Thapliyal (1967) from other parts of India. The reported incubation period is 40 to 47 days (Pandha and Thapliyal 1967). Eggs are laid immediately or shortly after heavy monsoon has set in, presumably to escape desiccation of the embryos during incubation. This also ensures abundant supply of food to the young lizards, since the number of insects and other animals on which they feed are abundant in this period. No report is available on the time of egg laying of *C. versicolor*. Egg laying in early morning is probably an attempt to escape predators such as crows *(Corvus splendens)* and foxes *(Vulpes bengalensis)*.

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DEATH-FEIGNING IN THE GRAY-BANDED KINGSNAKE *Lampropeltis alterna*

Death-feigning (letisimulation) has been reported for a number of snake genera (see reviews by Gehlbach 1970; Carpenter and Ferguson 1977) but not for kingsnakes, genus *Lampropeltis*.

On 28 May 1973, one of us (RKG) came upon an adult female *Lampropeltis alterna* on the road after dark 16 km W Lajitas, Presidio County, Texas. The snake was first seen in the headlights of the car with a ringtail cat *(Basseriscus astutus)* standing over it. The cat ran off the road as the car came to a halt but the snake remained motionless. It was initially assumed that the specimen had been struck by a car though no obvious injury could be detected, and that the cat was scavenging a road kill.

The specimen was limp throughout examination and did not attempt to right itself when placed on its back. After a minute or two, the specimen was placed in a semi-coiled position in the car and driving commenced. Approximately 10 minutes later the specimen was noted to be missing from the seat. Several minutes of searching revealed it actively crawling through the springs under the seat. At this time it appeared totally active and uninjured, and was later placed in the collection of the Dallas Zoo where successful reproduction occurred in later years. Similar behavior was not subsequently seen in this specimen.

On 30 August 1979, a group of eight neonate *L. alterna* was routinely weighed and measured one day after hatching. After being measured, one specimen became limp with neck slightly crooked and mouth slightly agape. When left undisturbed, the specimen slowly righted itself and began crawling normally. When touched, it quickly assumed the death-feigning position. This result was obtained several times in succession. Rough handling after the initial episode, however, failed to produce similar behavior.

In September 1980, a group of 18 hatchlings of this species was utilized to determine if this type of behavior could again be elicited through human handling. Each was placed on a carpet and tapped with a flat hand several times, once crawling began. Through repeated trials, specimens defecated and often coiled loosely and remained motionless with heads tucked beneath or between body coils, and began crawling a few seconds to several minutes after harassment was discontinued. None, however, exhibited feigning type behavior.

We feel that the death-feigning noted in two isolated instances could have been induced by odors or other stimuli from "natural" (versus "unnatural") predators. *L. alterna*, being almost entirely nocturnal, would be instinctively cautious of predatory mammals, such as *B. astutus*, and these predators represent a "natural" threat to this species whereas man may not. What caused one of the neonates to react in this manner is unknown, but since the squeeze-type measuring box had been used for numerous other species of young snakes, including *L. getulus holbrooki*, perhaps this was also induced by odors from "natural" predators.

The presence of death-feigning behavior in *L. alterna* after exposure to these types of stimuli but never, at least as far as is known, to that from man (an "unnatural" predator) during collection or harassment leads us to believe that death-feigning may only be elicited in some species under conditions not normally observed by man. Further, it is probable that this behavior may be partially or entirely dependent upon olfactory cues rather than physical harassment in some species. Another interpretation is that death-feigning in some species is a polymorphic behavioral trait, possessed only by some individuals. Additional research using a variety of "natural" and "unnatural" predator odors may eventually bear this out.

We thank Martin J. Rosenberg for his helpful comments on the manuscript.

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TECHNIQUES

NOOSE TUBE: A LIGHTWEIGHT, STURDY, AND PORTABLE SNAKE RESTRAINING APPARATUS FOR FIELD AND LABORATORY USE

Restraining apparatuses for venomous reptiles for purposes of handling and study have employed a variety of designs. Such devices have three principal functions: the safety of the investigator, the safety of the animal, and the safe handling of the latter while under restraint. Restraining devices designed for lab use can be large, complex, and time consuming to use. Field use requires compactness, sturdiness, simplicity, and the potential for rapid deployment. Ideally, such apparatuses should be usable by one investigator. MacDonald (1964) describes taping the reptile to a wooden dowel of slightly larger diameter than the animal. Murphy (1971) used a graded diameter series of tubes into which animals are coaxed. Another device uses troughs and "L" shaped boards onto which animals are placed and then restrained with nooses or velcro straps (Luck and Keeler 1929, Ward and Harrell 1978). Gillingham (1983) recently discussed an immobilization technique using a five gallon plastic pail. Freed and Freed (1983) described an apparatus for venomous snakes that employs freezer containers to restrain the head in a hole in the lid.

Although these apparatuses have utility in a variety of situations, they also have some constraints. The device described herein (which we term a "noose tube"), is practical in the field or lab for sexing and marking animals—especially venomous snakes, for making length measurements, minor and major surgical manipulations, heart puncture, venom collection, administration of drugs, and almost any "hands on" procedure (see Figs. 1 and 2).

Our apparatus is inexpensive, simple to use, and is easy to make or modify. Materials consist of a two inch (5 cm) diameter Lexan® tube, 18 to 24 inches (46-60 cm) in length (General Electric Corp., 1 Plastics Ave., Pittsfield, Mass. 01201), 0.375-inch (1 cm) aluminum tubing, 0.062 inch (2° mm) nylon cord and cord clamp, one large cork stopper "#12 (6 cm, top diameter)," two automotive hose clamps, one to fit each of the tubes, and two leather straps eight inches (20 cm) in length (Fig. 3). The cork is bored with a hole large enough to allow smooth movement of the aluminum tube and is inserted in one end of the Lexan® tube. When so constructed, the



Figure 1. Nylon cord loop being placed around a prairie rattlesnake's neck. Note that the investigator can remain a safe distance away from the serpent.

inner tube slides easily. The cork is then secured in place with leather straps, one on each side of the hole, and the large hose clamp. The nylon cord is doubled over forming a loop and fed through the aluminum tube, and about 20 cm of the loop should be exposed at the bottom of the tube. The free ends of the cord are placed in the cord clamps and then knotted so that the clamp may slide toward the tubing for tightening.

The apparatus is now ready for use (Figs. 1 and 2). Tether an animal by placing the loop over the animal's head and drawing the cord snugly around the animal's neck. The snake may then he held in place by moving the cord clamp down to the aluminum tube. The skull structure of most venomous snakes prevents escape, so the cord should be secure but need not be too tight. Some practice on the part of the investigator or user is a must in order to become familiar with the device. The clear Lexan® tubing allows for easy monitoring of the subject even when the animal is placed shallowly into the apparatus. The investigator can now expose as much of the snake as is required for the procedure.

This device has proven quite useful in both lab and field applications, on thousands of



Figure 2. A prairie rattlesnake safely restrained within the apparatus.

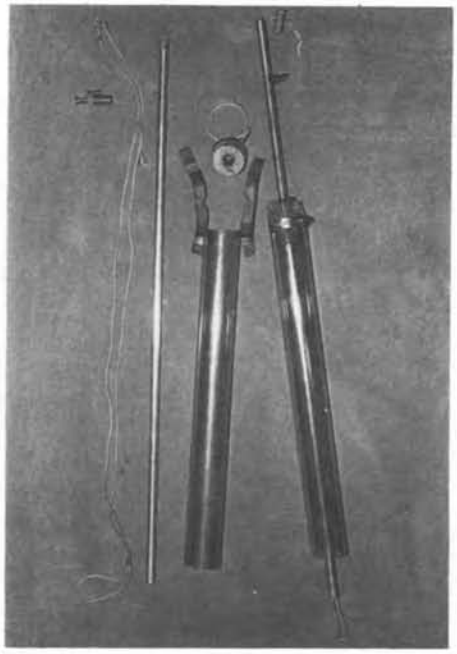


Figure 3. One assembled and one unassembled unit (showing the former's component parts), as described in the text.

snakes. Never once has an animal been hurt or overly stressed while restrained with this device. We think other investigators will find this apparatus to be efficacious and useful.

ACKNOWLEDGMENTS

All photographs by Dan Lewis. Grants from the National Geographic Society partially supported the development of this device.

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A QUICK, EASY AND PERMANENT TAGGING TECHNIQUE FOR RATTLESNAKES

Numerous visual and isotopic tagging techniques for snakes have been published (Blanchard and Finster 1933; Conant 1948; Woodbury 1948, 1956; Pendelton 1956; Hirth 1966; Hirth et al. 1969; Weary 1969; Pough 1970; Bennion and Parker 1976; Brown and Parker 1976a,b; Parker 1976; Fitch and Jacob 1981; Sanders and Jacob 1981). However, literature pertaining to tagging rattlesnakes in particular is limited (Fitch and Glading 1947; Pough 1966; Clark 1971; Pendelbury 1972; Lewke 1974; Klauber 1956). This paper presents a quick, easy and permanent tagging technique for rattlesnakes.

Fine stainless steel wire (B and S 30, 000 Steel, Monofilament Type B), coloured spangles (sequins) 0.5 cm (3/16 inch) in diameter, and "5 Minute Epoxy" were used for tagging. Each rattlesnake was restrained using the technique described by Almandarz (1978). One spangle (metallic pink for females; metallic light blue for males) was threaded onto a short piece of stainless steel wire. Each rattlesnake was identified (numbered) according to a (letraset) number stenciled on the spangle. The first female (and male) tagged had a spangle numbered 1. Females (and males) tagged thereafter had spangle numbers which increased sequentially. The wire was twisted together between the proximal rattle segment and the body of the rattlesnake making sure the spangle was placed flush against the lateral (widest) side of the rattle. The spangle and wire were then covered with a thin layer of epoxy.

This technique allowed an immediate sexing of tagged rattlesnakes in the field without handling. Sex identification was easily made at 15 m with the naked eye, even when rattlesnakes were in the coiled position. If individual identification was required, a closer examination of the spangle was necessary by use of binoculars or by physically restraining the snake. Since the epoxy dries clear, stenciled numbers on the spangles were protected and visible on close examination. Positioning a spangle on the side of a rattle prevented excessive wear when the rattle dragged on the ground. The "Five Minute Epoxy" provided a permanent fastening of a spangle and wire, preventing snagging in the wild and possible removal. Removal is only possible if the rattle breaks off anterior to the tag.

Tagged rattlesnakes displayed no apparent problems with ecdysis and there was no infection. The location of the spangle during subsequent captures can provide information on the number of shed cycles since the initial tagging. The writer used this technique to tag 23 prairie rattlesnakes. Marked specimens have been sighted a total of 16 times since April 1983.

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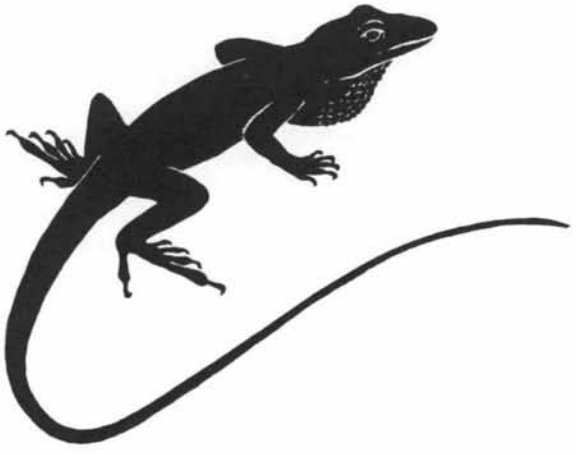
ANURA

RANA PALUSTRIS (Pickerel Frog). **OVIPOSITION.** On 10 March 1984 a large female pickerel frog was seen depositing eggs in Donaldson's Cave, Lawrence County, Indiana in a slow moving stream with an average depth of about 6 cm but with several pools up to 25 cm in depth. The female was laying the eggs on an old glove submerged in one such pool. The site of oviposition was about 50 m from the entrance in total darkness. An estimated 100-200 eggs had been laid when the observation was terminated. Fourteen additional frogs were counted, but no vocalizations were heard or other eggs seen. Two cave salamanders *(Eurycea lucifuga)*, cave crickets, and spiders were seen in the vicinity. Air temperature in the cave was 14° C.

The association of pickerel frogs with caves in Kentucky, Tennessee, and the Ozarks was emphasized by Schaaf and Smith (1970. Her-

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petologica 26:240-254) however breeding in caves has not been previously reported.

I acknowledge the help of Dr. Sherman A. Minton in the preparation of this paper.

Submitted by **DENNIS R. BROWN,** 2906 S. Taft Street, Indianapolis, Indiana 46241, U.S.A. ●

SAURIA

ANOLIS CAROLINENSIS (Green Anole). **INTERBREEDING.** Seven varieties of exotic anoles are known to have established breeding populations in the Miami area (Wilson & Porras, The Ecological Impact of Man on South Florida Herpetofauna, 1983). *Anolis sagrei sagrei* (brown anole) is naturalized from Cuba and was first reported in the United States from the Florida Keys (Garman 1887). It is now well-established throughout much of peninsular Florida and the Florida Keys and is now the most abundant lizard in urban areas of southern Florida. It has already displaced the native *A. carolinensis* in many areas of Florida through heavy competition for food and habitat.

A male *Anolis carolinensis* was observed copulating with a female *Anolis sagrei* (brown anole) in Goulds, Dade County, Florida on 12 October 1983. The female escaped capture after separating, and no juvenile anoles showing signs of hybridization have been observed in the vicinity. Interbreeding between *A. carolinensis* and *A. sagrai* is previously undocumented, and the possibility of hybridization between exotic anoles and *A. carolinensis* suggests that populations of the latter may be further threatened in areas of sympatry.

Submitted by **ROGER L. HAMMER,** Director, Castellow Hammock Nature Center, 22301 Southwest 162 Avenue, Goulds, Florida, U.S.A. ●

SERPENTES

BOIGA CYANEA (Green Cat-eye Snake). **ENVENOMATION.** Some viperid snakes are affected by their own venom, and there are many reports of fatal conspecific or self-inflicted bites (Pope 1955. **Snakes Alive,** 161-162; Bellairs 1970. **Life of Reptiles,** (2)517). However, there appear to be no reports of conspecific envenomation by rear-fanged colubrids. This note reports such a case.

On 28 April 1984, while feeding two *B. cyanea* housed in the same cage, a 120 cm snake struck a 155 cm snake about 2 cm behind the head while chasing a mouse. The attacker held on to its cage-mate for several minutes before they were separated. The larger snake became lethargic two hours after the bite. This muscular weakness increased over the next two days and the snake died 30 hours after having been bitten. No other symptoms were noted.

Submitted by **HAROLD F. DE LISLE,** P.O. Box 292, North Hollywood, California 91603, U.S.A. ●

CALLOSELASMA RHODOSTOMA (Malayan pit viper). **FEEDING MIMICRY.** Luring potential prey by tail movements has not been reported in *C. rhodostoma.* The diet of free-ranging *C. rhodostoma* includes species which are susceptible to luring (Blody 1983. Herp. Review 14:74). On several occasions from spring 1983 to late summer 1983, I observed a captive juvenile (S-V length, 292 mm; tail length, 36 mm) female *C. rhodostoma* exhibit tail movements similar to those used by related species for luring potential prey. Typically the entire tail was held vertically and would undulate slowly. Large arc movements of the tail were not observed. The specimen was always stationary and did not flick its tongue. The presence of food (newborn mice or frogs) was not necessary to stimulate the tail movements. Evidence that the tail movements could lure potential prey was obtained on 25 August 1983. At 2030 h the specimen initiated tail movements within minutes after a young *Rana pipiens* was placed in its cage. The frog oriented toward the moving tail, hopped to it, and was struck, killed and consumed. The frog was struck before it could bite the tail. Luring was observed several times following this observation, but it terminated by late summer, by which time the tail was increasing in gray coloration.

The specimen died 3 March 1984 of accidental causes. It is deposited at UMMZ (176879). Its S-V length is 351 mm; tail length is 42 mm.

It has been suggested elsewhere (Schuett et al. 1984. Anim. Behav. 32:625-626) that the term "feeding mimicry" is more appropriate than the term "aggressive mimicry."

Submitted by **GORDON W. SCHUETT,** Laboratory of Animal Behavior and Behavioral Ecology, Department of Biology, Central Michigan University, Mt. Pleasant, Michigan 48859, U.S.A. ●

COLUBER CONSTRICTOR MORMON (Western Yellow-belly Racer). **BEHAVIOR.** Aggressive or combat behavior among snakes of the same species is well documented (DeLisle 1978. Herpetology 10:8-14; Shaw 1951. Herpetologica 7:149-168; Shine 1978. Oecologica 3:269-277). Combat behavior in snakes usually is observed in captive specimens, most frequently crotalids (Carpenter 1979. Copeia 638-642; Carpenter et al. 1976. Copeia 764-780; Lindsey 1979. Herp. Review 10:93). This behavior has also been observed in a number of colubrid genera (generally in captivity), including *Elaphe* (Gillingham 1980. Herpetologica. 36:120-127.), *Masticophis* (Hammerson 1978. J. Herp. 12:253-255.), and *Lampropeltis* (Carpenter and Gillingham 1977. S.W. Nat. 22:517-524.). We report here on aggressive behavior of *Coluber constrictor mormon* observed in the wild.

On 9 June 1983, in a small limestone canyon near the Colorado-Utah border in Dinosaur National Monument (Uintah Co., Utah) we observed two *C. c. mormon* struggling with each other. The temperature was about 22-25° C with fair weather.

The snakes, 55 and 60 cm long, were on a wide ledge about 30 m from a small stream in the bottom of the canyon. The dorsal portion of each snake's head was contained in the mouth of the other, to such a depth that the eyes of neither snake were readily visible. The snakes were juxtaposed dorso-ventrally to obtain this mutual attachment. At least the anterior portion of one of the snakes always was on its back (Fig. 1).



Figure 1. Dorsal-ventral attachment of struggling *Coluber constrictor mormon.* (Photograph courtesy of RME Photographics.)

After about 10 min, the smaller snake weakened, but it did not appear that the larger snake could extricate itself from the smaller snake's mouth nor could it swallow the smaller snake because the latter's mouth contained the dorsal portion of the larger snake's head. It appeared that neither of the snakes would survive the confrontation, so we carefully separated them and released them about 50 m apart. Because of the weakened conditions of the snakes and our presence in a national monument, we minimized handling and therefore did not determine their sex prior to their release. After about 10-15 minutes, both snakes departed without any noticeable adverse effects from their encounter.

Competition for food, mates, territory, and dominance have been offered as explanations for combative behavior (Carpenter and Gillingham 1977. S.W. Nat. 22:517-524.). Because of the mortal nature of the combat observed here, mutual consumption appears to be the motivation. Fitch (1982. *In* Herp. Comm. USDI, FWS Res. Rep. 13. 83-97.) reported that in northeastern Kansas, almost 2% of the prey items for *C. constrictor* were its own kind. However, Brown and Parker (1982. *In* Herp. Comm. USDI, FWS res. Rep. 13. 59-81.) found that in northern Utah only 1% of the prey items for *C. constrictor* were snakes, represented only by *Masticophis taeniatus.*

We found a third *C. c. mormon* within 2 m of the previous two. We could not determine the sex of this snake since it avoided capture. Even though we did not observe the behavior of the snakes as the confrontation was initiated, locating 3 mature *C. c. mormon* in such close proximity, with two of them in combat, suggests that this behavior was probably an interaction not associated with capturing prey.

Submitted by **RICHARD M. ENGEMAN,** Denver Wildlife Research Center, U.S. Fish and Wildlife Service, Building 16, Denver Federal Center, Denver, Colorado 80225; **THOMAS A. SCRIPPS,** Scripps Information Services, P.O. Box 2314, Evergreen, Colorado 80439; **TIMOTHY G. BONZER,** Colorado Department of Health, 4210 E. 11th Avenue, Denver, Colorado 80220, U.S.A. The photograph is courtesy of RME Photographics. ●

NAJA MELANOLEUCA (Forest Cobra). **COPROPHAGY.** On 29 October 1983 a *Naja melanoleuca* was observed to deliberately ingest fresh fecal material. It is not known whether the feces were from the snake in question or from one of the other three specimens in the exhibit. This behavior was observed for almost 10 min after which the snake moved to another section of the display. The same snake had been observed with fecal matter in its mouth on the morning of 22 October but was not seen to swallow it. At that time it was assumed that the snake had picked up the feces accidentally during foraging. A further instance of coprophagy was observed on 30 December 1983.

No eggs, newly-hatched young or shed skins were in the exhibit on any of the three occasions so there seems little likelihood of the behavior being linked with reports of keratophagy (Groves 1977. SSAR Herp. Review 8(4):124) or post-parturient ingestion of dead young/fetal membranes (Groves 1980. Brit. J. Herp. 6(3):89-91) in snakes. The snake had also never been fed on reptiles or amphibians while in the collection and, to the best of my knowledge not before that time either, as she was captive-bred. On this basis the observed behavior would appear to be a quirk, possibly induced by captivity.

Although a number of lizard genera, particularly herbivorous iguanids (Groves 1983. Per. comm.; Troyer 1982. Science 216:540-542), are known to be coprophagic, I have been able to locate only one reference to such behavior in snakes (Peterson 1980. SSAR Herp. Review 11(1):9). This was a single observation of a female *Thamnophis s. sirtalis* eating its own feces immediately after defecation. I have also been advised that a *Notechis scutatus* at Houston Zoo ingested fecal matter on a number of occasions, including one instance of consuming two or three paper towels presumably because they held the odor of fresh feces. These were later regurgitated (Tryon 1984. Pers. comm.).

The assistance of John Groves and Bern Tryon in obtaining reference material is gratefully acknowledged.

Submitted by **CHRIS B. BANKS,** Reptile Department, Royal Melbourne Zoo, P.O. Box 74, Parkville, Victoria 3052, Australia. ●

THAMNOPHIS ELEGANS VAGRANS (Wandering Garter Snake). **COLORATION.** Melanistic *Thamnophis elegans vagrans* are known from western Washington and eastern Oregon but not from elsewhere in the Pacific Northwest (Nussbaum, Brodie, and Storm. 1982. Amphibians and Reptiles of the Pacific Northwest). We collected five melanistic individuals of *T. e. vagrans* from the Grand Rhond River valley in southeastern Washington. Two of these snakes were collected on the river bank in June of 1978 approximately 10.5 km S of Anatone, Asotin Co., WA. The three other individuals were collected in 1981, 15 km SW of Anatone, Asotin Co., WA. These five snakes plus two more that were observed but not captured represent 35% of the twenty *T. e. vagrans* observed at these sites. All of the melanistic snakes were collected on the rocky shore or in the water. Snout-vent lengths ranged from 272 to 570 mm and masses

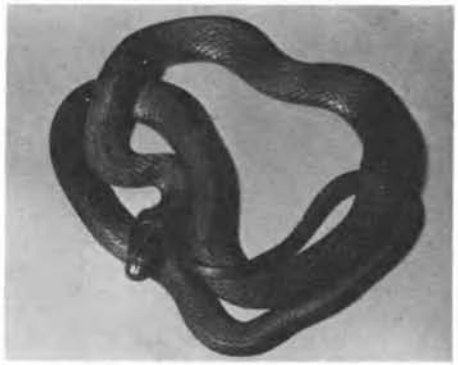


Figure 1. A melanistic male *Thamnophis elegans vagrans* (568 mm SVL). Asotin Co., Washington. The background is an 18% reflectance Kodak gray card.

ranged from 8 to 67 g. Both males and females were collected. The dorsal surfaces of these individuals are very dark but the spaces between some of the dorsal scales (visible when the body is distended) are light and a faint pattern is discernible (Figure 1). This pattern has become slightly more prominent during captivity. The ventral surface is dark blue except under the chin, which is a lighter blue grey color. To quantify the melanism, we measured the reflectances of the dorsal surfaces of melanistic and normally colored *T. e. vagrans* in Warren Porter's laboratory at the University of Wisconsin, Madison. The overall reflectances (290 - 2600 nm) were 6% and 16% for the melanistic and normal individuals, respectively. The reflectances in the visible range (400 - 700 nm) were 1.5 and 12.5%, respectively. The overall and visible reflectances of basalt (the most common substrate from the banks of the river) were 6% and 5%, respectively. These snakes have been kept alive for breeding experiments and ultimately will be deposited with the Field Museum of Natural History in Chicago, Illinois.

Submitted by **CHARLES R. PETERSON*** and **HENRY J. FABIAN,** Department of Zoology, Washington State University, Pullman, Washington and 225 North Lilly, Moscow, Idaho 83843, U.S.A.

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TESTUDINES

DERMOCHELYS CORIACEA (Leatherback sea turtle). **MIGRATION.** Although leatherbacks have been tagged on nesting beaches in several parts of the world, few long-distance recoveries of tagged individuals have been reported. This, along with the peculiar foraging habits of leatherbacks, with some individuals feeding in shallow littoral waters and others following pelagic jellyfish into high latitudes, has hampered efforts to discover the migratory routes of the various populations. The low rate of recovery is presumably due to the pelagic habitat preference of the species, to a particularly high rate of tag loss, and to the dearth of fisheries exploiting this species. Meylan (1982, pp. 91-100 *In:* Biology and Conservation of Sea Turtles, Smithsonian Institution Press) reviewed published records of long-distance recoveries on a worldwide basis, as of 1979. Of these, only seven recovered turtles were leatherbacks that had been tagged in the Caribbean. Two additional long-distance recoveries within the Caribbean, both involving stranded turtles, have been reported (Eckert and Eckert 1982. Rept. to U.S. Fish and Wildlife Service; Lambie 1983. Marine Turtle Newsletter, 24).

This note reports the recapture of a leatherback turtle tagged after nesting at Tortuguero, Costa Rica, on 11 July 1979, and captured at sea 23 August 1983, off the south coast of Cuba. The capture (method unknown) was made by the crew of a commercial fishing vessel near Isla Blanco (21°38'N, 79°53'W), a small cay 15 km SE of the port of Casilda. The minimum straightline distance between these localities is 1315 km. This leatherback is one of only three that have been tagged at Tortuguero during the course of a 28-year tagging project that has focused on the green turtle *(Chelonia mydas).* The tag was of monel metal, size #49 (National Band and Tag Company, Newport, Kentucky, U.S.A.). The recovery represents a retention time of slightly over four years.

Submitted by **ARCHIE CARR** and **ANNE MEYLAN,** Department of Zoology, University of Florida, Gainesville, Florida 32611, U.S.A. ●

PSEUDEMYS NELSONI (Florida red-bellied turtle) **BEHAVIOR.** Male aggression toward conspecific females in the genus *Pseudemys* has rarely been documented, although it has been seen in many other turtle genera (Jackson and Davis 1972. Herpetologica 28:58-64). The following observations were made with a mask, snorkle and wetsuit in Rock Springs run, Apopka, Florida, about 1 km downstream from the springs and at the site of an ongoing behavioral study of *P. nelsoni* and *P. floridana.* The incidents occurred on 27 and 30 Dec. 1983 after a very hard freeze. During these periods of observation the water temperature was about 21° C and the air temperature, about 18° C. The two incidents totalled 30 min of the 14.5 h spent underwater observing turtles in December.

In the first incident (1709-1732 h), I observed a female *P. nelsoni* which appeared to be resting on the bottom, approximately 1 m below the surface and below the fronds of a fallen palmetto floating at the surface. The mud bottom had been stirred up and at least six min passed before I realized that a male *P. nelsoni*, covered with mud, had the female's right front foot grasped in its jaws. Neither turtle appeared to respond to my presence. This was unusual as most turtles in the run initially orient towards me when sighted underwater. Nine min after I first saw the female, the male dragged her around in a small semicircle, resulting in the pair turning 180 degrees. During this sequence, I distinctly heard the shells clattering together caused either by the female's attempt to free her foreleg, rapidly repeating extension and retraction of the male's neck, or a combination of the two. I estimate that a clattering bout lasted 3-5 s and included 5-15 individual knocks.

The female then dragged the male upstream about 60 cm. A min later another male *P. nelsoni* swam to the female and perched on top of her carapace, with his neck fully extended and his head arched down. There was little movement for three min, then the first male, still grasping the female's leg, started jerking on it. The ensuing motion dislodged the second male, which swam slowly about the pair. The turtles' activity further stirred up the bottom and limited visibility but two bouts of clattering were heard in about 2 min. The second male left the area and five more bouts of clattering were heard in the following six min. The first male released the female, which swam in a semicircle and then upstream. Upon releasing the female, the male swam to the surface and breathed rapidly. I found the female about eight m upstream resting on the bottom, apparently unharmed.

The second incident (approx. 1630-1637 h) was much like the first and occurred about 15 m away. Although I could not ascertain the identity of the male, the females in the two incidents were different individuals. Before the female was released, there were seven bouts of shell clattering in approximately seven min.

The significance of these interactions is not known. The only observation of courting behavior in *P. nelsoni* is given by Jackson (1977. J. Herpetol. 11:221-222). He found active female participation but no agonistic behavior. There is, however, a marked similarity between the behavioral sequences described above and those observed by Davis and Jackson (1973. Herpetologica 29:62-64) describing the courtship of a male *P. scripta taylori*. Jackson and Davis (1972. op. cit.) suggest that biting during courtship is primitive in *Pseudemys* and, due to sympatry with other members of the genus, has been replaced in *P. scripta elegans* by a species-specific ritual. There is no reason to presume that all of the sympatric species have lost the biting act. In *P. nelsoni*, biting and shell-clattering may have become ritualized and necessary as a precursor to successful copulation.

Submitted by **MATTHEW KRAMER,** Department of Zoology, University of Tennessee, Knoxville, Tennessee 37996, U.S.A. ●

TERRAPENE CAROLINA CAROLINA (Eastern Box Turtle). **MORPHOLOGY AND BEHAVIOR.** A tiny *Terrapene carolina carolina* retained a rigid plastron and never developed a hinge throughout the four months of its captivity although its shell increased 20 per cent in length. This animal could only be induced to eat small earthworms, which were most readily accepted when the turtle was allowed to swallow them under 8 mm of water in a petri dish. The turtle (Michigan State University Museum, Herpetology Number 13000) was collected on the campus of Shorter College, Rome, Floyd County, Georgia, 2 May 1982. It measured 28.0 mm in carapacial length when it was caught, and 33.5 mm (cl) when it died suddenly from unknown causes, 8 December 1982. As far as I can determine, adult *Terrapene carolina* have not been reported to feed under water.

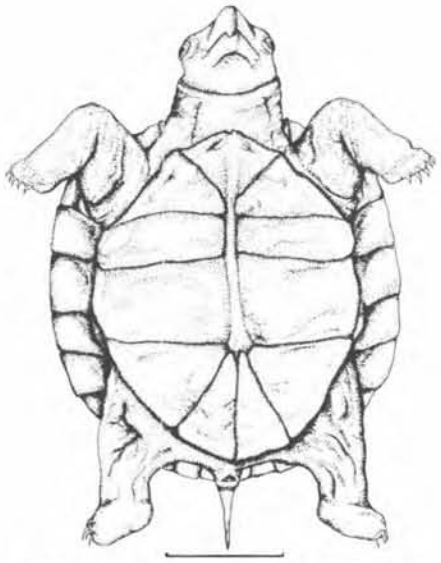


Figure 1. *Terrapene carolina carolina* (MSU-H-13000) from Rome, Floyd County, Georgia, in ventral view; drawn May 23, 1982. A hinge is missing and the plastron is immovable. The line equals 10 mm.

Submitted by **J. ALAN HOLMAN,** The Museum, Michigan State University, East Lansing, Michigan 48824, U.S.A. ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

CAUDATA

DICAMPTODON COPEI (Cope's Giant Salamander). USA: WASHINGTON: Lewis Co: T14N R8E Sec. 22, 9.0 km N, 8.3 km W Packwood, in a tributary of Skate Creek, off Skate Creek Road. 28 April 1984. Lawrence L. C. Jones. Verified by D. B. Wake and S. K. Sessions. Museum of Vertebrate Zoology, University of California, Berkeley (MVZ 187688). Represents the northernmost locality in the Cascade Mountains, extending the known range 35 km NE of Quartz Creek locality (Nussbaum. 1976. Misc. Publ. Mus. Zool., Univ. Mich. 149:1-94). This larval or neotenic specimen was taken below a waterfall at a depth of 15 cm. Contribution No. 18 of the Old-growth Forest Wildlife Habitats Program, USDA Forest Service.

Submitted by **LAWRENCE L. C. JONES** and **KEITH B. AUBRY,** College of Forest Resources, AR-10, University of Washington, Seattle, Washington 98195, U.S.A. Present Address (L. L. C. J.): P.O. Box 527, Welches, Oregon 97067, U.S.A. ●

SERPENTES

CHARINA BOTTAE (Rubber Boa). USA: CALIFORNIA: Kern Co: Piute Mountains, 0.8 km (by air) of Mace Meadow, 2012 m, T29S, R34E, Sec. 23. 20 August 1983. C. Uptain. Verified R. W. Hansen. Los Angeles County Museum of Natural History (LACM 136229). First record for the Piutes. Previous southernmost Sierran localities are near Alta Sierra in the Greenhorn Mountains, Kern Co (MVZ 77118, LACM 20271) and on the Kern Plateau, Tulare Co (Fish Creek Campground, S Fk Kern R drainage, 2244 m; Hansen and Tremper, Amphibians and Reptiles of Central California, in prep.). To the south, *Charina* has been recorded from near Tehachapi Mountain Park in the Tehachapi Mountains and from the Mt Pinos region, both Kern Co (Stewart, 1977, Cat. Amer. Amphib. Rept. 205:1-2; and G. R. Stewart, pers. comm.).

Submitted by **ROBERT W. HANSEN,** 7067 N Teilman #102, Fresno, California 93711, U.S.A. and **CURT UPTAIN,** CWESA, 1425 N. Vagedes, Fresno, California 93728, U.S.A. ●

LEPTOTYPHLOPS DULCIS DULCIS (Plains Blind Snake). USA: TEXAS: Crosby Co: White River, S U.S. 82, 8.8 km E Crosbyton. 22 April 1972. W. G. Degenhardt and C. Wellbourne. Verified by W. G. Degenhardt. Museum of Southwestern Biology, The University of New Mexico (UNM 25733-25736, 26110 and 40063). First record for county. All specimens have undivided anterior supralabials and are referable to *L. d. dulcis* rather than *L. d. dissectus*.

Based on D. E. Hahn's map (1979, Cat. Amer. Amphib. Rept. 231.1-231.2) this is the westernmost locality for this subspecies and lies in or very close to the contact zone with *L. d. dissectus*.

Submitted by **WILLIAM G. DEGENHARDT,** Museum of Southwestern Biology, The University of New Mexico, Albuquerque, New Mexico 87131, U.S.A. ●

TROPIDOCLONION LINEATUM (Lined Snake). USA: ILLINOIS: Morgan Co: within Jacksonville city limits. 29 August 1983. Mary Lou Scott. Verified by L. D. Moehn. Southern Illinois University at Edwardsville (SIUE 2643). Collected from a spider web. First record for Morgan County (Smith. 1961. The Amphibians and Reptiles of Illinois. Ill. Natur. Hist. Surv. Bull. 28, 1-298).

Submitted by **LOREN D. MOEHN,** Biology Department, Illinois College, Jacksonville, Illinois 62650, U.S.A. ●

TYPHLINA BRAMINA. MARSHALL ISLANDS: ENIWETOK ATOLL: Parry (=Percy?) Island. June 1954. Charles Okino and Alfred Souza. Verified by A. Loveridge. Museum of Comparative Zoology (MCZ 53782). First known specimen from Marshall Islands (Hahn. 1980. Das Tierreich 101: Anomalepididae, Leptotyphlopidae, Typhlopidae.)

Submitted by **JAMES L. KNIGHT,** Department of Herpetology, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, U.S.A. Present Address: Savannah River Ecology Laboratory, Drawer E, Aiken, South Carolina 29801, U.S.A. ●

NEW HERPETOLOGICAL RECORDS FROM ARIZONA NORTH OF THE GRAND CANYON

During the last 4 years, personnel of the Department of the Interior Bureau of Land Management, Arizona Strip district, and the Arizona Game and Fish Department have collected the following species in the northwestern corner of Arizona. Specimens are deposited in the Los Angeles County Museum of Natural History (LACM); identifications were verified by Robert L. Bezy.

HYLA REGILLA (Pacific Treefrog). USA: ARIZONA: Mohave Co: Middle Spring, 9 km SE Virgin Peak; T36N, R16W, SE Sec. 7, 1295 m. 25 May 1983. M. Serena. LACM 136195-99. Extends range approximately 28 km E (A. P. Blair, 1955, Amer. Mus. Novit. 1722:17-38: "*Hyla regilla* . . . found calling in chorus with *B. woodhousei* in the lower Virgin drainage.").

PHRYNOSOMA DOUGLASSII HERNANDESI (Mountain Short-horned Lizard). USA: ARIZONA: Mohave Co: 5 km SE Snap Point. T32N, R14W, NW Sec. 26, 1900 m. 4 June 1983. D. Roderick. LACM 136194. Extends range 95 km S (Stebbins, R. C. 1966. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston).

DIADOPHIS PUNCTATUS REGALIS (Regal Ringneck Snake). USA: ARIZONA: Mohave Co: Figure 4 Canyon, Virgin Mts., 1330 m. 26 April 1983. D. Smith. LACM 136192. Extends range 30 km SW (Stebbins, 1966, op. cit.).

THAMNOPHIS ELEGANS VAGRANS (Wandering Garter Snake). USA: ARIZONA: Mohave Co: 0.4 km NW Overnight Pond; T34N, R12W, NW Sec. 18, 1820 m. 16 June 1983. T. R. Soderquist. LACM 136190. Extends range 140 km W of North Rim, Arizona (Fowlie, J. A. 1965. The Snakes of Arizona. Azul Quinta Press, Fallbrook, CA). One additional specimen collected in Mohave Co. at Crosby Tank, 10 km NW of Mt. Trumbull; T35N, R9W, NW Sec. 27, 1820 m. 21 August 1980. N. R. Middlebrook. LACM 136191.

CROTALUS MOLOSSUS MOLOSSUS (Blacktail Rattlesnake). USA: ARIZONA: Mohave Co: Trail Canyon at Parashant Canyon; T33N, R10W, NE Sec. 11, 1210 m. 19 May 1979. J. Morgart and W. Stager. LACM 136193. Extends range 67 km NW (across Colorado River) from Havasupi (Havasu) Canyon, Coconino Co. (Fowlie, 1965, op. cit.). According to the late John Riffy, National Park Service Ranger, *C.m. molossus* is commonly seen in Tuweep Valley, 21 km E of Parashant Canyon (pers. comm. to NRM).

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BOOK REVIEWS

Mississippi Herpetology, by Ren Lohoefener and Ronald Altig. 1983. Mississippi State University Research Center Bulletin 1. 66 pp. $5.00.

An informative and inexpensive book on the amphibians and reptiles native to the state of Mississippi. The page size is 8½ x 11 inches. Three state maps in the foreword section of the book provide the following: county outline and county name (numbered with separate list of names), and locations of physiographic provinces; the name and location of major river systems (watersheds) plus the Gulf of Mexico; and the forest types of Mississippi. There are also eight small outline maps of Mississippi showing "approximate boundaries of eight herpetofauna groupings in Mississippi."

Major page space is devoted to keys to species and subspecies (9 pages) and an extensive bibliography which is presented in two forms: Guide to Literature Cited (4 pages) and Bibliography (11 pages). The guide to literature cited is a listing of references by species which are in alphabetical order. I personally have not seen this reference listing used in a regional herpetological publication. A valuable section entitled "Notes" contains helpful information on how the authors resolved problems of taxonomy and species distribution while updating the checklist. The checklist of species and subspecies is not in phylogenetic order. It begins with toads and frogs (Anura) and ends with turtles and tortoises (Testudinata). The common and scientific names are the same used by Collins, et al., 1982, *Standard Common and Current Scientific Names for North American Amphibians and Reptiles* (SSAR). The authors' names for species and subspecies were omitted from the checklist.

The dichotomous keys are generally easily read, are well constructed and should be useful in college herpetology classes. I found the arrangements of keys confusing. The keys are not in phylogenetic order. The first key covers crocodilians, followed by adult toads and frogs, then larval salamanders, then toad and frog tadpoles, then adult salamanders, etc. It would seem both logical and helpful to have placed the keys in phylogenetic order, including the placement of amphibian larvae keys before the adult (metamorphosed) sections.

The last table in the book lists the rare, threatened and endangered amphibians and reptiles of Mississippi. This is an important list and should be useful in herpetology classes as well as wildlife conservation agencies and organizations.

The last section is labeled "Appendix" but could also be titled "Illustrated Glossary." A total of 57 terms are defined and many are illustrated with outline drawings of amphibians and reptiles.

Apart from the cover drawing of a yellow-blotched sawback *(Graptemys flavimaculata)* by the senior author and the line drawings in the Appendix, there are no other illustrations or photographs. Black and white photographs of the various physiographic provinces or the state's rare and endangered species of amphibians and reptiles would have added substantially to the book.

This is a much needed reference and one that should be useful in college biology and herpetology classes within the state of Mississippi.

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The Book of Indian Reptiles, by J. C. Daniel. Bombay Natural History Society (Hornbill House, Shahid Bhagat Singh Road, BOMBAY 400023, INDIA) 141 pp. 1983. $7.50 plus $3.00 mailing fee.

This is the latest contribution to a growing Indian natural history series sponsored by the Bombay Natural History Society (BNHS). The author, Dr. J. C. Daniel, is the current curator of the society and one of India's best known naturalists.

General information on reptiles is provided in a short introduction and for each order at the beginning of each major section — Crocodiles, Turtles and Tortoises, Lizards and Snakes. The majority of the text is concerned with the natural history of the common species inhabiting the Indian subcontinent. Brief accounts are also provided for some of the rare and seldom seen forms. Subjects covered in the major accounts include local names,

size, identification, coloration, distribution and habitat, habits, food, breeding, and conservation status. Folklore, derivation of names and a variety of other information are included sporadically. For each subject the author interweaves cited literature accounts along with his own observations. Three species of crocodiles, 28 turtles, 45 lizards and 49 snakes are covered in the text.

Accompanying the text are 41 colored and 13 monochrome plates as well as numerous line drawings reprinted from the reptile volumes of **The Fauna of British India** by Malcolm Smith. The plates accompanying the crocodile, turtle and lizard sections are mostly photographs varying from fair to excellent quality. The plates of snakes consist chiefly of the attractive drawings that accompanied the series on common Indian snakes by Col. Frank Wall that graced the pages of the BNHS Journal early in the century. These have generally reproduced well but (e.g. the blind snakes p. 59) details of the scalation are vague in a few.

My criticisms are few and minor. I believe taxonomic keys would increase the utility of the book. Some identification of species is possible through use of the plates and the brief sections of diagnostic features. However, lack of keys and of comprehensive coverage greatly limits this function. In future editions, plate numbers should be included with the text. As the plates are often not particularly close to the corresponding text, one must consult the Table of Contents to see if there is an accompanying plate. I caught several typographical errors and at least one line omission (page 57) but these are too few to detract.

One serious error in content is found on page 25. Here the relatively dull colored male of *Kachuga dhongoka* is described as having: "red longitudinal stripes on the neck, red or yellow spots on the throat, head red above with blue sides." This coloration is actually characteristic of male *Kachuga kachuga*.

The underlying philosophy of the BNHS natural history series has been to expand public awareness of the Indian fauna as a necessary prerequisite for conservation action. Being concise and easily readable, **The Book of Indian Reptiles** should serve this purpose well. Besides giving the layman a quick overview to the Indian species, it provides the scientist with updated nomenclature and natural history references which augment the standard but now dated reference, **The Fauna of British India** series.

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The Endangered Species Handbook, by Greta Nilsson. 1983. The Animal Welfare Institute, P.O. Box 3650 Washington, D.C. 20007, U.S.A. 249 pp. $5.00.

Endangered species are those on their way to extinction. In a sense, extinction is inevitable; most species have a limited "life span" although their "lives" may be millions of years long. Such extinctions occur naturally as the environment changes or artificially as a result of man's activities. Unfortunately, man has caused an alarming increase in the rate of extinctions. It has been estimated that between 1600 and 1973 the rate of extinctions of birds and mammals was between 5 and 50 times greater than it was through most of the evolutionary past. **The Endangered Species Handbook** documents the human activities that diminish the duration of existence for many species.

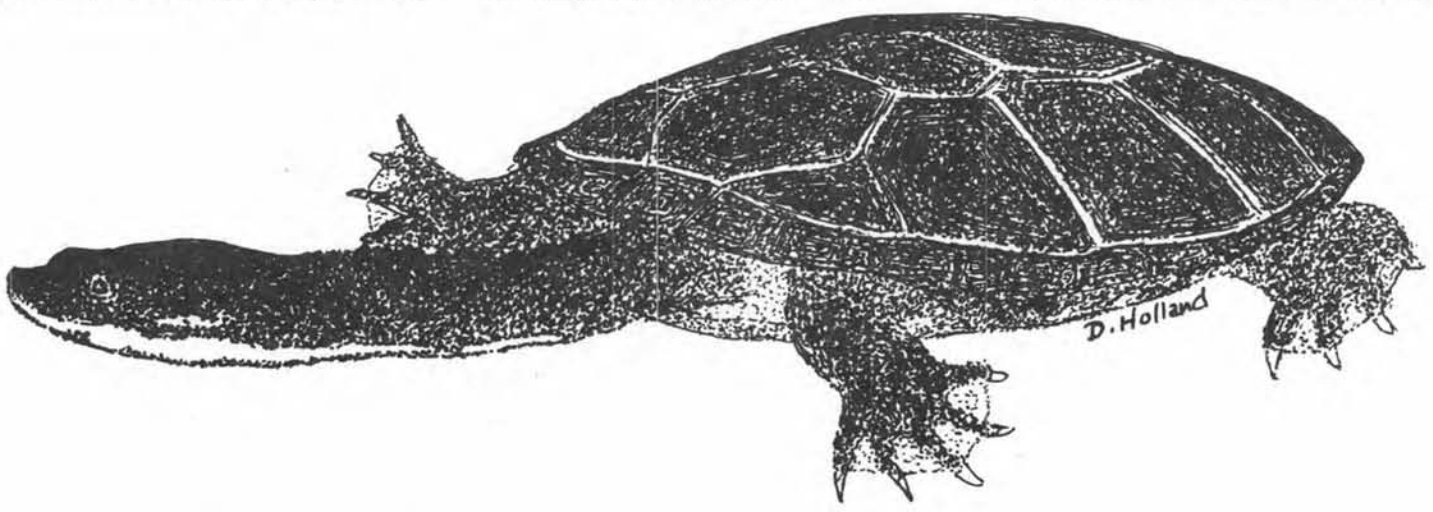
Driving a species to extinction by overhunting or habitat destruction is the ultimate insult. Some individuals, including Christine Stevens, President of the Animal Welfare Institute and author of the Foreword to this book, argue for the sanctity of life, and against the injustice and irreverence inherent in the destruction of a species. Others, such as Under Secretary of State James L. Buckley in the Opening Remarks, make the anthropocentric argument that high rates of extinctions reduce the potential growth of biological knowledge that might be used to improve health and nutrition. Inherent in the "Projects" section of the book is the view that living things should be preserved for their beauty and remarkable complexity. What arguments change the minds of individuals holding guns or operating bulldozers?

In its content and organization, **The Endangered Species Handbook** argues for the legislative process. It is primarily through the actions of individuals who eventually and collectively influence laws that environments are safeguarded and destructive habits ameliorated. The book attempts to educate individuals who can effect change and to provide ammunition for those who are gunning for anti-conservationists. It offers sobering statistics on the hunting of whales, the devouring of sea turtles, and the trampling of wildflowers. It documents a multitude of human activities responsible for the decline in animal populations.

This book is a treasure chest, full of all manner of jewels. It is divided into three major sections. The first section, "Vanishing Wildlife," gives an overview of why and how some species have been driven to extinction. Of interest to herpetologists are sections documenting reptile extinctions and the devastating effect the reptile trade in meats and skins has had on natural populations. How pet collectors have threatened particular reptile species is also sobering. That amphibians are some of the first victims of acid rain is well documented in another essay and should drive all readers to immediate environmental action.

The second major section of the book documents legislation at international, national, state, and local levels. An inspirational portion of this section is a group of essays entitled "People Who Make a Difference," which describes the achievements of individuals who have helped circumvent extinction for particular species. This section also suggests projects that will increase student awareness of animal behavior, ecology, and conservation. This latter portion, certain to be of interest to biology teachers, varies in its usefulness. No age level is suggested for the projects, which range from grade school to college. Some projects seem more in the realm of animal "awareness" than animal conservation while others test specific hypotheses. Herpetologists will want to read some of the special essays, particularly "Endangered Reptiles and Amphibians" by Dr. George Middendorf and "Evaluate Your Local Zoo" by Peter Batten.

The final section of the book, entitled "Resources," provides annotated film and



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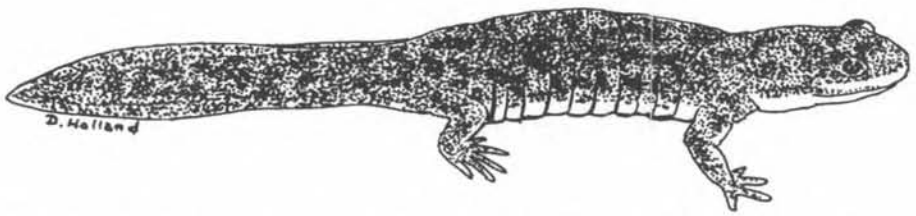
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book lists, names and addresses of conservation organizations, and a species-by-species list of extinct and endangered vertebrates.

The book has its imperfections. Plants are mentioned, but the emphasis is clearly on animals. Although the book is well referenced, the sources to which the author refers are only rarely original research. In one glaring instance Carl Sagan is cited in his volume COSMOS as an expert on whale communication. The practice of using one secondary source as a reference for another secondary source is unfortunate. However, these criticisms do not diminish the real usefulness of **The Endangered Species Handbook.**

This book provides a wealth of facts and figures—just the sort of thing that might make an impression when writing to one's senator about environmental issues. I recommend that you buy this book. Use it in battle.

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Vertebrate Ecology and Systematics. A Tribute to Henry S. Fitch, edited by Richard A. Siegel, Lawrence E. Hunt, James L. Knight, Luis Malaret and Nancy L. Zuschlag. 1984. 278 pp., ill. $30.00, paperback. Museum of Natural History, University of Kansas, Lawrence, Kansas 66045.

Collections of scientific papers honoring venerable population biologists seem to be proliferating of late. The present volume, although perhaps a trifle more modest than those dedicated to G. E. Hutchinson, R. H. MacArthur, and E. E. Williams, nonetheless stands as an equally substantial tribute to another eminent field worker, Henry S. Fitch.

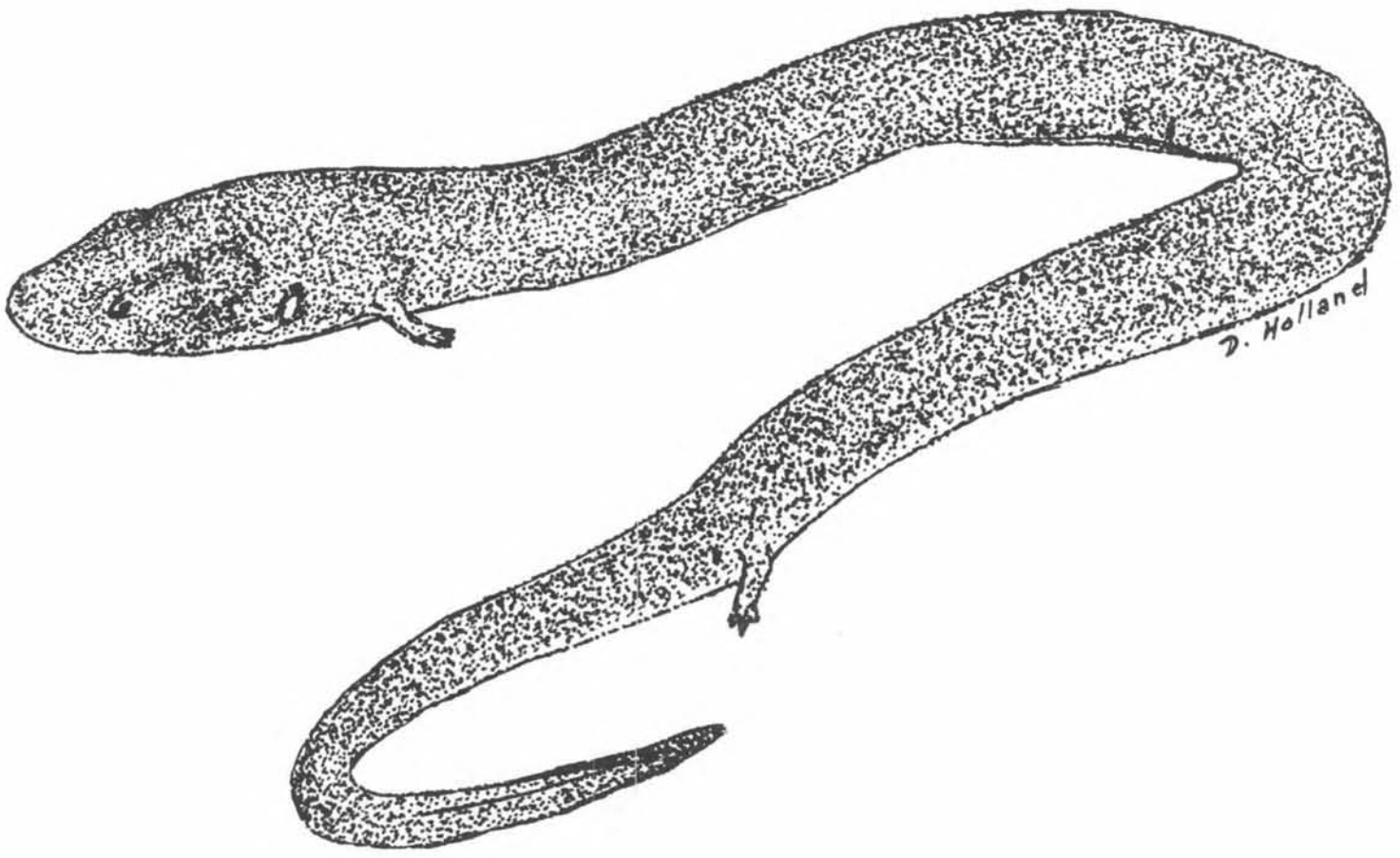
Appropriately, population studies of snakes dominate this volume (Fitch not only pioneered difficult work on snake ecology, but also contributed some of the most detailed and lasting ecological studies of serpents). Snakes are exceedingly intractable subjects for population studies, being cryptic, rare and mercilessly persecuted by humans (including herpetologists).

In the introduction, Duellman exploits the turtle-hare analogy, pointing out that Fitch avoided biological fads and jargon (often glib, fast and simplistic) in preference for solid natural history, frequently painstakingly slow and tedious. Fitch's wife, Virginia, provides a complete list of his 150 publications over the past half century, which encompass a wide variety of subjects, ranging from bird behavior to reptilian ecology. Fitch's studies include work on prairie succession, spiders, frogs, salamanders, turtles, hawks, owls, other birds, armadillos, bats, coyotes, opossums, and rodents, although the vast majority of his papers are on lizards and snakes.

Some 18 chapters follow, 8 of which are on snakes, 3 on lizards, and 2 on anurans. One chapter is devoted to reptilian chemoreception, another to herpetogeography, one to systematics of the percid fish *Etheostoma lepidum*, one to a turtle population study, and another (by John, son of Fitch) to habitat selection in the deermouse, *Peromyscus maniculatus*. The final chapter describes a new species of *Anolis* lizard named *fitchi*, of course, after the only biologist to have published field observations on the species.

This Festschrift is made even more wonderful by its appearance during the lifetime of its tributee. Congratulations, Henry, on your most productive scientific career (far from over!) and on the truly magnificent impact that you have had on population ecology.

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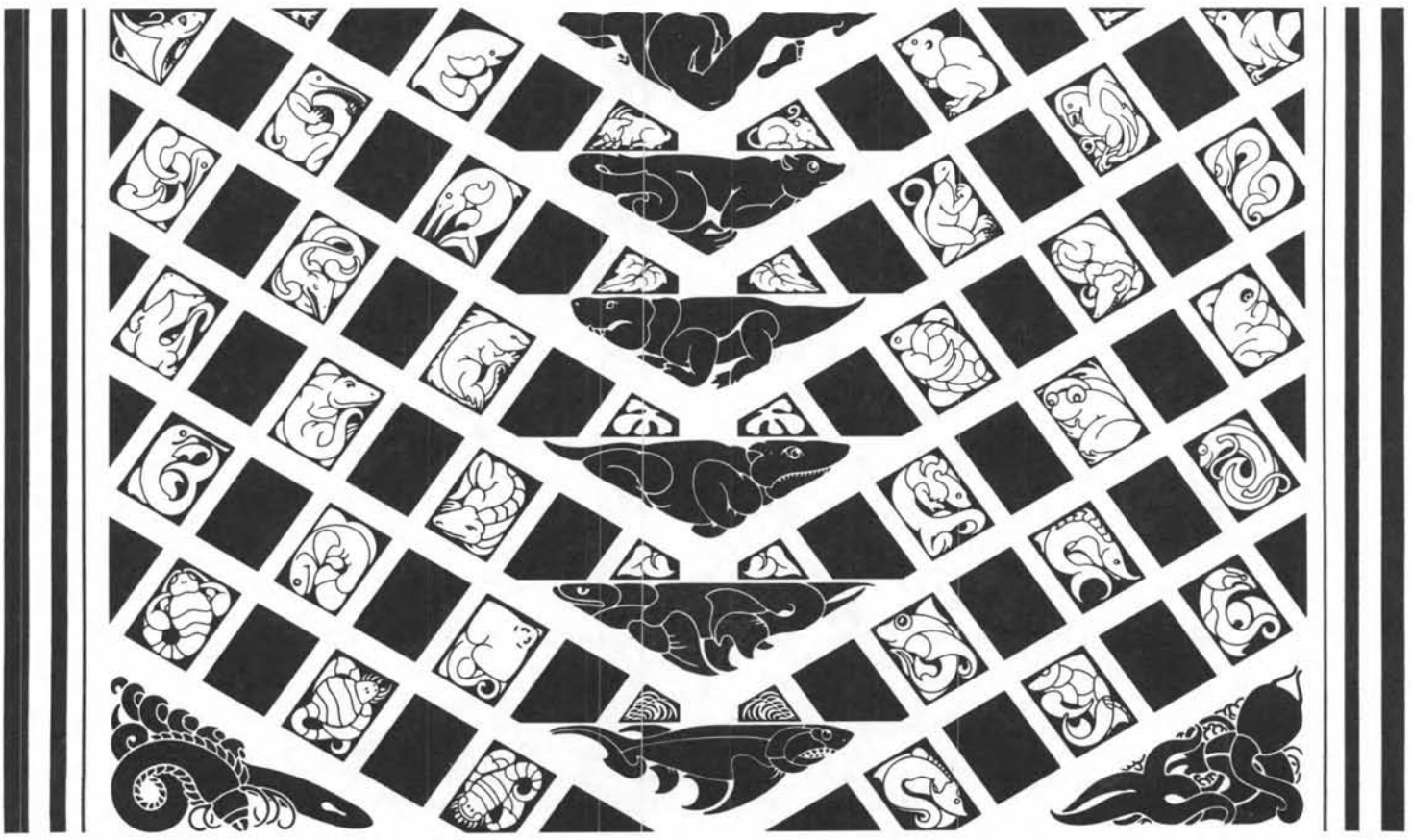
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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

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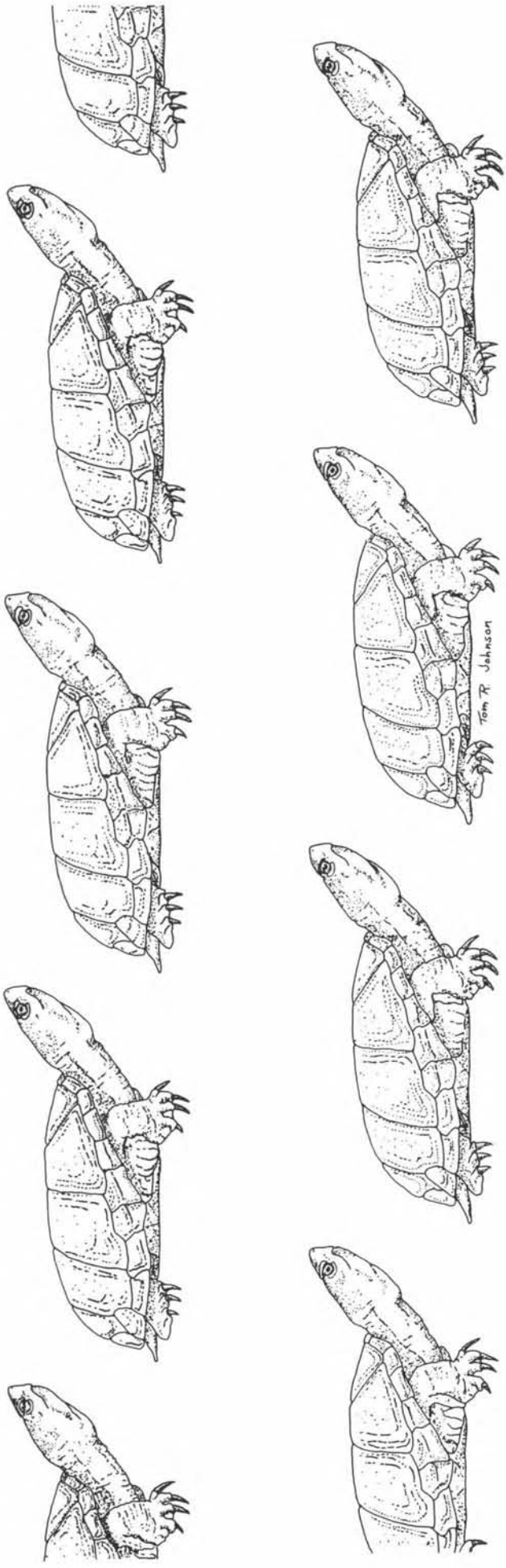
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1985 ANNUAL MEETING

The 1985 annual meeting will take place at The University of South Florida in Tampa, 4-9 August.

SSAR members are reminded that the Tampa meeting will include the ever-popular Annual Auction of herpetologically related books and other items. It is not too early to start collecting your collectibles, forwarding them (or a statement of your intention to bring them) to meeting chairman:

Henry R. Mushinsky
Department of Biology
University of South Florida
Tampa, Florida 33620, U.S.A.

David Dennis and Kraig Adler, co-producers of the "Herpetologists Then and Now" slide presentation given at the Oklahoma ASIH/HL/SSAR meeting, request that society members send them duplicate slides of memorable (or forgettable) herpetological happenings — and their participants — for inclusion in future presentations. Anonymity of donors is guaranteed. Slides should be mailed to:

David M. Dennis
General Biology Section
The Ohio State University
1060 Carmack Road
Columbus, Ohio 43210, U.S.A. ●

SSAR BUSINESS

SYMPOSIUM PROPOSALS FOR 1986 SSAR MEETING

Proposals for symposia for the **1986** SSAR meeting are now being accepted. In order to allow for necessary planning and coordination of symposia, the *deadline* for receipt of proposals for the **1986** meeting is 1 JANUARY 1985. Further information may be obtained from, and proposals submitted to:

Dr. Lynne Houck
Department of Biology
University of Chicago
1103 E. 57th Street
Chicago, Illinois 60637, U.S.A. ●

1984 SSAR GRANTS-IN-HERPETOLOGY AWARDS

The Society for the Study of Amphibians and Reptiles is pleased to announce the following awards in the 1984 Grants-in-Herpetology Program:

GRADUATE STUDENT RESEARCH:

Trip Lamb, Department of Zoology, University of Georgia. "An investigation of introgressive hybridization between the barking treefrog *(Hyla gratiosa)* and the green treefrog *(Hyla cinerea)* using mitochrondrial DNA analysis." $280.

Martha K. Pancak, Department of EPO Biology, University of Colorado. "Endocrine regulation of oocyte development in the Bidder's Organ, a remnant ovary in male toads." $280.

REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS:

Joseph C. Mitchell, Department of Biology, University of Richmond. "Reptiles and amphibians of far southwestern Virginia: a biogeographical and ecological survey." $240.

Yehudah L. Werner, Department of Zoology, Hebrew University of Jerusalem. "A gecko research facility." $350.

HERPETOLOGICAL CONSERVATION:

Robert E. Herrington, Department of Zoology, Washington State University. "The ecology, distribution, and habitat requirements of the Larch Mountain Salamander, *Plethodon larselli*." $430.

HERPETOLOGICAL RESEARCH IN ZOOS:

Michael K. Stoskopf, National Aquarium in Baltimore. "Amino glycoside kinetics in 3 families of Anura." $400.

FIELD WORK:

Calvin A. Porter, Department of Zoology, Brigham Young University. "Chromosomal variation in the iguanid lizard *Sceloporus grammicus* in central Mexico." $215.

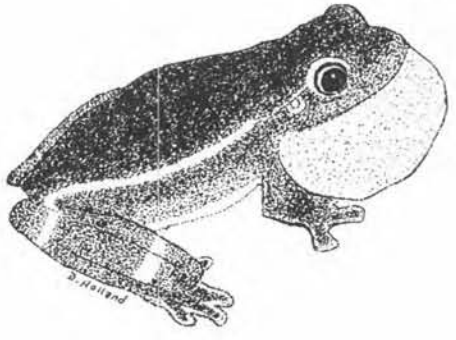
Mac F. Given, Biological Sciences Group, University of Connecticut. "Social behavior and acoustic interactions of the carpenter frog, *Rana virgatipes*." $215.

The number of proposals received in each category for this year and last year is:

	1984	1983
Conservation Research	9	15
Field Work	9	—
Graduate Student Research	33	34
Regional Herp. Societies	4	5
Zoo Research	5	0
Total:	60	54

SSAR extends its congratuations to all recipients of awards and encourages the submission of proposals for next year's program. Further details on the 1985 Grants-in-Herpetology program, and the deadline for receipt of proposals, will appear in the December issue of *HR*.

SSAR expresses its thanks to the 1984 Grants-in-Herpetology Committee, composed of Linda R. Maxson (Chairperson), James P. Bacon (Herpetological Research in Zoos), Donald C. Forester (Field Work), John B. Iverson (Herpetological Conservation), Robert W. Murphy (Graduate Student Research), and Malvin L. Skaroff (Regional Herpetological Society Programs). ●



IN MEMORIAM — FEDERICO MEDEM

On May 1, 1984, Federico Medem died of cancer in Bogotá, Colombia. He is survived by his widow, Flor Angela and daughter, Dina Maria. Not only has herpetology lost one of its most dedicated scholars, but more, the world has lost a rare human being; a man unaffected by the legend that was his life.

Friedrich von Medem Medem was born August 29, 1912 in Riga, Latvia. His family was nobility and many were notables at the Imperial Russian Court. An uncle and grandfather were generals in the Russian Army. His other grandfather had been chief of diplomatic mission from the tsar to China and so outstanding were his accomplishments, that when he died there, the other legations erected a monument to honor his memory.

In 1917, the Bolshevik Revolution obliged the Medems to flee their palatial estates and young Friedrich was taken to Berlin. From 1925 to 1928, he attended gymnasia in Namslau and Liegnitz, Silesia and then returned to Riga to receive his diploma in German humanities. Between 1936 and 1940, he studied at the Humboldt University and the University of Tuebingen. He then went to the Stazione Zoologica in Naples, Italy to research his doctoral thesis. He received his doctorate in Natural Sciences from Humboldt University in 1942 and later worked as assistant to the director of the Max Planck Institute in Hechingen, Germany. In those years, a dark star was rising over Germany and Medem watched with horror the lunatic rantings of Adolph Hitler. Although he wished only to occupy himself with science and literature, he could not dissemble his loathing for the new Nazi regime and he was eventually drafted into a special batallion of political dissidents and sent to the Russian front, where he was seriously wounded. After the war, he went to the Institute of Zoology at Berne University in Switzerland as an instructor. There he met Doctor Mario Laserna, who invited him to teach at the new University de Los Andes in Bogotá, Colombia.

In June, 1950, he arrived in Colombia. This was his first time in the Americas and although he spoke Russian, German and Italian fluently, he knew practically no Spanish. His finances were equally meager and he often referred to himself as a displaced person at that point in his life. Vicissitudes such as these never deterred him, however, and in the next thirty-four years he would establish himself as the foremost naturalist in the country and one of the world's leading experts on the natural history of crocodilians. Along the way, he adopted the name Federico, acquired Colombian citizenship and married his beautiful Colombian wife.

During his early years in Colombia, Federico lived for months among indian tribes, many of whom had probably never seen any outsider. With them, he explored the forests and rivers, submersing himself totally in the study of their exciting tropical world. His methodical nature and his absolute disregard for pain and discomfort impressed them greatly. One Guahibo tribe not only adopted him, but gave him one of the specially carved

wooden stools reserved solely for caciques. Federico was similarly impressed by the indians and identified with their spiritual kinship with Nature. Among his many stories about the tribes he had lived with were those about their sense of humor. Although they are quite prudish about personal sexual matters, they delight in the coarsest jokes and insults directed at one another and sometimes at the strange white man who was in their midst. Count von Medem, descended of a long line of nobility, was as unaffected by their stinging wit as he was by the vicious bites of the huge tabanids whose primary hosts were crocodiles and caimans. A species of this fly was named *medemi,* which not only honors him as its discoverer, but also commemorates his legendary indifference to the bite. The list of new species and subspecies named after him spans the orders of the animal kingdom, most named to honor Federico as discoverer.

Between 1953 and 1961, Medem received two separate grants from the Guggenheim Foundation to travel in the United States, to meet with colleagues and to study specimens preserved in museums and universities. In later years, he would sponsor other young scientists for similar grants. Then, for the next five years, he directed the Faunistic Section of the Corporación Autonoma Regional de los Valles del Magdalena y Sinu at Cartagena. It was there that he met and married Flor Angela Cortés.

In 1966, Federico was named director of the 'Roberto Franco' Institute in Villavicencio, which had been the site of the famous malaria research by Marston Bates and others in the 1940s. Villavicencio, at the foot of the Andes, is the gateway to the great Colombian savannahs and the rain forests to the south. Federico never enjoyed the higher altitudes and this new environment suited him perfectly. A year later, the National University appointed him full professor in a non-teaching capacity that he might devote all his time to his research. His more than ninety publications, including two books, attest to his tireless work.

In 1972-73, he traveled throughout South America gathering scientific data and studying the growing commerce in reptile hides. The trip was sponsored by the New York Zoological Society. He worked constantly to inform the world of the serious depredations upon wildlife species, especially the crocodilians. He was a born conservationist; a conservationist long before it became the thing to be. In the years to come, he would atttend international conservation congresses in Australia, New Guinea, Switzerland, India, Costa Rica and the U.S. In 1981, he was retained by FAO to go to Botswana and evaluate a management and conservation project for Nile crocodiles. For the last several years of his life, he was vice-chairman of the IUCN/SSC for all of South America. In September, 1983, the National University awarded him its highest possible academic tribute, the Medalla Al Merito Universitario. At that time, he was working on the manuscript of his third book, The Turtles of Colombia, which he was never to see completed.

For almost two decades, Fred Medem's home in Villavicencio was a mecca for colleagues, students and friends from all parts of the world. His courtly charm was denied to none and the only credentials needed was a sincere desire for knowledge. He was impatient with any sort of affectation or pretentiousness. He had none himself.

I first met Fred in February, 1979, while I was working to develop a zoo near Bogotá. In 1980, he invited me to live at the Institute and work for him as his personal secretary and librarian. I accepted this honor with alacrity and in the next year and a half, I came to know this unique and unforgettable man. After I left Colombia, we corresponded actively until shortly before his death.

MIKE WILLIAMSON
Curator - Dallas Zoo
Dallas, Texas 75203-2996, U.S.A. ●

LEGISLATIVE ALERT

COMMENTS SOUGHT ON *Sternotherus m. depressus*

The U. S. Fish and Wildlife Service announced a positive finding on a petition by the Environmental Defense Fund to list the flattened musk turtle, *Sternotherus minor depressus* (or *S. depressus*) as a threatened species (F.R. 49:67:13558-59, Apr. 5, 84). The petition was received by the Service on December 1, 1983, and a decision must be reached within 12 months of that date as to whether the requested action is warranted.

The Service is now receiving comments and soliciting data concerning the turtle; it is especially interested in information regarding "taxonomy, distribution, any recommended critical habitat for the species, and threats."

Comments and information may be submitted "until further notice" to the Associate Director — Federal Assistance, U. S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240. Additional information may be obtained by contacting John L. Spinks, Jr., Chief, Office of Endangered Species, same address as above. ●

FEDERAL REGISTER NOTICES

The SSAR Conservation Committee monitors the Federal Register and excerpts items concerning the herpetological resource. The following summaries briefly highlight those issues and identify the volume and date of publication. Those individuals interested in more detail are referred to the appropriate issue of the Register.

Volume 48, No. 161, pp. 37494-37498. August 18, 1983. 50 CFR Part 23. Proposed findings and rule for Export of . . . **American Alligator** . . . Taken in 1983-84 and Subsequent Seasons. Deadline for comments was September 19, 1983.

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) regulates international trade in certain animal and plant species. This proposed rule identifies the conditions for export for legally taken American alligator *(Alligator mississippiensis)* hides taken in Florida and Louisiana for the 1983-85 harvests.

Volume 48, No. 226, pp. 52740-52743. November 22, 1983. 50 CFR Part 17. Final Rule to Remove the Florida Population of the **Pine Barrens Treefrog** from the List of Endangered and Threatened Wildlife and To Rescind Previously Determined Critical Habitat. The rule became effective on December 22, 1983.

A final rule published on November 11, 1977 (42 FR 58754-58756) determined that the Florida population of the Pine Barrens treefrog *(Hyla andersonii)* was endangered. A critical habitat designation became effective on December 8, 1977. Subsequent investigations by the Florida Game and Fresh Water Fish Commission conducted pursuant to an Endangered Species Cooperative Agreement identified many additional sites occupied by this species. A proposed rule was published on September 15, 1982 (47 FR 40673-40676); six responses were received; five favored delisting and one opposed. This final rule officially removes the Florida population of *H. andersonii* from the federal endangered species list.

Volume 49, No. 5, pp. 1058-1060. January 9, 1984. 50 CFR Part 23. Final Findings and Rule for Export of **American Alligators** Taken in 1983-85 Harvest Seasons. The findings became effective on January 9, 1984.

The rule states the final conditions under which American alligator *(Alligator mississippiensis)* hides may be exported from Florida and Louisiana. Hides from animals taken on or before December 31, 1985 must be clearly identified as to species, state of origin and season of taking and must be tagged by a permanently attached, serially numbered tag of a type approved by the Service that is attached under conditions established by the Service. A summary of this rule is also available in the Endangered Species Bulletin (Volume IX, No. 3, March, 1984).

Volume 49, No. 11, pp. 1992-1994. January 17, 1984. 50 CFR Part 17. Final rule: Determination That the **Wyoming Toad** *(Bufo hemiophrys baxteri)* Is an Endangered Species. The rule became effective on February 16, 1984.

The Wyoming toad was discovered in 1946. It is closely related to the Canadian toad *(Bufo h. hemiophrys)* but was identified as a distinct subspecies in 1968. It is believed to be a glacial relict and occurs only in a restricted area in Wyoming. Surveys in recent years have yielded but few animals. A proposed rule was published on January 27, 1983 (48 FR 3794); five comments were received, all supportive of listing the Wyoming toad as an endangered species. No critical habitat designations have been made to date.

Volume 49, No. 12, p. 2128. January 18, 1984. 50 CFR Part 23. Notice of Amendment to Appendix and Request for Comments on: Indian Snakes Added to Appendix III of

Endangered Species Convention. Deadline for comments was February 3, 1984.

The following species were submitted by the Government of the Republic of India for inclusion in Appendix III of CITES:

Family Colubridae:
Atretium schistosum (olive keelback water snake)
Cerberus rhynchops (dog-faced water snake)
Natrix piscator (checkered keelback water snake)
Pytas mucosus (Indian rat snake)

Family Elapidae:
Naja naja (Indian cobra)
Ophiophagus hannah (king cobra)

Family Viperidae:
Vipera russellii (Russell's viper)

Volume 49, No. 41, pp. 7394-7398. February 29, 1984. 50 CFR Part 17. Final rule: Listing of Two Spanish Reptiles and the Delisting of the Indian Flap-Shelled Turtle. The rule became effective on March 30, 1984.

The **Hierro giant lizard** *(Gallotia simonyi simonyi)* is determined to be endangered. It is a large herbivorous species known only in the Canary Islands. It was believed extinct until 1975, but survives on a steep rocky arid cliff. Half of the estimated 200 individuals in 1975 were juveniles. Possible threats include proposed development, competition with goats, over-collecting and gull predation on juveniles. No critical habitat has been designated.

The **Ibiza wall lizard** *(Podarcis pityusensis)* is determined to be threatened. It is found on the Balearic Islands in the Mediterranean Sea. Threats and impacts include gull predation, scientific and commercial collecting, human-mediated hybridization of the subspecies, habitat alteration and destruction, and poisoning. No critical habitat has been designated.

The **Indian flap-shelled turtle** *(Lissemys punctata punctata)* has been removed from the endangered species list. It was listed on June 14, 1976 (41 FR 24062-24067) based on recommendations from Bangladesh that it be listed on CITES Appendix I. Subsequent investigations indicate that it is one of the most common turtles in India and there is no justification for retaining it on the endangered species list. Although provisions of the Endangered Species Act do not apply after the effective date of the rule, the species still remains on the CITES Appendix I and therefore is subject to trade restrictions.

A summary of this rule may also be found in the Endangered Species Bulletin (Volume IX, No. 3, March 1984).

Volume 49, No. 41, pp. 7416-7417. February 29, 1984. 50 CFR Part 17. Notice of: Findings on a Petition to List the **Alligator Snapping Turtle** as a Threatened Species. The Findings was made on February 10, 1984.

The Service received a petition on February 23, 1983, from Dr. Peter C. H. Pritchard, to list the alligator snapping turtle *(Malaclemys temmincki)*. The species was included in the Review of Vertebrate Wildlife for Listing as Endangered or Threatened Species published in the Register on December 30, 1982. The species appears to have declined throughout most of its range, although local populations in some areas appear stable. There was both support for and opposition to listing at this time. The Service concluded by stating there are insufficient data at this time to support listing but that it will continue to monitor the status of the turtle. An additional summary of this finding may be found in the Endangered Species Bulletin (Volume IX, No. 3, March 1984).

PATRICIA RIEXINGER
New York State Department
of Environmental Conservation
Albany, New York 12233, U.S.A. ●

SOCIETIES

OREGON HERPETOLOGICAL SOCIETY REVIVED

The Oregon Herpetological Society, which originated in 1955, has recently emerged from a decade of dormancy and finds itself alive and ready for action. A newsletter was published in June 1984 and a field trip was held in the same month. Regular meetings are held on the second Sunday of each month (except July and August), beginning at 7:00 P.M., in Eugene. Membership is $5 (regular) or $4 (corresponding) annually. For further information contact:

Mr. David Olson
OHS Treasurer
981 West 8th Avenue, #10
Eugene, Oregon 97402, U.S.A. ●

MINNESOTA HERP SOCIETY RECEIVES GRANT

The Minnesota Herpetological Society has received a grant from the Minnesota Department of Natural Resources to do field work in the Missouri River Drainage in the southwestern corner of the state. The $1500 grant is to support three field trips to the area. ●

AMPHIBIA-REPTILIA AND THE "SOCIETAS EUROPAEA HERPETOLOGICA"

In 1980, *Amphibia-Reptilia*—a major new international journal of herpetology—was established in Europe, yet many of our colleagues, especially those in America, are unaware of it and fewer still have seen copies. We take an opportunity, then, to review this journal, now completing its fourth volume in 1984, to discuss its importance for world herpetology and a potential problem for its further development.

In subject matter and geographical coverage *Amphibia-Reptilia* is quite cosmopolitan. To illustrate the diversity of coverage, the articles in volume 3 (1982) can be divided into the following categories: seven on molecular and karyotypic studies; five on ecology and behavior; five on taxonomy and systematics; three on anatomy; three distributional and faunistic papers; three on reproduction; two on development; and one other paper each on genetics, evolution, physiology, conservation and paleontology. The journal emphasizes European species (23 of the 33 papers in volume 3), but nearly one-third of the articles covered species from other regions including three on Asia; three on the Americas; one each for Africa and Australia; and with two others that are world-wide in coverage. However, whatever the geographic focus, the subject matter of most articles is of general interest. There is also a section for book reviews and newsnotes at the end of each issue. The vast majority of papers is in English (in volume 3, 25 papers) but also French (5), Spanish (2) and German (1)—the four official languages of the journal. English abstracts are provided for all papers.

The journal is quarterly, although double numbers occasionally appear. The format and typography are highly professional and the photographs are of an especially high standard. To date, each volume comprises about 400 pages. In general, the quality of the articles and of the editing is very good.

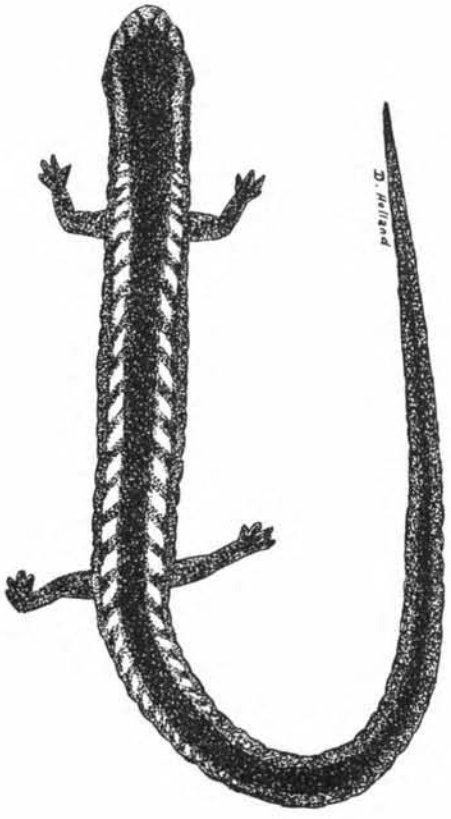
One cannot fairly review *Amphibia-Reptilia* without commenting on its sponsoring society. The "Societas Europaea Herpetologica" (SEH) is the first multi-national rather than linguistic or national society to develop in Europe. Two pivotal meetings provided the real impetus for a pan-European society, both for a society and the journal. Following discussions between French and German herpetologists, a working session was held at Montpellier, 21-23 June 1979, and the formal founding session at Bonn, 10-11 September 1979. Membership, especially among professional herpetologists in Europe, grew rapidly for several years and is now about 385 (as of March 1984). Besides the journal, biennial meetings have been held (Vienna 1981; León 1983; 1985 planned for Prague, jointly with herpetologists from Eastern Europe and the USSR) and several committees established, the most active of which is that concerning conservation.

SEH founded *Amphibia-Reptilia* in a manner quite unlike that of the comparable journals based in America. In the latter societies, for better or worse, the size and format of their respective journals developed over many years in parallel to the growing financial capabilities of the sponsoring societies. For *Amphibia-Reptilia*, on the contrary, it was decided to establish a fully professional journal at the very beginning, but in order to do so the SEH had to ask a commercial firm to publish the journal, with the society guaranteeing a certain financial support. Unfortunately, their first publisher went bankrupt during 1983 but SEH has recently contracted with the well-known firm of E. J. Brill in Leiden, to publish *Amphibia-Reptilia*. All commitments to subscribers will be honored and the journal should be back on schedule by the end of

1984. We believe that *Amphibia-Reptilia* is an excellent journal and deserves a broader readership. Compared to other journals now printed in Europe it is very modestly priced. On the other hand we note that *Amphibia-Reptilia* currently addresses itself to university and museum personnel although herpetology as a discipline is much more extensive. One would hope that the editors, in further developing their journal, will broaden the journal's appeal so that *Amphibia-Reptilia* will show up in more libraries and on more desks and, as a result, enlarge the financial base for the journal which seems necessary for its survival.

We hope that our colleagues will consider membership in SEH (which includes subscription to *Amphibia-Reptilia*), at least for a trial year. Dues for individuals are presently 75 Deutschmarks and can be paid by check, in marks, to the treasurer, Dr. Heinz Wermuth, Staatliches Museum für Naturkunde, Arsenalplatz 3, D-7140 Ludwigsburg, Federal Republic of Germany. In addition, by a special new arrangement, dues can also be paid in USA dollars, by sending a check for $32 to Dr. Wermuth.

KRAIG ADLER
Cornell University
Ithaca, New York 14853, U.S.A.
and
CARL GANS
The University of Michigan
Ann Arbor, Michigan 48104, U.S.A.



NOW PUBLISHED!

THE TURTLES OF VENEZUELA

by Peter C. H. Pritchard and Pedro Trebbau

This book is the first in-depth treatment of a major South American turtle fauna. It covers all turtles known from Venezuela including the matamata and other sidenecks (11 species), tortoises (2 species), pond and land turtles (5 species and subspecies), and the sea turtles (5 species), together comprising half of the turtle species described from the South American continent. There is an extensive discussion of the distribution and zoogeography of South American turtles and a key to species (in both English and Spanish). Each species account consists of a synonymy followed by a diagnosis; a detailed description (including shell, soft parts, color, and sexual dimorphism); and sections on size and growth, distribution, geographic variation, habitat, feeding, reproduction, economic importance, and vernacular names. The family accounts give a detailed review of the fossil history and present distribution of all genera, worldwide, but with emphasis on South America. There is also a comprehensive bibliography and a list of locality records from throughout the entire continent for all Venezuelan taxa.

The book is beautifully illustrated. There are 48 full-page plates in color, 26 of which are original watercolors and the remainder a collection of 165 photographs of both turtles and their habitats. In addition, there are two distribution maps for each species: a spot map showing the detailed Venezuelan distribution and another map showing the continent-wide range.

The book is 414 pages, 8½ x 11 inches (21.5 x 28 cm), bound in buckram, price US $45. A special leatherbound patron's edition, in two volumes, is US $300. A four-page ad with sample color plates was published in the December 1982 issue of *Herpetological Review*, and copies may be obtained on request from Dr. Douglas H. Taylor, Department of Zoology, Miami University, Oxford, Ohio 45056, USA.

Orders may be placed with Dr. Taylor. Please make checks payable to "SSAR." All USA orders are postpaid; shipments outside the USA will be charged only the *additional* shipping costs in excess of domestic rates. Overseas customers must pay in USA funds or by International Money Order, or may charge to MasterCard or VISA (give account number and expiration date). A complete list of Society publications and membership information can be obtained from Dr. Taylor. The Society publishes *Journal of Herpetology, Facsimile Reprints in Herpetology, Herpetological Review, Herpetological Circulars, Catalogue of American Amphibians and Reptiles, Contributions to Herpetology,* and *Recent Herpetological Literature.*

SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

HERPETOLOGY IN AFRICA

Africa is large, and herpetologists few. Problems of distance, finance, and, not the least, politics all limit contact between us. In my capacity as Editor/Secretary of the Herpetological Association of Africa (HAA), I have been asked to attempt an 'overview' of herpetological research on the continent. Frankly my efforts are doomed. I apologise at the outset for the parochial nature of this report; it is heavily biased towards southern Africa. Not through choice, I hasten to add. It is simply where I live and work, and the area with which I am most familiar. I appeal to all herpetologists working on African reptiles and amphibians to keep me informed of their current research projects, publications and conference announcements. Through these columns I offer them an opportunity to contact, advise and inform their colleagues.

FORTHCOMING CONFERENCES

From 16-18 July 1985, the Zoological Society of Southern Africa (ZSSA) and Herpetological Association of Africa will be holding a herpetological conference, in conjunction with the ZSSA conference on "Competition and Co-existence," at the University of Natal, Pietermaritzburg. Herpetologists interested in presenting papers are invited to contact the author for further details.

Sixth Symposium on African Amphibians, Department of Biology, University of Miami, U.S.A. 13 April 1987. Organized by the African Amphibian working group, participation in the symposium will be by invitation to scientists active in the study of African amphibians. Information can be obtained from Prof. Jay M. Savage, Department of Biology, University of Miami, Coral Gables, Florida 33124, U.S.A.

PUBLICATIONS

Herpetology of Africa. A checklist and bibiography of the Orders Amphisbaenia, Sauia and Serpentes by Kenneth R. G. Welch, 1982, 293 pp, $19.50, Robert E. Krieger Publ., Malabar, Florida. This recent publication, despite its name, is restricted to African squamates, but is nonetheless a very useful checklist. Detailed, constructive reviews by Broadley and Branch appeared in J. Herpetol. Assoc. Afr., 29:22-36, 1983. A companion volume on African amphibians is in preparation.

The Transvaal Branch of the Wildlife Society of Southern Africa has printed a large colour poster illustrating all Transvaal snakes. Copies can be obtained from the Society (P.O. Box 44344, Linden, 2104, South Africa) for R3.50.

FitzSimons' *Snakes of Southern Africa*, Delta Books, Johannesburg, 376 pp, 83 maps, 209 figs., 84 col. pls., R59.65. FitzSimons' 1962 monograph has been completely revised by Dr. D. G. Broadley, and is now the definitive treatment of the subcontinent's snakes.

Die Slange van Suidwes-Afrika by P. J. and P. J. C. Buys. Gamsberg Publ., Windhoek, R7.75 (in Afrikaans).

Danie Immelman and Pietro de Lange (University of Stellenbosch) have completed M.Sc. theses on "The cranial morphology of *Phrynomerus annectans* Werner, with special reference to the systematic position of the Phrynomerinae (Microhylidae)" and "Kidney morphology in *Geochelone pardalis*," respectively.

Niel Jacobsen (Transvaal Nature Conservation Division) has completed his M.Sc. thesis (University of Pretoria) on "The ecology of the reptiles and amphibians in the *Burkea africana - Eragrostris pallens* savanna of the Nylsvley Nature Reserve" and is now completing his survey of the Province's herpetofauna.

CURRENT RESEARCH

Dr. Mike Picker (University of Cape Town) is investigating habitat selection in *Xenopus gilli* and *X. laevis*, and hybridization between the two species. *Xenopus gilli* is an endangered amphibian and Dr. Picker is a member of the Council for Cape Platanna Conservation.

'Amphibia Zambesiaca,' a study of the amphibians of Mozambique, Malawi, Zambia, Botswana, Zimbabwe, and the Caprivi Strip of Namibia, is co-authored by D. G. Broadley and J. C. Poynton. Part 1 (Scolecomorphidae, Pipidae, Hemisidae and Arthroleptidae) has recently been published (Ann. Natal Mus., 26, 1984), and Part 2 (Ranidae) is in press. Dr. Broadley is currently working on the companion monograph - 'Reptilia Zambesiaca.'

Professor Robert Capranica (Cornell University) recently completed a 4 month sabbatical, working in collaboration with Dr. Neville Passmore (University of the Witwatersrand) on mate recognition in *Kassina* and phonotaxis in *Hyperolius marmoratus*.

Jim Campbell (ex Portland State University, Oregon) has joined the Desert Ecological Research Unit in the Namib Desert to investigate body temperature regulation and digestive efficiency in *Angolosaurus skoogi* and *Aporosaura anchietae*. Physiological parameters of this investigation will be studied by Professor D. M. Mitchell, Medical School, University of the Witwatersrand.

Dr. C. W. D. Gibson (Animal Ecology Research Group, Oxford University) is continuing studies on the Aldabran giant tortoise *(Geochelone gigantea)*. Dr. Malcolm Coe, of the same department, is undertaking a survey of the Kora National Reserve, Kenya, and herpetological studies include:

1. Producing an inventory of the herpetofauna
2. Studying the activity and biomass of lizards
3. Factors affecting the breeding and dry season activity of amphibians
4. Studying the distribution and activity of the pancake tortoise *(Malocochersus tornieri)* on rock outcrops

Dr. Jim Hebrard (Department of Zoology, University of Nairobi) is studying the ecology and distribution of chamaeleons in Kenya.

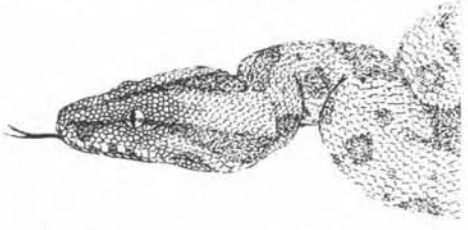
NEWS

Wulf Haacke, Curator of Lower Vertebrates, Transvaal Museum, Pretoria, has won the recent Wildlife Society of Southern Africa/ Agfa Photographic competition (with a shot of an elephant!). His prize - a trip for 2 to the Galapagos!

RECENT AFRICAN HERPETOLOGICAL LITERATURE

This bibliography is published in the *Journal of the Herpetological Association of Africa*. The world literature is scanned for relevant publications. The Editor (Port Elizabeth Museum, P.O. Box 13147, Humewood 6013, South Africa) invites authors working on African Herpetology to inform him of their publications for inclusion in the bibliography.

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THE STATUS OF *Micrurus ruatanus* (GÜNTHER), A CORAL SNAKE ENDEMIC TO THE BAY ISLANDS OF HONDURAS

Roze (1982) recently provided a systematic and biological summary of the members of the genus *Micrurus*. In this work, Roze modified the status of a number of taxa within the genus. One of these changes involved placing the nominal species *Micrurus ruatanus* (Günther), 1895, as a subspecies within *M. nigrocinctus*, a widespread Middle American species, occurring also in adjacent Colombia. The reasoning given for this shift was as follows: "Whereas no intergradation is known (Wilson and Meyer, 1972), apparently, this subspecies is related to *M. nigrocinctus*. Some specimens of *M. n. divaricatus* from Honduras (*sic*) mainland approach the high number of black bands found in the population of Isla Roatan (*sic*)." He went on to say "is *ruatanus* already a species or not (*sic*) is an open question due to its insular distribution."

Micrurus ruatanus has been discussed several times by my coworkers and myself (Wilson and Meyer, 1972; Wilson and Hahn, 1973; Wilson and Meyer, 1982). These authors considered this coral snake to be a distinct species. I would like to reaffirm this earlier position and provide the justification below.

Roze (1982) credited Wilson and Meyer (1972) with pointing out that "no intergradation is known" between *ruatanus* and the mainland members of the *nigrocinctus* complex. These authors made no such statement, inasmuch as it is obvious that an insular form is not going to intergrade with a mainland taxon. He further stated that "apparently, this subspecies *ruatanus* is related to *M. nigrocinctus*" but provided no justification for the statement, except to note the approach in "some specimens of *M. n. divaricatus* from the Honduran mainland" in high black band count to that of *M. ruatanus*.

Wilson and Meyer (1972) pointed out that Roze, in an earlier paper (1967), had misidentified a specimen of *M. nigrocinctus* from the department of Atlántida in northern Honduras as *M. ruatanus*. In spite of the statement by Wilson and Meyer (1972) that the resemblance between the mainland specimen (TCWC 21181) and insular *ruatanus* in black body band count "is only superficial," Roze (1982), apparently, used the same specimen to support his statement that "some" specimens of mainland *nigrocinctus* have black body band counts that "approach"the high numbers seen in *ruatanus*.

It seems worthwhile to again examine the data presented by Wilson and Meyer (1972, 1982) and Wilson and Hahn (1973) in a somewhat different light in order to defend the opinion that *Micrurus ruatanus* is a distinct species.

Wilson and Meyer (1972) examined variation in *M. nigrocinctus* in Honduras in detail and concluded that recognition of subspecies in Honduras is unwarranted. They pointed out, however, that "specimens from northern Honduras generally are bicolor and have a *low number of black body bands* (italics mine) and ventrals and a long pale head band." The italicized portion of the above-quoted remarks calls into question Roze's (1982) remark about high black body bands in "some" northern species. This comment ignores much of what Wilson and Meyer (1972) had to say, i. e., that the northern bicolor populations exhibit a morphocline in the amount of deposition of black pigment on the red body bands extending from a condition where such pigment is absent or restricted to a few scattered scales through five intermediate stages to one in which the black pigment on the red bands has coalesced into a band indistinguishable from the other black body bands (i. e., the condition exhibited by TCWC 21181). Thus is explained the purported but spurious "approach" toward the condition of high black body band counts in "some" specimens from northern Honduras. Other specimens from the remainder of the country have black body band counts ranging from 11-24, $\bar{X}$ = 17.4, (the figure of 27 given for a male specimen, LSUMZ 21773, from population D in Wilson and Meyer, 1972, is incorrect; the correct count is 14; the number 27 was inadvertently obtained by adding the number of pairs of black blotches in the red band area, Fig. 5A in that paper). That range does not closely approach the counts for *M. ruatanus*.

Micrurus ruatanus was discussed and described by Wilson and Hahn (1973) and Wilson and Meyer (1982). These authors pointed out the high numbers of black body bands, ranging from 33 to 45 ($\bar{X}$ = 38.9). There is no overlap in the ranges of black body band counts between *M. ruatanus* and *M. nigrocinctus*, even counting the "double-banded" TCWC 21181. The means are separated by approximately *22* scales! There is also a noteworthy distinction in the *nature* of the banding. In the northern Honduran mainland populations of *M. nigrocinctus*, the accretion of black pigment in the red body bands acts to produce rounded blotches which, in one specimen, have coalesced into complete bands. In *M. ruatanus*, however, the black bands in some specimens are of two types, viz., longer complete bands and narrower disrupted bands that alternate with one another, most conspicuously on the posterior portion of the body (Wilson and Hahn, 1973). Ventral numbers also range lower in *ruatanus* than in *nigrocinctus* from Honduras (Wilson and Meyer, 1972). Male *ruatanus* have 183-185 ventrals; males of *nigrocinctus* from Honduras have 190-208. Females of *ruatanus* have 193-203 ventrals; female *nigrocinctus* from Honduras have 206-224. *Micrurus ruatanus* is, finally, a smaller coral snake than *M. nigrocinctus* from Honduras, especially those from the north coast. The largest known *ruatanus* (LSUMZ 22341) is a female with a total length of 681 mm; the largest *nigrocinctus* (MCZ 33342) from Honduras is 1194 mm in total length (not 1076 mm, as indicated by Wilson and Meyer, 1982). The latter specimen is from Lancetilla on the northern coastal plain.

It is evident that *Micrurus ruatanus* is a coral snake differing conspicuously from *M. nigrocinctus* in having a higher, non-overlapping black body band count, a distinct color pattern morphocline, lower ventral numbers, and a smaller body size. On the basis of the distinctiveness of these features, it is my opinion that *Micrurus ruatanus* deserves specific status.

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OBSERVATIONS OF THE FEEDING HABITS OF THE SHORT-TAILED SNAKE, *Stilosoma extenuatum* IN CAPTIVITY

Knowledge of the natural history of the short-tailed snake, *Stilosoma extenuatum*, is limited. It is certainly one of the least studied serpents in North America. Carr (1934) noted this species' power of constriction and remarkable muscular control and placed *Stilosoma* on par with kingsnakes as a constrictor and ophiophage. Ditmars (1939) reported that two captive *Stilosoma* killed and ate small brown snakes *(Storeria)* by constriction but refused small lizards. Allen and Neill (1953) reported short-tailed snakes kill prey by constriction and prey upon lizards and other unspecified snakes. Other than these few reports, the ecology of the short-tailed snake is unknown. Here I report on the results of 39 feeding trials with a single individual.

MATERIALS AND METHODS

An adult male with a snout-vent length of 540 mm was collected in Hillsborough County, Florida, on 21 February 1983. The snake was maintained in a 50 l aquarium in about 2 cm of local sand. Room temperature

ranged from 17 to 23° C. Water and refuge were always available. The feeding habits of this snake were closely monitored while offering it nine different prey species over a seven month period. Prey were offered to the *Stilosoma* every 8-12 days between 1000 and 1500 h and continuously observed for 60 min. If the *Stilosoma* did not attack or pursue the prey in that hour the prey was allowed to remain for 24 hours. If at the end of the 24 hour period the first prey species was still alive, it was replaced by a Florida crowned snake, *Tantilla relicta*. Again, I watched the snake closely for 1 hour. If the *Stilosoma* did not attempt to follow or inspect (tongue flick) any offered prey species during the first 30 minutes of observation, I carefully restrained the prey with forceps and allowed the *Stilosoma* an opportunity to examine the prey as I held it about 5 cm away. Continued lack of interest would result in that prey remaining in the snake cage for 24 hours. If the *Stilosoma* became interested in the prey I would release it near the snake. Prey species are listed in Table 1.

RESULTS

Ten of 16 successful feeding bouts are summarized in Table 2; six prey were ingested at night and not witnessed. Two additional bouts were observed but the prey ultimately escaped. Only *Tantilla relicta* was ingested by the *Stilosoma*. On several occasions the short-tailed snake showed interest in, but never attacked, other prey species, mostly snakes.

Generally the *Stilosoma* would begin a feeding bout with a *Tantilla* by directing and increasing the rate of tongue flicks. Nine of twelve attacks occurred as the *Tantilla* moved past the *Stilosoma*. The *Stilosoma* trailed the *Tantilla* in the remaining three. The position of the first bite and the method of killing (ingestion or constriction) influenced the total handling time. If the first bite was within 10 mm of the head, ingestion would begin in about 20 min. whereas a more posterior bite would considerably increase the (pre-ingestion) handling time.

Constriction was used to restrain a *Tantilla* on 4 occasions. The first is reported as feeding bout 2 in Table 2; two others were unsuccessful attempts at predation that lasted in excess of 120 minutes. During the 9th observed feeding bout (Table 2) constriction was used to hold the *Tantilla* for 30 min, but eventually the body hold on the prey was released and the *Tantilla* was restrained by the bite until ingested.

DISCUSSION

My observations, like those of Ditmars (1939), suggest that *Stilosoma extenuatum* is strictly ophiophagous specializing on Florida crowned snakes. It does not seem to be interested in lizards (contrary to Allen and Neill 1953) including those sand-swimming lizard species that are specialized for syntopic existence in the Florida sandhills.

Killing by constriction appears very costly in terms of time and energy when compared to ingestion of live prey. Carr (1934) watched an adult male take two hours and fifteen minutes to kill and eat a *Tantilla*. My three observations of *Stilosoma* attempting to kill a prey snake by constriction all extended beyond 2 hours and two of the bouts terminated as the *Tantilla* escaped.

When constricting a *Tantilla* the *Stilosoma* would use the anterior third of its body to wrap three coils around the prey and then proceed to stretch the *Tantilla* between the coils and its more anterior bite. From this posture the *Stilosoma* would "walk" its bite anteriorly on the *Tantilla* as it pulled the posterior portion of the prey in the opposite direction, appearing to injure the prey snake. The actual form of the constriction behavior was very similar to what Greene and Burghardt (1978) termed the boid pattern of constriction. The *Stilosoma* would seize the prey and with an initial twist in the first loop, turn about its long axis as it applied the loops to form a horizontal coil. Thus, the coil was applied with the anterior portion of the predator's body in such a way that the *Stilosoma's* venter faced its head. However, as a precautionary note, Greene and Burghardt (1978) found intergeneric, intraspecific and individual variability in coil application movements within the colubrid snakes.

A statement about the evolutionary implications of a relatively small reptile (with a limited size range of prey) becoming such a highly specialized predator seems in order. According to Smith (1982) *Tantilla relicta* feeds almost exclusively on Tenebrionidae larvae (89.6% of 270 prey from 124 stomachs). Tenebrionids and *Tantilla relicta* are exceedingly abundant in the patchy sandhills of central Florida. Mushinsky (unpubl. data) used pit-fall traps to collect over 150 *Tantilla relicta* (in 12 mo) on approximately 20 ha. of sandhill habitat. A logical conclusion regarding this food chain is that it reflects a long-term stability that has allowed natural selection to produce these highly stenophagic snakes. It is, however, paradoxical that we find such a well defined trophic relationship in a habitat that is itself dependent upon fire and other disturbances for its own survival. Campbell and Christman (1982) stated that the reptile community occurring in the sandhills of Florida does not actually respond to a particular plant association but rather to the physical structure of the habitat (i.e. dry, well-drained with patches of open sand). Additional field studies of this rapidly disappearing sandhill community are necessary before we can make any definitive statements regarding trophic relationships.

Table 1. Prey species (and number) offered to adult male *Stilosoma extenuatum*.

1. *Anolis carolinensis* (1)
2. *Scincella lateralis* (3)
3. *Eumeces inexpectatus* (3)
4. *Eumeces egregius* (2)
5. *Neoseps reynoldsi* (3)
6. *Diadophis punctatus* (3)
7. *Cemophora coccinea* (2)
8. *Rhadinaea flavilata* (2)
9. *Tantilla relicta* (21)

Table 2. Observations of *Stilosoma extenuatum* feeding on *Tantilla relicta*.

Trial No.	Snout-vent length of *Tantilla* (mm)	Latency to attack (sec)	Position of first bite behind head (mm)	Number of bites	Time to bite head (min)	Time to ingest (min)	Total handling time (min)	Method of Killing
1	165	240	75	3	32	14	46	Ingestion
2	160	350	30	1	214*	26	240*	Constriction
3	120	60	45	4	30	14	44	Ingestion
4	170	60	10	1	18	27	45	Ingestion
5	165	600	5	1	22	14	36	Ingestion
6	215	10	5	1	1	18	19	Ingestion
7	175	35	10	1	21	27	48	Ingestion
8	165	15	15	1	33	6	39	Ingestion
9	160	45	30	2	64	12	76	Ingestion
10	135	70	35	2	30	21	51	Ingestion
$\bar{X}$	163	148.5	26	1.7	27.8	17.9	44.8	

*not included in column average

ACKNOWLEDGMENTS

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DISEASE STUDIES AID KEMP'S RIDLEY SEA TURTLE HEADSTART RESEARCH

Since 1977, the Southeast Fisheries Center's Galveston Laboratory, (NOAA National Marine Fisheries Service) has been conducting sea turtle headstart research. Kemp's (Atlantic) ridley sea turtles *(Lepidochelys kempi),* designated an endangered species by the U.S. Endangered Species Act of 1973, are raised in captivity during their first year of life and then are tagged and released at sea in hopes that they will continue their growth to adulthood. Analysis of the results of this project will assist to determine if headstarting can augment the natural nesting populations of the Kemp's ridley (Klima and McVey 1982).

In nature, Kemp's ridley hatchlings are highly vulnerable to mortality, primarily through predation. Turtle biologists have estimated that less than 5 percent of these hatchlings survive through their first year. With headstart techniques, about 68 to 95 percent survival has been achieved with captive turtles during this critical first year.

Kemp's ridley hatchlings are supplied to the Galveston Laboratory through the cooperative efforts of the Instituto Nacional de Pesca, Mexico, the U.S. Fish and Wildlife Service, and the U.S. National Park Service. They are reared for 7 to 12 months and those in good condition are tagged and released off Padre Island, Texas (earlier release sites included the west coast of Florida) (J. P. McVey and R. S. Wheeler, pers. comm. 1978-1981). Also, approximately 86 headstarted yearlings of the 1978 and 1979 year-classes have been distributed to Miami Seaquarium in Miami, Florida, and Sea Arama Marine World in Galveston, Texas, to provide a potential captive brood stock (R. S. Wheeler, pers. comm. 1981). Of these turtles, 8 are still surviving at Miami, and 10 at Galveston (F. H. Berry and R. M. Harris, pers. comm. 1983).

At the beginning, loggerhead *(Caretta caretta)* hatchlings rather than Kemp's ridley hatchlings were reared so that the Galveston staff could gain experience for future application to the endangered ridleys. In September 1977, 1,160 loggerhead hatchlings, obtained soon after hatching from eggs collected by the Florida State Department of Natural Resources, Jensen Beach, Florida, were shipped to the Galveston Laboratory. These hatchlings were reared communally in large close-ended concrete tanks (raceways), containing recycled natural seawater, and originally designed for shrimp culture (C. R. Mock and C. T. Fontaine, pers. comm. 1977). Later, many culture methods were developed and used, including flow-through tanks in which the seawater was constantly and gradually exchanged through a supply valve and a drainage outlet (A. Brown, Jr. and R. S. Wheeler, pers. comm. 1977). The animals were fed mainly a frozen fish diet.

The decision to experiment first with the loggerheads proved to be quite beneficial. Although there was only a 9 percent loggerhead survival, by the end of the 10-month rearing period the staff had learned much about turtle diseases and their prevention and treatment. Almost 100 percent of the loggerhead hatchlings became ill at one time or another and many died. The most serious kind of death (about 40 percent) involved a "sudden hatchling death" (SHD) syndrome in which the animals suddenly died without any discernible cause. Other commonly occurring diseases were skin and shell lesions, eyelid infection, emaciation, bowel obstruction, and anal infection (Leong 1979). Mortality due to SHD rapidly dropped from a peak of about 4 percent to about 0.2 to 0.3 percent per day when the turtles were transferred from the closed raceways to flow-through tanks. However, the other diseases appeared one after another.

Laboratory work indicated that the primary requirements for disease treatment and control were clean water and individual isolation of sick turtles. Both requirements were met by holding individual sick animals in plastic 10-liter buckets containing seawater, which was changed daily. When necessary, therapeutic drugs or antibiotics were administered topically, by intraesophageal intubation or by subcutaneous injection. The development of isolation techniques and chemotherapy led to the recovery of many sick turtles. A successful therapeutic treatment involved the use of static formalin bath in conjunction with injections of an antibiotic such as ampicillin or chloramphenicol.

During July and August 1978, the first shipment of 3,081 Kemp's ridley hatchlings was received at the Galveston Laboratory. The turtles were reared together in large, communal, fiberglass raceways. Water was changed completely three times weekly. The turtles were fed a commercial pelletized feed.

Every turtle contracted diseases or infections of one kind or another. Some illnesses were similar to those we had experienced with the loggerheads, but there were also many new diseases. In addition, the ridley hatchlings were extremely aggressive, and soon after being placed in the raceways most suffered injuries caused by either biting or scratching each other. Such aggressive behavior was not observed in the loggerheads.

Most of the diseases and injuries in the 1978 year-class of ridleys were successfully controlled through isolation and treatment techniques as previously established for loggerheads. However, the maladies recurred after the ridleys were returned to the communal raceways. Experiments showed that biting and wounding could be eliminated and turtle disease vastly reduced by isolating each hatchling in individual containers within the raceways. Therefore, in subsequent rearing practices, individual turtles were isolated in perforated buckets suspended in the raceways. Survival rate for the 1978 year-class was 68 percent.

Bowel compaction was common among the hatchlings of the 1977 and 1978 year-classes. In attempts to develop a diagnostic tool for this condition, a cooperative effort was launched (with Dr. G. L. McLellan) to explore the use of x-ray technology. Tests showed that the barium-fluoroscopic method, normally used on humans with gastrointestinal problems, produced good quality x-ray films of the gastrointestinal tracts of healthy hatchlings (McLellan and Leong 1981). This result indicated that x-radiography was potentially useful for diagnosing intestinal obstructions in sea turtle hatchlings.

Kidney infection was another malady requiring internal diagnosis. We tried, unsuccessfully, to develop radiological diagnostic techniques, using radio-opaque material. We learned from this trial, however, that subcutaneous injections of a radio-opaque material, sodium diatrizoate, administered to the neck region, were absorbed much faster than those administered to the suprafemoral pouch (referred to as "hind limb" in McLellan and Leong 1982), as was the general practice in parenteral administration of drugs for disease treatment in turtle hatchlings. This finding suggested that injection of drugs into the neck area for disease treatment was probably more effective than injection into the suprafemoral pouch (McLellan and Leong 1982).

In 1979 and 1980, prevention and treatment of diseases in ridleys contributed to survival rates of 83 and 95%, respectively. During this time, however, an outbreak of a bloating syndrome affected more than 300 ridley hatchlings, killing about 150 of them. Autopsies revealed that the animals had duodenal ulcerations. Follow-up clinical observations and feeding experiments showed that a modification of feeding regimens, either by reducing the amount and frequency of feeding from 4 times to 2 times per day or less, or by replacing the manufactured turtle feed with a ground fish diet, were successful in stopping the spread of the bloating, and led to the recovery of the sick turtles.

The 1,865 ridley hatchlings received in 1981 did not fare nearly as well as the 1980 year class. From the outset, the 1981 year-class was plagued with at least two kinds of fungal infections. The first type surfaced in August 1981 shortly after the hatchlings arrived at the Galveston Laboratory. Autopsies revealed a hardened yolk sac, heavily infested with fungal spores and mycelia. Three different fungi were isolated in laboratory cultures. One, *Paecilomyces* sp., was suspected to be a pathogen. More studies will be needed to confirm the pathogenicity of the isolated fungi. In slightly older hatchlings, a similar type of fungal infection, also apparently associated with *Paecilomyces*, was found in the liver, lung, muscle, and brain. To date, there has been no effective treatment for the *Paecilomyces* type infection, but circumstantial evidence suggested that sunlight could be helpful in curing head lesions infected by the fungus. Generally, infected hatchlings show few external signs or symptoms that can be used for early diagnosis, although in advanced stages of the disease, sick turtles are emaciated and stunted in growth.

Another type of mycotic infection in the 1981 year-class involved the fungus *Scolecobasidium constrictum.* The primary site of infection was in lung tissue, but the fungus was also observed to damage bone tissue. The disease usually did not become apparent until the affected turtles were 6 to 7 months old. So far, we have not found a cure. By providing the sick animals with a clean and warm environment during clinical isolation, however, we have been able to obtain spon-

taneous recovery in some cases. In June 1982, the survival rate of the 1981 year-class prior to release was 79%.

We have not determined whether the diseases occurring in captive sea turtles also occur in the wild, or if they are peculiar to the conditions of rearing sea turtles at the Galveston Laboratory. Nevertheless, it is clear that successful disease prevention and treatment have contributed greatly to the high survival rates experienced with these animals in captivity during their first year of life. Such success has led to the release of larger numbers of healthy, yearling Kemp's ridley sea turtles, which we hope will contribute significantly in the years ahead toward the conservation of the species. The Galveston Laboratory has continued with sea turtle pathology research to try to improve techniques and methods for diagnosis, prevention, and treatment for diseases and injuries in sea turtles.

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THE ESTABLISHMENT OF *Podarcis muralis* IN CINCINNATI, OHIO

Several species of European animals have been purposely and accidentally released in the United States. Among the earliest planned introductions were those that occurred during the years 1872-1874, when 4000 individuals of 20 European birds were imported to Ohio for release in Cincinnati (Langdon 1881). This attempt by the Acclimatization Society of Cincinnati to increase the number of Ohio songbirds ended in total failure. Not even the European starling, *Sturnus vulgaris*, survived, although the species later spread through most of the United States following its successful 1890 and 1891 introductions in New York City (Long 1981).

Exact dates of accidental introductions are more difficult to determine. For example, the European lizard colonies *(Podarcis sicula* and *Lacerta viridis)* in Topeka, Kansas, were probably established in the 1950s from specimens that escaped from an animal dealer (Collins 1982). Conant (1945) reported the occasional appearance of various European lizards on the piers and grounds of a cork import company in Gloucester, New Jersey. While none of the four observed species succeeded in establishing themselves in Gloucester, one of them, *Podarcis muralis*, did succeed when it was deliberately introduced in Cincinnati.

In September 1951, following a family visit to Europe, a Cincinnati resident brought two European wall lizards, *P. muralis*, to the United States. The animals had been caught in the Lake Como area of northern Italy, and were released in the backyard of the resident's Cincinnati home. The *P. muralis* population has since spread throughout much of southeastern Cincinnati. The purpose of this note is to outline the possible reasons for the success of this European wall lizard transplantation.

Hundreds of European plant and animal species have been established in North America, but relatively few have invaded native habitats. The vast majority occupy cultivated and urban areas, new habitats that humans introduced to North America (Elton 1958; MacArthur 1972). Indigenous American species did not have time to colonize these manmade habitats before the arrival of such immigrants as chicory, *Cichorium intybus*, dandelion, *Taraxacum officinale*, cabbage butterfly, *Artogeia rapae*, Norway rat, *Rattus norvegicus*, and starling, *S. vulgaris*. These species succeeded in their new American environments because they were already adapted to living alongside humans in towns and fields of Europe.

The wall lizard, *P. muralis*, is a good example of an animal that lives in association with human habitations in Europe. It seems likely that *P. muralis* evolved in dry, rocky regions and that it spread into many of the areas it now occupies subsequent to human agricultural and construction activities. In Europe, I have observed wall lizards on stone walls, sides of houses, piles of rocks, and railway embankments. According to Arnold and Burton (1978), *P. muralis* is the most urban Lacertid in Europe.

The two wall lizards transplanted to Cincinnati in 1951 (not 1948 as reported by Vigle 1977) were released on a stone wall. Their descendents have since spread to limestone rock outcrops and all of the same urban habitats as those listed above in Europe. The wall lizard's ability to adapt to the Cincinnati environment is largely due to pre-adaptation in its original range.

In addition to suitable habitat, lack of competition is another obvious criterion for the success of imported species. *P. muralis* has not had to compete with native lizards in its present 6 km² Cincinnati range. The eastern fence lizard, *Sceloporus undulatus*, five-lined skink, *Eumeces fasciatus*, and broad-headed skink, *E. laticeps*, occur in the Cincinnati region (Conant 1951), but none of these species inhabit the area that has been colonized by *P. muralis* since 1951.

Another European species, the starling, *S. vulgaris*, is also found throughout the area now occupied by *P. muralis*. Like the wall lizard, the immigrant starling is pre-adapted to an urban habitat and meets with little competition from native animals (Forbush 1920). But unlike the wall lizard introduction, the deliberate transplantation of foreign-born starlings to Cincinnati was unsuccessful, possibly due to climatic differences between the starlings' native localities and Cincinnati (Roots 1976).

Unlike the initially unsuccessful starlings, the wall lizards from Italy's Lake Como region were probably better pre-adapted to Cincinnati's climate. Similar temperature and precipitation patterns occur in Cincinnati and Milan, the meteorological station nearest Lake Como, 40 km distant (Fig. 1). The average monthly temperature is 13.3 ° C in Cincinnati and 12.8 ° C in Milan. The average-monthly precipitation is 82 mm in Cincinnati

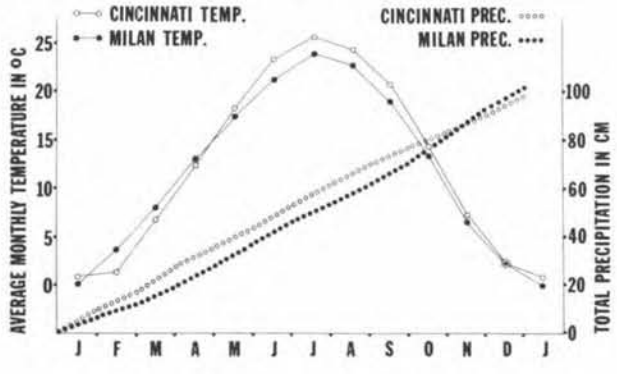


Figure 1. Temperature and moisture patterns of Cincinnati, Ohio and Milan, Italy (data from Miller 1961).

and 84 mm in Milan (Miller 1961). The similarities of climate and habitat between the European place of origin and the American site of introduction are probably the major factors that allow *P. muralis* to survive in Cincinnati.

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TECHNIQUES

A MODIFIED SEINING TECHNIQUE FOR SINGLE PERSON SAMPLING OF DEEP OR COLD WATER

Seining is the most successful and widely used method of sampling small bodies of water for aquatic vertebrates. Two drawbacks of seining are 1) two people are required to operate the seine, and 2) the operators must enter the water, making cold or deep water difficult to sample thoroughly. In order to conduct a study of *Ambystoma tigrinum*, a salamander found in ponds which are sometimes too deep or cold for ordinary seining methods, I developed the technique described below.

An ordinary seine is modified as shown in Figure 1A and 1C. Eye bolts are attached to each brail by drilling holes through the pole near the lead-line end, threading the bolts through, and attaching hexagonal nuts to secure the bolts. Flat washers should be used to protect the brail and lock washers will prevent accidental loosening with use. Figure 1B depicts an alternative method of brail modification. A weight (e.g. 2.8 kg of lead shot in a sturdy canvas bag) is attached to the bottom eyebolt of each brail. The weights serve to submerge the seine, therefore their heaviness will vary with the size of the brails and the buoyancy of the float line. A separate tow rope is connected to each brail by the eyebolts at a particular level. Attachment of weights and tow ropes can be done with sturdy metal clips to facilitate their repeated removal, since it is easier to carry the seine and equipment separately.

After the weights and tow ropes are attached, the seine can be used in two ways. If two people are available, each person can tow one rope with the seine extended between them. If the ropes are long enough a pond can be straddled and the samplers need not enter the water. I have successfully used this method (with two 30 m ropes) to seine Nebraska cattle ponds, since these bodies of water usually lack trees and other shoreline impediments.

When portions of the shoreline are obstructed or only one person is available, the following alternative method can be used: The seine is stretched along one shore parallel to the opposite side. Tow ropes are extended across the pond by carrying them around or by tying a strong lightweight cord to the rope, throwing the cord across the pond by means of an attached weight, and pulling the rope across with the cord. (The latter is helpful when tall vegetation is found near the shore). On the opposite shore each rope is inserted through one of two metal loops which have been screwed into the ground a seine-width apart. Dog-leash tie-outs, which can be purchased at most pet stores, work best. These loops serve to hold the ropes apart and close to the ground, keeping the seine extended and helping to prevent "hopping" (repeated lifting of the lead line off the bottom). The operator can then tow the seine across the pond by pulling the ropes

simultaneously, either hand over hand or by holding on and walking away. I am approximately 1.8 m tall and weigh 79.5 kg, and have been easily able to tow a 10 m by 2 m bag seine of 1 cm by 1 cm mesh. On occasions when the seine has become caught on underwater obstacles, releasing one rope and pulling on the other has never failed to free the net.

I have found that this method is most successful with bag seines. The brails tend to lean backward as they are being pulled and the bag captures organisms that would be washed over the float line of a normal seine. This problem can be alleviated by towing normal seines more slowly, by attaching the tow ropes at a higher level, or by firmly attaching styrofoam floats to the tops of the brails.

The above seining modifications are especially useful for sampling small ponds which are normally too deep and/or cold to enter. For example, in order to capture reproductive *Ambystoma tigrinum* (which are explosive breeders in late winter) it has previously been necessary to surround entire ponds with drift fence, which requires time-consuming maintenance and frequent nighttime surveillance. Seining allows the frequent sampling of numerous winter ponds without debilitating immersion. In addition, I have been able to collect fish, neotenic salamander larvae, and overwintering frogs from ponds deeper than 7 m. I doubt that this technique will be useful on any but the most sluggish of lotic waters, and I have only attempted to use it on ponds, stream backwaters, and dammed creeks. However, biologists working in the latter environments may be able to use this modified seining method to increase their sampling productivity.

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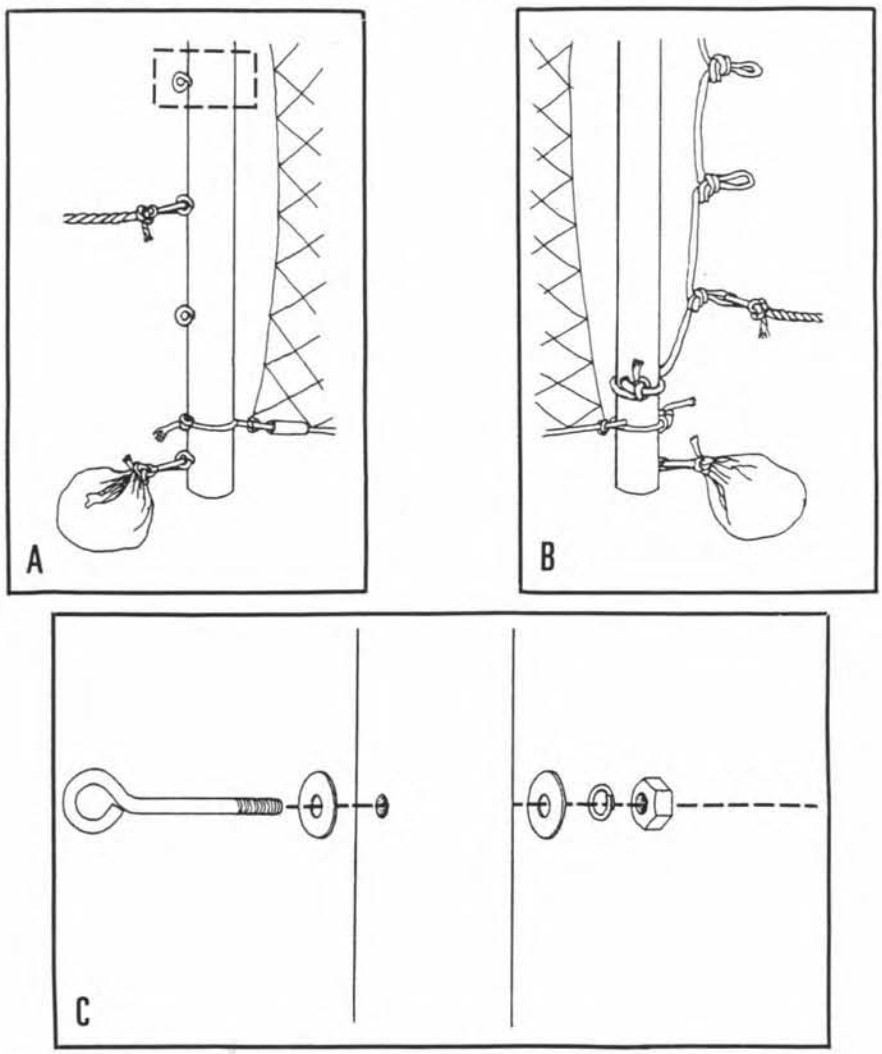


Figure 1. Diagrammatic representation of brail modifications for seine towing. A) Brail with eye bolts. B) Brail with knotted rope replacing eye bolts. C) Exploded view of eye bolt attachment. See text for details.

A TAGGING METHOD FOR USE IN HATCHLING TURTLES

It is important in laboratory studies of behavior and growth of hatchling turtles to be able to identify individuals (reviewed by Plummer 1979). Toe clipping and scute notching (Cagle 1939), marking with waterproof pens (Sarnat and McNabb 1981), lacquered ink (Miller 1955), and insertion of plastic buttons (Pough 1970) have all been used with success. However, in turtles with dark shells, the marking pen and similar techniques are not effective. The scute notching and toe-clip techniques require handling the animals to obtain a positive identification, and if not applied properly, the shell notching may either heal over completely or seriously deform the animal as it grows (Cagle 1939). The use of "Buttoneer" tags (Pough 1970) may not be possible in hatchling turtles until the posterior marginal portions of the carapace are ossified and the animal can withstand a hole being drilled into its carapace. Here we describe a simple method of marking hatchling turtles using plastic beads tied through pierced posterior carapacial scutes, which allows individual identification without handling. This technique is similar in some ways to those devised for marking individual amphibians (Nace and Manders 1982) and reptiles (Pough 1970).

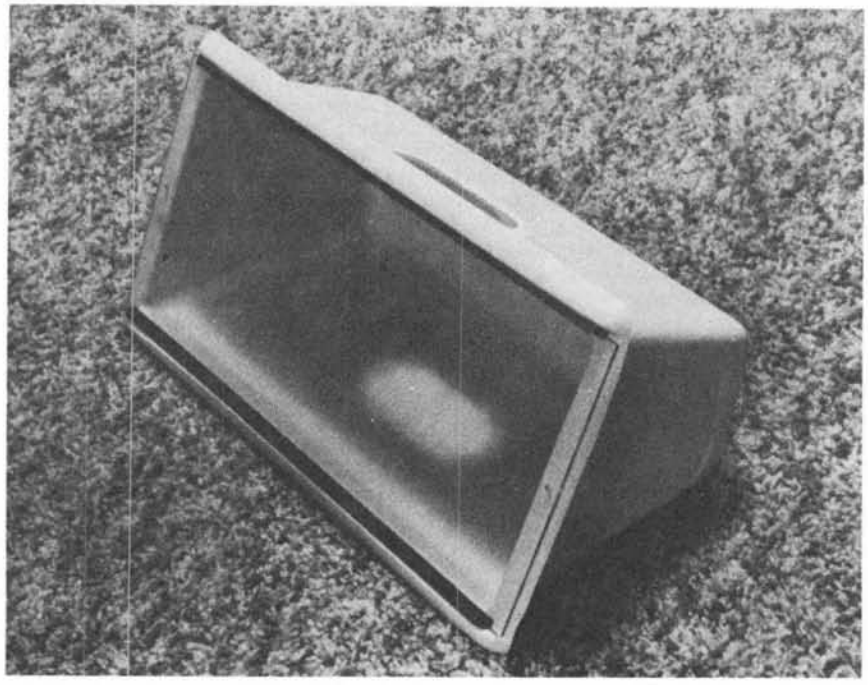
METHODS

Each tag consisted of a pair of colored plastic beads tied together through a pierced posterior marginal carapacial scute. Color combinations were selected for individual identification. The tags were prepared beforehand by tying one of the plastic beads (approximately 2.5 mm in diameter, 1.5 mm in thickness) securely with a reef knot onto the middle of a piece of monofilament nylon or polyester thread at least 15 cm in length. In the present study, two regimes of tagging were implemented. Seventy-five hatchling snapping turtles *(Chelydra serpentina)* were tagged in the initial study by tying the monofilament threads with a reef knot. A subset of 61 turtles was blotted dry on paper towelling and weighed, tagged, and immediately reweighed. In a second experiment, 26 turtles were tagged. Sixteen tags were tied and then the knot was melted with a fine soldering pencil; the remaining 10 turtles' tags were tied, but the knot was not melted.

The turtles were placed into cold torpor prior to tagging. The dorsal and ventral posterior margins of the carapace were swabbed with alcohol. A posterior marginal scute was selected and pierced from below with a short, fine-gauge hypodermic needle. The free ends of the tag threads were passed through the needle, from the point side, while it was still protruding through the shell. The needle was then withdrawn, leaving the threads through the carapace, hanging free on the underside. The threads were gently pulled to bring the upper bead against the carapace, and the lower bead was then threaded and tied. The trailing ends of the threads were trimmed to within 4 mm of the knot. If trimmed more closely, the tag tended to become untied after awhile.

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RESULTS AND DISCUSSION

Most turtles tagged in this fashion ignored the tag completely, but some pushed against the lower bead with the nearest hind foot, and some snapped at tags on others, especially brighter tags in warm colors. It did not appear that the tagging techniques caused any mortality among the hatchlings, although this was not controlled for. The turtles weighed significantly less after tagging (prior to tagging, $\bar{X} = 7.09 \pm 1.84$ g; after tagging, $\bar{X} = 6.85 \pm 1.67$ g; paired $t = 13.28$, $P < 0.0005$, $n = 61$). The tags themselves weighed very little ($\bar{X} = 0.02785 \pm 0.00701$ g; $n = 20$), and the difference in hatchling weights before and after tagging was attributed to water lost during handling. The turtles in the first study (monofilament thread not fused) were maintained at 26° C for 69 days. During this time, 14 hatchlings died, and 17 lost tags at least once. Tags were lost in two ways: either the knots untied or the tag broke through the remaining portion of the scute. On average, 2.5% of surviving turtles lost tags each week. Five hatchlings were observed beyond 10 weeks and none of these lost the bead tags over the next 10 months.

Animals in the second study were maintained at room temperature for 7 weeks. During this period, two of the 26 turtles died, one of the 10 tied-only animals lost its tag (10%), and two of the 16 fused-knot tags were lost (12.5%). Occasionally the threads would be cut by the soldering pencil while tagging, and the whole process had to be repeated (five of 16 tags). Therefore, although the two techniques had very similar loss rates during this brief study, the problems with tagging caused by trying to melt the threads without burning the animal or cutting the threads would suggest that tying alone is sufficient.

This technique facilitates positive identification of individual turtles without handling, as long as both beads can be seen. The relatively high tag-loss rate (2.5% per week), as compared to similar techniques (Nace and Manders 1982) may be attributed to the incompletely ossified posterior carapace in hatchling turtles. The use of a wire implant through a bone such as a humerus or femur (Nace and Manders 1982), although perhaps less likely to be lost than a threaded tag, may cause serious injury to an animal less capable of regeneration than an amphibian. It is not known if the present technique could be used in a field-marking situation, but it is possible that if the beads were tied on with enough slack, growth to adult size could be accommodated.

ACKNOWLEDGMENTS

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PAINT-MARKING THE RATTLE OF RATTLESNAKES

The explicit statement of Tinkle (1979) emphasizes a need for long-term field studies based on marked individuals in populations. Despite an obvious need for a uniform marking technique for each major species group of amphibians and reptiles, methods have become so numerous as to allow recent reviews of them (Spellerberg and Prestt 1978; Swingland 1978; Ferner 1979). No single marking system yet seems to be accepted as ideal for all members of a given group.

In rattlesnakes (genera *Crotalus* and *Sistrurus*), several workers describe temporary marking techniques of the rattle itself (copper wire, Fitch and Glading 1949; colored discs, Pendlebury 1972) or tail near the rattle (colored beads, Hudnall 1982). The rattle is a logical place to mark the animal because of its conspicuousness and relative permanence from year to year. We here describe a practical and simple technique for marking the rattle of rattlesnakes: paint it. Our method has the major advantage of being quick and easy to us in the field or lab.

Our painting technique is done by applying permanent water-proof paint to the basal segments of the rattle and distal portion of the tail. We have paint-marked *Crotalus viridis* since 1976 (Gannon, Secoy) and *C. horridus* since 1978 (Brown). Paint may be applied by spraying (Gannon and Secoy 1984) or by dabbing (Preston 1964; Brown, unpublished). In dabbing paint on the rattle, we recommend using "Liquitex®," an acrylic artists' paint (Binney & Smith, Inc., Easton, Pennsylvania 18042) available in a variety of bright colors. The paint is mixed with water to get the desired consistency and is dabbed on the rattle using a small wooden applicator. After drying, this paint is permanent, flexible, waterproof, and long-lasting. Paint-marks have remained visible on rattles of recaptured *C. horridus* for up to four years.

Paint-marking is especially valuable when used with a permanent mark for individual identification (e.g., ventral scale clipping, Brown and Parker 1976). Major advantages of paint-marking are the following (cf. Fitch 1949, and Pendlebury 1972, who noted the first advantage, and Preston 1964 and Gannon and Secoy 1984, who noted the first two):

1. Shedding frequencies may be directly and accurately measured; the number of unpainted basal segments added to the rattle indicates the number of sheds in the interval between captures. The shedding rate is a powerful datum in estimating the age of rattlesnakes when used with growth increments of recaptured individuals. (Incidentally, shed skins of freshly painted snakes occasionally may be found in the field and these can be identified both by the intact paint and scale-clip scars.)

2. Each separate study population may be identified by a different color. If recaptures occur away from release locations (after individuals have moved or dispersed), spatial overlap of snakes from different locations may be recorded. Also, by color-coding each locality, accidentally releasing marked snakes at the wrong place is avoided.

3. Sometimes only glimpsing an escaping rattlesnake is possible; when visual sightings occur, a painted rattle usually may be seen and its color noted, thus reducing the need to exert an all-out capture effort when the snake has gotten away. At least it will be known to be marked.

4. When a number of snakes are measured, weighed, and marked at one time, freshly paint-marked individuals are easily distinguished from unpainted individuals when both are temporarily put together in a single holding container. This makes sorting and handling more efficient and less traumatic to the snakes.

5. Paint on a rattle will be noticeable to a layperson who might happen to see a marked animal, find a dead specimen, or kill a marked snake. A specimen may thus be saved and turned in to wildlife personnel, providing a record of a marked animal whose loss from the study population otherwise may never be known to the investigator. Also, in cases where rattlesnakes are the deliberate targets of a human predator seeking an epidermal souvenir, the indissoluble colored paint may make the rattle a sullied and therefore less desirable "trophy."

The very simplicity of the rattle-painting technique perhaps has been one reason why heretofore, to our knowledge, it has not been formally described. Paint-marking should be applicable to any field study of a rattlesnake where shedding rates and age estimation form the foundations of long-term natural history and demographic research.

ACKNOWLEDGMENTS

Funding to Brown was provided by a federal endangered species Grant in Aid Agreement (NY-E-1) with the New York State Department of Environmental Conservation for status surveys, culminating in full statewide legal protection of *C. horridus;* support from the National Geographic Society (Grants 2590-83, 2823-84) assists current ecological work on this species. Field and laboratory assistance have been provided by Randy Stechert and Tommy Davis.

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GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

ANURA

CENTROLENELLA FLEISCHMANNI (Glass Frog). BELIZE: CAYO DISTRICT: 7.1 km SSE Belmopan. 4 July 1980. R. E. Olson. REO 5540-5542. Verified by R. E. Olson. To be deposited in St. John's College, Belize City. The frogs were collected as they called from palm fronds above the banks of a rushing stream. Second record for Belize; extends range about 30 km NE San Luis, Cayo District (Henderson and Hoevers. 1975. Milwaukee Publ. Mus. Contr. Biol. Geol. 5:13).

Submitted by **R. EARL OLSON,** Department of Biology, Cornell College, Mt. Vernon, Iowa 52314, U.S.A. (present address: 133 S. Cleveland, Cambridge, Minnesota 55008, U.S.A. ●

HYLA CHRYSOSCELIS (Cope's Gray Treefrog). USA: MINNESOTA: Hubbard Co: 12.8 km S Lakely. 20 June 1981. R. E. Olson Collection (REO 5688). Isanti Co: Springvale. 20 June 1970. REO 2977-2978; 30 June 1972. REO 3369-3370. 1.8 km W Cambridge. 25 May 1980. REO 5408-5411. 13.3 km NW Cambridge. 21 June 1983. REO 6205-6206. Kandiyohi Co: 1.2 km E Sunburg. 3 June 1980. REO 5428-5430. 3.8 km E Sunburg. 3 June 1980. REO 5431-5432. 14.8 km W New London. 3 June 1980. REO 5433-5434. 18.7 km E Sunburg. 21 May 1981. REO 5610-5612. Mille Lacs Co: 5.8 km E Princeton. 25 May 1980. REO 5416. Morrison Co: 8.4 km W Pierz. 14 June 1981. REO 5676-5684. Sherburne Co: 6.7 km S Princeton. 25 May 1980. REO 5419. Stearns Co: 3.4 km W Paynesville. 14 June 1981. REO 5430. Swift Co; 27.8 km E Benson. 3 June 1980. REO 5427. Todd Co: 12.5 km E Osakis; 8.5 km E Long Prairie (voice records). R. E. Olson. Verified by R. E. Olson using voice records or karyotypes. There are no published records of this species in Minnesota. *Hyla chrysoscelis* occurs in the western, grassland counties, with no occurrence of *Hyla versicolor (sensu stricto)* documented west of central Stearns Co. Thus, strict allopatry of these species is demonstrated in the ecologically different areas approaching the grasslands: both species occur in forests, but only *Hyla chrysoscelis* in grasslands.

Submitted by **R. EARL OLSON,** 133 So. Cleveland, Cambridge, Minnesota 55008, U.S.A. ●

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HYPEROLIUS ARGUS. AFRICA: TANZANIA: Tanga Region. Korogwe District. West Usambara Mts, Ambangulu tea estate, 5°05'S, 38°26'E, 12 km north of Korogwe, 1200 m asl. 23 February 1981. K. M. Howell and S. N. Stuart. Verified by Miss A. G. C. Grandison. British Museum (Natural History) (BM. 1982.565). Adult female collected from herbaceous vegetation 0.3 m above ground level, at edge of road near stream in intermediate altitude rain forest, canopy of which dominated by *Newtonia buchanaii.*

Schiotz (1975. The Treefrogs of Eastern Africa. Steenstrupia, Copenhagen) records this species from "coastal Kenya to Mozambique, in the lowlying eastern parts of the savanna." In Tanzania, it is known from Muheza, Ngomeni, and Amani (in and near the East Usambara Mts), Kilosa, and Morogoro, Dar es Salaam, the Mtwara area, Mafia and Zanzibar islands. This is the first record from the West Usambara Mts, 23 km W Amani and 220 km NE Morogoro.

Submitted by **K. M. HOWELL,** Department of Zoology and Marine Biology, Box 35064, University of Dar es Salaam, Dar es Salaam, Tanzania and **S. N. STUART,** Department of Applied Biology, University of Cambridge, Pembroke St., Cambridge, United Kingdom. ●

LEPTOPELIS VERMICULATUS. AFRICA: TANZANIA: Tanga Region. Lushoto District. West Usambara Mts, University of Dar es Salaam's Mazumbai Natural Forest Reserve, 4°48'S, 38°29'E, 8 mi NE Bumbuli, 1500 m asl. November 1980. S. N. Stuart. Verified by A. G. C. Grandison. British Museum (Natural History) (BM. 1982.582). Korogwe District. West Usambara Mts, Ambangulu Tea Estate, 5°05'S, 38°26'E, 12 km NW Korogwe, 1200 m asl. 20, 23 February 1981. K. M. Howell and S. N. Stuart. Verified by R. Crombie, U.S. National Museum of Natural History (USNM 226810), and A. G. C. Grandison, (BM. 1982.583, BM.1982.584-586). Previously known only from Amani in the East Usambara Mts (23 km due E Ambangulu and 34 km SE Mazumbai) and from Rungwe, ca. 750 km to the southwest (Schiotz. 1975. The Treefrogs of Eastern Africa. Steenstrupia, Copenhagen).

Submitted by **K. M. HOWELL,** Department of Zoology and Marine Biology, Box 35064, University of Dar es Salaam, Dar es Salaam, Tanzania and **S. N. STUART,** Department of Applied Biology, University of Cambridge, Pembroke St., Cambridge, United Kingdom. ●

CAUDATA

AMPHIUMA PHOLETER (One-toed Amphiuma). USA: ALABAMA: Baldwin Co: Fairhope, shore of Mobile Bay 0.4 km S of Fly Creek. 20 March 1984. S. D. Carey and D. M. Steedley. Verified by R. H. Mount. Auburn University Museum (AUM 32391). A cypress swamp, draining into Mobile Bay, is adjacent to the capture site and represents the only available habitat for *A. pholeter* in the immediate vicinity. Extends known range approximately 130 km to the west and is the first record for Alabama. (Mount. 1975. The Reptiles and Amphibians of Alabama. Alabama Agric. Exper. Sta., Auburn, AL; Means. 1977. Florida Mar. Res. Publ. No. 26:37-57).

Submitted by **STEVEN D. CAREY,** Division of Natural Sciences, Mobile College, P.O. Box 13220, Mobile, Alabama 36613, U.S.A. ●

TESTUDINES

ERETMOCHELYS IMBRICATA (Hawksbill). ST. HELENA ISLAND: (Southeast Atlantic Ocean), near Rupert's Bay, NW coast of island. 14 July 1983. Photographed at a depth of 10 m by A. Edwards. Museum of Comparative Zoology (Photo No. 797). The only other record for St. Helena is reported in a letter from A. Loveridge to L. Brongersma (Brongersma. 1982. Marine Turtles of the Eastern Atlantic Coast. In: K. Bjorndal (ed.) *Biology and Conservation of Sea Turtles.* Smithsonian Institution Press, Washington, D.C. pp. 407-416).

Submitted by **J. FRAZIER,** Department of Zoological Research, National Zoological Park, Smithsonian Institution, Washington, D.C. 20008, U.S.A. and **A. EDWARDS,** Department of Zoology, University of Newcastle upon Tyne NE1 7RU, England. ●

GRAPTEMYS VERSA (Texas Map Turtle). USA: TEXAS: McCulloch Co: 10 km SSE Brady on San Saba River at US Hwy 87. 15 March 1984. J. Bertl, T. James and F. C. Killebrew. Verified by F. C. Killebrew. West Texas State University Museum of Natural History (WTSU 9776). Previously recorded only in the Colorado River (Vogt. 1981. Cat. Amer. Amphib. Rept. 280.1-280.2). Extends range into a new drainage.

Submitted by **F. C. KILLEBREW, TERRY L. JAMES** and **JEFF BERTL,** Department of Biology, West Texas State University, Canyon, Texas 79016, U.S.A. ●

PELUSIOS NIGER (Black African Sideneck). AFRICA: LIBERIA: SINO: Sapo National Park, 22.5 km E Juazohn Village. 11 February 1983. E. Glumac, K. Kranz and J. Toah. Verified by R. Bour. Four color slides are deposited in the photographic file of the Division of Amphibians and Reptiles, USNM. The specimen was walking in several cm of water in a narrow creek draining into the Sino River. Sapo National Park is primarily composed of mature secondary evergreen forest (Voorhoeve, 1965 *Liberian High Forest Trees,* Wageningen.) Bour (1983, *Bull. Mus. Natn. Hist. Nat.* ser 4, 5A (1):343-382) could find one record from Liberia. Field work was funded by the Florida State Museum through a grant from the Griffis Foundation.

Submitted by **J. FRAZIER, K. KRANZ,** Department of Zoological Research, National Zoological Park, Smithsonian Institution, Washington, D.C. 20008, U.S.A.; **E. GLUMAC,** College of Agriculture, Texas A & I University, Campus Box 218, Kingsville, Texas 78363, U.S.A.; **J. TOAH,** Wildlife & National Parks, Forestry Development Authority, P.O. Box 3010, Monrovia, Liberia. ●

STERNOTHERUS ODORATUS (Stinkpot). USA: INDIANA: Wayne Co: 5.6 airline km SW Richmond. 13 June 1984. A. Whitman Miller and David P. Young, Jr. Verified by John B. Iverson. Joseph Moore Museum (HR-622). New county record fills hiatus between Henry County, IN (Minton, List and Lodato. 1983. Proc. Indiana Acad. Sci. pp. 489-498) and Darke County, OH (Conant. 1951. The Reptiles of Ohio, 2nd ed. Notre Dame, Ind.: American Midl. Natur.).

Submitted by **A. WHITMAN MILLER** and **DAVID P. YOUNG, JR.,** Biology Department and Joseph Moore Museum, Earlham College, Richmond, Indiana 47374, U.S.A. ●

SAURIA

ANOLIS SAGREI (Brown Anole). CAYMAN ISLANDS: GRAND CAYMAN: between Georgetown and South Sound. 20-26 February 1984. Twenty-two adults definitely identified by dewlap color. Voucher specimen in Minton Collection (No. 1899) from 1 km south of Georgetown. Collected 21 February 1984 by Madge and Sherman Minton. First record from Grand Cayman. Previously known from Little Cayman and Cayman Brac (Grant, C. 1940, Bull. Inst. Jamaica Sci. Ser. No. 2; Schwartz, A. and Thomas, R. 1975, A Checklist of West Indian Amphibians and Reptiles, Carnegie Mus. Nat. Hist. Spl. Pub. No. 1). In the immediate environs of Georgetown it appears to outnumber the endemic *Anolis conspersus;* between Georgetown and South Sound, *conspersus* outnumbers it in about a 2 to 1 ratio (based on sight records).

Submitted by **SHERMAN A. MINTON** and **MADGE R. MINTON.** Indiana University School of Medicine, Indianapolis, Indiana 46223, U.S.A. ●

ANOLIS SAGREI SAGREI (Brown Anole). USA: FLORIDA: Monroe Co: Dry Tortugas, Garden Key. Collected and verified by C. E. Winegarner, W. B. Robertson and W. Hoffman. 8-10 April 1983. Archbold Biological Station (ABS 921). 3 males, 1 female. First specimens from the Dry Tortugas. Nearest localities are Key West, 105 km east and northwestern Cuba, 170 km south. Specimens taken on a large pile of bricks and rubble just east of the moat surrounding Ft. Jefferson. Population currently seems limited to this small portion of the island so introduction may have been very recent. A construction barge moored adjacent to the collection site from October 1981 to June 1982, possibly was a source of colonizing individuals, however, the regular arrival of Park Service boats and private vessels are other possibilities.

Submitted by **CHESTER E. WINEGARNER,** Archbold Biological Station, Route 2, Box

180, Lake Placid, Florida 33582, **WILLIAM B. ROBERTSON, JR.,** South Florida Research Center, Everglades National Park, Homestead, Florida 33030, and **WAYNE HOFFMAN,** Biology Department, University of South Florida, Tampa, Florida 33620, U.S.A. ●

LYGOSOMA CF TANAE. AFRICA: TANZANIA: Kilimanjaro Region. Same District. South Pare, Ndungu Village, 4°20'S, 38°08'E, app. 500 m asl. January 1980. Collected by Ida Msechu. Verified by A. F. Stimson. British Museum (Natural History), (BM.1980.293). Found under leaf litter in banana plantation. Loveridge (1935. Bull. Mus. Comp. Zool. 59(1):11-12) collected the type and other specimens near the mouth of the Tana river in Kenya, and later (1957. Bull. Mus. Comp. Zool. 117 (2):214) gave the range for the species as "coastal Kenya" without listing further localities. This specimen, collected app. 345 km SW of the mouth of the Tana river, is the first record of the species in Tanzania.

Submitted by **K. M. HOWELL,** Box 35064, Department of Zoology and Marine Biology, University of Dar es Salaam, Dar es Salaam, Tanzania and **MS I. MSECHU,** Box 1622, Karatu Secondary School. Karatu, Tanzania. ●

TARENTOLA MAURITANICA (Moorish Gecko). GREECE: PELOPONNESE: Prefecture of Achaia: E border Patra city. 8 June 1971. Collected by D. Matopoulos and M. Kaparianos. Identified by B. P. Chondropoulos. Zoological Museum of Patra University (A-E 2402). The geographic distribution of *Tarentola mauritanica* in Greece is the Ionian islands Ithaki, Kefallonia and Zakynthos, as well as Crete (Ondrias. 1968. Liste des Amphibiens et des Reptiles de la Grèce. Biol. Gallo-Hellen., 1:111). This is the first record for the Peloponnese, indicating a larger range in Greece.

Submitted by **B. P. CHONDROPOULOS,** Section of Animal Biology, Department of Biology, Patra University, Patra, Greece. ●

SERPENTES

DRYMOBIUS RHOMBIFER. BOLIVIA: DEPT. DE LA PAZ: 20 km by river below Puerto Linares. 6 June 1981. Juvenile male (275 mm s-v) collected by T. S. Schulenberg. Louisiana State University Museum of Zoology (LSUMZ 43279). 29 June 1981. Adult male (841 mm s-v) collected by A. P. Capparella. LSUMZ 43278. Verified by D. A. Rossman. First specimens reported from Bolivia (Peters and Orejas-Miranda. 1970. Bull. U.S. Natl. Mus. 297, p. 99).

Submitted by **RANDY H. VAETH** and **DOUGLAS A. ROSSMAN,** Section of Herpetology, Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana 70893, U.S.A. ●

LAMPROPELTIS CALLIGASTER CALLIGASTER (Prairie Kingsnake). USA: MISSOURI: Mississippi Co: 8 km S Charleston on Mo Rt 102. 28 April 1984. Michael A. Morris and Mary Beth Morris. Verified by M. A. Morris. Southern Illinois University at Carbondale (SIUC R-1797). Road-killed adult. Surrounding habitat grassy fields. First record for county and Missouri lowlands (Anderson. 1965. The reptiles of Missouri. Univ. Missouri Press, Columbia). Known from Jackson Purchase of Kentucky (Barbour. 1971. Amphibians and reptiles of Kentucky. Univ. Press of Kentucky, Lexington), but absent from Mississippi border of Illinois adjacent to Missouri lowlands (Smith. 1961. The amphibians and reptiles of Illinois. Illinois Nat. Hist. Surv. Bull. 28:1-298). Helps fill gap in north-central part of range (Blaney, 1979, *Lampropeltis calligaster*. Cat. Amer. Amphib. Rept.:229.1-229.2).

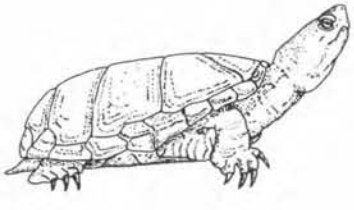
Submitted by **MICHAEL A. MORRIS,** Department of Zoology, Southern Illinois University at Carbondale, Carbondale, Illinois 62901 and **MARY BETH MORRIS,** 322 N. 9th Street, Murphysboro, Illinois 62966, U.S.A. ●

PITUOPHIS MELANOLEUCUS SAYI (Bullsnake). USA: TEXAS: Medina Co: 0.1 km W Castroville on US 90. 27 May 1984. C. T. McAllister and E. A. McAllister. Verified by R. Ward. North Texas State University Herpetological Collection (NTSUHC #R 655, head only). This represents a new county record filling a distributional hiatus between Bexar and Uvalde counties of southcentral Texas (Raun and Gehlbach. 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. 2).

Submitted by **CHRIS T. McALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, U.S.A. ●

SONORA SEMIANNULATA (Ground Snake). USA: TEXAS: Kimble Co: 6.4 km N Jct. off US Hwy 83. 13 April 1984. C. T. McAllister and J. R. Glidewell. Verified by R. Ward. North Texas State University Herpetological Collection (NTSUHC R667-669). New county record and partially fills the distributional gap between Trans-Pecos and Edwards Plateau populations (Raun and Gehlbach. 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. No. 2. These specimens were collected under limestone shelf rock in cedar glade habitat.

Submitted by **CHRIS T. McALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216, U.S.A. ●



NEW DISTRIBUTIONAL RECORDS FOR SOME SEMIAQUATIC AMPHIBIANS AND REPTILES FROM THE RÍO SABINAS BASIN, COAHUILA, MEXICO

Milstead (1960) recognized 14 relict species inhabiting the Chihuahuan Desert, and identified the Rio Sabinas as an area with mesic-adapted relict species. Conant (1978) recognized 19 relict or riparian species from the Chihuahuan Desert, but omitted reference to several other semiaquatic forms that are apparently not restricted to riparian situations.

In May, 1983, we traversed the upper Río Sabinas drainage system, which until recently lacked adequate roads. Our collections include range extensions of relict and riparian species into the desert. These are marked below with an asterisk, and supplement localities recorded by Milstead (1960) and Conant (1978). Records of species he listed were verified by Conant (pers. comm.). Other data reflect new localities of semiaquatic species not restrictred to riparian habitats. Specimens are deposited in the Bobby Witcher Memorial Collection (BWMC) at Avila College, Kansas City, MO 64145.

SALIENTIA

BUFO PUNCTATUS (Red-spotted Toad): COAHUILA: 29 km N Musquiz (2 km N Puente El Corrizo) on Hwy 93. N. L. Laposha and J. S. Parmerlee. 28 May 1983. BWMC 2135.

BUFO SPECIOSUS (Texas Toad): COAHUILA: 43 km N Musquiz (16 km N Puente El Corrizo) on Hwy 93. D. D. Smith and R. Powell. 28 May 1983. BWMC 2136. 14 km N Musquiz (1 km S Puente Río Sabinas) on Hwy 93. N. A. Laposha and J. S. Parmerlee. 28 May 1983. Not catalogued, sent to the Direccion General de Flora y Fauna Silvestres, Mexico, D. F.

*BUFO VALLICEPS** (Gulf Coast Toad): COAHUILA: 37 km N Musquiz (10 km N Puente El Corrizo) on Hwy 93. R. Powell and D. D. Smith. 28 May 1983. BWMC 2134. 16 km N Musquiz (1 km N Puente Río Sabinas) on Hwy 93. N. A. Laposha and J. S. Parmerlee. 28 May 1983. Not catalogued, sent to the Direccion General de Flora y Fauna Silvestres, Mexico, D. F. Río Sabinas at San Juan de Sabinas. D. D. Smith. 27 May 1983. BWMC 2133.

RANA BERLANDIERI (Rio Grande Leopard Frog): COAHUILA: 10 km N Musquiz, Hwy 93. D. D. Smith and R. Powell. 28 May 1983. BWMC 2129. 7 km N Musquiz, Hwy 93. R. Powell and D. D. Smith. 28 May 1983. Uncatalogued specimen sent to the Direccion General de Flora y Fauna Silvestres, Mexico, D. F. Tadpoles, 27 km N Musquiz at Puente El Corrizo, Hwy 93, in pool of intermittent tributary stream. J. S. Parmerlee and R. Powell. 27 May 1983. BWMC 2148.

SCAPHIOPUS COUCHII (Couch's Spadefoot): COAHUILA: 34 km N Musquiz (6 km N Puente El Corrizo) on Hwy 93. N. A. Laposha and J. S. Parmerlee. 28 May 1983. BWMC 2131. 32 km N Musquiz (5 km N Puente El Corrizo) on Hwy 93. R. Powell and D. D. Smith. 28 May 1983. BWMC 2130.

TESTUDINES

KINOSTERNON FLAVESCENS (Yellow Mud Turtle): COAHUILA: 27 km N Musquiz at Puente El Corrizo, Hwy 93, in pool of intermittent tributary stream. J. S. Parmerlee, R. Powell, N. A. Laposha, and D. D. Smith. 28 May 1983. BWMC 2149, uncatalogued specimen sent to the Direccion General de Flora y Fauna Silvestre, Mexico, D. F.

*PSEUDEMYS CONCINNA** (River Cooter): COAHUILA: 27 km N Musquiz at Puente El Corrizo, Hwy 93, in pool of intermittent tributary stream. D. D. Smith, N. A. Laposha, R. Powell, and J. S. Parmerlee. 28 May 1983. BWMC 2087.

*TRIONYX SPINIFERUS** (Spiny Softshell): COAHUILA: 27 km N Musquiz at Puente El Corrizo, Hwy 93, in pool of intermittent tributary stream. N. A. Laposha, D. D. Smith, J. S. Parmerlee, and R. Powell. 28 May 1983. BWMC 2086, uncatalogued specimen sent to the Direccion General de Flora y Fauna Silvestres, Mexico, D. F.

SERPENTES

*NERODIA ERYTHROGASTER** (Plainbelly Water Snake): COAHUILA: Río Sabinas at San Juan de Sabinas. N. A. Laposha and J. S. Parmerlee. 27 May 1983. BWMC 2144.

*NERODIA RHOMBIFERA** (Diamondback Water Snake): COAHUILA: 27 km N Musquiz at Puente El Corrizo, Hwy 93. R. Powell. 27 May 1983. BWMC 2143.

THAMNOPHIS MARCIANUS (Checkered Garter Snake): COAHUILA: 12 km N Musquiz on Hwy 93. J. S. Parmerlee and N. A. Laposha. 28 May 1983. BWMC 2138. 10 km N Musquiz on Hwy 93. N. A. Laposha and J. S. Parmerlee. Uncatalogued specimen sent to the Direccion de Flora y Fauna Silvestres, Mexico, D. F.

*THAMNOPHIS PROXIMUS** (Western Ribbon Snake): COAHUILA: 15 km N Musquiz at Puente Río Sabinas, Hwy 93. R. Powell. 27 May 1983. BWMC 2146. 27 km N Musquiz at Puente El Corizo, Hwy 93. R. Powell. 28 May 1983. BWMC 2147, uncatalogued specimen sent to the Direccion General de Flora y Fauna Silvestres, Mexico, D. F.

ACKNOWLEDGMENTS

We wish to thank Dr. Roger Conant for taking the time to verify records. We also express appreciation to the Direccion General de Flora y Fauna Silvestres, Mexico, D. F., who granted us permission to collect in Mexico. The permit was issued to R. Powell.

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BOOK REVIEWS

Amphibians and Reptiles of New England: Habitats and Natural History, by Richard M. DeGraff and Deborah D. Rudis. Illustrated by Abigail Rorer. University of Massachusetts Press, Amherst. 1983, 112 pp., 6 black-and-white photos, 56 drawings, 57 maps. $14.00 cloth, $6.95 paper.

In the first comprehensive survey of the New England herpetofauna in a very long time, the authors have undertaken the considerable task of synthesizing nearly 70 years of literature and documenting the distribution of 56 taxa. The book is intended for use by the scientific community, although it also will be interesting to amateurs.

The text is introduced by sections on the history of herpetological investigations, habitats present, and population status of rare species. The species accounts that follow discuss abundance, habitat use, breeding biology, home range, and food. Accompanying maps illustrate general distributions and denote county records with dots. There is a wildlife management emphasis to much of the book, which reflects the conservation background of the authors. I find this orientation timely, particularly in light of the recent emphasis by many state agencies on nongame wildlife programs.

Despite this useful perspective, the book is weak in aspects of its systematic and ecological coverage. I feel that one of the principal functions of a regional work is to document morphological characteristics of local populations. Yet, no original measurements were made, and there is little discussion of regional color patterns. The weak patterning of northeastern *Scaphiopus holbrookii* compared to southern individuals should have been documented, for example. Moreover, descriptions of habitats sometimes emphasize vegetation features that are of questionable importance to reptiles and amphibians. The heavy reliance on personal communications tends to promote this incomplete view of habitat use, and it results in habitat specificity being implied when it is not really present. For example, it is unlikely that old fields are a "special" habitat requirement of *Terrapene carolina,* or that *Crotalus horridus* is restricted to forests with high rodent density. Rodent density undergoes dramatic temporal fluctuation, and in any event current *Crotalus* distribution is more closely tied to recent historical factors (e.g. eradication campaigns). Statements about the important role of herptiles in insect and rodent control (p. 10) also seem a bit sweeping, particularly considering recent studies that suggest resource superabundance in the northeast.

Concerning evolutionary topics, the discussion of speciation in Ambystomid salamanders is unfortunately worded to sound as if reproductive isolation was caused *by* glaciation rather than having developed *during* glaciation. Furthermore, hybridization between *Bufo americanus* and *B. woodhousii fowleri,* so frequent on Cape Cod and in coastal Connecticut, is not discussed at all. A recent MS thesis completed at the University of Connecticut provides additional data on intergradation between *Chrysemys p. picta* and *C. p. marginata.*

The distributional data presented, although by far the best in print, suffers from an incomplete review of collections. Several major New England collections, including those at the Yale Peabody Museum (YPM) and University of Connecticut (UCM), were apparently not examined. Notable omissions were those of Connecticut specimens of *Ambystoma tigrinum* (YPM) and *Trionyx spiniferus* (UCM). Some UCM leopard frogs also appear to be *Rana utricularia* rather than *pipiens.* In addition, Cope's classic *Batrachia of North America* (1889; U.S. Nat. Mus. Bull. 34), with its wealth of New England data, was not consulted.

I found most comments on abundance reasonable. However, the uncommonness of *Thamnophis sauritus* is overrated; it is regularly found in marshes. Recent discoveries of some large *Ambystoma* cf. *laterale* populations also suggest that members of the *jeffersonianum* complex may be more common than previously thought. Additionally, further discussion of the extent of the rarity of *Eumeces fasciatus* and *Scaphiopus holbrookii* would have been interesting. Many feel that both these species are well on the way to



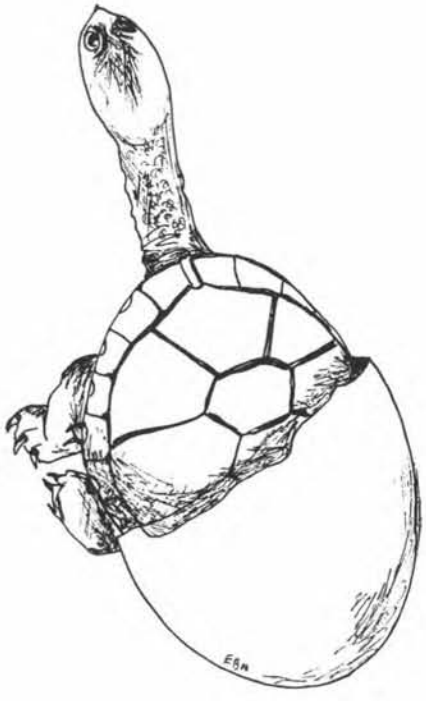
extinction in New England. Finally, the tabular listing of *Desmognathus ochrophaeus* as rare in Connecticut (p. 8) is apparently a typographical error.

Even with the several shortcomings of the text, the authors are to be commended for their substantial compilation. They have summarized a great deal of regional literature and have included many original observations. Readers will find the comments section of the species accounts particularly enlightening. Individuals interested in the northeastern herpetofauna will find this a useful volume.

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A Review of the Diseases and Treatments of Captive Turtles, by James B. Murphy and Joseph T. Collins, 56 pp. 1983. AMS Publishing, Lawrence, Kansas 66044.

This book, as the authors have stated, is useful primarily for those who deal with chelonians professionally, particularly veterinarians. But it should be found in the library of anyone who keeps turtles, as it is especially useful when consulting with a professional. The most valuable part of the book is the extensive bibliography after each chapter and at the end. The authors have done an exhaustive amount of work to bring together, in one volume, widely scattered information, consulting a variety of authorities, both with medical and non-medical backgrounds. Furthermore, the authors do a good job throughout the book of stating the findings of many researchers, yet reserving judgement about the "correct" procedure.



The preface must be read by all. The ethical statement made by the authors is important enough that I quote a part of it here. "The removal of a wild turtle from its natural environment, for whatever purpose, carries with it the ethical responsibility to house and maintain that turtle in a healthy state. Persons not wishing to shoulder that responsibility should not attempt to maintain captive turtles."

Although the contents may have been arranged in a number of ways, starting with "Environmental Factors" was a wise choice, since most problems are secondary to poor husbandry. Environmental factors, such as water temperature, light (quality and quantity), humidity and psychological requirements are listed and, for the most part, discussed adequately. Certain important points that the authors state include: matching the natural environment as closely as possible, minimum of 30-day quarantine of new arrivals, cleanliness of water, and availability of temperature gradients. One area that might have been stressed more in terms of importance was "Psychological Requirements." Many times this can be a cause of sudden illness in a long-term captive due to incompatibility during the mating season.

In the section, "Viral, Bacterial, Mycotic and Algal Infections," several good points are brought up. One stresses the importance of good hygiene of handlers so the handler doesn't get the disease. Another stresses increasing the temperature of the environment to help stimulate the immune system. Another states a very important fact: infections are often secondary to poor husbandry. Another important fact: know all about the drugs you are using - don't guess! Finally, the importance of a "culture and sensitivity" for identification and treatment of bacteria and fungi should have been better stressed by the authors. Although it may seem costly to the layman, it may prevent a delay in treatment without "guessing" which antibiotic will work, and perhaps prevent the loss of a valuable animal or animals.

In the sections, "Protozoan Infections," "Helminth Infections" and "Arthropod Infestations," it is emphasized that several fecal (stool) exams may be necessary to identify specific types of intestinal parasites so the correct "wormer" is used. This usually takes a professional. Another important point the authors stated is that one of the most effective ways of controlling parasite levels is through extreme cleanliness and sanitation. Furthermore, disinfectants must be carefully used, and those not recommended include ones containing coal tars, pine oils, carbolic acid, phenols, or heavy metals.

In the section "Dietary Deficiencies," it is stated that diet requirements (especially nutritional supplements) are still inadequately known. This is a big dilemma for any chelonian keeper, and no one diet has been proven successful for more than a few species; so the authors have listed an array of diets by many writers. In most cases, variety is the key. The authors recommended that no shellfish of any type be fed - but why?

In the section "Non-Infectious Diseases and Injuries" certain bacterial infections are mentioned, which may have been better included in a previous section. It does cover several medical problems, including cuts, shell repair, and nail and beak trims. Some can be handled by the layman, and some should be handled by professionals.

"Surgical Procedures" is definitely geared to the professional, especially the veterinarian, but can be understood by anyone with a biological background. Again, a good point is brought up by the authors: proper husbandry techniques will eliminate many surgeries. The radiology and electrocardiology segments might have been better placed under the previous section or a medical heading, but this is a minor point.

The "Necropsy Technique and Specimen Collection" section is again geared more for the professional, but it does bring up an important fact for the layman. A careful, thorough postmortem by a qualified pathologist familiar with reptilian tissues can be diagnostic for the dead — and the living. A very good detailed example is listed in this section.

The final section is the main bibliography. The bibliography itself, along with the sectional bibliographies, makes the book a valuable part of your library. This book would definitely make a nice gift for your veterinarian.

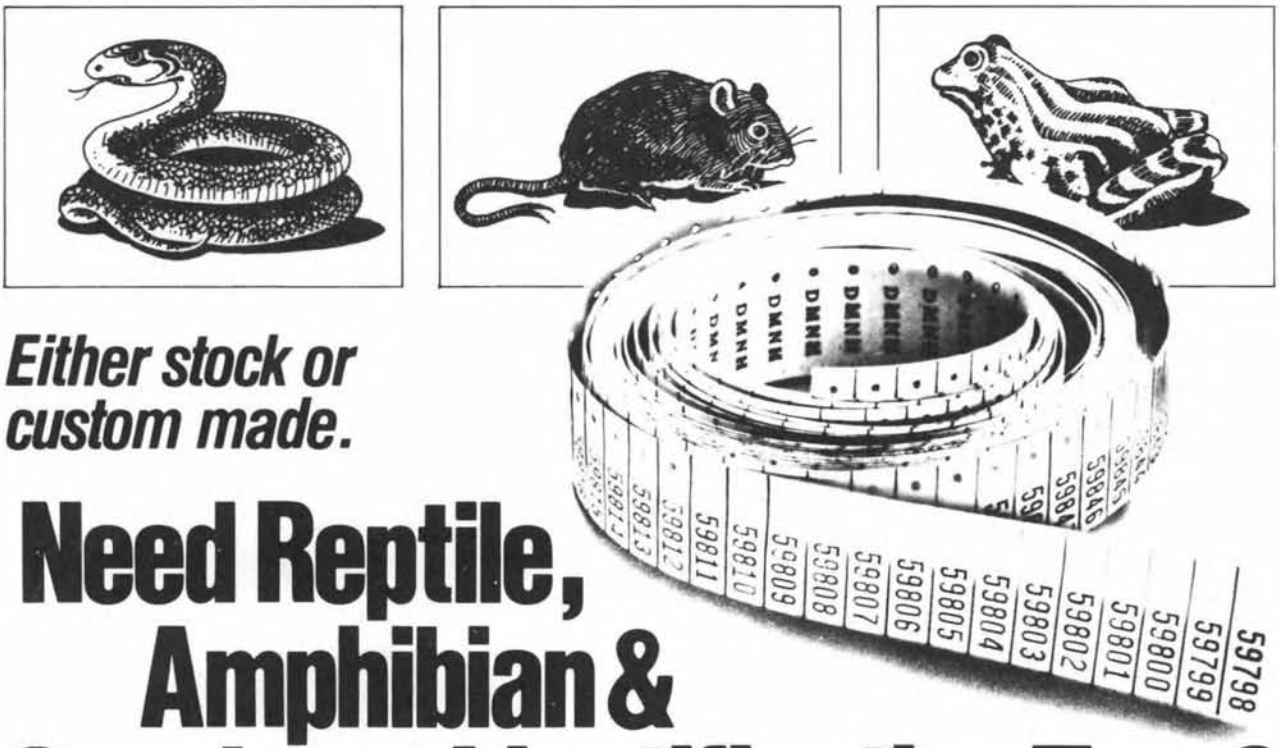
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Iguanas of the World: Their Behavior, Ecology and Conservation, by Gordon M. Burghardt and A. Stanley Rand (eds.). 1982. Noyes Publications. 472 pp. $55.

Iguanines include a small but important group of lizards. Their large size, specialization for herbivory and adaptation to a diversity of ecosystems makes them ideal subjects for investigating a variety of interesting biological questions. Their attractive appearance, longevity, large size, palatability, and restriction of many to fragile habitats has led to heavy exploitation of them, both direct and indirect, by humans. Most, if not all, forms are threatened to some degree with extinction.

Burghardt and Rand have undertaken the ambitious task of organizing current knowledge on this group and focusing future investigation. Considering what was previously available, I suggest they have succeeded admirably. The general introduction and prologues to each of the six sections (Systematics and Biogeography, Food and Energetics, Demography and Life History Strategies, Adaptive Behavior and Communication, Social Organization, Conservation and Management) summarize the individual chapters well and crystalize the most important facts, hypotheses and approaches. The six topics reflect current interest and are logically arranged. The writing is well edited.

As in many symposium proceedings the contributions vary in breadth, readability and rigor of support of their conclusions. It is obvious from many contributions that only



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additional long-term, intensive research will more definitely focus the issues and answer the most important questions.

The section on Systematics and Biogeography includes two chapters, one by Etheridge and the other by Blanc. Readers of these two chapters will obtain a good grasp of the taxonomy and current hypotheses of the evolutionary history of the iguanines. Etheridge's checklist, in particular, should prove a valuable starting point for those developing an interest in the group.

The section on Food and Energetics contains four chapters with rather different approaches that mesh well. Nagy presents a general model relating energy requirements to body size in iguanid lizards. It is based on studies of field metabolic rates of free living lizards (mostly insectivores) using doubly-labelled water techniques. He suggests how conservative this relationship seems to be and predicts what we should expect as data on energy requirements of more iguanas accumulate. Iverson offers a clear definition of herbivory, emphasizes the functional anatomy of iguanine herbivory, and discusses whether large size or herbivory evolved first. McBee and McBee document experimentally that hindgut fermentation produces volatile fatty acids that are a significant energy source to the green iguana. Auffenberg presents an extensively documented field study of feeding of the Caicos ground iguana, showing the complexity of factors to be considered in studying a foraging herbivore. He suggests that iguanas are highly selective feeders and not motivated solely by energy content as some simple foraging models suggest.

The section of Demography and Life History Strategy contains five chapters that point out variations in life-history traits among iguanas. Wiewandt summarizes variation among the iguanines in several life-history traits. He offers several speculative hypotheses for their evolution and he correctly points out that none but serious long-term efforts will succeed in significant advances in our knowledge. Rand and Green cleverly extract data from museum collections on geographic variations of the reproductive cycle of *Iguana iguana* and demonstrate a correlation of the reproductive cycle with the timing of the wet and dry seasons. Iguanas mate at the beginning of the dry season and hatching occurs at the beginning of the wet season. Thus, incubation occurs when it is appropriately dry and warm and hatchlings emerge to an abundant food supply of new leaves. Harris and Van Devender in separate chapters increase our knowledge of basic natural history of *Iguana* and *Ctenosaura* and demonstrate the difficulty involved in documenting iguanine demography. The growth rates of *Iguana* vary both geographically and seasonally. Van Devender speculates that herbivory may have preceded the evolution of large size in iguanas. Case presents the first detailed natural history account of the insular giant *Sauromalus*. Aside from large size the insular forms are unique in being very sedentary, showing an expanded niche, lacking aggression and having remarkably sporadic reproduction. In some years they are subject to devastating droughts during which reproduction ceases and mortality is high. Case presents a model invoking predation and starvation as cofactors in the evolution of large body size of these forms.

One of the special problems in constructing life-tables of the long-lived iguanines is the difficulty in accurately aging the oldest individuals. Several, e.g. Wiewandt p. 124, Dugan and Wiewandt p. 307, assume iguanas to have indeterminate growth that continues, albeit slowly, throughout life. If this is true, indirect data such as growth rings might be useful for determining absolute age; if not, such data can be seriously misleading (see Case p. 191). Only monitoring programs that follow marked individuals for perhaps decades will determine whether or not iguanine growth is truly indeterminate and reveal the true age structure of the populations.

The section on Adaptive Behavior and Communication seems random, which reflects the unfocused state of many aspects of the field of animal behavior. The first three chapters describe action patterns. Carpenter compares in his general qualitative style the aggressive displays of a diversity of iguanine species. Greenberg and Jenssen concentrate on the detail of displays of a small captive colony of *Brachylophus*. Distel and Veazey concentrate on an action pattern inventory of a captive group of *Iguana*. Each of the three are thoroughly descriptive but emphasize a different level of focus. The trio points out how hopelessly far we are from a complete understanding of display communication of any iguana species.

The last two chapters in the behavior section, one by Drummond and Burghardt the other by Boersma seem totally unrelated to each other or the previously described three chapters in this section. The first is an observational and experimental study of orientation and dispersal in hatchling *Iguana*. Hatchling iguanas do not disperse randomly but in the most advantageous direction; their choice of direction is influenced by their peers but other important environmental cues are obscure and probably complex. Boersma provides evidence for the hypothesis that Galapagos marine iguanas *(Amblyrhynchus)* form sleeping aggregations (cuddle) to retain heat for faster more efficient digestion. The aggregation seems to serve functionally like the burrow of the land iguanas.

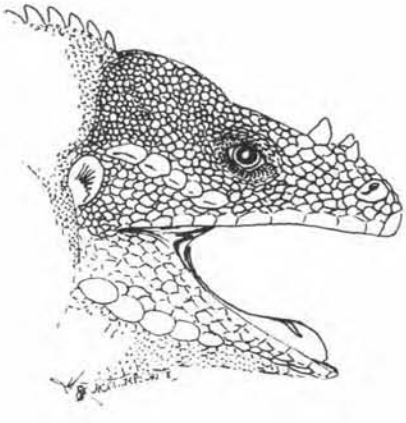
The fifth section, Social Organization, contains five chapters. The first chapter by Dugan and Wiewandt and the last by Ryan are comparative and attempt to provide an evolutionary framework to explain variations in social organization. Dugan and Wiewandt present terms and models currently used by sociobiologists. They point out factors that may influence through natural selection the social organization of the iguanines. They emphasize the uniqueness of iguanine social organization among the iguanid lizards but most of the discussion details known or suspected determinates of iguanine social behavior in a rambling non-comparative fashion. A concise tabular presentation that compares similarities and differences between iguanines and other iguanids and includes possible differences in the selective environment would have been a useful addition to their chapter.

Ryan's chapter on variation of chuckwalla mating systems includes concise, testable models of how variations of the environment and the cost of territoriality can alter behavioral strategies that in turn influence social organization. It provides an excellent example of how to start an analysis of the evolution of social organization.

The three middle chapters of the fifth section are noncomparative descriptions of social behavior of three different iguana species. Differences in emphasis, focus and the detail presented make comparison of the chapters by the reader difficult. Dugan clearly relates age to differences in mating strategy among male *Iguana* and shows that males do not actively "control" females or their critical resources. Hers is the most quantitatively documented of the three chapters. Werner describes the seasonal ontogeny of male territories in *Conolophis subcristatus*, shows the importance of the male-constructed burrow during the breeding season and emphasizes the dynamics of the male-female interaction. Christian and Tracy emphasize the nesting dynamics of *Conolophis pallidus* and detail the variability of nest construction and defense behavior. All three chapters provide important baseline information for future study of these and other species.

The final section on conservation and management begins with an introduction and is followed by a chapter by Fitch, Henderson and Hillis. Together these two contributions clearly detail the status of Central American and Caribbean iguanas. Strikingly absent is a chapter on status and management of the Galapagos iguanas. Gibbons and Watkins provide a general account of the natural history and status of *Brachylophus* in the South Pacific. The epilogue, a plea for the iguana as a peace symbol by Burghardt is entertaining but perhaps might have been replaced with a statement of overview with more heuristic impact. The volume contains important material that should be read by anyone interested in research, conservation or management of iguanas. Hopefully, in a decade or two, a more sophisticated sequel will result as was spawned by Milstead's 1967 symposium on lizard ecology.

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The Ecological Impact of Man on the South Florida Herpetofauna, by Larry Davis Wilson and Louis Porras 1983. The University of Kansas Museum of Natural History and World Wildlife Fund - U.S. $7.00 postpaid.

This book discusses the several intertwining environmental problems peculiar to southern peninsular Florida in a most lucid and readable manner. Consisting of 89 pages (+ i-vi) within which are discussed the environment, both historic and present, the severe and immediate problems created by a burgeoning human population and the status of the herpetofauna, native and introduced, it is a publication which should be of extreme interest to anyone with any affinity whatever to the "Sunshine State."

Besides being keen field biologists, the status of both authors in Florida (Wilson being an educator and Porras, until recently, being involved in the animal trade) has not only allowed them immediate access to reported introductions of alien reptiles and amphibians, but also given them the opportunity to critically evaluate such reports on both the short and long term basis.

While the introduction of herpetofauna has been reported in several prior publications, this is the first in several years to report on all known established introductions and to mention, at least cursorily, numerous failed introductions. It is, perhaps, the only booklet to explore the dramatic role played by the rampant environmental alterations which are occurring daily in Florida as they pertain to the herpetofauna. One may read of geologic, physiographic, hydrographic, climatic, vegetational and populational changes, the present as opposed to the historic, and gain insight and perspective while so doing.

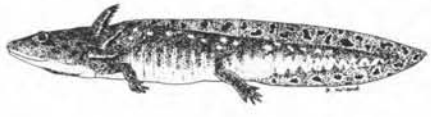
The Florida as we knew it in the '50s, '60s, or even the '70s is a thing of the past. Unfortunately the environmental alterations have not lessened in the '80s. Indeed, the pressures of the never-ending flood of humanity have now grown to include most, if not all, of the counties south of a line connecting Tampa Bay, Gainesville and Jacksonville.

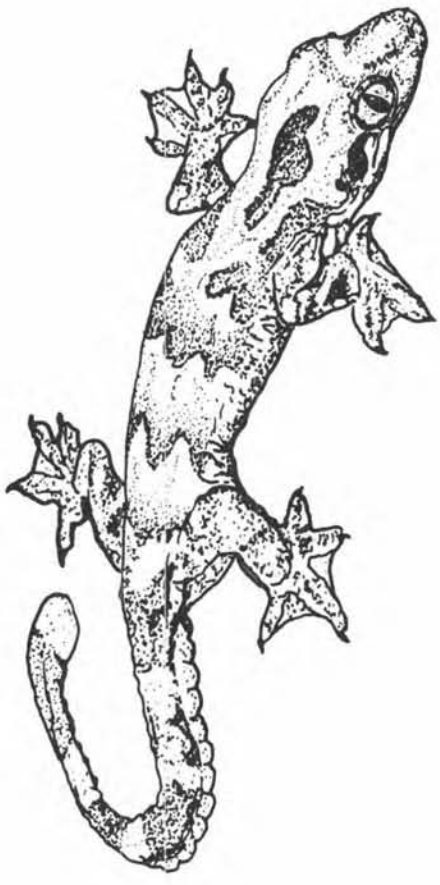
Where once existed wetlands now stand shopping malls; along the well drained central ridges so crucial to the existence of numerous threatened endemic poikilothermic creatures are citrus groves and mobile home parks of immense proportions.

While the "approaching ecocollapse" mentioned by the authors pertains specifically to southern Florida we will, I fear, see it echoed in more northerly areas of the state within the next decade or two.

In addition to the thought provoking text the book contains three maps or charts, five tables, 33 excellent quality black and white photographs, an extensive bibliography, appendix and an index to scientific names.

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NEWSNOTES

NEW JERSEY STATE MUSEUM COLLECTION

The New Jersey State Museum has recently completed renovation of a new collection storage range for fishes, amphibians and reptiles. The ichthyological collection of The Wetlands Institute, made mainly by Lehigh University and Stockton State College, and the herpetological collection of the late James D. Anderson of Rutgers University have been donated to the museum and are now catalogued and incorporated into the museum's range. The collection is made up of more than 2,000 lots of fishes, amphibians and reptiles collected from across the State and its coastal waters during the 1950s, 1960s and 1970s. The amphibian collection is strong in series lots, particularly relating to specimens of *Ambystoma* adults and larvae, while the fish collection is strongest in bay and estuarine species. Computerization of the records of this collection will be undertaken this coming year. Persons interested in examining parts of this collection may do so by contacting:

Raymond J. Stein
Bureau of Science
New Jersey State Museum, CN-530
Trenton, New Jersey 08625, U.S.A. ●

NIXON GRIFFIS ESTABLISHES FUND FOR ZOOLOGICAL RESEARCH

New York Zoological Society trustee Nixon Griffis has established a unique fund for zoological research. Open to zoo and aquarium scientific staff members across the nation, fund recipients may be curators, keepers, veterinarians, and research and consulting biologists. Programs to be considered for support include those in: animal behavior, veterinary medicine, reproductive biology, genetics, exhibition design and other research areas that address the care, management and propagation of wildlife in captivity.

Grants, not to exceed $3000, will be awarded biannually. For information about the Fund and grant applications, interested biologists are urged to write to:

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HERP SLIDES REQUESTED

The Nevada Chapter of The Wildlife Society is nearing completion of a slide-tape program entitled *Silver Amphibians and Reptiles*. This conservation education tool will be available for free presentations and sale to the public in 1985. A few more slides are needed to complete the program. High quality color slides, horizontally oriented, depicting the animals and their habitats are being sought. Slides need not have been taken in Nevada but must be representative of the Silver State. All original slides will be returned to the owners. Photographers whose slides are selected for the program will be acknowledged in the written narrative. Specific slides needed are: bullfrog eggs, desert tortoise, rattlesnake combat dance, northwestern pond turtle. Please contact:

Rex Baxter
Nevada Chapter, The Wildlife Society
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Elko, Nevada 89801, U.S.A. ●

PATHOLOGY COLLOQUIUM PROCEEDINGS

The Proceedings of the First International Colloquium on Pathology of Reptiles and Amphibians are now available. The Proceedings from this colloquium, held 29 September - 2 October 1982 in Angers, France, consist of about 280 pages, with 60 plates, in fifty contributions. Following the introduction, there are three major sections: Physiopathology, Microbial and Parasitic Diseases; Tumours and Lesions of the Integument; and Developmental Abnormalities.

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[1] Joint committee with the Herpetologists' League

[2] Joint committee with the American Society of Ichthyologists and Herpetologists

HERPETOLOGICAL REVIEW EDITORIAL POLICY

The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (four issues per year), **Herpetological Review** (four issues per year), occasional issues of **Facsimile Reprints in Herpetology,** and **Recent Herpetological Literature.** Members may purchase other Society publications at reduced rates.

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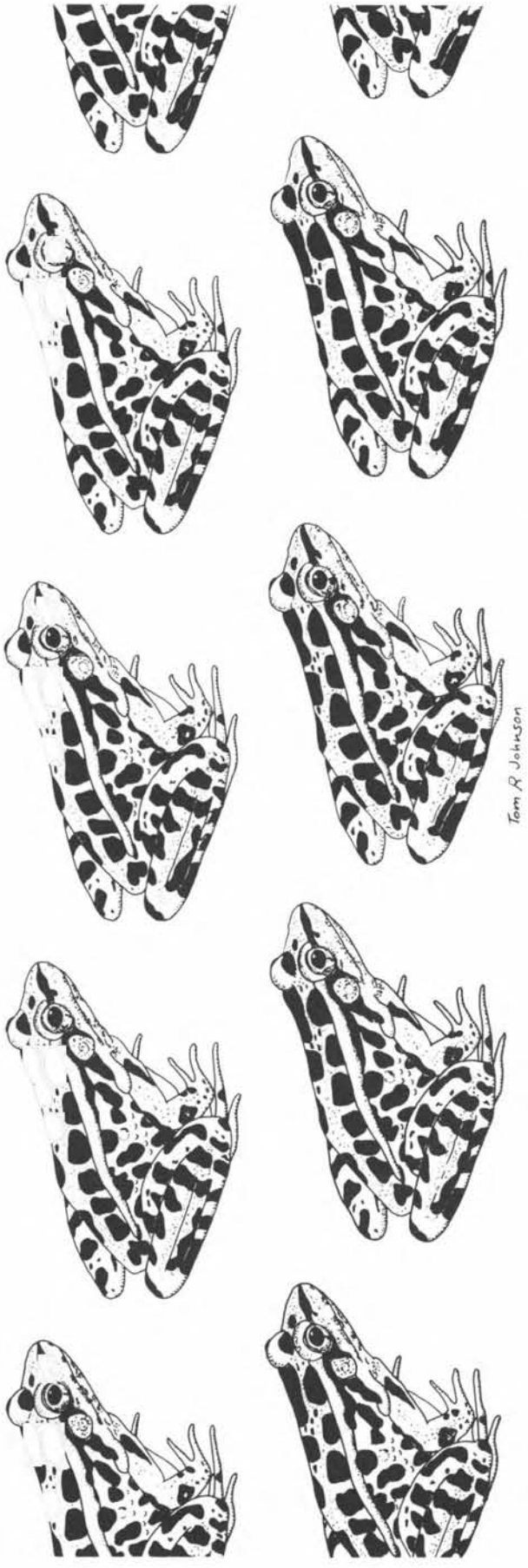
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SSAR BUSINESS

DUES INCREASE

The Board of Directors has approved an increase in dues for Sustaining Members to $35 per year. This increase is currently in effect. ●

1985 ANNUAL MEETING

The 1985 annual meeting will take place at The University of South Florida in Tampa, 4-9 August. Additional information about this meeting will be published in forthcoming issues of *HR*. Inquiries may be directed to:

Henry R. Mushinsky
Department of Biology
University of South Florida
Tampa, Florida 33620, U.S.A. ●

1984 CONSERVATION DIRECTORY

The 1984 SSAR Directory of State Nongame/Natural Heritage Program Coordinators, prepared by the SSAR Conservation Committee, is now available. This directory includes the names of state wildlife agency or commission employees who are responsible for nongame, significant habitat, or natural heritage programs and who have been designated as contacts on issues concerning threats to herpetofaunal resources. The 1984 edition is a thorough update of the 1983 version. Copies of the directory may be obtained gratis from:

John L. Behler
Department of Herpetology
New York Zoological Society
185th Street & Southern Blvd.
Bronx, New York 10460, U.S.A. ●

CORRECTION FOR IHIC ADDRESS

The address given for the Israel Herpetological Information Center (IHIC) in SSAR's Silver Anniversary Membership Directory (Herpetological Circular No. 13) is incorrect. The correct address for IHIC is:

Israel Herpetological Information Center
Mr. Amos Bouskila
Har Gilo
D. N. Harei Yerushalaim 91076
Israel

The IHIC is an enterprise of the Society for the Protection of Nature in Israel, in collaboration with Tel Aviv University and the Hebrew University of Jerusalem. It cooperates with both universities but is independent of them.

Please make the above address correction on p. 34 of your Directory. ●

8th ANNUAL REGIONAL HERPETOLOGICAL SOCIETIES CONFERENCE

The Eighth Annual Conference of the Regional Herpetological Societies will be held on the afternoon of Monday, 30 July 1984 with the combined meeting of SSAR-HL-ASIH at the University of Oklahoma at Norman. The title of the conference is: "Monitoring Reptile and Amphibian Populations: An Important Role for Regional Herpetological Societies." The program will include the following presentations:

Mike Plummer (Harding University, Searcy, Arkansas) will present techniques used to study reptile populations with an emphasis on turtles.

Ray Semlitsch (Savannah River Ecology Laboratories, Aiken, South Carolina) will discuss techniques he has used in research on amphibian populations.

Steven Secor (University of Oklahoma, Norman) will discuss DOKARRS, a computer program that stores distributional and other information on collections and site records of reptiles and amphibians as well as museum records. These data are then used to plot up-to-date distribution maps and other information on range, reproduction-status, population structure, etc.

Steve Hammack (Fort Worth Museum of Science and History and the North Texas Herpetological Society) will report how their regional society, with the aid of a grant from the SSAR, has compiled distributional data for a publication and slide presentation on the "Reptiles and Amphibians of Dallas and Taron Counties, Texas."

Additional information on the conference may be obtained from Jeff Black, Department of Biology, Oklahoma Baptist University, Shawnee, Oklahoma 74801, U.S.A.

For information on the combined meeting of SSAR-HL-ASIH contact the local chairman: Victor Hutchison, Department of Zoology, University of Oklahoma, Norman, Oklahoma 73109, U.S.A. (405)-325-6721. ●

NEW SUBSECTION IN *HR*

Herpetological Review is adding a new subsection to its Geographic Distribution section. It will be called "Recent Population Changes" and will provide a widely disseminated outlet for anecdotal or minimally documented information on local extinctions or regional population changes.

RATIONALE: Very little information about fluctuating population sizes or of local extinctions ever reaches the research literature. When such things happen, local investigators usually are not aware of anything having happened until after the fact (often several years) and thus there has been little or no data accumulation for formal scientific substantiation. By ignoring such information, however, the scientific community is being deprived of valuable historic indications that might enhance our understanding of very long term population trends (in excess of 20 years) and changes in distribution patterns. *Herpetological Review* can provide that informational outlet because it imposes fewer strictures on material that can be published.

If you feel you have a suitable contribution for the new subsection, please inform its Editor (Dr. Ralph W. Axtell, Department of Biological Sciences, Southern Illinois University, Edwardsville, Illinois 62026, U.S.A.) of your interest or provide a preliminary manuscript for his attention. ●

SYMPOSIUM ON PREDATOR-PREY RELATIONS IN LOWER VERTEBRATES

This symposium will critically examine the value and contribution of diverse approaches to the study of predation and predator defense. Participants are specialists in the physiology, morphology, ecology, and behavior of predator-prey relationships, and include A. Bennett, I. Johnston, P. Webb, G. Roth, C. Gans, M. Feder, G. Lauder, R. Huey, G. Helfman, E. Werner, J. Endler, and S. Arnold. Participants will examine questions such as: What are the advantages and drawbacks of particular types of analyses (e.g., experimental, comparative, ecological, natural historical) in understanding predator-prey relationships? What major questions in each area are yet to be answered? How can diverse approaches be integrated? Contributed papers will follow the symposium sessions. The symposium is supported in part by the National Science Foundation and is organized by M. Feder and G. Lauder. It will be held on July 31-August 1, 1984, at a combined meeting of the American Society of Ichthyologists and Herpetologists, Herpetologists' League, and Society for the Study of Amphibians and Reptiles, in Norman, Oklahoma. For information contact Dr. Victor Hutchison, Department of Zoology, University of Oklahoma, Norman, Oklahoma 73019, U.S.A. ●



SOCIETIES



Celebrating its 10th year, members of the Kansas Herpetological Society gathered in Lawrence, Kansas for their annual meeting in November 1983. The Society plays an active role in herpetological and conservation activities in Kansas. With over 200 members worldwide, the KHS publishes a quarterly *Newsletter* and other publications on an occasional basis, the most recent a color brochure on endangered and threatened amphibians and reptiles in Kansas, co-sponsored by an SSAR Grant-in-Herpetology. Photo by Joseph T. Collins. ●

MEETINGS

CAPTIVE PROPAGATION AND HUSBANDRY SYMPOSIUM

The Eighth International Herpetological Symposium (formerly Reptile Symposium) on Captive Propagation and Husbandry will be held 17-21 July 1984 in Columbus, Ohio, hosted by the Columbus Zoo. In addition to papers on herpetological husbandry and propagation, there will be a tour of the College of Veterinary Medicine, Ohio State University, including demonstrations of the latest diagnostic veterinary techniques, and an open house at the Columbus Zoo Reptile and Amphibian facilities. For registration information contact:

Herpetological Symposium
13019 Catoctin Furnace Road
Thurmont, Maryland 21788, U.S.A. ●

CAPTIVE PROPAGATION CONFERENCE

The Northern California Herpetological Society will sponsor its second conference on the Captive Propagation and Husbandry of Reptiles and Amphibians on January 19 and 20, 1985 in Davis, California. All herpetologists, either amateur or professional, are invited to attend and/or present a paper at the conference.

The Proceedings of the 1983 conference are available at $13 per copy.

Abstracts for the 1985 meeting (due by August 30, 1984) or requests for the 1983 Proceedings should be sent to:

Randall L. Gray
NCHS
706 Arnold Street
Davis, California 95616, U.S.A. ●

THIRD INTERNATIONAL CONGRESS OF SYSTEMATIC AND EVOLUTIONARY BIOLOGY, 1985

The Congress will be held on 4-10 July 1985 at the University of Sussex, near Brighton, England. It is sponsored by the Royal Society, British Ecological Society, Linnean Society, Palaeontological Association and Systematics Association.

The major aims of this Congress are to encourage and facilitate the integration of the work of biologists in adjacent or overlapping fields in the general area of systematic and evolutionary biology.

The programme will include a number of symposia devoted to specially-selected broad interdisciplinary themes, with invited speakers. The proposed subjects include: Symbiosis in Evolution; Conservation of Tropical Ecosystems; Biogeographic Evolution of the Malay Archipelago; Adaptation Aspects of Physiological Processes; Co-evolution in Ecosystems and the Red Queen Hypothesis; Angiosperm Origins and the Biological Consequences; The Measurement of Rates of Evolution; Molecular Biology and Evolutionary Theory; Co-Evolution and Systematics; Molecules vs. Morphology in Phylogeny: Conflict or Compromise? Random and Directed Events in Evolution; Biochemical Innovation in Microbial Communities.

There will also be a full provision for intending participants to suggest and arrange symposia of special interest to particular groupings of biologists. Other sessions will provide opportunities for the presentation of papers concerned with particular topics or groups of organisms. There will also be a number of poster sessions.

Accommodation and meals will be available on the campus of the University of Sussex. In addition, hotels are available in nearby Brighton, an attractive historic resort town on the South Coast.

Further information will only be sent to those who request it. Anyone wishing to be placed on the mailing list, or to suggest topics for Special Interest Symposia, or to contribute to any of the Congress Symposia listed above, should write to:

Professor Barry Cox
c/o ICSEB Congress Office
130 Queen's Road
Brighton, Sussex BN1 3WE, U.K. ●

SECOND INTERNATIONAL COLLOQUIUM ON THE PATHOLOGY OF REPTILES AND AMPHIBIANS

The Second International Colloquium on the Pathology of Reptiles and Amphibians will take place in Nottingham, England, 17-21 September 1984. The scientific sessions will be held at the Medical School of the University of Nottingham, part of the Queen's Medical Centre, which opened in 1976.

Sessions on the following topics are being planned: Immune responses and immunopathology; spontaneous tumours and chemical carcinogenesis; microbial and parasitic diseases; developmental abnormalities and mutations; problems related to maintenance in captivity.

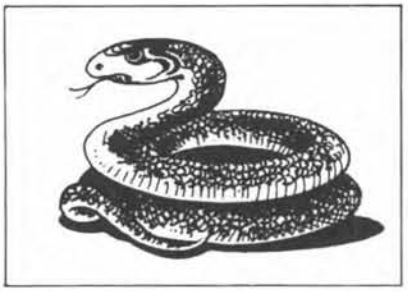
Further information may be obtained from:

Dr. Richard Clothier
Department of Human Morphology
University of Nottingham Medical School
Nottingham NG7 2UH, England ●

CHEMICAL SIGNALS IN VERTEBRATES IV

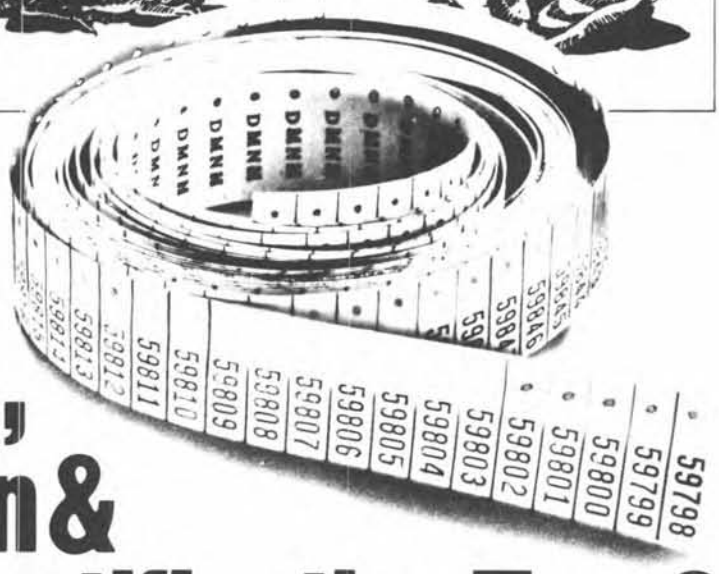
The Fourth International Conference on Chemical Signals in Vertebrates, formerly held in Sarasota, Florida and Syracuse, New York, will be held at the University of Wyoming, Laramie, from 27-29 (and the morning of the 30th, if necessary) July 1985. Paper and poster presentations will be by invitation only, and the International Organizing Committee requests input, inquiries, and correspondence from those who wish to present a topic or simply attend. The meeting will take an evolutionary, ecological, and comparative theme, but in this context specific presentations will likely consider issues as wide ranging as pheromone chemistry, endocrine and neurobiological mechanisms, matters of adaptation and preadaptation, life history ecology and strategy, ethology, and general evolutionary and comparative biology. Proceedings of the meeting will be published as Chemical Signals in Vertebrates, Vol. 4. For further information, contact:

Dr. David Duvall, Chair
International Organizing Committee
Chemical Signals in Vertebrates IV
Department of Zoology and Physiology
University of Wyoming
Laramie, Wyoming 82071, U.S.A. ●









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1984 AAZV MEETING

The 1984 annual convention of The American Association of Zoo Veterinarians will be held in Louisville, Kentucky at the Hyatt Regency Hotel, October 15-18. The scope of the meeting will be broad, including sessions on infectious diseases, pathology, hoofstock, case reports, small mammals and carnivores, marine mammals and fish, reptile medicine, avian medicine, and reproduction. Potential speakers or attendees for this program are invited to contact:

Dr. Morton O. Silberman, AAZV
School of Medicine, 214 WMB
Emory University
Atlanta, Georgia 30322, U.S.A. ●

THE 6th INTERNATIONAL SYMPOSIUM ON AFRICAN AMPHIBIANS

Sponsored by the Working-group on African Amphibians the 6th International Symposium on African Amphibians will be held the week of April 13, 1987 in South Florida, with the University of Miami, Department of Biology as host.

Participation will be by invitation only and is restricted to scientists actively working on African amphibians. Qualified individuals may contact the chairman of the local committee to receive further information on the program as it develops. Please write:

African Amphibia
c/o Jay M. Savage
Department of Biology
University of Miami
Coral Gables, Florida 33124, U.S.A. ●

IN MEMORIAM

It is with great sorrow that the herpetological community learned of the recent death of Dr. T. Paul Maslin, Curator-Emeritus of the University of Colorado Museum and Professor of Biology. Dr. Maslin passed away on Sunday, 26 February 1984.

After receiving his Ph.D. from Stanford in 1945, Dr. Maslin began his academic career at Colorado State University. He moved to the University of Colorado two years later where he served as professor of Natural History and curator of zoological collections until his retirement in 1973. During this period he dedicated his life to teaching and to the building of the Museum's herpetological collections. He earned an international reputation for his discovery in 1961 that the whiptail lizard *Cnemidophorus* is an all-female species.

We offer our condolences to Dr. Maslin's wife Mary, daughter Diana, and three grandchildren Shona, Aaron and Zacharias Baum. ●

LEGISLATIVE ALERT

The U.S. Fish and Wildlife Service has taken the following actions: the Hierro giant lizard *(Gallotia simonyi simonyi)* is now an endangered species and the Ibiza wall lizard *(Podarcis pityusensis)* is a threatened species, under the provisions of the Endangered Species Act of 1973, as amended. In addition, the Service delisted the Indian flap-shelled turtle *(Lissemys punctata punctata)* from provisions of the Act. This rule became effective on 30 March 1984. Refer to the Federal Register, Vol. 49, No. 41, Wednesday, 29 February 1984. ●

A presidential decree from the President of Greece, published in January 1981, proclaims ten species of amphibians and thirty-nine species of reptiles, as well as numerous other plants and animals, as being protected species for which collecting, wounding, killing, preserving, buying, selling, transporting and exporting from Greece is prohibited without permission from the Ministry of Agriculture and notification of the Biological Department of a Greek University. Additional species of animals may have been added to the list since the initial decree. The Hellenic Zoological Society is willing to offer any information to those interested in Greek fauna and is soliciting input concerning the biological status of the Greek fauna as it relates to the need for protection of species. For further information contact:

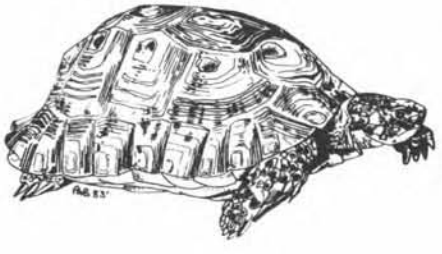
Dr. S. Drosopoulos, Secretary
Hellenic Zoological Society
P.O. Box 3249 C.T.
Athens 102 10, Greece ●

NEWSNOTES

Varanus INFORMATION SOUGHT

Current plans call for completion of my long-term studies of *Varanus bengalensis* under both captive and wild conditions within the next two years. My intention is to produce a volume on this species similar to that on *V. komodoensis*. My interest in making this new piece as complete as possible suggests that I call on the herpetological community for help in documenting as much regarding the biology of this species as possible. Accordingly, I would be pleased to consider for inclusion in this volume (with due credit given, of course) those items you consider of possible importance that might corroborate, refute, or extend published information. Please contact:

Walter Auffenberg
Florida State Museum
University of Florida
Gainesville, Florida 32611, U.S.A. ●



SEXUALLY DIMORPHIC PLASTRAL KINESIS IN *Heosemys spinosa*

A plastral hinge is not currently considered to be characteristic of the batagurine turtle genus *Heosemys* (McDowell, 1964). Bramble (1974) predicted that plastral kinesis would be found in the genus when he included *Heosemys* in the *Cyclemys* group of genera. My observation of a distinct functional hinge in two live adult female *H. spinosa* which I collected in Malaysia confirms Bramble's prediction.

Plastral kinesis in *H. spinosa* has probably not been reported previously because there is no indication of a hinge in adult males or juveniles and the kinesis of females is poorly developed. Externally, the hinge is indicated by incomplete separation of the abdominal scute into hyoplastral and hypoplastral elements and by fragmentation of the inguinal scute (Fig. 1). Modification of the inguinal scute into small plates separated by expandable sulci permits dorsal-ventral movement of the hypoplastron. Internally, the hinge mechanism consists simply of a pad of fibrous connective tissue separating the hypoplastral buttress from the carapace (Fig. 2). Maximum ventral displacement of the plastron of the freshly-sacrificed specimens was only about 3.5 mm, measured at the tip of the anal scute. In adult males and juveniles there is a rigid suture connecting the immobile plastral and carapacial bones.

The plastral kinesis of *H. spinosa* does not appear to provide any protection to the turtle. Perhaps the limited movement of the plastron allows the production of larger eggs than would otherwise be possible. That hypothesis is consistent with the well-established trend for tropical birds and turtles to lay larger eggs than temperate species (MacArther, 1962). Between the time of capture and 15 months later when the females were sacrificed no change in the hinge mechanism was noticeable. It is certainly possible, how-

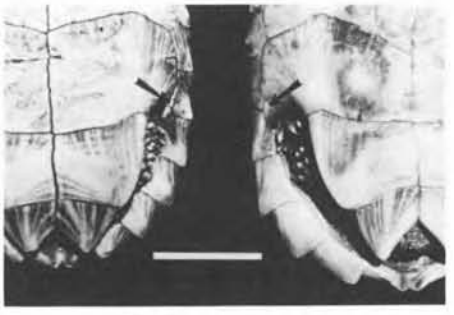


Figure 1. Plastron of adult male (right, UU 17299) and female (left, UU 17313) *Heosemys spinosa*; arrows point to an inguinal scute of the male and a homologous structure of the female. Incomplete separation of the abdominal scute of the female is visible on the specimen illustrated, the inguinal and abdominal scutes of a second female (UU 17314) are similar to those of the specimen figured. Scale = 50 mm.



Figure 2. Anterior aspect of left hypoplastral buttress of a freshly-sacrificed female *Heosemys spinosa* (UU 17313). The arrow indicates the pad of connective tissue on the dorsal extremity of the buttress. Scale = 10 mm.

ever, that prior to egg-laying the hinge complex could be enhanced by bone resorption and substantially increase the small amount of kinesis observed.

The male shown in Figure 1, and the female shown in Figures 1 and 2, and the second female turtle referred to in this paper have been deposited with J. M. Legler, curator of the Museum of Zoology (Herpetology), University of Utah, and they have been catalogued as numbers UU 17299 and 17313-17314.

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NATURAL LONGEVITY OF IGUANID LIZARDS IN SOUTHERN NEVADA

Maximal life spans of animals have long held a general interest for biologists. Indeed, Major Stanley Flower, a British fusilier, occupied himself for years in cataloging ages of animals kept as pets or in zoos for long periods of time (e.g., Flower, 1937). More recent records of captive longevities have been summarized by Bowler (1977). The problem with observations of this nature is that records of animals in captivity have no clear relevance to natural situations.

Very aged animals in natural populations are of little functional significance. Even if these individuals remain sexually active, they contribute only a tiny fraction to overall reproductive effort. However, life spans may be selectively influenced, and knowledge of this attribute can be of value in comparing different populations of the same species. Information drawn from protracted field studies of long-lived species is of particular interest.

Table 1. Observed life spans among four species of iguanid lizards in Rock Valley, Nye County, Nevada.

Species	Sex	Estimated age (months) at conclusion of study	Estimated age (months) when first registered (and snout-vent length, mm)
Cnemidophorus tigris	m	94	10 (67)
	m	94	12 (--)
	f	81	22 (78)
	f	81	22 (84)
Crotaphytus wislizenii	m	118	8 (84)
	m	117	33 (100)
	f	82	2 (68)
Phrynosoma platyrhinos	f	82	10 (72)
	f	82	22 (81)
	m	81	22 (78)
	m	81	0 (35)
	m	81	1 (34)
Uta stansburiana	f	58	7 (38)
	f	46	19 (48)
	f	45	13 (48)
	m	45	22 (54)
	m	37	8 (45)

Field studies of lizards were carried out in Rock Valley, Nye County, Nevada (Turner et al., 1969a, b, 1970; Medica et al., 1973; Turner, 1977). Work was conducted in four 9-ha areas, three of which were fenced. One of the fenced areas was continuously irradiated during the course of these investigations. Sampling occurred regularly between early March and September, 1962-1973. Ages of all lizards were estimated at time of first capture, basing these estimates on the animals' sizes. At the beginning of the study, ages of many individuals of longer-lived species *(Phrynosoma platyrhinos, Cnemidophorus tigris, Crotaphytus wislizenii)* could not be accurately determined, and this was also true of a few of the largest *Uta stansburiana*. However, as the study progressed new animals encountered were generally new recruits of readily ascertained age. Ultimately, as the older lizards disappeared, we worked with populations of known age distributions. All field procedures were described by Medica et al. (1971).

Although we have records from all four areas, we restricted our analysis to two fenced plots, excluding the irradiated area and the unfenced area. Sterility of some female lizards inhabiting the irradiated area was described previously: *Crotophytus* and *Cnemidophorus* (Turner et al., 1973); *Phrynosoma* (Medica et al., 1973); and *Uta* (Turner and Medica, 1977; Pearson et al.) Table 1 gives longevity data for the oldest individuals observed among four species of iguanids. Ten of the 17 lizards were originally marked within their first years of life, and only one was assigned an age exceeding 22 months at time of first capture.

These observations indicate natural life spans of about 94 months in *Cnemidophorus*, 118 months in *Crotaphytus*, 82 months in *Phrynosoma* and 58 months in *Uta*. Female *Uta* definitely outlive males, as we suggested in an earlier analysis (Turner et al., 1969c) and as observed by Tinkle (1967) in Texas. We believe that the observed longevities of *Uta* represent the true capacities of this species in southern Nevada. On the other hand, had observations been continued we probably would have observed longer life spans among some individuals of the other three species.

The figures in Table 1 can be given added interest by considering the number of different lizards registered in the two plots between 1962 and 1973. The numbers of each species (with numbers of males and females in parentheses) were as follows: *Uta stansburiana* 3,575 (1,753:1,822), *Cnemidophorus tigris* 1,097 (532:565), *Crotaphytus wislizenii* 202 (109:93), and *Phrynosoma platyrhinos* 249 (140:109). Chi-square tests of observed sex ratios gave X^2 values (1 d.f.) of around 1 to 1.7 for *Uta*, *Cnemidophorus* and *Crotaphytus* and 3.6 for *Phrynosoma*. All are statistically insignificant ($X^2 0.05 = 3.8$), assuming an expected sex ratio of 1:1.

ACKNOWLEDGMENTS

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MORPHOLOGICAL CHARACTERISTICS OF A PERIPHERAL ISOLATE OF THE PARTHENOGENETIC TEIID LIZARD, *Cnemidophorus flagellicaudus*

On 7 July 1983, we unexpectedly encountered an individual of *Cnemidophorus flagellicaudus* at the site of Clay Springs Ranch, approximately 25 air miles (40 km) NNW Hackberry, Mojave Co., Arizona (35° 43' 42" N—113° 52' W). Eleven specimens were collected between 3:00 and 6:30 P.M. (MST), and seven more were secured on the morning of 8 July (numbers HLT 8337-54). The sample was collected within an elevational range of 4280 to 4400 ft. (1305 to 1342 m) from a "weed habitat," as defined by Wright and Lowe (1968).

The site lies at the bottom of a box canyon that ascends from the Hualapai Valley in a NE direction to penetrate the Grand Wash Cliffs. An unimproved road parallels a narrow wash at the bottom of the canyon. The margins of this wash are dominated by mesquite *(Prosopis juliflora)* and catclaw *(Acacia greggi)* trees. The five large specimens (86-93 mm SVL) were collected from this association. Tree density diminishes on the adjacent gentle, gravelly slopes, and there are many small clearings dominated by snakeweed *(Gutierrezia sarothrae)*, annual grasses, and scattered *Opuntia* and *Cholla* cacti. Eleven of twelve smaller specimens (64-75 mm SVL) were collected from such clearings. This apparent ecological segregation may be seasonally based because of differences in the reproductive physiology of the two size classes (see Table 1). Upper slopes of the canyon are dominated by blackbrush *(Coleogyne ramosissima)* and include occasional juniper outliers from the woodland that occupies the plateau above. One or more springs emanate from the northwest slope. The presence of water has stimulated past human efforts to capture and divert this resource for human and livestock needs, and this activity has resulted in a locally disturbed habitat. *C. flagellicaudus* was the only species of the genus found at this site, although *C. tigris* was locally abundant at lower elevations in the contiguous Hualapai Valley.

Table 1. Reproductive data from the Clay Springs sample of *Cnemidophorus flagellicaudus*.

Specimen Size (SVL in mm)	Number of Yolked Follicles >3mm		Number of Oviductal Eggs	
	L	R	L	R
64	—	—	—	—
66	—	—	—	—
66	—	1	—	—
67	—	—	—	—
69	—	—	—	—
69	—	—	—	—
69	—	1	—	—
71	—	—	—	—
72	—	—	—	—
72	—	—	—	—
74	—	—	—	—
74	—	—	—	—
75	1	2	—	—
86	2	2	—	—
86	1	4	—	—
90	1	1	—	—
91	—	—	2	2
93	1	1	—	—

The Clay Springs sample provides important information related to this species:

1. The range for *C. flagellicaudus* is extended approximately 71 miles NW of the northern boundary previously described (Lowe and Wright, 1964) and mapped (Wright and Lowe, 1968; Behler and King, 1979).

2. The maximum body length is at least 93 mm, exceeding the previously reported maximum by 5 mm (Lowe and Wright, 1964).

3. The ranges of variation for four other taxonomic characters (GAB, FP, PV/GAB x 100, and IPS) are extended beyond values previously reported (Lowe and Wright, 1964).

4. An opportunity is provided for describing the ontogenetically transient color pattern of young adult individuals.

Statistical Comparisons. Data reductions for our sample are summarized in Table 2 along with those for previously reported *C. flagellicaudus* and *C. sonorae* samples. Character abbreviations used are:

GAB = number of dorsal granules around midbody. This count was standardized as per Wright (1966).

FP = number of femoral pores.

PV = number of dorsal granules separating paravertebral stripes.

PV/GAB x 100 = an average ratio of PV to GAB, expressed as a %.

IPS = ratio of interparietal scale width to length, expressed as a %. Measurements were made with an ocular micrometer and dissection microscope. Means for IPS for individuals >85mm (N=5) and for individuals <86 mm (N=11) were 72.7 and 73.3 respectively. Because of this close agreement, all individuals were treated as a single sample.

SVL = Snout-vent (body) length measured to the nearest mm with dial calipers.

Lowe and Wright (1964) alluded to intraspecific variation occurring within this species. This fact is illustrated in Table 2. The intraspecific differences in FP and GAB means for the two *flagellicaudus* samples are greater than the interspecific differences in FP and GAB between *C. flagellicaudus*[1] and the two samples of the superficially similar *C. sonorae*.

Color Pattern. Lowe and Wright (1964) described the color patterns of hatchlings and large adults of *C. flagellicaudus*, but the transient color pattern of individuals in the ontogenetic shift from unspotted hatchlings to spotted adults has not been reported. The following description refers to the color pattern, in life, of individuals 64-75 mm in SVL. A comparison is made with the color pattern characterizing the larger individuals (> 85 mm SVL) of our sample (see Figure 1).

Table 2. A comparison of quantitative characters of the Clay Springs sample of *Cnemidophorus flagellicaudus* with published values for other samples of this species and for *C. sonorae*. Data sequence is mean and (one standard error), (range of variation), and sample size. See text for abbreviations.

Species	GAB	FP	PV	PV/GAB x 100	IPS	SVL
C. flagellicaudus AZ, Mojave Co. Clay Springs	84.9 (0.69) (79-89) N=18	41.4 (0.31) (39-43) N=17	4.7 (0.21) (3-6) N=18	5.5% (3.6-7.1) N=18	72.7% (67.9-80.6) N=16	89.2 (86-93) N=5
C. flagellicaudus[1]	80.4 (0.38) (77-84) N=33	38.4 (0.28) (35-41) N=31	5.0 (0.19) (3-6) N=33	6.2% (3.84-7.59) N=33	64.7% (59.2-70.2) N=10	86.1 (83-88) N=10
C. sonorae[2]	77.4 (0.30) (74-80) N=31	35.9 (0.32) (32-39) N=28	5.6 (0.14) (5-8) N=30	7.2% (6.41-10.0) N=30	78.5% (65.9-95.5) N=10	80.8 (78-83) N=10
C. sonorae[3]	77.3 (0.47) (73-80) N=19	37.5 (0.59) (33-41) N=17	4.1 (0.27) (2-6) N=19	5.08% (0.33) (2.74-7.79) N=17	———	———

1 NM, Catron Co., Hot Springs area; data from Lowe and Wright (1964)
2 AZ, Santa Catalina Mountains area; data from Lowe and Wright (1964)
3 AZ, Pima Co., Huerfano Butte; data from Lowe, Wright, Cole, and Bezy (1970)

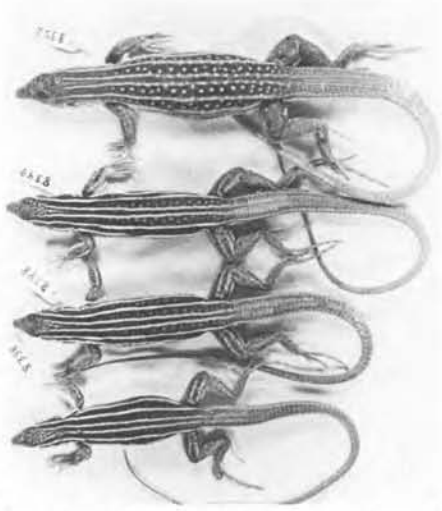


Figure 1. Dorsal view of representatives of *Cnemidophorus flagellicaudus*. Body lengths (SVL) from bottom-to-top are, respectively: 64, 74, 75, and 93 mm.

There are six stripes, and some individuals have a partial vertebral stripe on the nape. The stripes are pale yellow on the sides of the head and nape. The paravertebral stripes lose the yellow pigment and become light tan posteriorly; the dorsolaterals fade to white. The lateral stripes are white for their entire length, exclusive of the neck area. The paravertebral stripes have slightly irregular margins; the other stripe margins are straight, and all stripes are sharply defined. Middorsal, dorsolateral, and lateral darkfields are very dark brown. The flank darkfields are paler and a gray-brown shade. Indistinct, pale brown spots appear in the dorsolateral and lateral fields by the time a body length of 64 mm has been attained, but the middorsal and flank fields remain essentially unspotted throughout pattern ontogeny. Enhancement of pale spot definition begins at a body length of about 75 mm. The spots become relatively smaller, lighten to a pale tan shade, develop sharply defined margins, and contrast sharply with fields and stripes. This change occurs in a posterior-to-anterior direction. A further increase in body size is accompanied by reduction of stripe definition and the superimposition of pale spots on them. The stripes on the nape become pale chartreuse. Middorsal, dorsolateral, and lateral darkfields lighten to a medium brown shade, and the tail color changes from completely light brown to pale blue-green distally. The dorsal surface of each thigh is light gray-brown, with two irregular, tan stripes. The shank is gray-brown and mottled. These surfaces are uniformly pale brown in large individuals. The forearms have a dark brown dorsal surface, each bearing, posteriorly, a single longitudinal, pale brown stripe. This surface lightens in ontogeny, and the forearm stripe is not visible in large individuals. The ventral surface of all age groups is white and immaculate.

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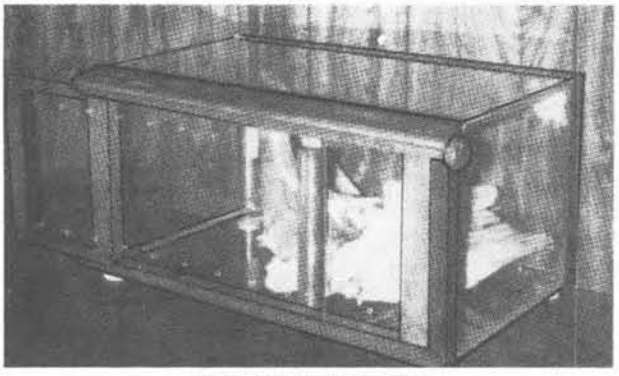
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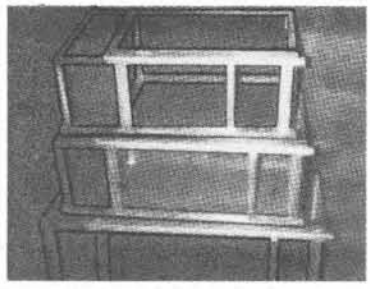
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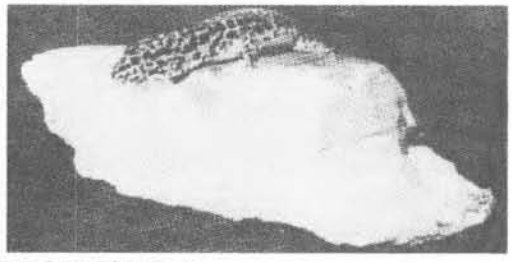
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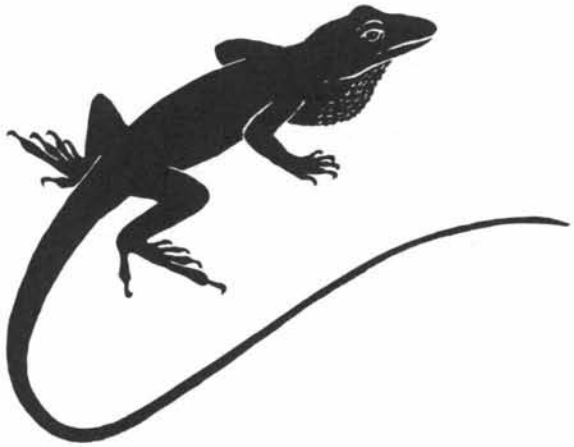
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The American Naturalist

PROPOSAL FOR A PHOTOGRAPHIC METHOD FOR SIZE ESTIMATES OF CROCODILIANS

Recently, Magnusson (1983) summarized the advantages and disadvantages of visual estimates of size of crocodilians. His experiments showed that inexperienced observers could not accurately estimate the lengths of pieces of cord whose sizes were comparable to those of crocodilian heads under field conditions. However, he did conclude that experienced observers are able to use a series of clues that enable fairly accurate size estimates to be made with some species.

If an observer can get close enough to a crocodilian to make a visual estimate of the length of a crocodilian's head, then they are close enough to take a photograph. An electronic flash at night does not appear to disturb wild crocodilians and a photograph of the head often gives definitive taxonomic data and features that may be measured accurately.

In four species examined for this report, increasing size is associated with a progressive lengthening of the snout in relation to the total head length (Fig. 1). *Crocodylus intermedius* measured were captive specimens, whereas the others were wild caught.

Given that the ratio of the snout length divided by the total head length of any one species is related directly to the total size of the individual, then a photograph of a crocodilian head (when taken at right angles to the head) can be used to calculate this ratio, and thus the size of an individual. Since it is a ratio, it is a figure that is somewhat independent of the distance at which the photograph was taken.

Preliminary results show that providing the photograph is taken at right angles to the head of the animal, then the ratio calculated from a 35mm colour slide projected onto a screen is the same as the ratio obtained by direct measurement. Deviations from 90° will distort the ratio measured on a photograph, but since an observer is invariably higher than the crocodilian head to be photographed,

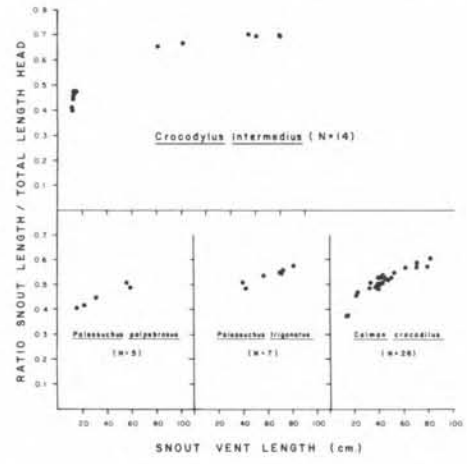


Figure 1. The Snout Length:Total Head Length Ratio as a function of the snout-vent length in four species of crocodilians.

and can thus usually see both of the eyes, the eye orbits may be used in the manner of rifle sights to orientate the observer to the required angle. When both eye orbits of the crocodilian are in line with the eye of the observer the head of the crocodilian is at a 90° angle, and therefore at the correct angle to be photographed. Adult crocodilians will often facilitate this by swimming broadside on to the observer. Failing this many individuals stay on the surface long enough for an observer, either on foot or in a boat, to move their position.

I have not attempted to fit curves to Fig. 1 because the data are incomplete, and ratios derived from photographs need to be compared with those derived from direct measurements. It can be seen from Fig. 1 that the ratio levels out when a snout-vent length of about 80 cm is reached. Thus, this technique has limited use for the adults of large species. These few data did not show any obvious differences between sexes of any one species. Webb and Messel (1978) have shown sexual dimorphism in *Crocodylus porosus* with regard to interocular width and the width of the head at the midpoint of the cranial platform, and Ayarzagüena (1980) has demonstrated that the eyes of female *Caiman crocodilus* are proportionally larger and more rounded than in the male. It may well be possible to detect such differences with photographs. I am initiating such a study, and am most interested in pooling my data with other crocodilian workers to see if calibration curves for the aforementioned species can be derived.

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EGG EXTRUSION AFTER BELLY PRESSING: A SIMPLE MEANS FOR THE DETERMINATION OF OVULATION IN THE SMOOTH NEWT

In a number of urodele amphibian species, females do not ovulate unless they have been inseminated (Humphrey, 1977; Tsutsui, 1931). In the roughskin newt *Taricha granulosa*, ovulation appears to be induced via a neuroendocrine reflex involving male courtship behavior, insemination and the hormone progesterone (Moore, McCormack and Swanson, 1979). This mechanism of induced ovulation can be seen as an adaptation that prevents the wastage of female parental effort resulting from oogenesis and premature ovulation in the absence of active spermatozoa.

During the course of an investigation of the breeding ecology of the smooth newt, *Triturus vulgaris*, a simple method was discovered which enables one to determine whether females have started to ovulate and, thus, have probably mated.

METHODS AND RESULTS

If a female smooth newt is held belly upwards and gentle pressure is exerted by rolling a finger along the belly in a snout-vent direction, up to 3 eggs, encapsulated in jelly coats, may be extruded from the cloaca. These eggs appear to be identical to those which females normally lay, wrapped individually in the leaves of aquatic plants.

Three experiments were conducted to determine if extruded eggs are indeed ovulated and fertilized eggs.

1. Fifty extruded eggs were collected from 21 females in the field. These eggs were brought back to the laboratory and maintained in plastic troughs containing aged tap water. Within 3 to 4 days, developing embryos were clearly visible in 37 (74%) eggs. None of these developed as far as hatching, due to a fungal infection.
2. Five females which extruded eggs in the field were maintained in the laboratory in individual troughs containing aged tap water and pieces of aquatic vegetation. Within 7 days, all of the females had laid eggs, and inspection of the clutches revealed them to contain developing embryos.
3. Female newts captured on land as they migrated to the water (N = 5) and captured in the water (N = 14) had their bellies pressed and were then preserved in formalin. Upon dissection, a check was made for the presence of eggs in the oviducts. None of the females captured on land extruded eggs when pressed and none contained oviducal eggs. This result is not surprising, as smooth newts court and oviposit in water. Seven of the aquatic females extruded eggs when pressed, all of them also containing oviducal eggs. Of the 7 aquatic females which did not extrude eggs, only 2 had eggs in their oviducts.

DISCUSSION

The data presented above strongly suggest that extruded eggs are fertilized and that egg extrusion after belly pressing is a reliable indicator of ovulation in the smooth newt. Failure to elicit egg extrusion usually, but not always, indicates the absence of ovulation. Such failure may result if a female has either not been inseminated, or if she has already laid her complement of yolked eggs.

The technique of belly pressing has obvious application for the field biologist requiring a simple, quick and reliable means for assessing the reproductive status of a female. It is currently being used to determine the proportion of a population of female smooth newts which are available for mating at any given time in the breeding season. Knowing this proportion, it is then possible to calculate the operational sex ratio of the population (see Emlen and Oring, 1977), for inseminated females tend to be unresponsive to further

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male courtship (Halliday and Verrell, in press). The usefulness of belly pressing in other urodele species is currently under investigation; preliminary results indicate that female crested newts (*T. cristatus*) and palmate newts (*T. helveticus*) will extrude eggs if their bellies are pressed.

I thank Verina Waights for her assistance in conducting the experiments and Tim Halliday for reviewing the manuscript. Financial support was provided by the Open University Research Committee.

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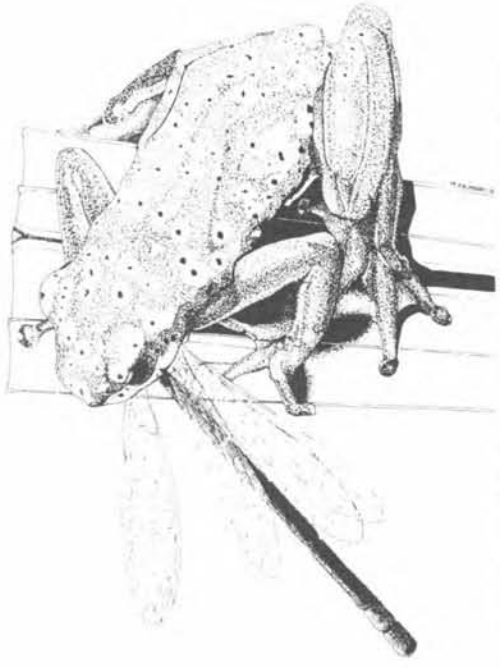
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AMPHIBIAN AND REPTILE BIOLOGY AT CORNELL UNIVERSITY

Cornell University has had a long tradition of research and training in herpetology, beginning most prominently with the work of Albert Hazen Wright, a member of the zoology faculty from 1908 to 1947. Wright had many distinguished students—among them Sherman C. Bishop, Raymond B. Cowles, James Kezer, Ch'eng-chao Liu and Karl P. Schmidt—and gained prominence from his studies on the life histories of frogs of the Ithaca area and those of the Okefenokee Swamp and from his handbooks of frogs and of snakes, both co-authored with his wife Anna. Indeed, it was largely through the Cornell expeditions to the Okefenokee from 1909 to 1922 by Wright and his students (including Bishop, W. D. Funkhouser and Francis Harper) and their extensive publications on the fauna and flora of this great swamp on the Georgia-Florida border that it was eventually set aside as a national wildlife refuge (in 1937). Wright was one of the pioneers in ecology, as recognized in 1955 by his election as Eminent Ecologist by the Ecological Society of America.

Earlier, Simon Henry Gage, who retired in 1908, conducted studies of respiration in turtles and amphibians but is also known for having worked out in detail the complex life cycle of the red-spotted newt (published in 1891). Gage co-founded Comstock Publishing Company in 1893, and later donated it to Cornell University Press. The well-known handbooks of American frogs (by the Wrights, published 1933), salamanders (by Bishop, 1943), lizards (by Hobart M. Smith, 1946), turtles (by Archie Carr, 1952), and snakes (by the Wrights, 1957) were issued under the Comstock imprint. Benjamin F. Kingsbury, Gage's successor, published extensive studies on amphibian anatomy including the gut, lateral line system, brain and the columella auris. Later still, Howard B. Adelmann, who had been an associate of Hans Spemann at Freiburg, conducted a long series of experimental studies on development of the eye, lens and mesoderm in salamanders.

Today, studies in herpetology at Cornell are no less active but are more widely dispersed in several academic units as a result of the reorganization of biology and the establishment of an intercollegiate Division of Biological Sciences in 1964. All of the biology units are located on the central campus, including the Sections of Ecology & Systematics and Neurobiology & Behavior which occupied two new research buildings there in 1982. We take this opportunity, therefore, to provide a brief review of current activities, including those of recent graduates.

RESEARCH

In the Department of Anatomy of the College of Veterinary Medicine Daniel Blackburn, a student of Howard E. Evans, is completing his Ph.D. dissertation on the evolution of viviparity and fetal nutritional specializations in reptiles and other vertebrates. Blackburn analyzed the selection pressures, preadaptations, and constraints affecting reproductive mode evolution. He also compared placentation and reproductive anatomy of some representative reptiles, including *Mabuya heathi*, a species that has evolved a suite of "eutherian" reproductive specializations. Earlier, Blackburn completed a masters thesis under Harvey Pough, on the comparative, functional, and evolutionary myology of sceloporine iguanid lizards. Howard Evans, who has published extensively on the anatomy of fishes, snakes and birds, has completed a revision of his chapter on reptile anatomy in "Zoo and Wild Animal Medicine," to be published shortly by W. B. Saunders Co.; included in the revision are illustrations and descriptions of the pelvic limbs and cloacal region of pythons. In the Department of Physiology of the same college Charles L. Guard is studying reptilian digestive physiology and recently completed a major review of the subject that was published by Cambridge University Press.

In the Section of Genetics and Development of the Division of Biological Sciences, several individuals in the laboratory of Antonie W. Blackler are studying gene regulation in *Xenopus* frogs. Blackler is engaged in a study of the control of rRNA synthesis at an abbreviated rRNA locus translocated to the end of a chromosome that does not normally carry it, and with Robin Tropper is engaged in a study

of nucleolar fusion in cells that carry the translocation in single and double copies. Sharon Camhi is using the fluorescent property of *X. borealis* chromosomes to examine the effects of cytoplasmic aging prior to fertilization. Michael Newstein is determining the gene copy number in the *X. laevis* translocation, and whether the translocated locus is active during oocyte gene amplification. Other projects in Blackler's lab concern allelic exclusion at the "*albino*" locus in *borealis*/*laevis* hybrids and determination of the distribution of sex-determining loci in the *Xenopus* genome.

In the Section of Ecology & Systematics, Harvey Pough's research interests center on ecological energetics. He is continuing work on simultaneous changes in physiology, morphology, and behavior during the post-metamorphic ontogeny of anurans. Suzanne Kamel, after completing a master's degree with Robert Gatten at the University of North Carolina at Greensboro, spent the summer of 1983 at Cornell working with Pough in these studies. Kamel has now begun doctoral study with Martin Feder at the University of Chicago. Robin Andrews, from Virginia Polytechnic Institute and State University, is spending her sabbatical leave as a Visiting Professor at Cornell in 1984. Pough and Andrews are engaged in studies of lizard energetics, especially the energy costs of feeding. Gatten and also Kirk Miller of Franklin and Marshall College will spend portions of their sabbaticals in Pough's lab in 1984-85. Pough and Margaret M. Stewart from SUNY at Albany, and their students, have collaborated since 1979 in a study of the Puerto Rican coquí, *Eleutherodactylus coqui*. Among other results, they have found that the density of populations of coquíes in the forest at El Verde depends upon the availability of daytime retreat sites. The coquíes have complex water-conserving behaviors they employ during their nightly periods of activity. Frogs that are prevented from exerting this behavioral control over evaporative water loss may become lethally dehydrated during a night, whereas free-ranging frogs experience negligible water loss. The frogs' hydroregulatory behaviors interact with other activities like feeding and calling in a manner analogous to the thermoregulatory behavior of lizards. Coquíes have been shown to have internal fertilization, and the eggs are brooded by the male. Predation by other male coquíes is a major source of egg mortality, and a brooding male defends his eggs against these incursions. The attending male also provides water to the eggs, which triple their mass during development. Eggs that do not absorb sufficient water during development are unable to use all the yolk, and produce smaller than normal hatchlings. Alan de Queiroz is a new graduate student in Pough's laboratory. His interests center on behavioral ecology, and he has been attempting to quantify aspects of prey-handling behavior of snakes and lizards.

Theodore Taigen completed a doctorate in Pough's lab in 1981 with a series of studies of the relationship between exercise physiology and behavior of anurans. In collaboration with Pough and with Sharon Emerson from the Field Museum of Natural History, Taigen found a close correlation between aerobic capacity for exercise and the foraging mode used by a phylogenetically and ecologically diverse group of anurans. Subsequently, in collaboration with Pough, he extended these analyses to field studies of time budgets of frogs in Panama and Puerto Rico. Taigen is now an assistant professor at the University of Connecticut. In conjunction with Kentwood Wells, who obtained his doctorate in Pough's lab in 1976, Taigen has begun measurements of the energetic cost of anuran vocalizations. Carol Beuchat finished her doctorate in Pough's laboratory in 1982 with a study of the ecological and physiological consequences of viviparity for *Sceloporus jarrovi*. She found that pregnant female lizards thermoregulated at lower body temperatures than males or post-parturient females. Pregnant female lizards had higher metabolic rates than non-pregnant lizards, and oxygen consumption during parturition increased to four to six times resting values. In conjunction with Steven Ellner, a graduate student in applied math at Cornell, Beuchat developed a general model for the costs and benefits of thermoregulatory behavior. Currently Beuchat is continuing postdoctoral work with Eldon Braun and David Vleck at the University of Arizona. Ellen and Robert Dawley will join Ecology & Systematics next fall, sharing the position of instructor in "The Vertebrates" course. Ellen is finishing her doctorate with Wells studying olfactory communication in salamanders.

The Cornell Laboratory for Ecological and Evolutionary Genetics, housed at Langmuir Laboratory, is engaged in electrophoretic studies of evolution by gene duplication of polyploid fish, amphibians and other organisms. Ellen Marsden, a student of Peter Brussard, is working with the tetraploid *Hyla versicolor* and its diploid counterpart *H. chrysoscelis* as well as species from the polyploid lineage *Xenopus*.

Alan H. Savitzky taught at Cornell from 1978 to 1982, both for Ecology & Systematics and for Neurobiology & Behavior, and was for several years in charge of the laboratories for "The Vertebrates" course. Savitzky, now assistant professor of biology at Old Dominion University in Virginia, is continuing his studies of snake functional morphology and systematics. In particular, he is studying the parallel evolution of specialized feeding and defensive structures, including venom delivery systems and morphological correlates of aquatic foraging.

In the Section of Neurobiology & Behavior there are several students and faculty working with amphibians and reptiles. Joanne Ballarino, a student of Howard C. Howland, is studying the formation of otoconial crystals in the otolithic organs of vertebrates. Reptiles are the key phylogenetic group in this comparative study since they produce both aragonite and calcite crystals, typical of amphibians and of birds and mammals, respectively. Leo J. Fleishman, another of Howland's students, is studying visual communication in *Anolis* lizards. His particular interest is perception of motion, how they discriminate important (e.g., prey, predators, displays of conspecifics) from less relevant motion such as windblown vegetation. Fleishman's field work is done at the Smithsonian Tropical Research Institute in Panama. Paul Watson, a student of Stephen T. Emlen and Paul W. Sherman, is investigating the reproductive biology of the newt. In particular, he is studying the fall reproductive period, especially the significance of male pheromones for intersexual selection and coordination of mating. He is presently attempting to purify and chemically characterize the pheromones.

Students in the laboratory of Robert R. Capranica are studying various aspects of communication in frogs. Harold Zakon completed a dissertation on the anatomy and electrophysiology of regeneration of the eighth cranial nerve in *Bufo* and *Rana*. After transection, the auditory nerve fibers regenerate with a remarkable precision to reestablish their exact same synaptic terminals in the central auditory system. Walter Wilczynski, a postdoctoral fellow in Capranica's laboratory, completed anatomical and electrophysiological studies on sound localization in anurans. He discovered that sound reaches the inner ear in two ways (via the tympanum and also a separate extratympanic route) that interact to permit directional sensitivity. Both Zakon and Wilczynski are now assistant professors of zoology at the University of Texas at Austin. David Yager, a current student, is conducting studies of sound production and communication in *Xenopus*. He found that the larynx comprises about one-quarter of their body size and that their mating calls are produced by an unique mechanism involving "implosion" in the larynx. Presently he is studying call discrimination among hybrids and their parental species. Gary Rose, now on a postdoctoral at University of California, San Diego, completed a dissertation on temporal processing in the auditory system of frogs, in particular the way in which amplitude-modulated (AM) calls are transformed when being passed from peripheral to central auditory systems. The central neurons are tuned to preferred rates of AM in a species-specific way. Andrea Megela, now assistant professor of biology at Brown University, performed electrophysiological and behavioral studies of species of *Rana* and *Hyla* in which adaptation rates of auditory nerve fibers range from phasic "on" units to tonic patterns. The results suggest that rapidly adapting fibers play an important role in sound localization. Robert Capranica is currently involved in a project on accuracy of female phonotaxis and their ability to discriminate the male calls against a complex acoustic background. Field studies are being conducted in South Africa with *Hyperolius* and *Kassina*, and his electrophysiological studies in the laboratory deal with neural encoding of frequency-modulated (FM) calls in the peripheral and central auditory systems. Two-choice female phonotaxis trials verify that the direction, rate and frequency range of modulation are critical cues in species recognition.

Also in the Section of Neurobiology & Behavior, students in Kraig Adler's group are studying various aspects of orientation behavior, sensory physiology and social behavior. Michael J. Ryan completed his thesis on sexual selection and communication in the neotropical frog *Physalaemus pustulosus;* the thesis will soon be published in book form by University of Chicago Press. Ryan found

that the call components serve different functions: the "whine" is involved in species recognition while the "chuck" provides information used in mate choice by females, who choose the largest males by discriminating the fundamental frequencies of the chuck component. At the Smithsonian station in Panama, he has also worked collaboratively with A. Stanley Rand on *Physalaemus* biology and with Merlin D. Tuttle on the frog-eating bat *Trachops*. Ryan is presently a Miller Fellow at University of California, Berkeley, and in September will become assistant professor of zoology at the University of Texas, Austin. Gordon H. Rodda finished a dissertation on orientation and navigation in alligators, research in which he used resighting, radiotracking and arena-testing techniques. Juveniles homed accurately, with no evidence for random searching, although habitat barriers deflected their homeward paths. Older juveniles tested in distant arenas were highly oriented toward home and errors in their headings were correlated to natural variation in the dip angle of the earth's magnetic field; significantly, the errors were correlated with magnetic values only within 20 min. of testing time, suggesting that dip angle may provide one component of an hypothesized bicoordinate map sense. Rodda just completed a Smithsonian postdoctoral project in Venezuela on iguana social behavior and is now assistant professor of psychology at University of Tennessee. Bruce Waldman, presently a postdoctoral fellow at Cambridge University, finished a dissertation on kin recognition and sibling association in anurans. He found that *Bufo americanus* tadpoles chose to associate with siblings, preferring full-siblings over paternal, but not maternal half-siblings. Recognition was not dependent upon prior experience with siblings since the preference occurred even when embryos were allowed to hatch in isolation, but early postembryonic interactions can alter their recognition template. Comparative studies on *Rana sylvatica* tadpoles also revealed sibling preferences but other aspects were significantly different. In September 1984 Waldman will join Harvard University as assistant professor of biology.

Among Adler's current students and associates, John B. Phillips is studying the ability of newts to use magnetic cues for orientation and navigation. Phillips has shown that magnetic cues can be used as a compass and is currently determining whether newts have an axial or polar compass mechanism. In other studies, partly in collaboration with Adler, Phillips is investigating the possibility that newts, which are unusually sensitive to the earth's magnetic field, may utilize magnetic cues also as a map, studies involving both correlational analyses and direct experimental tests. In Fall 1984 Phillips will begin a postdoctoral fellowship in neurophysiology at Yale University to study sensory aspects of orientation. John D. Crawford is presently studying the use of skylight polarization cues for orientation, both in frogs and lizards. He is researching the role of the lizard parietal eye as a polarization analyzer, using single-unit electrophysiological techniques. In addition, he is examining the importance of individuality in frog orientation. Douglas Brust, an undergraduate honors student working under Adler's supervision, is finishing a study of thermoregulatory behavior in iguanas, a field study begun in Venezuela in 1982. Brust will begin his doctoral work with Vleck at the University of Arizona next fall. Robert Madden, professor at Marymount College in Tarrytown, New York, regularly comes to Cornell each summer to conduct his on-going studies of orientation in *Chrysemys picta*. He has developed a simple test arena, one that can be easily transported to critical sites and in which the turtles exhibit consistent orientation. Kraig Adler is exploring several aspects of the orientation behavior of amphibians and reptiles. Recently he completed a study, using a portable apparatus that shifts the magnetic field, showing that newts do not monitor the magnetic field during displacement; the complementary experiments are now underway to test for the use of magnetic cues only at the time of release. Another of his projects involves the use of polarization cues by the desert lizard *Uma notata*. He has shown that they can orient to polarized light patterns and do so in a time-compensated manner; currently he is studying the possible role of the parietal eye as the critical analyzer. A list of available reprints of papers by the Adler group can be obtained on request.

TEACHING

An introductory course, "The Vertebrates," forms the basis of the undergraduate curriculum in vertebrate biology. The textbook *Vertebrate Life* by William McFarland, Harvey Pough, Tom Cade and John Heiser had its origin in that course. After "The Vertebrates," undergraduates can take courses in mammalogy, ornithology, ichthyology, or herpetology. The "Herpetology" course, offered in the fall term in alternate years, is taught by Harvey Pough and enrolls about 25 students. Extensive teaching collections, housed in Stimson Hall, are used for the vertebrate biology courses, and Ithaca's location in the Finger Lakes region of upstate New York allows field trips to a variety of habitats near campus.

Reptiles are being treated in increasing numbers at the Small Animal Clinic of the Veterinary College, and interest in reptile and amphibian medicine continues to grow among Cornell's veterinary students. For each of the past few years, the student chapter of the American Association of Zoo Veterinarians has organized a herpetological seminar series on taxonomy, captive raising, and clinical methods. In recognition of the expanding need for professionals with expertise in the area, the American Veterinary Medical Association will soon recognize Zoo Animal Medicine as a certified board specialty.

There is also an active student zoology club, "Jordani," that sponsors a monthly lecture and film series, field trips and other programs. The club is named for David Starr Jordan, the famed ichthyologist who occasionally published in herpetology and authored the *Manual of the Vertebrates*, mainstay of vertebrate biology courses in America for several decades at the turn of the century. Jordan graduated from Cornell in 1872, the only person in the university's history to receive a masters degree upon completion of an undergraduate course of study!

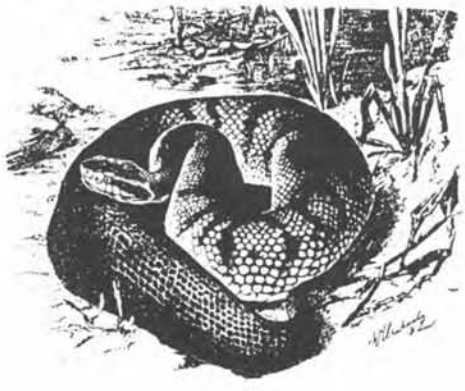
COLLECTIONS

The Vertebrate Collections are administered by the Section of Ecology & Systematics. The fish collection is largest, with about 1,000,000 specimens; the bird and mammal collections total about 53,000 specimens. The herpetology collection, with a total 30,000 specimens, was organized by A. H. Wright; the first catalog entry is dated January 10, 1922. Wright's specimens from the eastern United States, particularly from the Okefenokee Swamp, comprised the majority of the initial holdings. During his term as curator, Harvey Pough added 6,000 specimens, concentrating on material from outside North America. As a result of his efforts, there are significant holdings from Costa Rica, Puerto Rico, and Australia. Requests for loans should be addressed to the present curator, Amy R. McCune at the Section of Ecology & Systematics, Corson Hall.

At the Laboratory of Ornithology there exists an extensive collection of tape-recorded sounds of vertebrates, the Library of Natural Sounds, curated by James L. Gulledge. The library was begun in the early 1930s by two Cornell professors, Arthur A. Allen and Peter Paul Kellogg, who performed the first high-speed flash photography as well as acoustic recordings of frogs. This work resulted in the classic phonograph record "Voices of the Night," originally issued in a 78 RPM version in 1947 and republished by the Laboratory in 1982 in a completely revised 33-1/3 RPM edition. The herpetological tape collection at the Laboratory presently contains about 235 individual recordings of some 60 taxa, primarily frogs, toads, and crocodilians, worldwide in distribution. There are a large number of additional recordings in the unedited collection (mostly neotropical), and the collection is being actively enlarged for research purposes.

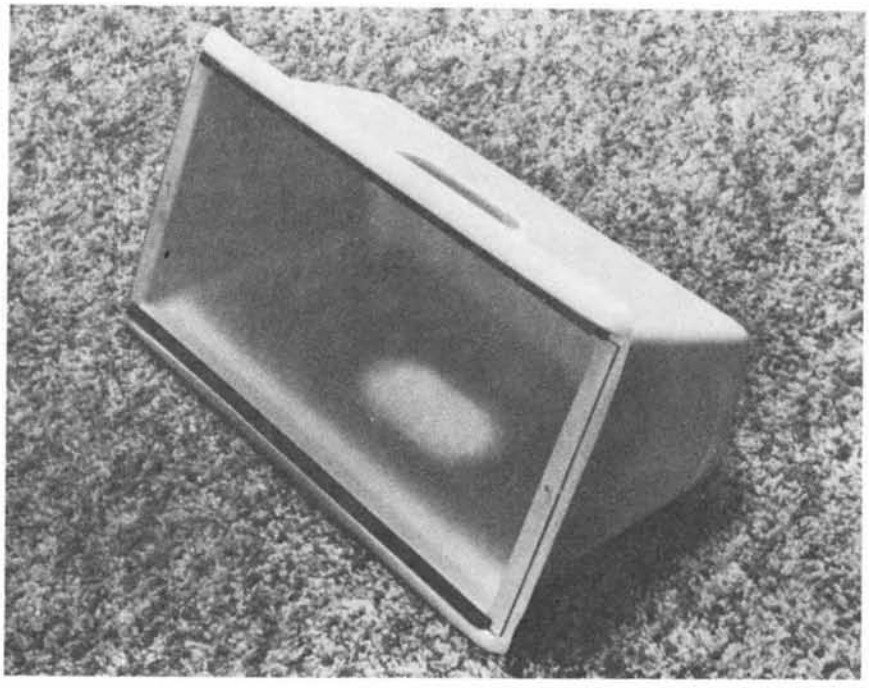
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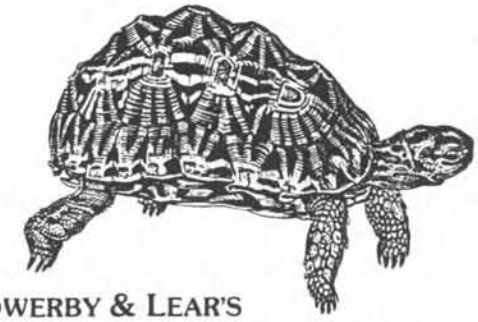
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This book is generally regarded as the finest atlas of turtle illustrations ever produced, drawn by the famous nineteenth century artists James de Carle Sowerby and Edward Lear. The short text is by John Edward Gray. Originally published in London in 1872, the book was reprinted by the Society for the Study of Amphibians and Reptiles in 1970 but this edition was sold out some years ago. The reprint includes an extensive introduction by Ernest E. Williams, of Harvard University, detailing the history of the book and its authors and artists, and equating the scientific names to current nomenclature.

The atlas includes 61 black-and-white plates of turtles, depicting species from all parts of the world. The book measures 8½ by 11 inches (about 22 by 28 cm) and is clothbound. Copies can be purchased for $20.00 from the SSAR Publications Secretary, Douglas H. Taylor, Department of Zoology, Miami University, Oxford, Ohio 45056, U.S.A. The price includes postage in the U.S.A.; only the *additional* surface mailing costs will be charged for non-U.S.A. shipments. Payments from overseas should be made in U.S.A. funds, by International Money Order, or may be charged to MasterCard or VISA (include account number and expiration date of credit card).

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BOOK REVIEWS

Amphibians and Reptiles of the Pacific Northwest, by Ronald A. Nussbaum, Edmund D. Brodie, Jr. and Robert M. Storm. 1983. 332 pages. The University Press of Idaho. ISBN 0-89301-086-3.

The authors' stated aim is to provide a concise guide to identification of the species of amphibians and reptiles that occur in the Pacific Northwest. In this they have succeeded well. The geographic scope is Oregon, Washington, Idaho and British Columbia; 62 species (18 salamanders, 14 frogs, 2 turtles, 11 lizards and 17 snakes) of 37 genera and 17 families comprise the fauna. Species accounts, following a standard format, include: common name, scientific name and authority, photograph of the live animal, paragraph of general remarks (mostly recognition characters) and brief sections headed Habitat, Variation, Life History, Remarks (for some species), and References. There are introductory chapters entitled Introduction, Collecting and observing amphibians and reptiles, Composition and origin of the herpetofauna, Herpetology and Nomenclature. There is a brief description of each class, order, family and genus. There is an illustrated key to the salamanders, and for the frogs there are separate keys, one, illustrated by photographs, for metamorphosed forms, and the second, for tadpoles, illustrated by diagrammatic drawings. Each of the 62 species is illustrated at least once with a photograph; some are shown two or more times, in both color and black and white. For *Dicamptodon ensatus* for instance, the four photographs of a color plate show, respectively, a large adult, an adult in defensive posture, an albino larva, and a female guarding eggs, while a black and white photo accompanying the species account compares a larva with one of the less robust *Dicamptodon copei* from the same locality. The black and white photographs are of page width, are all originals of high quality, and all serve well to illustrate the general characters and aspect of the animal illustrated. Some serve also to illustrate aspects of behavior, habitat or life history.

Although all groups are competently dealt with, the authors are perhaps at their best in the accounts of salamanders and frogs. Three examples, the Pacific Giant Salamander *(Dicamptodon ensatus),* the Tailed Frog *(Ascaphus truei),* and Mary's Peak Salamander *(Plethodon gordoni)* must suffice to cite a few of the many interesting facts summarized in each species account. *D. ensatus* reaches a maximum length of 351 mm as a paedogenic larva. It varies geographically in voice (described as a rattling or growling sound), in defensive posture and behavior, and in the tendency to metamorphose or to remain a permanent larva. Terrestrial adults may feed upon small snakes, shrews, mice and salamanders, but invertebrates probably make up most of their food. The female guards the nest in a submerged and concealed chamber until the eggs hatch, a period as long as 200 days. The usual larval period is 18 to 24 months. *A. truei* is voiceless, mates in early Fall, underwater, with internal fertilization, sperm remaining viable in the oviducts for 10 months until oviposition. Usual clutch is only 44 to 75 eggs and females produce only in alternate years. Larval development lasts two or three years; young metamorphose August-September. *P. gordoni* may be only an unstriped morph of *P. dunni,* as the two occur in microsympatry, are similar biochemically. However, *P. gordoni* is slightly smaller, has an average of one less costal groove, a narrower head and longer legs.

The distribution maps show a surprising abundance and scattering of locality records, attesting to the rapid progress of herpetology in the Northwest in the 40 years since this reviewer's field work in the area. Some hasty approximate counts show the following numbers of locality records. For *Thamnophis elegans,* 138 in Oregon, 120 in Idaho, 94 in Washington, 70 in British Columbia; for *Elgaria coerulea* 95 in Oregon, 79 in Washington, 51 in British Columbia, 7 in Idaho; for *Ascaphus truei* 64 in Idaho, 52 in Washington, 42 in Oregon, 19 in British Columbia; for *Masticophis taeniatus* 31 in Oregon, 21 in Idaho, 8 in Washington.

For the distribution maps outline maps of two kinds were used. Those with Oregon, Washington and Idaho each occupy an entire page; those with these same three states and also British Columbia, used for the more northern species, are shown on a more reduced scale and occupy about 3/4 page. In each case the actual species range may occupy only a small part of the map, resulting in much wasted space that could have been used for text. Overall species ranges are not shown, and uninitiated readers will not know whether ranges stop at the Oregon and Idaho

boundaries or extend beyond, although this could have been shown with no loss of space.

Much significant new information is contributed for many of the species. The authors do well in distinguishing between their own original records and those from publications, and between published literature from the Northwest and that from other regions which might not apply in the Northwest. Few errors were noted. For *Crotalus viridis* varying litter sizes are reported for the subspecies *viridis, lutosus* and *oreganus;* for the latter the alleged "3 to 5" young per litter seems much too low in view of Klauber's (1956. Rattlesnakes, their habits, life histories... Univ. California Press) findings. For 79 *oreganus* litters that Klauber listed, mean was 6.6 (1-14). Likewise, for *Cnemidophorus tigris* the authors state that females from more southern areas, outside the Northwest, produce larger clutches (compared with the 2.65 mean of southern Idaho) with as many as eight eggs per clutch. Actually, the highest mean clutch size reported for a population of *C. tigris* is 4.1 (Goldberg, 1976, Copeia:260-266) for a montane population, and other samples from the southern half of the range average less than 2.5.

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Amphibians and Reptiles of New England: Habitats and Natural History, by Richard M. DeGraff and Deborah D. Rudis. Illustrated by Abigail Rorer. University of Massachusetts Press, Amherst. 1983, 112 pp., 6 black-and-white photos, 56 drawings, 57 maps. $14.00 cloth, $6.95 paper.

In the first comprehensive survey of the New England herpetofauna in a very long time, the authors have undertaken the considerable task of synthesizing nearly 70 years of literature and documenting the distribution of 56 taxa. The book is intended for use by the scientific community, although it also will be interesting to amateurs.

The text is introduced by sections on the history of herpetological investigations, habitats present, and population status of rare species. The species accounts that follow discuss abundance, habitat use, breeding biology, home range, and food. Accompanying maps illustrate general distributions and denote county records with dots. There is a wildlife management emphasis to much of the book, which reflects the conservation background of the authors. I find this orientation timely, particularly in light of the recent emphasis by many state agencies on nongame wildlife programs.

Despite this useful perspective, the book is weak in aspects of its systematic and ecological coverage. I feel that one of the principal functions of a regional work is to document morphological characteristics of local populations. Yet, no original measurements were made, and there is little discussion of regional color patterns. The weak patterning of northeastern *Scaphiopus holbrookii* compared to southern individuals should have been documented, for example. Moreover, descriptions of habitats sometimes emphasize vegetation features that are of questionable importance to reptiles and amphibians. The heavy reliance on personal communications tends to promote this incomplete view of habitat use, and it results in habitat specificity being implied when it is not really present. For example, it is unlikely that old fields are a "special" habitat requirement of *Terrapene carolina*, or that *Crotalus horridus* is restricted to forests with high rodent density. Rodent density undergoes dramatic temporal fluctuation, and in any event current *Crotalus* distribution is more closely tied to recent historial factors (e.g. eradication campaigns). Statements about the important role of herptiles in insect and rodent control (p. 10) also seem a bit sweeping, particularly considering recent studies that suggest resource superabundance in the northeast.

Concerning evolutionary topics, the discussion of speciation in Ambystomid salamanders is unfortunately worded to sound as if reproductive isolation was caused *by* glaciation rather than having developed *during* glaciation. Furthermore, hybridization between *Bufo americanus* and *B. woodhousii fowleri*, so frequent on Cape Cod and in coastal Connecticut, is not discussed at all. A recent MS thesis completed at the University of Connecticut provides additional data on intergradation between *Chrysemys p. picta* and *C. p. marginata*.

The distributional data presented, although by far the best in print, suffers from an incomplete review of collections. Several major New England collections, including those at the Yale Peabody Museum (YPM) and University of Connecticut (UCM), were apparently not examined. Notable omissions were those of Connecticut specimens of *Ambystoma tigrinum* (YPM) and *Trionyx spiniferus* (UCM). Some UCM leopard frogs also appear to be *Rana utricularia* rather than *pipiens*. In addition, Cope's classic *Batrachia of North America* (1889; U.S. Nat. Mus. Bull. 34), with its wealth of New England data, was not consulted.

I found most comments on abundance reasonable. However, the uncommonness of *Thamnophis sauritus* is overrated; it is regularly found in marshes. Recent discoveries of some large *Ambystoma* cf. *laterale* populations also suggest that members of the *jeffersonianum* complex may be more common than previously thought. Additionally, further discussion of the extent of the rarity of *Eumeces fasciatus* and *Scaphiopus holbrookii* would have been interesting. Many feel that both these species are well on the way to extinction in New England. Finally, the tabular listing of *Desmognathus ochrophaeus* as rare in Connecticut (p. 8) is apparently a typographical error.

Even with the several shortcomings of the text, the authors are to be commended for their substantial compilation. They have summarized a great deal of regional literature and have included many original observations. Readers will find the comments section of the species accounts particularly enlightening. Individuals interested in the northeastern herpetofauna will find this a useful volume.

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Dorsal Ventricular Ridge. A Treatise on Forebrain Organization in Reptiles and Birds, by P. S. Ulinski. 1983. 284p illus. John Wiley and Sons. $39.95

The dorsal ventricular ridge is a forebrain structure characteristic of the brains of reptiles and birds. It forms the lateral walls of the telencephalon and protrudes into the lateral ventricle. Functionally, the DVR forms a linkage between principle sources of sensory information to the telencephalon, i.e., from various receptors to structures in the brain that modulate behavior. An overall understanding of the uses of sensory information in modulating vertebrate behavior must rest ultimately in detailed accounts of each of the major variants of telencephalic structure and function, including DVR in the case of reptiles and birds. This important contribution should be of significant value to neuroethologists.

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Their Blood Runs Cold: Adventures with Reptiles and Amphibians, by Whit Gibbons. The University of Alabama Press, P.O. Box 2877, University, Alabama 35486, 158 pp., 1983. $19.75 cloth, $9.95 paper.

I can't remember when I enjoyed reading a book as much as I did **Their Blood Runs Cold.** Whit Gibbons has interspersed science with wit, in a masterful way. The science is correct and aimed for the layperson, but don't buy the book for the science - buy it for the great stories of herpetologists in action. In this small volume Whit portrays the professional herpetologist as a scientist using his training to understand the natural history and evolution of this group of animals that few people understand and most people loathe. He also lays bare the trait found in so many field biologists (especially herpetologists) - the retention of the enthusiasm and a little of the craziness found in a group of teenage herpers on their first big snake hunt.

If you have ever crawled in the mud to collect a salamander; fallen into a pond going after a frog; suffered the indignities of backing into cactus collecting lizards; or been frightened nigh to death by a venomous snake, this book will speak to you. I made the mistake of trying to read it in my office and soon was surrounded by colleagues and students demanding to know why I was laughing uncontrollably.

Buy the book to read about Whit's "capture" of an eight-foot alligator that terrorized the staff of the Savannah River Ecology Laboratory. I would like to see Whit write a TV series of herpetological adventures and misadventures in the style of his gator story. I recommend **Their Blood Runs Cold** to all herpetologists, amateur or professional: if

you don't like this book turn in your snake-stick and potato-rake!

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Catalogue of New World Amphibians, by Keith A. Harding. 1983. Pergamon Press. 406 pages. $80.00.

Most biologists fail to be aware of how rapidly new taxa are being found or of the number of systematic changes proposed for the highly diverse neotropical fauna. Biologists of every stripe require some readily available checklist in order to exploit organic diversity. The previous catalogues of American amphibians are badly out of date and out of print: Boulenger's two catalogues of amphibians were published in 1882, essentially at the beginning of his forty year dominance of herpetology. Persons needing information on organic diversity have had to make do with works of more limited coverage augmented with difficult searches through an ever-increasing sea of new literature. Harding's new book will satisfy a serious need.

The book is attractive and the binding sturdy enough for rough use by this reviewer. The pages are printed by offset of an original typescript but are attractive and easily read. The type is not overly small but varies only in that species names are italicized lower case whereas generic names are all italicized capitals and family group names are roman capitals. Major headings (order and chapter titles) are in yet larger type.

Harding's book consists of five parts. Section 1 (pp. 1-197) is a checklist of the American amphibians arranged alphabetically within families. Families and orders are arranged phylogenetically (see below). For each species and subspecies, the original usage is given as well as page reference to the description or proposal, the type-locality, and a limited statement of distribution (the country or countries in which the form has been reported). Harding includes countries into which the species was introduced (if the form is native to the Americas) without indicating that such distributions are introductions. Curiously, he does not report *Xenopus laevis* for the USA even though the species is established in California nor *Rana rugosa* for the Hawaiian Islands (except in the last case, in the geographic list). Such would be logical extensions of his reporting of various West Indian *Eleutherodactylus* from non-native areas, of *Bufo marinus* from the Old World, or of *Rana catesbeiana* and *Dendrobates auratus* from the Hawaiian Islands.

Section 2 (pp. 201-247) consists of geographic lists of species for each political unit (countries and islands). These lists were apparently generated by computer sorting—if the country occurs in the list of countries for the species' distribution, the species is listed in the geographic lists—and augmented by reports of the fauna of geographic areas (cited as 'Identification' following each geographic list; such references are intended to direct users of the Catalogue to keys which would aid in identifying specimens).

The third part (pp. 251-286) provides access to names now considered synonyms of other names. Harding's "Alphabetical Synonymy" is arranged alphabetically (within each order) by synonymous trivial name. All take the following form: "*hidalgoi, Cystignathus* Jiménez de la Espada 1875 = *Batrachyla taeniatus (sic)* Cei 1980." The original form of the name, its author and date, the name as used in the Catalogue, and the author and date who Harding follows (he frequently uses regional synopses or recent works rather than the reference wherein the synonymy or new combination was first proposed).

The fourth part (pp. 289-345) consists of full references to all works cited in the text (original descriptions, proposals of synonymies and new combinations, and identification guides). Unfortunately, not all the information contained in those references found its way into Harding's catalogue (e.g., Savage, 1974, is cited with regard to naming *Eleutherodactylus andi* but was apparently ignored in dealing with some of the synonyms of *E. fitzingeri* (i.e., *Hyla grisea, Hylodes palmatus,* and *Hylodes nubilis,* two of which are reported by Harding as recognized species of *Eleutherodactylus, nubilis* and *palmatus*) and its distribution (also found in Nicaragua).

The fifth part (pp. 349-406) consists of author and subject indices.

Although the book contains a few 1982 references, one cannot decide how trustworthy the literature search might have been. Harding provides no statement as to when he ceased to add to the manuscript aside from the date of 'October, 1982' in the Preface. I confess to being eclectic in my analysis of completeness but discovered a number of 'missed' references in the period 1980-1982 and relatively few prior to that. I view his catalogue as satisfactorily complete prior to 1980 but as uneven from 1980 to present.

In order to monitor completeness, I carefully sampled *Eleutherodactylus.* The genus *Eleutherodactylus* is the largest vertebrate genus and exclusively neotropical. In addition to its size, it is perhaps the most complex and interesting herpetological element in the Americas. Harding listed 387 species. I did not expect to encounter the six species of the genus named or one resurrected *(E. stejnegerianus)* in 1983, but the following named (date in parentheses) and recognized species are missing: *E. boulengeri* (1981), *E. brevifrons* (1981), *E. colostichos* (1982), *E. cuaquero* (1980), *E. grandoculis* (1904), *E. lineatus* (1879), *E. mimus* (1955), and *E. ruizi* (1981). Harding recognized the following taxa although each has been considered a synonym (synonym and date of proposal of synonymy in parentheses: *E. bufonoides (E. spatulatus,* 1970), *E. lineatissimus (E. mexicanus,* 1970), *E. nubilis (E. fitzingeri,* 1974), *E. oaxacae (E. mexicanus,* 1970), and *E. palmatus (E. fitzingeri,* 1974). For unknown reasons, he placed *Hylodes orientalis* Philippi, 1902, in *Eleutherodactylus* (for the first time), creating a secondary homonymy with *E. atkinsi orientalis.* I noted the following spelling errors: *bolbodactyla* for *bolbodactylus, crassidigitatus* for *crassidigitus, erythropleura* for *erythropleurus, lactea* for *lacteus, nigrogrisea* for *nigrogriseus, punctariola* for *punctariolus,* and *ricordi* for *ricordii* (such minor errors, disagreements in gender, pepper the book). Harding missed the synonymy of *Amblyphrynus* with *Eleutherodactylus* and the transfer of *Leptodactylus mantipus* to *Eleutherodactylus.*

The distributions given (countries only) contain several errors—*E. aaptus* (also Colombia), *E. buckleyi* (also Colombia), *E. cerasinus* (also Nicaragua), *E. chloronotus* (also Colombia), *E. conspicillatus* (not including Bolivia), *E. diastema* (also Ecuador), *E. elassodiscus* (also Colombia), *E. fitzingeri* (also Nicaragua), *E. glaucus* (not Guatemala), *E. gollmeri* (also Honduras, Nicaragua, Panama), *E. greggi* (also Mexico), *E. latidiscus* (excluding Panama), *E. leucopus* (also Colombia), *E. lymani* (excluding Brasil, Colombia), *E. matudai* (also Guatemala), *E. melanostictus* (also Panama), *E. nigrovittatus* (also Brasil), *E. noblei* (also Panama), *E. pseudoacuminatus* (also Colombia), *E. pygmaeus* (also Guatemala), *E. rubicundus* (occurs in Ecuador, not 'unknown'), *E. taurus* (also Panama), *E. terraebolivaris* (excluding Brasil, Colombia), *E. thymelensis* (also Colombia), *E. unistrigatus* (also Colombia), and *E. urichi* (excluding French Guiana). These errors are unfortunate inasmuch as the author views the geographic indices as "a distinct approach" presumably improving this document over the forthcoming World Checklist of the Association of Systematics Collections. Most of these omissions and errors can be retrieved from the references cited by Harding.

I am aware of 124 names proposed for *Eleutherodactylus* which are now considered as synonyms of other names. These include six names mentioned above, of which Harding recognized 5 as valid. Harding's "Alphabetical Synonymy" includes 78 of the 124 synonyms. The 37% he failed to include show no pattern of omission. The earliest was proposed as a synonym in 1870 and the latest in 1980; most were placed in synonymy between 1920 and 1970. Casual checks on other genera with which I have some acquaintance reveals comparable levels of omitted synonyms. The "Alphabetical Synonymy" is the poorest and least useful section of the book.

A potpourri of other omissions include (1) new taxa named before 1982: *Desmognathus santeetlah* Tilley, *Bufo atelopoides* Lynch and Ruiz, *Melanophryniscus cambaraensis* Braun and Braun, *Melanophryniscus macrogranulosus* Braun and Braun, *Argenteohyla altamazonica* Henle, *Hyla elkejungingerae* Henle, *Hyla leptolineata* Braun and Braun, *Adenomera griseigularis* Henle, and *Proceratophrys cristinae* Braun, (2) taxa restored to recognition: *Rhinoderma rufum* Philippi (see Formas et al., 1975, Physis), (3) generic transfers: *Atelopus proboscideus* to *Rhamphophryne* (see Izecksohn, 1976, Rev. Brasil. Biol.), and (4) incorrect usage of names: *Crepidophryne epioticus,* not *Crepidius epioticus* (change pointed out by Cope, 1889, Bull. U.S. Nat. Mus. 34:260), *Hylactophryne occidentalis,* not *Hylactophryne mexicanus* (change pointed out by Lynch, 1976, Herpetologica 32:444).

Several other omissions are of a different sort. For example, Duellman (1970), Monogr. Mus. Nat. Hist. Univ. Kansas, 1:173, 328) placed *Hyloscirtus* in *Hyla* and recognized the *bogotensis* group which he later (1972,

Occ. Pap. Mus. Nat. Hist. Univ. Kansas, 11:1-31) monographed. Lutz and Ruiz (1977, Bol. Mus. Nac. Rio de Janeiro, zool., 289:1) named *Hyloscirtus vermiculatus*. Presumably, Harding viewed Lutz and Ruiz's usage of *Hyloscirtus* as sufficient to ignore Duellman's view that the genus not be recognized. Duellman continued to name new species of the *bogotensis* group and to place them in *Hyla* (e.g., *H. torrenticola*). Harding's taxonomic decision in this instance was to ignore Duellman (1970) but accept part of later arguments (i.e., *H. torrenticola* is a *Hyla*, but of a group whose type-species is the type-species of another genus). Perhaps Harding wished to avoid creating a new combination for the species named by Lutz and Ruiz, which is now considered a synonym of *Hyla bogotensis*, *fide* Ruiz and Lynch, 1982, Caldasia, 13(64):650.

The systematic arrangement (four orders, Gymnophiona, Caudata, Meantes, and Anura; sequence for families; and apparently some generic assignments to subfamily) follows, curiously enough, Goin, Goin, and Zug's (1978) "Introduction to Herpetology" rather than original papers where data are discussed. For example, Harding placed the monotypic hylid genera *Anotheca* and *Nyctimantis* in Amphignathodontinae, probably following Duellman (1970). However, Duellman and Trueb (1976, Occ. Pap. Mus. Nat. Hist. Univ. Kansas, 58:1-14), who studied these frogs, concluded (albeit, in a vague way) that both genera must be placed in the Hylinae.

Many authors have discussed the phylogenetic arrangement of salamanders and most have rejected Cope's notion of a separate order for sirenids. The only place the notion persists is in the various editions of "Introduction to Herpetology" and now, Harding's Catalogue. One wishes that Harding had evaluated such works as Edwards (1976, J. Morph. 148:305-328), Estes (1965, Amer. Zool. 5:319-334), Regal (1966, Evol. 20:392-407), and Wake (1966, Mem. So. California Acad. Sci. 4:1-111) before critically adopting Goin et al. (1978). However, the salamander arrangement will not likely confuse users.

The phylogenetic arrangement for the larger and more diverse group, Anura, was taken likewise from Goin, Goin, and Zug (1978). This arrangement in turn was taken from Jay Savage's imaginative and provocative arrangement proposed in part without so much recourse to systematic as to biogeographic data and in part based on Starret's study of tadpole morphology (both published in 1973 in "Evolutionary Biology of the Anurans: Contemporary Research on Major Problems," edited by J. L. Vial). Starret's proposal received serious and unanswered criticism from Sokal (1975, Copeia, 1975:1-23, and 1977, J. Zool., London, 182:505-508). Few anuran systematists subscribe to Starret's arrangement, which although that doesn't make it wrong, certainly raises questions as to why Harding would promulgate it.

I am vexed less by use of Xenoanura, Scoptanura, Lemnanura, and Acosmanura than by use of the 'family' Allophrynidae (*sic*). In the former case one has recourse to data and arguments whereas in the latter one encounters no wisps of either. This ethereal family, presented as a group coordinate to other families by Harding and by Goin, et al. was never proposed, it simply appeared on stage one day and none of us noted the conjurer's art until Savage's paper appeared in the 1973 book edited by James Vial. *Allophryne ruthveni* may belong to its own family but, going by primary literature (in which data, arguments, and formal proposals are made), is merely a curious hylid (Lynch and Freeman, 1966, Univ. Kansas Publ., Mus. Nat. Hist. 17:493-502; Duellman, 1970, op. cit.:19-20; Duellman, 1977, Das Tierreich, 95:5-6). Its recognition as a family reminds me of an opposite case of decades ago. Davis (1936, Zool. Ser. Field Mus. Nat. Hist. 20:121), in discussing Bidder's Organ and recognition of both Bufonidae and Leptodactylidae remarked "In other words, Noble's reason for reducing them to subfamily rank (non-existence of a defining character) no longer remains." I've treasured always the implicit logic embodied in that sentence, i.e., if not definable by character or data, then the group is a subfamily. In this case, Allophrynidae (*sic*) was listed casually in a biogeographic analysis and set of hypotheses, never having been proposed as a family, and was adopted without stated rationale by an introductory textbook. Its continuing establishment, without being supported by evidence or formally proposed, offends my sense of scientific propriety. Its use in Harding's book undermines my confidence in his choices as to species recognition, family assignments, family sequence, and ordinal recognition when I cannot evaluate the original data. His use of a leptodactylid subfamily, the Hylodinae (*sic*), also follows Goin et al. (1978) who followed Savage (1973) in spite of Lynch's (1971, Misc. Publ. Mus. Nat. Hist. Univ. Kansas, 53:10) point that Günther's (1859, Catalogue of the Batrachia Salientia . . . British Museum, p. 90) Hylodidae was based on *Hylodes* of Fitzinger, 1843, not *Hylodes* Fitzinger, 1826, requiring that if the southeastern Brasilian frogs of the genera *Crossodactylus*, *Hylodes*, and *Megaelosia* are to be placed in their own family group, the name must be Elosiinae rather than Hylodinae (following the Rules of Nomenclature rather than common sense).

In the preface, Harding states that "The primary aim . . . is to provide a source of basic, but rapidly retrievable information . . ." He hopes it will be" . . . of use to the taxonomist, conservationist and dedicated amateur alike." It is less clear to me what its use might be to amateurs than to conservationists and taxonomists. The latter two groups are likely to be more concerned about completeness and correctness. Using *Eleutherodactylus* as a guide, the 387 species listed by Harding include six not now recognized, seven proposed prior to 1982 and still considered valid but not listed by Harding, and three listed by him in other genera, for an error rate of 4.1%. Twenty-six species have incomplete statements of distribution (error rate of 6.7%). As mentioned above, the alphabetical synonym has an error rate of 37%. Taxonomists will not be seriously misled unless they assume absolute accuracy. Conservationists, unlike taxonomists, are unlikely to question Harding's accuracy and might err but I doubt the errors would be serious. If the error rates for other groups are all lower than those for *Eleutherodactylus* then the book still will be of considerable use; I am not entirely sanguine in suggesting that error rates are generally low for groups other than tropical plethodontids and the 'treefrogs' (Centrolenidae, Hylidae, and Pseudidae).

Lastly, one must comment on the price of the volume. Is it worth $80? On page iv one finds explanations as to why the book was reproduced directly from the author's typescript (" . . . as economically and as rapidly as possible . . . . "). I did not receive a price from the Reviews Editor but confidently inquired of the price at a Lincoln bookstore. They reported that the "tentative" price was $80. Such a price had a chilling influence on my graduate students' enthusiasm and caused one to await the forthcoming World Checklist of Reptiles and Amphibians from the Association of Systematics Collections. I will find the book a helpful one because I am interested in all neotropical amphibian groups but feel very confident about the literature of only one.

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The Snakes of Honduras, by Larry David Wilson and John R. Meyer, 1982. Milwaukee Public Museum Publications in Biology and Geology, No. 6. [iii], 159 pp., 96 figs., 6 tables, frontis. (color). Available from the Milwaukee Public Museum, 800 West Wells St., Milwaukee, Wisconsin 53233. $22.50, plus $1.00 for shipping and handling. A 10% discount offered to libraries and institutions, 40% to resellers and bookstores.

This 8 1/2 x 11 paperback with a marvelous color photo of *Bothrops schlegeli* on the front cover cannot fail to catch the eye of any herpetologist, regardless of specialty. More careful inspection will yield further rewards for anyone interested in tropical and subtropical American snakes, or simply in identification of Honduran snakes, or in systematics in general, or in the ecology of Honduras. How such a seemingly specialized work can appeal to such a broad spectrum of readers calls for explanation.

Reviews have previously appeared by the same authors for the 52 species of amphibians (1971) and 58 non-ophidian reptiles (1973) of Honduras. The 91 species of snakes now reported yields a total herpetofauna of 201 species as of the dates of publication. Actually the preface for the present work was written 8 March 1979, appearing in print some 3.5 years later. Very little had been published on the herpetofauna of Honduras prior to the involvement of those authors, beginning twenty years ago. Thus these summaries are highly significant contributions that go far toward elimination of the unknowns lying between Mexico-Guatemala to the northwest, and Costa Rica-Panama to the southeast, all much better known. No claim of finality can be made for current knowledge of Honduran herpetology even now, but it is in a far better state than existed prior to the 1970's.

Wilson's preface, briefly reviewing the field work that forms the foundation for the review of the snakes of Honduras, strikes a poignant

note, revealing an appealing streak of romanticism seldom evident in the coldly impartial contexts of research reports. The progressive exacerbation of political tension since that was written, superimposed over the rapid environmental degradation evident even then and continuing unabated now, warn that the golden age of scientific endeavor in Honduras, which Wilson and his colleagues so briefly enjoyed—although it was sensed as a lifetime—draws to a tragic end. It is not likely that **The Snakes of Honduras** will soon be superseded.

The account begins with an excellent, brief "description of the physiography, geology, climate and vegetation of Honduras" (abstract, p.2), illustrated with maps, photos and graphs. The bulk of the book consists of separate species accounts, each including "a partial synonymy, including all references dealing with the species in Honduras; a statement of the total geographic range; a description of the species based on its entire range, with parenthetical statements concerning the range of variation in Honduran specimens; a statement of ecological distribution of the species in Honduras; a list of locality records for the species in Honduras" (abstract, p. 2). A spot map for each species in the country, illustrations of dorsal pattern of selected species, and keys to families, genera and species are provided. The book ends with an analysis of distribution patterns (5 pp.), six tables (including physiographic, vegetational and altitude correlation of distribution), a brief epilogue (as of 25 June 1979), an abstract in Spanish, a supplemental list of ten localities not listed in the gazetteers of their previous synopses, and seven pages of "Literature Cited" (approximately 350 references). There is no index, and no coverage of "natural history" other than ecological distribution.

Most species accounts include a section on "taxonomic comments," mostly concerning nominal species and subspecies recognized by previous authors. They are of vast interest to students of species-group systematics not only of Honduras but of other Central American countries and Mexico. That section makes fascinating reading.

Thus the synopsis of the snakes of Honduras is much more than the usual presentation of factual information, although that is the major thrust of the book and is exhaustively thorough. It is also highly interpretive, taxonomically, of that information. Not since Bogert and Oliver's classic analysis of the herpetofauna of Sonora, Mexico (1945), has such an extensively critical taxonomic discourse appeared on the herpetology of Mexico and Central America. It is not only exhaustively thorough, hence valuable in that context regardless of conclusions, but it is also the first consistent application throughout an entire major reptile monograph of the philosophy of strong (although not rigid) species-group monotypy. That is, subspecies are rarely accepted, and then only when overwhelmingly confirmed. Although Wilson and Meyer accept subspecies in a very few species, in no instance are they given formal entry, by rubric, in their accounts. They practice the principles of what might be called the "Stringent" school of thought on subspecies, in common with a respectable minority of their colleagues, whereas the majority of herpetologists (and other vertebrate zoologists) adhere in general, perhaps largely in habit, to the principles of the "Indulgent" school. Wilson and Meyer defend their philosophy with some vigor and clarity, making it plain that workers in the future should think seriously about the rationality of what has become habitual in treatment of geographic races.

In these several ways the appearance of Wilson and Meyer's **Snakes of Honduras** is a major event in herpetology, and should stimulate all workers in herpetological systematics. It is a great step forward in factual information and summary, and marks a crossroads of decision, both personally and for the discipline. It deserves far wider attention than its title may attract.

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LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Coloration, Morphology, *etc.*). Longevity records are not accepted for this section. Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1982. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

Please submit Life History Notes in the standard format directly to the ***SECTION EDITOR*** to avoid delays in publication: Bern W. Tryon, Knoxville Zoological Park, P.O. Box 6040, Knoxville, Tennessee 37914.

SAURIA

CROTAPHYTUS COLLARIS COLLARIS (Eastern Collared Lizard). **REPRODUCTION.** Various aspects of the reproductive biology of collared lizards have been documented including the classic monograph by Fitch (1956. Univ. Ks. Mus. Nat. Hist. 8:213-274) and comprehensive studies by Trauth (1978. J. Herp. 12:461-470; 1979. Herpetologica 35:184-192). Although much is known regarding *C. collaris* reproduction, there are few reports which deal directly with clutches and pre-hatchlings. Recently, Smith (1983. Herp. Review 14:46) reported data on clutches and hatchlings of captive *C. collaris*. The following includes additional information on a clutch and pre-hatchlings of *C. c. collaris*.

On 10 April 1983 a male (110 mm SVL) and female (96 mm SVL) *C. c. collaris* were captured by hand at an abandoned rock quarry, 18.8 km W Denton along U.S. 380 in Denton Co., Texas. The lizards were placed in a 208 l terrarium containing limestone rocks and sand and fed various arthropods *ad libitum*. Courtship behavior and copulation were not observed but on 28 May (1045 to 1545 hrs) the female oviposited a clutch of 11 eggs without digging a nesting burrow. After measuring the eggs, four showed signs of damage; the remaining eggs were placed in a container of damp vermiculite at approximately 25° C. Despite careful handling and care to prevent molding, additional damage to incubating eggs occurred following measurements on day 32 and 58. One pre-hatchling collared lizard on day 32 and three on day 58 were placed in preservative. All lizards were alive prior to preservation. Egg and pre-hatching measurements are shown in Table 1. All measurements are in millimeters (mm) except where noted and provided as mean ($\bar{X}$) $\pm$ 1 standard error of the mean (SEM).

Trauth (pers. comm., 1984) has handled *Cnemidophorus sexlineatus* eggs roughly during collection without causing excessive damage. However, eggs may become more fragile as incubation proceeds due to less calcium or a reduction in calcium in the eggshells of some squamates (D. L. Cox, unpubl., Vasser College).

It is suggested that future attempts to hatch *C. collaris* eggs include only minimal disturbance to incubating clutches because of their extremely fragile eggshells. In the present case, molding of eggs was uncommon with most damage done while attempting to measure egg dimensions using a caliper.

Voucher specimens are on deposit in the Arkansas State University Herpetological Museum (ASUHM #'s 4048-4052).

Thanks to Drs. V. Rick McDaniel (Arkansas State University) for technical assistance and Stanley E. Trauth (Southern Methodist University) for reviewing this note.

Submitted by **CHRIS T. MCALLISTER**, Renal-Metabolic Lab (151-G), VA Medical Center, Dallas, Texas 76216, U.S.A. ●

Table 1. Measurements of clutch and pre-hatchling *C. c. collaris*.

Date	Incubation Day #	#Eggs	Egg Measurement (L X W)	Pre-hatchling Measurement (SVL); Wet Weight (gms)
28 May	1	11	19.5 $\pm$ 0.3 X 11.7 $\pm$ 0.2	—
28 Jun	32	5	21.7 $\pm$ 0.6 X 15.8 $\pm$ 0.3	13.0; 0.1
24 Jul	58	3	28.4 $\pm$ 1.0 X 21.6 $\pm$ 1.3	27.0 $\pm$ 1.2; 0.71 $\pm$ 0.1

PHELSUMA MADAGASCARIENSIS KOCHI (Koch's Day Gecko). **TWINNING.** Twinning in oviparous reptiles is not rare in snakes, but is rarely reported in lizards. Although isolated cases have probably been reported in lizards, a search of the literature was not fruitful. Certainly, even less common are joined monozygotic twin embryos.

On 22 August 1982, a solitary egg was laid by a Koch's Day Gecko *(Phelsuma madagascariensis kochi)* at the Tulsa Zoological Park. The egg weighed 1.2 g and had a diameter of 13.5 mm. The mean weight of eight previous eggs laid by the same female (none containing twins) was 1.35 g and the mean diameter of nine previous eggs was 13.2 mm. The egg was incubated at 28-32° C. When it failed to hatch it was opened revealing two dead but well preserved embryos joined at the dorsum of the heads (Figure 1). The combined weight of the embryos was 0.6 g. The total length of one twin was 28.6 mm with a snout-vent length of 13.6 mm. The total length of the second twin was 31.5 mm with a snout-vent length of 18.3 mm.



Figure 1. Twin *Phelsuma madagascariensis kochi* embryos joined at the dorsum of the heads. The caudal ends of the tails are absent, having been inadvertently severed in transit for this photograph.

Submitted by **TIM TYTLE,** 12004 Camelot Dr., Oklahoma City, Oklahoma 73120 and **RUSTY GRIMPE, DARELL PICKERING,** and **LINDA PUTNAM,** Tulsa Zoological Park, 5701 East 36th Street North, Tulsa, Oklahoma 74115, U.S.A. ●

SERPENTES

ARIZONA ELEGANS ELEGANS (Kansas Glossy Snake). **COLORATION.** An albino *Arizona elegans elegans* was collected 3 miles east and 1 mile north of Whitedeer, Carson County, Texas on 4 September 1965 by Mary Buchanan. The specimen is an adult female (477 mm SVL) that lacks all integumentary and eye pigmentation characteristic of a complete albino (Figure 1). This specimen is deposited in the West Texas State University Natural History Museum (WTSU 2802).

Dyrkacz (1981. Society for the Study of Amphibians and Reptiles Herpetological Circular No. 11) summarized other reports of albinistic Kansas glossy snakes. One was a juvenile female collected in the San Felipe Valley, Anza-Borrego State Park, San Diego, California which showed some trace of a brownish pink pattern. A hatchling was also collected near San Luis, R.C. but it was unclear whether the specimen showed any pattern. The nearest albino *Arizona elegans elegans* locality to our specimen was an adult male collected at Sand Prairie Natural History Reservation, Burton, Harvey Co., Kansas. This specimen was collected approximately 450 km north of our specimen's locality and was a complete albino.

Submitted by **F. C. KILLEBREW** and **T. L. JAMES,** Department of Biology, West Texas State University, Canyon, Texas 79016, U.S.A. ●

CEMOPHORA COCCINEA COPEI (Northern Scarlet Snake). **REPRODUCTION.** Few records concerning reproductive biology of *C. c. copei* have been published. Wright and Wright (1957, Handbook of Snakes of the United States and Canada, Cornell Univ. Press, Vol. 1, p. 115) summarized the available data. Additional information has appeared in Woolcott (1959, Copeia (3):263), Palmer and Tregembo (1970, Herpetologica 26(3):300-302), Brandner (1981, Herp. Review 12(3):79), Trauth (1982, Herp. Review 13(4):126), and Herman (1983, Herp. Review 14(4):119). Only Woolcott and Brandner provided measurements of hatchlings.

On the night of 20 June 1983, a gravid female scarlet snake (461 mm SVL, 513 mm+ total length) was collected on Apalachicola National Forest Rd. 13, 27.4 km E of Wilma, Liberty County, Florida. The snake was maintained in a small cage provided with a container of moist sawdust. Seven elongate white eggs, two of which were weakly adherent, were laid in the sawdust on 4 July 1983. Lengths of the eggs averaged 28.9 mm (range 27.2 - 30.8), width 13.1 mm (range 12.4 - 13.6), and weights 2.85 g (range 2.7 - 3.0). Blood vessels were visible through the shells of the freshly laid eggs.

The eggs were incubated at 24 - 26° C. in slightly moist sawdust in a 2-liter glass container stored on a shelf in the laboratory. All hatched on 24 - 25 September 1983 and the young were sexed, weighed (triple beam balance), measured, and preserved on 26 September 1983 (Table 1).

Table 1. Total length, Tail length, mass, and sex of hatching *Cemophora Coccinea Copei.*

Total Length	Tail Length	Mass	Sex
176 mm	28½ mm	3.3 g	male
177 mm	27 mm	3.3 g	male
173 mm	27 mm	3.4 g	male
168 mm	25 mm	3.2 g	male
183 mm	28 mm	3.6 g	male
174 mm	25½ mm	3.1 g	female
179 mm	25 mm	3.4 g	female
$\bar{X}$ = 176 mm	26.5 mm	3.3 g	

Tail lengths as a percentage of total lengths averaged 15.5 (range 14.9 - 16.2) in five males, and 14.4 (14.0 - 14.7) in two females. The young exhibited a variety of patterns, with some having black bands joining to form dorsal circles with white centers on the anterior body, while others appeared normal.

The adult female (NCSM 24056) and neonates (NCSM 24508-24514) were deposited in the North Carolina State Museum of Natural History.

Submitted by **ALVIN L. BRASWELL** and **WILLIAM M. PALMER,** N. C. State Museum of Natural History, Box 27647, Raleigh, North Carolina 27611, U.S.A. ●

COLUBER CONSTRICTOR PRIAPUS (Southern Black Racer). **FOOD.** The racer, *Coluber constrictor,* is well known for its catholic food habits and has been recorded as a predator on a spectacular variety of taxa including insects, anurans, lizards, lizard eggs, snakes, turtles, birds, bird eggs, and small mammals (Klimstra, 1959. Copeia 1959:210-214; Fitch, 1963. Univ. Kansas Publ. Mus. Nat. Hist. 15:351-468). This note documents an observation of a racer feeding opportunistically on fish eggs.

The University of Florida's Center for Aquatic Weeds maintains a facility 20 km NE of Gainesville, Florida, for the study and induced propagation of the grass carp, *Ctenopharyngodon idella,* which is being researched as a potential control agent for aquatic weeds. At the conclusion of spawning experiments, unfertilized grass carp eggs are customarily flushed from large holding tanks into a grassy area outside the main building. These hydrated grass carp eggs are gelatinous balls 4-6 mm in diameter. On 15 April 1982, at approximately 1400 h, one of us (FJA) observed an adult *Coluber constrictor priapus* (ca. 90 cm total length) positioned at the exit of the fish egg effluent pipe, successively dipping its head and biting into egg masses as they emerged. The snake paused briefly between feeding bouts to raise its head and tongue flick. This activity was observed for about 10 min before the racer saw the observer and fled.

The above observation is noteworthy because it demonstrates the resourcefulness of *C. constrictor* to make use of a food item that is not naturally available. Fitch (op. cit.) reported several semi-aquatic amphibian (*Rana* and *Hyla* spp.) and reptilian *(Chrysemys picta, Nerodia sipedon)* prey in the diet of racers, but no obligately aquatic prey (e.g. fish, fish eggs, larval amphibians, amphibian eggs). Although it is possible that naturally-occurring fish or amphibian eggs have been eaten by racers but not recognized from their stomach contents, such aquatic prey would be inconsistent with *C. constrictor's* strongly terrestrial habitat preference (Ditmars, 1936, The Reptiles of North America, Doubleday, Garden City; Schmidt and Davis, 1941, A Field Book of Snakes of the United States and Canada, G. P. Putnam's Sons, New York). Despite the unnatural occurrence of fish eggs in a terrestrial habitat, they were nevertheless recognized by *Coluber* as a potential source of food energy. This type of opportunistic foraging behavior is probably one of the factors responsible for *C. constrictor's* overall success and widespread geographic distribution.

Submitted by **DAVID G. COOK,** Department of Herpetology, Atlanta Zoological Park, 800 Cherokee Ave. SE, Atlanta, Georgia 30315 and **FREDERICK J. ALDRIDGE,** Center for Aquatic Weeds, School of Forest Resources and Conservation, University of Florida, Gainesville, Florida 32611, U.S.A. ●

CROTALUS VIRIDIS (Prairie Rattlesnake). **FOOD.** Three adult *Crotalus viridis* were collected from the National Bison Range, Lake County, Montana on 19 June 1983 consisting

of two females and one male. One of the female snakes (842 mm) was found to have a juvenile *C. viridis* (264 mm) folded in half in its stomach. Also in the gut were four voles *(Microtus montanus),* three large adults weighing 30-40 g each, and a juvenile weighing approximately 15 g.

Although there have been several reports of cannibalism in captive rattlesnakes, Klauber (1972. Rattlesnakes, their habits, life histories, and influence on mankind. 2d ed. Univ. Calif. Press) concluded that cannibalism among rattlesnakes in the wild is quite rare. In the few instances when it has occurred, the snake eaten had sometimes been dead before it was swallowed. It cannot be determined whether or not the young snake in this instance was dead before being eaten; the body and skin were still intact with minimal decomposition.

It has been suggested that in cases of cannibalism such as this the smaller snake may have been attempting to ingest prey that the larger snake swallowed (H. M. Smith, pers. comm.). There was no evidence suggesting that the juvenile snake was eaten simultaneously with any of the other items in the adult's stomach.

This specimen is being housed in the herpetological collection of the vertebrate museum at the University of Colorado, Boulder.

Submitted by **DAVID L. GENTER,** Department of Zoology, University of Montana, Missoula, Montana 59812, U.S.A. ●

CORALLUS CANINA (Emerald Tree Boa). **BEHAVIOR.** Agonistic behavior between male boid snakes has been documented by several researchers including Carpenter et al. (1978. Herpetologica 34:207-212).

On 18 January 1984, one adult female and two adult male *Corallus canina,* all previously separated, were placed together in an enclosure at the Oklahoma City Zoo Herpetarium. The enclosure measured 152 x 170 x 122 cm. Within several hours aggression between males was observed. Individual behaviors of chasing, mounting, and body writhe movements occurred. No biting was evident. These movements occurred on the floor of the enclosure and on horizontal branches of varying heights above floor level. After ca 15 min one male appeared dominant. For several hours thereafter the dominant male continued aggressing the subordinate male with the subordinate attempting to flee. Following this period the dominant male began to constrict the subordinate male. As opposed to prey constriction, where primarily the anterior portion of the body is used, the dominant male used the posterior portion of the body to constrict the neck area of the subordinate male. The subordinate male, although in apparent distress, was not observed to actively oppose this constricting behavior. To avoid physical damage, the subordinate male was removed from the enclosure. Reintroductions of the subordinate male or another male resulted in the same series of events with the exception that constrictions were observed on all portions of the subordinate males' body. The constricting behavior was only observed when both specimens occupied positions on the same or nearby horizontal branches. The dominant male was also observed on several occasions to aggress and constrict the adult female, a permanent resident in the enclosure.

This observation may be important in captive management of *Corallus canina* where a limited amount of space is available for retreat by subordinates.

Submitted by **STEVEN T. OSBORNE,** Oklahoma City Zoo, 2101 N.E. 50th, Oklahoma City, Oklahoma 73111, U.S.A. ●

HELICOPS ANGULATUS (South American Water Snake). **REPRODUCTION.** There appear to be only two literature accounts concerning reproduction in *Helicops angulatus (Trinidad:* Mole, 1924. Proc. Zool. Soc. London 1924:235-278; *Colombia:* Rossman, 1974. HISS News-J. 1:189-191), both of which reported instances of egg laying. Because the period from deposition to hatching was less than 2-1/2 weeks in the case of the Colombian specimens (unknown for the Trinidad clutch), I suggested that *H. angulatus* might prove to be facultatively ovoviviparous. The purpose of this note is to present evidence that such, indeed, seems to be the case and that *H. angulatus* thus represents only the ninth species of snake reported to exhibit reproductive bimodality (Tinkle and Gibbons, 1977. Misc. Publ. Mus. Zool. Univ. Michigan No. 154:1-55).

On 30 September 1974, Richard Thomas collected an adult female *Helicops angulatus* (LSUMZ 27337) between 105 and 110 km SW Puerto Maldonado, Depto. Madre de Dios, Peru. When he preserved the female (410 mm SVL), Dr. Thomas removed seven apparently full-term young (LSUMZ 27340-46) averaging 101 (97-104.5) mm SVL. These little snakes appear to be as well developed as the two hatchlings from Colombia and are comparable in length to the one that is not deformed (LSUMZ 22893; 103.5 mm SVL). No egg shells or obvious yolk were present, hence the evidence suggests that had this particular female *H. angulatus* not been collected when she was, she would have functioned as a live bearer rather than egg layer.

Submitted by **DOUGLAS A. ROSSMAN,** Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana 70803, U.S.A. ●

LAMPROPELTIS MEXICANA (Nuevo Leon Kingsnake). **COLORATION.** A melanistic male *Lampropeltis mexicana (thayeri* morph) was hatched from a clutch of five eggs on 5 September 1982. The remaining four hatchlings exhibited normal coloration. The parents were siblings of a brood of eight normal patterned offspring from a melanistic female and normal patterned male, the originally collected stock. These snakes were collected in the Galeana area of Nuevo Leon, Mexico.

The melanistic offspring is overall black (including eyes) with underlying banding evident when held up to light. It behaves normally and feeds readily on lizards *(Eumeces)* and pink mice.

Considering the 1:4 ratio of the F_2, and based on several other wild-caught and captive-bred specimens I am aware of, it appears that this is a simple recessive trait with the Mendelian 1:2:1 ratio. Further reproduction must be carried out for more understanding of this trait. One point of interest is that of the few *thayeri* morph snakes that have been collected, several have been melanistic or heterozygous melanistic. The specimen is being maintained in the collection of Steven T. Osborne.

Submitted by **STEVEN T. OSBORNE,** Animal Technician in Herpetology, Oklahoma City Zoo, Oklahoma City, Oklahoma 73111, U.S.A. ●

RHINOCHEILUS LECONTEI ANTONII (Mexican Long-nosed Snake). **BEHAVIOR.** Male combat in colubrid snakes is a common occurrence that has been observed elsewhere (Shaw, C. E. 1951. Herpetologica 7:149-168).

On 6 July 1980 at 2300 h I observed combat between two male *R. l. antonii* in a cultivated field ca 85 km N. of Mazatlan, Sinaloa, Mexico. Both snakes were completely intertwined from head to tail. They were traveling at a rapid rate in a straight path across the field. The specimens became aware of human presence but rather than halting, simply changed direction and continued the behavior. After several minutes of observation the snakes were captured, probed, and found to be males.

Submitted by **STEVEN T. OSBORNE,** Oklahoma City Zoo, 2101 N.E. 50th, Oklahoma City, Oklahoma 73111, U.S.A. ●

TESTUDINES

PSEUDEMYS RUBRIVENTRIS (Red-bellied Turtle). **FOOD.** From 13-16 June 1983 ten gravid red-bellied turtles *(Pseudemys rubriventris)* ranging in CL from 288.8 - 306.6 mm ($\bar{X}$ = 299.9) were collected on the Tuckahoe-Corbin City Fish and Wildlife Management Area, Tuckahoe, Cape May County, New Jersey. These turtles were transferred to a child's plastic wading pool containing clean water on 17 June. Within two hours more than one individual defecated and one scat appeared to contain a blackened turtle shell fragment. Careful checking revealed several carapacial fragments in the dropping of one female (identity unknown). Six bones were subsequently recovered and identified as painted turtle *(Chrysemys picta)* peripherals and costals by George Zug (pers. comm.). The turtle from which they came was estimated to be about 120 mm in carapace length. In addition, a posterior neural from a much larger (> 200 mm CL) turtle was found. This bone closely resembles the sixth neural of red-bellied turtles in my collection. The circumstances under which the adult female red-bellied turtle ingested these shell pieces are unknown, but I speculate that scavenging on the remains of dead turtles is the most plausible explanation.

The Animal Research and Conservation Center of the New York Zoological Society provided travel support for this project.

Submitted by **TERRY E. GRAHAM,** Department of Natural and Earth Sciences, Worcester State College, Worcester, Massachusetts 01602, U.S.A. ●

STERNOTHERUS ODORATUS (Stinkpot). **REPRODUCTION.** On 7 March 1983, a female *Sternotherus odoratus* was collected by seining in shallow water of the Hillsborough River near Frog Creek, Tampa, Hillsborough County, Florida. The specimen had three growth annuli and a carapace length of 63.7 mm. On 18 July 1983, she deposited two eggs, measuring 22.2 x 13.2 mm and 23.4 x 14.2 mm. Ernst and Barbour (1972. Turtles of the United States. Univ. Kentucky Press. 347 pp.) state that females in the southern portion of the range lay from March through July and that clutch size ranges from one to four. They cite reports of eggs with measurements averaging 27.6 x 14.8 mm and 27.1 x 15.5 mm. The age of this female at deposition equals the youngest and the carapace length approaches the minimum of 61 mm (mean 82 mm) for reproductive females reported by Tinkle (1961. Ecology 42:68-76). Clutch size is within the range reported, though two for such a small female is unusual as clutch size and female body size are positively correlated.

The eggs were incubated on moist paper towels at temperatures ranging from 24 to 32° C. On 12 October 1983, the eggs were opened. The smaller contained a fully formed dead embryo with a carapace length of 18.5 mm, the larger egg contained only yolk. The smallest hatchling previously reported had a carapace length of 19 mm (Risley. 1933. Pap. Mich. Acad. Sci. Arts Lett. 17:685-711).

The hatchling has been deposited in the Bobby Witcher Memorial Collection (BWMC 02109) and the female is currently being kept in captivity at Avila College, Kansas City, Missouri 64145. Appreciation is extended to Donald D. Smith for reviewing this note.

Submitted by **ROBERT POWELL,** Department of Natural Sciences, Avila College, 11901 Wornall Road, Kansas City, Missouri 64145 and **STEVE PHILLIPS,** 2907 N. Dale Mabry, Tampa, Florida 33609, U.S.A. ●

STERNOTHERUS DEPRESSUS (Flattened Musk Turtle). **COLORATION.** Albinism has been reported in turtles on a number of occasions (reviews by Hensley, 1959, Publ. Mus., Mich. State Univ. 1(4):133-159; Ewert, 1979, *In* Harless and Morlock, Turtles: Perspectives and Research, Wiley and Sons, N.Y., pp. 333-413; Dyrkacz, 1981, SSAR Herp. Circ. 11:15-16). However, few instances of xanthism have been documented for turtles. Griffin and Ernst (1974, Herp. Rev. 5(4):105) described a xanthic *Pseudemys scripta* from Arkansas. Ewert (1979) reported another xanthic *P. scripta* and Harding and Latinen (1982, Herp. Rev. 13(1):19) described an "erythroxanthic" *Chrysemys picta* from Michigan. We here report another instance of xanthism in turtles.

On 23 August 1983, an unusually-pigmented juvenile *Sternotherus depressus* (Fig. 1) was captured on the Sipsey Fork of the Black Warrior River near the Sipsey River Recreation and Access Area, Bankhead National Forest,



Figure 1. Xanthic juvenile *Sternotherus depressus* (left); normally-pigmented juvenile (right).

Winston Co., Alabama. The specimen was captured while wading at night with lights in approximately one foot of water over a sand flat. Carapace length, width and height (in mm), respectively, at time of capture were 48.5, 44.0 and 12.0; weight was 15.0 g. Sex was undetermined and age was estimated by growth annuli to be three years.

Normally-pigmented juvenile *S. depressus* of this particular size have a brown carapace, with numerous dark spots or streaks, a flesh-colored plastron, and a greenish or light brown integument with a reticulum of dark markings (Fig. 1; Mount, 1975, The Reptiles and Amphibians of Alabama, Auburn Univ. Agricultural Experiment Station, Auburn). The overall color of our captured specimen is yellow-orange. The edges of the dorsal scutes and marginals are outlined in brown-black. Several dark spots are apparent on the carapace, with some very faint spots on the marginals, but all are much fainter and less numerous than in normally-pigmented individuals. The region of the carapace adjacent to the marginal scutes is slightly lighter and brighter yellow-orange than the more medial carapace area. Though there are faint stain marks on the edges, the plastron is generally light pink or colorless. The legs and tail are light yellow, but the thin integument near the edges of the shell are colorless. The claws are yellow. The color of the head and neck is slightly brighter yellow than the rest of the integument, closely matching that of the carapace. Brown blotches are present on the head and neck, but are not as dark or obvious as in typical specimens. The eyes are normally-pigmented, with dark pupils and a yellow iris. The animal is normal in morphology except that the anterior portion of the plastron is slightly asymmetrical, the right side being smaller.

Ewert (1979) discusses variations in turtle pigmentation. The suspected causes include both environmental stresses during incubation and genetic background.

The specimen is currently being maintained alive and well in the Biology Department at the University of Alabama in Birmingham. Upon its death it will be deposited in the University of Alabama in Birmingham Vertebrate Museum.

Submitted by **KEN R. MARION,** Biology Department, University of Alabama in Birmingham, Birmingham, Alabama 35294, **WILLIAM A. COX** Department of Biology, Samford University, Birmingham, Alabama 35229, and **CARL H. ERNST,** Department of Biology, George Mason University, Fairfax, Virginia 22030, U.S.A. ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

ANURA

BUFO WOODHOUSII FOWLERI (Fowler's Toad). USA: VERMONT: Windsor Co: White River Junction, Hillcrest Terrace. 22 April 1983. The specimen was photographed and released. Photograph deposited in Carnegie Museum of Natural History (Acc. No. 32489). Numerous sightings were made in the area throughout the summer of 1983. Photographs were verified by Drs. Lauren Brown, Illinois State University, Normal, IL.; Robert Mount, Auburn University, Auburn, AL; and Thomas French, The Nature Conservancy, Boston, MA. Specimen captured in residential neighborhood near area of northern hardwoods.

Although there have been several verbal reports of *Bufo woodhousii fowleri* in Vermont in recent years, mainly in the Connecti-

cut River Valley, this is the first tangible evidence of its occurrence in the state. Nearest records include the Merrimack River Valley, NH (Oliver and Bailey, 1939, *In* Warfel, Biological Survey of the Connecticut Watershed, Survey Report f:195-217), Albany County, NY (Bishop, 1923, Copeia, 1923:83-84; Stewart and Rossi, 1981, Amer. Midl. Nat., 106:282-292) and the Connecticut River Valley, MA (Dunn, 1930, Bull. Boston Soc. Nat. Hist., 57:3-8). The identity of specimens (4 tadpoles, Univ. Mich. Mus. Zool. 143170) reported from Hanover, Grafton County, NH, just across the Connecticut River from Norwich, VT (Oliver and Bailey, 1939) is now considered questionable.

Submitted by **MARGARET W. BARKER** and **MICHAEL J. CADUTO,** Vermont Institute of Natural Science, Woodstock, Vermont 05091, U.S.A. ●

PSEUDACRIS TRISERIATA FERIARUM (Upland Chorus Frog). USA: ALABAMA: Escambia Co: 12.6 km E East Brewton on Co Rt 4. (T2N, R11E, Sec. 35). 8 October 1983. Auburn University Museum (AUM 32343). Covington Co: 2.9 km ENE Dixie (T2N, R14E, Sec. 7). 19 November 1983. (AUM 32363). Collected by students of R. H. Mount. Verified by R. H. Mount. Localities are in lowlands near the Conecuh River. First records from well within the Lower Coastal Plain herpetofaunal region west of the Apalachicola drainage (Mount, 1975. The Reptiles and Amphibians of Alabama, Al. Agr. Exp. Sta.).

Submitted by **WILLIAM R. GATES,** Department of Zoology-Entomology, Auburn University, Auburn, Alabama 36849, U.S.A. ●

RANA CANCRIVORA INDIA: Madhya Pradesh: Mandla District: Kanha National Park. 30 December 1964. G. Schaller. Verified by S. K. Dutta. Deposited in the Field Museum of Natural History (FMNH 152458-59).

The distribution of *Rana cancrivora* had been confined to the Philippines, Java, Sumatra, Borneo, The Malay Archipelago and the Lesser Sundas. These specimens represent the first record of this species from India.

Submitted by **SUSHIL K. DUTTA,** Division of Herpetology, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, U.S.A. ●

RANA CATESBEIANA (Bullfrog). USA: ARKANSAS: Pike Co: Lake Greeson. 3 October 1969. T. Stringer, T. Rush and K. Brown. Verified by F. C. Killebrew. West Texas State University Museum Nat. Hist. (WTSU 165, 166, 212, 213, 214, 2629-2631). Pike Co: Caddo River at US Hwy 70 near Glenwood. 4 October 1969, 18 July 1973. T. Rush, D. Humphreys, J. Needham, S. Carter and R. Stone. Verified by F. C. Killebrew. (WTSU 215, 217, 1671, 1672, 1757, 1761-1765). Clark Co: Caddo River near Amity. 24 July 1973. P. Ross. Verified by F. C. Killebrew. (WTSU 1684). Stone Co: Allison Creek at Ark Hwy 14 6 June 1970. A. Clark. Verified by F. C. Killebrew. (WTSU 610). Stone Co: 18 km S Jct Ark Hwy 14 on Ark Hwy 5. 3-6 June 1970. J. Sikes, F. Killebrew, D. Bailey, J. Lanham, A. White, and J. Steed. Verified by F. C. Killebrew. (WTSU 575-577, 594, 615, 629). New county records, between previous localities in Arkansas (Dowling. 1957. Occas. Pap. Univ. Arkansas Mus. 3, 51p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016, U.S.A. ●

RANA MUSCOSA (Mountain Yellow-legged Frog). USA: NEVADA: Douglas Co: area around mouth of Edgewood Creek where it empties into Lake Tahoe. Henry William Henshaw. October 1876. U.S. National Museum (USNM 8685). Cited by Cope (1899. Bull. U.S. Natl. Mus. 34:434) as *Rana temporaria pretiosa (=Rana pretiosa),* but reindentified by Linsdale (1940. Proc. Amer. Acad. Arts Sci. 73(8):210) as *Rana boylii sierrae (=Rana muscosa).* According to Yarrow and Henshaw (1878. App. L of App. N.N., Rept. Sec. War, Vol. II, pt. III, p. 1632) the specimens were collected at "Lake Tahoe" during (October) "1876". Lt. M. M. Macomb and supporting parties camped at Rowland's (on the SE shore of the lake) on September 26th, and proceeded to explore the Tahoe Range in the vicinity of Freel's Peak (Macomb. 1877. App. F. of App. N.N., Rept. Sec. War, Vol. II, pt. II, pp. 1278-1284). While the main party moved south, a small party (apparently including naturalist Henshaw) explored eastward in Hope and Carson Valleys almost to Genoa, returned by the Kingsbury Grade to Lake Tahoe, then moved south along the lake shore to Lake Valley, California. On the official expedition map (Topographical map of the Lake Tahoe Region, Sierra Nevada, California and Nevada. Expeditions of 1876 and 1877 under the command of 1st Lt. G. M. Wheeler. Issued June 30, 1881), only "Friday Creek" (=Edgewood Creek) is shown entering Lake Tahoe within the short length of shoreline between Rowland's and the California State boundary. This is probably the area where Henshaw collected his specimens. This locality is the first for the area southeast of Lake Tahoe (in Douglas County) and extends the range of the species 35 km south from Mt. Rose, Washoe County, Nevada (Zweifel. 1955. Univ. California Publ. Zool. 54(4):207-292: Zweifel. 1968. Cat. Amer. Amphib. Rept. 65.1-65.2). These records help document the historical presence of *Rana muscosa* around the whole of Lake Tahoe, which supports the contention that *R. pipiens* was introduced into the Tahoe Basin around the turn of the century (Bryant. 1917. Calif. Fish Game. 3(2):90; Storer. 1925. Univ. Calif. Publ. Zool. 27:1-343).

My thanks to Roy W. McDiarmid for providing information about these specimens.

Submitted by **MARK R. JENNINGS,** School of Renewable Natural Resources, 210 Biological Sciences East Building, The University of Arizona, Tucson, Arizona 85721, U.S.A. ●

RHINOPHRYNUS DORSALIS (Burrowing Toad; Sapo Borracho). NICARAGUA: Departmento de León: León Viejo. 1976. Collected (and later released) by Mauricio Zambrana. Identified by Jaime Villa from a photograph by José Angel Benavides. Photograph deposited in Carnegie Museum of Natural History (Acc. No. 32479). This toad is known from México to northwestern Costa Rica (Fouquette, 1969, Cat. Amer. Amphib. Rept., 78:1-2). On the Pacific coast of Central America records are few (Duellman, 1971, Herpetologica, 27:55-56), and (Villa, 1972, Anfibios de Nicaragua, 59-60). Most records come from moist forest environments; Duellman (*op. cit.*) recorded the first specimen from Nicaragua, collected in pine savannah at Waspám (outside the distribution area mapped by Fouquette). The León Viejo specimen comes from Tropical Dry Forest (also outside the area mapped by Fouquette), similar to the habitats of Costa Rican populations. Based on these few records it appears that *R. dorsalis* is not found exclusively in moist environments in the southernmost part of its range, but its fossorial habits and apparently relictual distribution make the sapo borracho a very elusive species.

Submitted by **JAIME VILLA,** Biology, University of Missouri, Kansas City, Missouri 64110, U.S.A. ●

SAURIA

OPHISAURUS ATTENUATUS LONGICAUDUS (Eastern Slender Glass Lizard). USA: KENTUCKY: Larue Co: Wonderland Rd, 2.4 km E Jenkins Rd. 1 July 1983. Collected by William Copelin. R. E. Todd, Jr. Collection (RET 1814). Larue Co: Jct Wonderland Rd and Jenkins Rd. 24 July 1983. Collected by R. E. Todd, Jr. R. E. Todd, Jr. Collection (RET 1893). Verified by R. E. Todd, Jr. First records for Larue County.

Submitted by **R. E. TODD, JR.,** Route 1, Box 90-B, Sonora, Kentucky 42776, U.S.A. ●

SERPENTES

ELAPHE GUTTATA EMORYI (Great Plains Rat Snake). USA: ARKANSAS: Pike Co: Hwy 27, 1 mi S Kirby. 6 June 1983. F. C. Killebrew. Verified by F. C. Killebrew. West Texas State University Museum Nat. Hist. (WTSU 9149). New county record. Nearest records are Polk and Garland Counties. (Dellinger and Black. 1938. Occas. Pap. Univ. Arkansas Mus. 1, 47p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016, U.S.A. ●

ELAPHE GUTTATA GUTTATA (Corn Snake). USA: KENTUCKY: Grayson Co: 4.2 km W Millerstown (Hwy 224, near Royal). 22 October 1983. Collected by Riley Downs. Verified by R. E. Todd, Jr. R. E. Todd, Jr. Collection (RET 2251). New county record. Previous reports are from counties to the east.

Submitted by **R. E. TODD, JR.,** Route 1, Box 90-B, Sonora, Kentucky 42776, U.S.A. ●

LAMPROPELTIS CALLIGASTER (Prairie Kingsnake). USA: ILLINOIS: Mercer Co; 4.8 km W Joy on Ill Rt 17. 17 August 1975. G. L. Paukstis and G. Morrow. Verified by R. S. Funk and J. K. Tucker. Illinois State University (uncataloged). New county record, extends range 27.5 km N of locality in Henderson County (Smith, 1961. Ill. Nat. Hist. Surv. Bull. 28(1):1-298).

Submitted by **GARY L. PAUKSTIS,** Department of Zoology and Entomology, Colorado State University, Fort Collins, Colorado 80523 and **RICHARD S. FUNK,** P.O. Box 21092, Columbus, Ohio 43221, U.S.A. ●

LAMPROPELTIS GETULUS HOLBROOKI (Speckled Kingsnake). USA: ARKANSAS: Stone Co: Allison. 5 June 1970. D. Bailey. Verified by F. C. Killebrew. West Texas State University Museum Nat. Hist. (WTSU 592). Pike Co: Rosboro. 30 July 1973. S. Carter. Verified by F. C. Killebrew. (WTSU 1707). New county records (Dellinger and Black. 1938. Occas. Pap. Univ. Arkansas Mus. 1, 47p.; Schwardt. 1938. Bull. Arkansas Exper. Sta. 357, 47p.; Dowling. 1957. Occas. Pap. Univ. Arkansas Mus. 3, 51p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016, U.S.A. ●

OPHEODRYS AESTIVUS (Rough Green Snake). USA: ARKANSAS: Pike Co: Langley. 5 April 1980. F. C. Killebrew. West Texas State University Museum Nat. Hist. (WTSU 6418). Howard Co: Jct of Ark 84 and Ark 246. 24 September 1982. F. C. Killebrew. (WTSU 8629). Verified by F. C. Killebrew. New county records. Fills gap between Polk, Montgomery, Garland, and Hot Spring Counties (Schwardt. 1938. Bull. Arkansas Exper. Sta. 357, 47p.; Dellinger and Black. 1938. Occas. Pap. Univ. Arkansas Mus. 1, 47p.; Dowling. 1957. Occas. Pap. Univ. Arkansas Mus. 3, 51p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016, U.S.A. ●

TESTUDINES

CLEMMYS MARMORATA PALLIDA (Southwestern Pond Turtle). MEXICO: BAJA CALIFORNIA NORTE: 6.0 km S El Testerazo on Hwy 3, in an intermittent stream known locally as Arroyo El Chicharro. 2 April 1983. James R. Buskirk. Verified by John B. Iverson. Not collected. Photographs deposited in MVZ, Berkeley. First record from the Rio de las Palmas, the northernmost stream system in Baja Californa. Fills gap between Guadalupe Hot Springs, 9.5 km E Guadalupe (SDNHM) to the south and the Rio Tecate (USNM). BAJA CALIFORNIA NORTE: Rancho Jesus Maria, 11.2 km NE Ensenada on Hwy 3. 2 April 1983. James R. Buskirk. Verified by John B. Iverson. Hatchling, juvenile and adult photographed and released at capture site. Photographs deposited in MVZ, Berkeley. The habitat is a semi-permanent stream known locally as Arroyo de San Antonio, which reaches the Pacific Ocean approximately 1 km N San Miguel village.

Submitted by **JAMES R. BUSKIRK,** 4108 Howe Street, Oakland, California, 94611, U.S.A. ●

GRAPTEMYS GEOGRAPHICA (Map Turtle). USA: ARKANSAS: Garland Co: Lake Ouachita near Crystal Springs. 23 June 1983. F. Killebrew and T. James. Verified by F. C. Killebrew. West Texas State University Museum Nat. Hist. (WTSU 9062, 9095, 9409-9413). New county record, between previous localities in Pike County (Killebrew. 1982. Herp. Review 13:80) and Saline County (Dellinger and Black. 1938. Occas. Pap. Univ. Arkansas Mus. 1, 47p.).

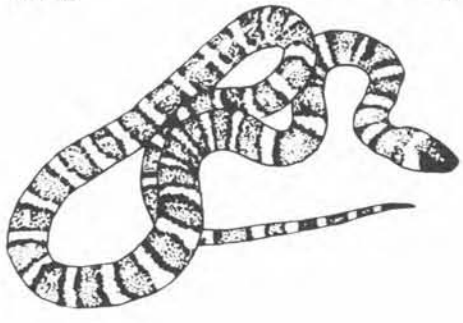
Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016, U.S.A. ●

GOPHERUS AGASSIZII (Desert Tortoise). MEXICO: SONORA: Ejido de Sabino, 25 km E Agua Caliente on road between Nuri and Esperanza. 11 August 1983. Peter Sachs. Verified by Howard Lawler. Two adult males and a female found beneath tree at edge of cornfield. Weighed, measured, photographed, marked (nos. 201-3) and released. Photographs deposited in MVZ, Berkeley. First record in area between Guaymas-Bahia San Carlos and Alamos-Aduana.

Submitted by **JAMES R. BUSKIRK,** 4108 Howe Street, Oakland, California 94611, U.S.A. ●

KINOSTERNON ALAMOSAE (Alamos Mud Turtle). MEXICO: SINALOA: Sibajahui (or Sivajahui), 5 km N San Blas on Hwy 32. 9 July 1983. James R. Buskirk. Verified by John B. Iverson. Three adult turtles found in rainpools immediately W of the highway embankment. Photographed and released. Photographs deposited in MVZ, Berkeley. Second record for Sinaloa; approximately 60 km NNW previous record (Berry and Legler. 1980. Los Angeles Co. Mus. Nat. Hist., Contr. Sci. 325:10.), and first Sinaloa record from the Rio Fuerte basin.

Submitted by **JAMES R. BUSKIRK,** 4108 Howe Street, Oakland, California 94611, U.S.A. ●



ADDITIONS TO THE HERPETOFAUNA OF THE SOUTH COLORADO DESERT, BAJA CALIFORNIA, WITH COMMENTS ON THE RELATIONSHIPS OF *Lichanura trivirgata*

The Colorado Desert of northeastern Baja California, east of the Sierra Juárez and Sierra San Pedro Mártir south to the vicinity of Bahia de Los Angeles, is not well known biologically. The area is characterized by a lack of predictable rainfall and is one of the hottest places in the world (Meigs, 1953). Shreve (1934) remarked that this area may be the most sparsely vegetated of any area in North America. Climatic extremes combined with inaccessibility are major reasons for a lack of biological investigations in the southern portion of the Colorado Desert.

Slevin (1951) surveyed the herpetofauna along Highway 5 (Mexicali to San Felipe) but had poor results. Welsh (1976) and Seib (1980) considered the herpetofauna of the southern Colorado Desert to be depauperate due to climatic extremes. The purpose of the present paper is to report on a field collection from the southern Colorado Desert.

MATERIALS AND METHODS

From 29 April to 4 May 1979, we collected specimens in the northern part of the Valle de San Felipe, on a west to east transect from San Matias Pass (31°19'N, 115°30'W) to the junction of Highways 3 and 5 (31°25'N, 115°03'W; localities given as east of San Matias Pass), and south on Highway 5 to San Felipe (31°01'N, 114°50'W; given as north of San Felipe; Fig. 1). The transect covered about 91 km across the southern Colorado Desert from the Baja California Cordillera to the coast of the Gulf of California and included a variety of sandy flatland and rocky upland desert habitat. Collecting methods included nocturnal road driving, particularly along the newly paved eastern stretch of Highway 3 (Ensenada to San Felipe) between San Matias pass and the junction with Highway 5. In the morning hours, we captured lizards by hand, dust shot, or with a noose.

SPECIES ACCOUNTS

Coleonyx variegatus. Three specimens (USNM 225301-303) taken 15.7 to 26.2 km E San Matias Pass showed distinct pale nuchal loops and body bands characteristic of the Pacific coastal form *C. v. abbotti* (Klauber, 1945). These specimens support Welsh's (1976) contention that San Matias Pass and Valle de San Felipe are areas of intergradation between Gulf and Pacific slope populations of *C. variegatus.* A specimen from 16.8 km N San Felipe (USNM 225304) is a typical *C. v. variegatus.*

Petrosaurus mearnsi. Three specimens were collected in the Sierra San Felipe, 24.2 km E San Matias Pass, on Hwy. 3, 1.3 km S of Villa del Sol turnoff (USNM 225311-313).

Sauromalus obesus. One adult was collected in the Sierra San Felipe, 24.2 km E San

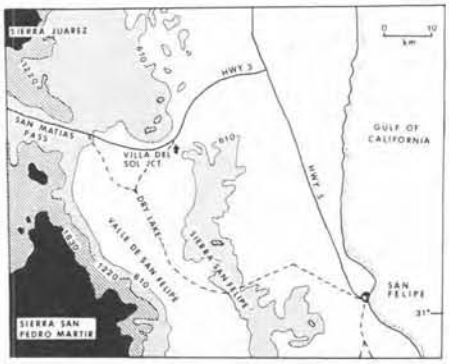


Figure 1. Major features of the south Colorado Desert, Baja California, Mexico. Elevations are in meters. Dashed lines are dirt roads; dotted lines enclose sandy areas.

Matias Pass on Hwy. 3, 1.3 km S of Villa del Sol turnoff (USNM 225317). These are the first records of *P. mearnsi* and *S. obesus* east of the Peninsular Cordillera. The Sierra San Felipe is an isolated mountain range of the Colorado Desert surrounded by sandy lowland habitat.

Urosaurus graciosus graciosus. One specimen (USNM 225326) was taken at the southeastern end of the Valle de San Felipe, 26 km by dirt road SE of the Villa del Sol turnoff. This is the third inland record for *U. graciosus* in the southern Colorado Desert and is 35 km NE of a specimen reported by Welsh (1976) from the mouth of Cañon Agua Caliente at the base of the San Pedro Mártir. We also observed *U. graciosus* at the base of the Sierra San Felipe (1.3 km S of Villa del Sol turnoff).

Uta stansburiana. We observed this common lizard along the base of the Sierra San Felipe. None were taken.

Dipsosaurus dorsalis dorsalis. One individual (USNM 225309) was collected in a sandy wash at the base of the Sierra San Felipe, 1.3 km S of Villa del Sol turnoff. Many others were observed along the Villa del Sol road, 2 and 8 km S of Hwy. 3, and one was found 6.6 km W of Hwy. 5 along Hwy. 3.

Phrynosoma platyrhinos. This lizard is common in Valle de San Felipe. We took specimens at three localities: 13.7 km S of Hwy. 3, along Villa del Sol road (USNM 225314); 5.4 km W of Hwy. 5, along Hwy. 3 (USNM 225315); and 3.2 km N of San Felipe on Hwy. 5 (USNM 225316).

Callisaurus draconoides rhodostictus. We collected specimens 26 km SE (USNM 225305-307) and 22 km SE (USNM 225308) of Hwy. 3 (Villa del Sol turnoff). These lizards were abundant in the large sand dunes on the east and southeast edges of the dry Laguna del San Felipe. Some dunes rise to about 15 m in height. These extensive areas of open sand are favored by *Uma notata*, but apparently this species does not occur as far south as Laguna de San Felipe (Slevin 1951; Pough 1977). Here *Callisaurus* apparently occupies the dune niche in the absence of *Uma*.

Gambelia wislizenii wislizenii. One adult (USNM 225310) was taken on the Valle de San Felipe road, 11.7 km S of Hwy. 3, in a flat area with scattered burro weed *(Franseria dumosa)* and saltbush *(Atriplex* sp.).

Sceloporus magister uniformis. We secured specimens from 26 km SE of Hwy. 3 (Villa del Sol turnoff), in the southeastern end of the Laguna de San Felipe (USNM 225320-323). They were found in vegetated areas on the flanks of the dunes or in hollows that were grown to thickets of palo verde *(Cercidium* sp.), mesquite *(Prosopis* sp.), and various bushes. At 9.8 km SE of Hwy. 3 (Villa del Sol turnoff), N end of Laguna de San Felipe (USNM 225324-325), these lizards occurred in hummock areas with mesquite and creosote *(Larrea tridentata).* We also saw *S. magister* at 1.3 km and 5 km S of Hwy. 3 (Villa del Sol turnoff). The species appears to be widespread in the region but is wary and difficult to catch.

Cnemidophorus tigris multiscutatus. One adult (USNM 225329) was taken 22 km SE of Hwy. 3 (Villa del Sol turnoff), in the dunes east of Laguna de San Felipe. The species was common on the flanks of the dunes and elsewhere in the Valle de San Felipe.

Xantusia vigilis. We found three lizards (USNM 225330-332) under debris and fallen yucca *(Yucca schidigera)* at 12.1 km E of Valle de Trinidad (12.2 km W of San Matias Pass), along Hwy. 3. These appear to be morphologically intermediate in dorsal pattern characters (Savage, 1952) between populations of central Baja California *(X. v. wigginsii)* and those of the southwestern United States *(X. v. vigilis),* as do *Xantusia* from the Sierra San Pedro Mártir region (Welsh, 1976). These specimens support Savage's (1952) evidence of a clinal pattern of variation in Baja California *X. vigilis.*

Lichanura trivirgata. We found a subadult (USNM 225337) 21.3 km E Villa del Sol turnoff (45.4 km E San Matias pass), along Hwy. 3. Gorman (1965) identified one specimen from 24 km N San Felipe as *L. roseofusca,* but omitted this locality on his range map. J. R. Ottley (pers. comm.) reported that this snake is from 25 km S San Felipe. Our specimen is the second record for northeastern Baja California. In pattern, coloration (Fig. 2), and ventral scales (Table 1), it most closely matches Klauber's (1931, 1933) and Stebbins' (1966) descriptions of *L. r. gracia.* Many of its scale counts (Table 1) fall within the range of *'roseofusca'* from Baja California and *'trivirgata'* from Baja California Sur, Arizona, and Sonora (Gorman 1965, Bostic 1971).

Stebbins (1966) stated that *L. trivirgata* is absent in extreme low desert from the Coachella Valley southward. The distribution of *Lichanura* apparently is spotty (Gorman, 1965, Stebbins, 1966) and further work in northeastern Baja California and northwestern Sonora may uncover new specimens. Our record is from an elevation of 270 m; such a low desert form may be expected to differ from animals farther to the west *(roseofusca* types), which occur in more mesic areas. The mountain range also may be a barrier to dispersal except across San Matias pass (elev. 980 m). Although *Lichanura* may occur up to 1,360 m, records in the Sierra San Pedro Mártir region indicate that it inhabits the lower Pacific slope and the San Quintín Plain west of the higher mountains (Welsh, 1976).

Ottley et al. (1980) reported one snake (no museum number and apparently alive) from El Arco, Baja California (28° 02'N, 113° 27'W),

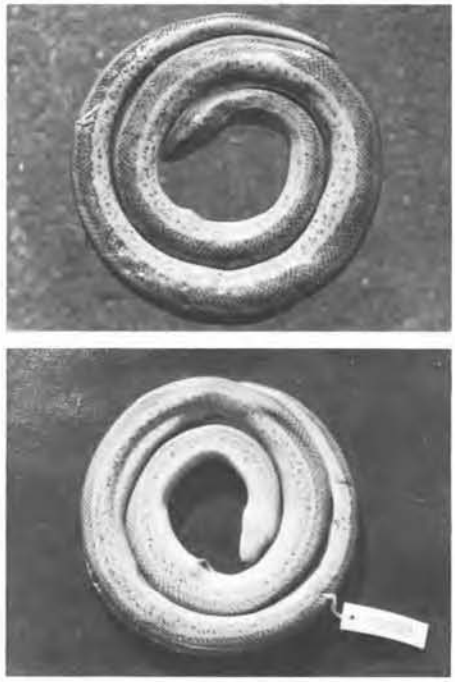


Figure 2. Dorsal and ventral view of *Lichanura trivirgata* taken in the south Colorado Desert. Tag on specimen shows field number (later cataloged as USNM 225337).

Table 1. Scale characters on some Baja California *Lichanura.* Mean with ranges given in parenthesis.

Location Source	Cape Region (Gorman, 1965)	San Marcos (Gorman, 1965)	San Ignacio (Gorman, 1965)	El Arco (Ottley et al., 1980)	Central Desert (Bostic, 1971)	This study
N	10	1	1	1	2	1
Dorsal Scale Rows	39.2 (36-41)	39	40	41	41 (40-42)	39
Ventrals	218.5* (219-223)	207	224	224	223.5 (222-225)	227
Caudals	45.0 (42-49)	41	44	48	44.5 (43-46)	46
Oculars one side	10.1 (9-11)	10	10	10.5 (10-11)	10.3 (10-11)	10
Supralabials one side	12.8 (12-14)	14	12.5 (12-13)	14.5 (14-15)	14.5 (14-15)	13
Infralabials one side	13.8 (13-15)	15.5 (15-16)	12.5 (12-13)	15.5 (15-16)	14.5 (14-15)	14

*Gorman's (1965) mean value (218.5) is apparently an error. Data are not available at this time to recalculate the correct figure.

that is intermediate in coloration and scale counts between *L. trivirgata* and *L. roseofusca* as recognized by Gorman (1965). However, the El Arco snake has few distinct features (ventrals, oculars, and infralabials) from specimens of *L. trivirgata* at San Ignacio or Isla San Marcos in Baja California Sur (Table 1).

Arizona elegans eburnata. Our records, the first for northeastern Baja California, are from 13.9 km E Villa del Sol turnoff, along Hwy. 3 (USNM 225338); 4.3 km E of San Matias pass, along Hwy. 3 (USNM 225339); 22.6 km N San Felipe, along Hwy. 5 (USNM 225342); 2.9 km S of the junction of Hwy. 3 (48.3 km N San Felipe), along Hwy. 5 (USNM 225343); 6.9 km W of Villa del Sol turnoff, along Hwy. 3 (USNM 225340); and 10.6 km E of San Matias pass, along Hwy. 3 (USNM 225341).

We assign these specimens to *A. e. eburnata*, which occurs to the north in the Colorado and Mojave deserts (Klauber, 1946a), and is known from the south by a single specimen collected at Rancho Rosarito on the Pacific slope at the southern end of the Sierra San Pedro Martir (Welsh, 1976). The subspecies *A. e. occidentalis* occurs along the Pacific side of Baja California as far south as El Rosario (Dixon and Fleet, 1976) and southeast near the junction of Hwy. 1 and the turnoff to Bahia de Los Angeles (Seifert, 1980). Intergradation between these forms likely occurs across San Matias pass.

Pituophis melanoleucus. One subadult (USNM 225363) was found 9.1 km E San Matias pass, Hwy. 3. This specimen matches Klauber's (1946b) description of *P. m. annectens*, a Pacific coastal form, except for the background coloration that is more characteristic of *P. m. affinis*, a subspecies of the Colorado Desert and areas farther east and south. There presumably is a zone of intergradation between Pacific and Gulf slope populations of the species across San Matias pass.

Phyllorhynchus decurtatus perkinsi. We found four specimens that match Klauber's (1940) description for the subspecies: 8.2 km E Villa del Sol turnoff (32.3 km E San Matias pass; USNM 225357); 1.1 km S Hwy. 3 (51.1 km N San Felipe), along Hwy. 5 (USNM 225358); 4.3 km W of Hwy. 5 (52.8 km W San Matias pass), along Hwy. 3 (USNM 225359); and 11.5 km E San Matias pass, along Hwy. 3 (USNM 225360). Welsh (1976) reported two other specimens from the Colorado Desert: 1.6 km N and 21.8 km N of San Felipe. The four new records verify the presence of the species across this section of Colorado Desert from the Gulf coast west to the mountain slopes.

Rhinocheilus lecontei lecontei. One specimen (USNM 225364) was taken 45.2 km E San Matias Pass, along Hwy. 3. This species is known previously in the south Colorado Desert from seven specimens from in and around the agricultural region near Mexicali and a single specimen from near San Felipe (Medica, 1975). The new record confirms its presence in the inland desert.

Salvadora hexalepis hexalepis. We found a single specimen (USNM 225365) 38.6 km E San Matias pass (14.4 km E of Villa del Sol turnoff), along Hwy. 3. This specimen confirms Bogert's (1945) speculation that the race *S. h. hexalepis* occurs in the Colorado Desert of Baja California.

Trimorphodon biscutatus vandenburghi. An adult (USNM 225367) was taken 9.9 km E Villa del Sol turnoff (34.0 km E San Matias pass), along Hwy. 3. This is the sixth specimen of the species known for Baja California, and the first report for the southern Colorado Desert (Welsh, 1976). The snake has an entire anal plate and 34 body blotches, thus matching Gehlbach's (1971) description for this race.

Chionactis occipitalis annulata. A series of six was obtained: 16.3 km N (USNM 225344), 18.1 km N (USNM 225345), and 18.2 km N (USNM 225346) of San Felipe, along Hwy. 5; 8 km W of Hwy. 5, along Hwy. 3 (USNM 225347); 0.5 km S of Hwy. 3, along Hwy. 5 (USNM 225348); and 11 km W of Hwy. 5 (46.1 km E San Matias pass), along Hwy. 3 (USNM 225349). Wake (1966) found the first Baja California record of *Chionactis* from 57.6 km N and 11.2 km W of San Felipe. Cross (1970) reported 11 specimens taken 1.6 to 52.8 km N of San Felipe along Hwy. 5, and all specimens were within 3.2 km of the Gulf of California coastline. We found no specimens farther inland than 14.2 km despite intensive driving along Hwy. 3. *Chionactis* may be restricted to the sandy coastal zone, but there is potential habitat for the species in sandy washes and in the extensive dune system around Laguna de San Felipe.

Our series is similar to other Baja California *Chionactis* in primary body bands, body bands plus unblotched ventral band positions (b.u.v.p.), and ventral and caudal scale counts (Table 2). Cross (1970) reported that the few *C. o. annulata* (11%) that had more than 44 b.u.v.p. are wholly from an Anza-Borrego population in southern California, but gives the range of b.u.v.p. for his 14 Baja California specimens as 31-51. The b.u.v.p. counts for our specimens are 45 or less. The primary bands are dark brown to black in the new series; Cross (1970) reported that the San Felipe animals had brown bands. Although Cross (1970) demonstrated some distinctive characters for the San Felipe population, the total known (N=21) from Baja California is small compared to other areas.

Masticophis flagellum piceus. We obtained two specimens east of the Sierra San Felipe: 4.6 km W of Hwy. 5, along Hwy. 3 (USNM 225353); and 15 km W of Hwy. 5, along Hwy. 3 (USNM 225354). We also saw snakes or found unsalvageable snakes at 12 km W San Matias pass, 2.9 and 21.9 km E Villa del Sol turnoff, and about 5 km W of Hwy. 5, all along Hwy. 3; and 24.3 km N of San Felipe. Wilson (1973) showed the species as widespread through the peninsula, but indicated only one previous record in the Colorado Desert near San Felipe. Our specimens were all red phase snakes.

Table 2. Comparison of Baja California *Chionactis*. Mean ± S.E. is given with range in parenthesis.

	Wake (1966)	Cross (1970)	This study
Sample size	1	14	6
Primary body bands	33	26.6 ± 0.8 (22-31)	26.0 ± 2.9 (23-31)
Body bands plus unblotched ventral band positions (b.u.v.p.)	42	39.7 ± 1.7 (31-51)	36.5 ± 5.6 (30-45)
Ventrals			
Males	145	149.5 ± 1.1 (143-154) N=10	151.5 ± 3.8 (146-156) N=4
Females		166 N=2	162.5 ± 3.5 (159-166) N=2
Caudals			
Males	46 + 1	44.2 ± 0.5 (42-47) N=9	43.7 ± 1.7 (42-46) N=3
Females		44 N=1	39.5 ± 4.5 (35-44) N=2

Crotalus ruber ruber. One individual (USNM 225374) was collected 20 km W of Hwy. 5, along Hwy. 3.

Crotalus mitchellii pyrrhus. Two specimens were taken at 1.3 km SE Villa del Sol turnoff (USNM 225372) and at the junction of Hwy. 3 and 5 (USNM 225373).

Crotalus cerastes laterorepens. Four sidewinders were taken along Hwy. 3: 22.9 km E (USNM 225368), 15.8 km E (USNM 225369), 2.4 km W (USNM 225370), and one km SE (USNM 225371) of the Villa del Sol turnoff. These records indicate that *C. cerastes* is common in the southern Colorado Desert up to 450 m elevation.

SUMMARY

In the winter of 1978-1979, northern Baja California received exceptionally high rainfall. In the spring of 1979 we found many reptiles in this region, including three species previously unreported and several others poorly represented in herpetological reports from northeastern Baja California. Our data indicate that the previous absence of some species in northeast Baja California, as compared with adjacent desert regions, is due to inadequate exploration rather than climatic extremes. Further, examination of this new material suggests that within some species there is genetic exchange between Pacific coastal and Gulf of California desert forms across San Matias Pass (980 m), the lowest gap in the northern Baja California Cordillera.

As with other species, there possibly is a broad area of intergradation of *Lichanura* across the San Matias pass. This area holds promise as a region where the distinction between *roseofusca* and *gracia* forms may be better defined.

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All specimens are deposited at the National Museum of Natural History (USNM).

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TECHNIQUES

A TECHNIQUE FOR INDIVIDUALLY MARKING FROGS IN BEHAVIOURAL STUDIES

There are a number of methods for individually marking anurans (reviewed in Ferner, 1979). Toe-clipping and tattooing are particularly useful in long term studies of marked populations. In behavioural studies, however, these techniques have the severe disadvantage that the frog has to be captured and its mark examined before its identity can be established. It is often impossible to be sure of the identity of the protagonists throughout a fight or courtship display.

In a behavioural study of bullfrogs, *Rana catesbeiana*, Emlen (1968) marked individuals with colour-coded elastic waistbands so that they could be identified without disturbance. I tried this technique on the following Australian hylids and leptodactylids: *Litoria aurea, L. raniformis, L. peroni, L. verreauxi, Limnodynastes tasmaniensis, L. dumerli, Uperoleia rugosa, U. marmorata, Pseudophryne bibroni* and *Neobatrachus sudelli*. In all cases the frogs would not tolerate the waistbands but attempted to shake the bands off by twisting, jumping and somersaulting. The larger hylids, particularly *Litoria aurea* and *L. raniformis*, began struggling as soon as bands were placed on them and did not stop until the bands were removed. The other species of frogs reacted to the bands more intermittently, but it was clear that the bands were disrupting their normal behaviour. It is also difficult to make waistbands small enough for the smaller species of frogs. I describe below a method which I developed for use in a behavioural research project on the breeding biology of the small (< 40 mm snout-vent length) leptodactylid *Uperoleia rugosa* in which it was essential to identify individuals without disturbance (Robertson 1982, in press and in preparation). This technique was only tested with *U. rugosa* but it is likely to work with other species.

Each frog was marked with a unique combination of one to three squares (c 1 mm x 1 mm) of Scotchlite® brand reflective sheeting (3M company) attached to the head. The head of the frog was first wiped dry with tissue paper and the reflective squares were glued in place with a fast-setting cyanoacrylate tissue cement (Ethicon Bucrylat). The frogs were also marked by excising the last digit of one to three toes in a unique sequence (Nace, 1974). The reflective squares would stay in place for up to ten days, which was sufficient for some short term experiments but not enough for long term studies. The reflective squares were apparently becoming detached because of the secretions from the skin glands under the adhesive. Freeze-branding the top of the head for 10 sec with a pressurised refrigerant (Lazarus and Lowe, 1975) inhibited the skin glands.

This method has been used successfully on about 100 individuals of *U. rugosa*. I did not always record when the reflective squares needed to be replaced, but in general they stuck to the brand for about three weeks and sometimes as long as six weeks. For 15 frogs on which I have detailed notes, the reflective squares remained attached for between 16 and 41 days ($\bar{X}$ = 26.27, S.D. = 6.49). The length of time that a reflective square remains attached will probably vary with other species of frogs but by experimenting with the timing of the freeze-branding it should be possible to attach the reflective squares for at least three weeks.

In combination with toe-clipping this is a useful method for identifying frogs in behavioural studies. Frogs can be identified without disturbance for several weeks and when the squares of reflective Scotchlite® sheeting fall off, the frog can still be identified from its toe-clips. The reflective squares can be replaced successfully after a fresh freeze-branding. The reflective squares shine well in the light of a head-torch and the frog can be identified at up to 5 m which is far enough away to avoid disturbance. The range at which the frogs can be identified can be increased by using binoculars or by attaching larger squares of reflective sheeting to the frogs. The frogs seem to suffer no ill effects from this marking technique and their behaviour was indistinguishable from that of unmarked frogs.

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ARTIFICIAL NESTS FOR FEMALE GREEN IGUANAS

Extracting accurate data on egg clutches laid by green iguanas, *Iguana iguana*, at communal nest sites is important in many respects. Information on clutch size, individual egg measurement, and nest construction are necessary for our understanding of reproductive capacity and nesting behavior of females. Egg clutches are often difficult to find, and because females are known to dig complex, interconnecting tunnel systems (Rand, personal communication), correct identification of a particular female's clutch can be difficult if not impossible.

An artificial "laying device" was designed to make possible the quick recovery of freshly laid clutches, the accurate association of female with clutch, and the identification of variables that constitute an adequate nest site.

An enclosure 10.5 m (L) x 9.3 m (W) x 1 m (H) was constructed of corrugated zinc (Fig. 1). Wooden posts (5 cm x 5 cm x 2 m) supported the walls from the outside. The zinc walls were buried 30 cm in the ground and lined with a cement strip 25 cm wide to prevent nesting females from digging out. Four bamboo houses 100 cm x 60 cm x 60 cm, placed in the area, provided shade and hiding places for the iguanas. A pit (4.8 m x 2.8 m x 50 cm) was dug in the center of the enclosure, and then refilled with the now broken-up soil. Four "nest holes" 40 cm deep were started in the pit by hand.

Six gravid females, collected from a natural nest site in Summit Gardens, Parque Nacional Soberanía, Panama, were placed in the enclosure on February 2nd and 3rd, 1984. All females began to dig in the pit, and in several days produced an elaborate tunnel system. Within two days the number of holes had doubled and several tunnels were connected to each other (Fig. 2). Observations made daily between 1700 and 1900 h enabled us to identify females with numbered holes. Females #2-6 laid their eggs between 2/6/84 and 2/13/84 (Table 1). Because of the tunnel network, exploratory digging was delayed until at least two of the females had deposited eggs.

In the areas where females had dug and covered up a hole, excavation failed to yield any eggs. It was necessary to dig the pit out entirely before clutches from females #2 and #3 were found in two side walls of the pit. The pit had been refilled and dug out again before clutches from females #4, #5 and #6 were found underneath the cement strip along the perimeter of the enclosure. Each clutch required an average of two days to find, and none were located in the tunnels dug by the females.

Drawbacks of the set-up were: (1) Failure to locate eggs, (2) Failure to identify without a doubt the origin of the clutch, (3) Disruption of the nest area and females, (4) Excessive expenditure of time.

An artificial laying device was designed, and six of these were placed in the pit (Fig. 1). The device consisted of six 40 cm x 20 cm x 10 cm concrete blocks and two 30 cm long clay tubes (Fig. 3). The artificial nests were placed in the bottom of the pit and covered with 3 cm of dirt, after filling the laying chambers completely with dirt. The two clay tubes (outside diameter 20 cm, inside diameter 15 cm) were placed in line with the chamber opening to form the entrance tunnel, the floor of which was covered with 7 cm of dirt. The only visible part of the entire device was the top half of the entrance hole (Fig. 1), although the interior of a chamber could be viewed easily by removing one or both of the concrete blocks on top. Other conditions in the pit and enclosure were the same as before, but now the females had the additional choice of using the artificial laying devices for egg deposition.

At the time the laying devices were placed in the pit on 2/14/84, five gravid females were in the enclosure. The morning following installation, a clutch of 33 eggs from female #1 was discovered in the back of chamber #4. Two more females occupied devices #1 and #3. During the next three days, four additional clutches, removed from the chambers, yielded 176 more eggs. At least two females occupied chambers at all times.

After introduction of the artificial device egg deposition time was reduced from 6 days to 2 days. Time for recovering eggs has been reduced from 2 days for each nest, to less than five minutes. Immediately after introduction to the enclosure, gravid females enter the device. An observer can tell when a chamber is either occupied by a female or a clutch has been laid, by simply looking at the entrance way. Females that are in the device block the entrance entirely with excavated dirt from the chamber. Those that have laid eggs refill the tubes and remain outside the nest. All clutches we obtained had been laid in the very back of the chamber and were seen easily after removing the top blocks and clearing 1 cm of dirt within the chamber. The eggs were removed for artificial incubation (Miller and Werner, in prep.) and the chambers refilled for the next female.

The observation that females laid clutches under the cement strip, in the hard walls of the pit, in the devices, and in certain nest holes in the wild, suggests that a solid roof may be an important factor in nest construction. Boylan (in press), writes of captive female *Cyclura cornuta cornuta* digging tunnels and nests under logs and slabs of rock. Solid cover over the eggs prevents caving in and could protect clutches from predators and adverse environmental conditions, and may provide the appropriate environment for successful incubation.

Female green iguanas have been observed nesting in a wide variety of substrates including different mixtures of soil, sand, and even ashes and refuse in garbage dumps.

From our experiments it is evident that:

1) If an adequate nest is available to a female she will use it.
2) Substrate composition appears to be relatively unimportant.
3) The immediate use of the artificial nest chambers by the females leads us to believe that the structural requirements of the nest chamber i.e. solidity of the walls and roof is a decisive factor for the female.

It is anticipated that experiments during artificial incubation (Miller and Werner, in prep.) will give insight into the importance of humidity, temperature, and substrate for normal egg development and successful hatching, and that further investigation of nest construction will provide information on egg arrangement and immediate environment (air spaces) surrounding the eggs.

Captive management enables the experi-

Table 1. Date on which female was placed in cage, date when she laid, and number of days between placing female in cage and laying. The number of eggs and locality where she laid are indicated. For nest site location see Figure 1.

Female #	Date Placed in cage	Date Eggs Laid	Interval in days	# of Eggs	Location
3	2-02-84	2-06-84	4	46	Hole in wall C
2	2-02-84	2-08-84	6	50	Hole in wall A
5	2-03-84	2-10-84	7	53	Under cement E strip
6	2-08-84	2-10-84	2	57	Under cement F strip
4	2-03-84	2-13-84	10	33	Under cement D strip
1	2-02-84	2-15-84	13	33	Tube # 4
8	2-10-84	2-16-84	6	44	Tube # 6
12	2-14-84	2-16-84	2	42	Hole in wall C
15	2-15-84	2-16-84	1	50	Tube # 4
13	2-14-84	2-17-84	3	60	Hole in wall B
16	2-17-84	2-18-84	1	42	Tube # 2
14	2-15-84	2-19-84	4	40	Tube # 1
22	2-21-84	2-23-84	2	33	Tube # 6

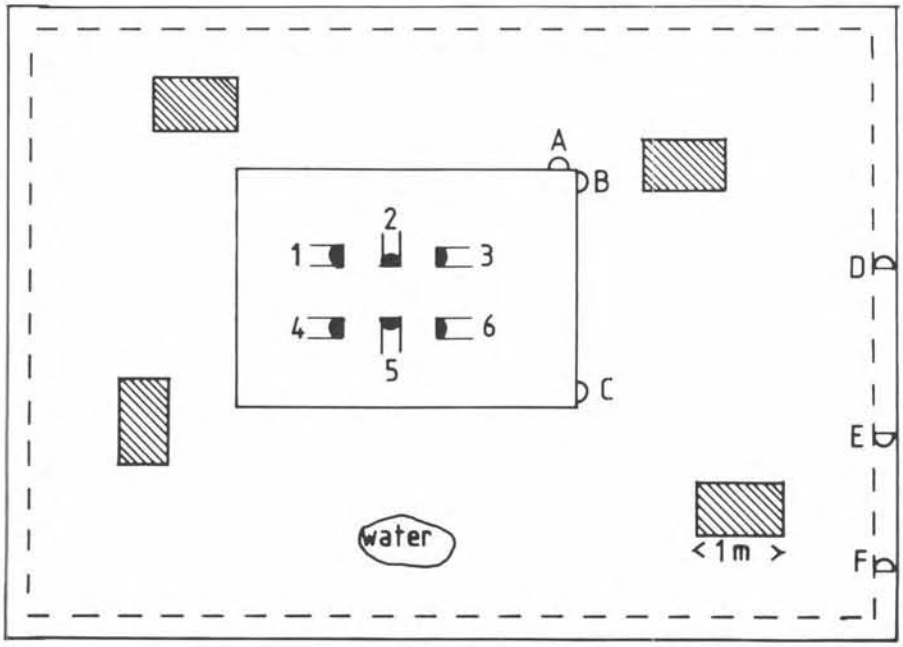


Figure 1. Enclosure with natural holes (⌓ A-F) dug by females. The location of artificial laying devices is indicated by: ⊔ 1-6. ▨ hiding boxes.

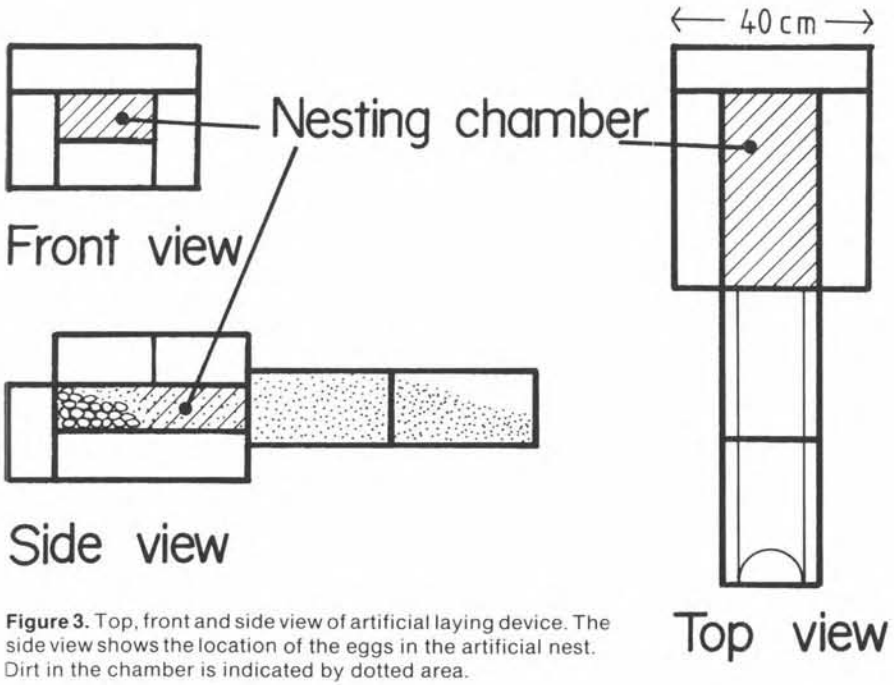


Figure 3. Top, front and side view of artificial laying device. The side view shows the location of the eggs in the artificial nest. Dirt in the chamber is indicated by dotted area.

mentalist to explore the variables that affect the many behaviors of the green iguana. The artificial nest device has already provided many insights into nesting behavior, a way to keep accurate records on females and their respective clutches, and sufficient eggs for artificial incubation.

This low-cost and easy-to-install device can be used for a number of purposes.

1. CONSERVATION: In areas where appropriate nest sites are not available to females, laying devices can be constructed easily. In areas where female iguanas are killed for their eggs (Fitch, et al., 1982; Ruiz and Rand, 1981), laying devices can be installed in nest areas and eggs removed, while keeping the females alive for subsequent seasons.
2. REPOPULATION AND MANAGEMENT PURPOSES: Depending upon needs a defined number of eggs can be collected and incubated.
3. IN ZOOS: The device allows easy construction of a laying site in a limited sized exhibit.

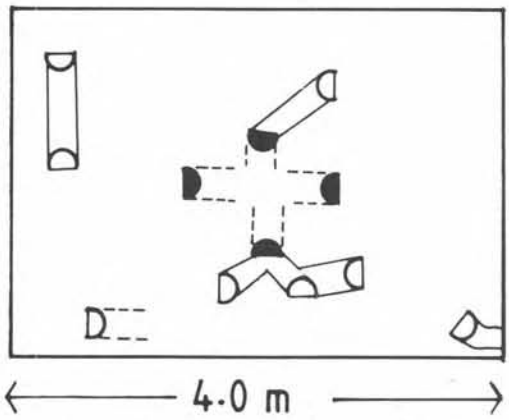


Figure 2. Natural holes (⌓) with tunnel network (⊏⊐) dug by females, and location of hand started holes (●). Dotted lines: exact destination of tunnel unknown.

We are confident that this laying device can be adapted easily to the needs of other species of reptiles by adjusting its size and location in a given area.

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COMBINED MEETINGS

The 27th Annual Meeting of

THE SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

with

The 32nd Meeting of

THE HERPETOLOGISTS' LEAGUE

and

The 64th Annual Meeting of

THE AMERICAN SOCIETY OF ICHTHYOLOGISTS & HERPETOLOGISTS

AT

THE UNIVERSITY OF OKLAHOMA

Norman, Oklahoma

28 July - 3 August 1984

SYMPOSIA AND WORKSHOPS

Workshop in Larval Amphibian Biology (ASIH, SSAR), 30 July

Predator-Prey Relations in Lower Vertebrates (ASIH, SSAR), 31 July - 1 August

Biology of *Cnemidophorus* (ASIH, HL, SSAR), 1-2 August

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Victor H. Hutchison, Department of Zoology, University of Oklahoma, Norman, Oklahoma 73019, U.S.A. Telephone: (405) 325-6721. ●

WORLD CONGRESS OF HERPETOLOGY

Planning for the first World Congress of Herpetology is proceeding on schedule. The Executive Committee, an international group of 17 persons, and the recently-elected 50-member International Herpetological Committee are now evaluating the criteria to be used in choosing a site and date, and discussing the format and content of the Congress. It is our plan to organize a Congress to be held in about 4 years that will be accessible to and of interest to all persons who study amphibians and reptiles. Potential hosts should contact the Secretary-General: Kraig Adler, Cornell University, Seeley G. Mudd Hall, Ithaca, New York 14853, USA. As soon as a decision on venue and date is reached, an announcement will be published in this journal giving the full details and the address to write for further information.

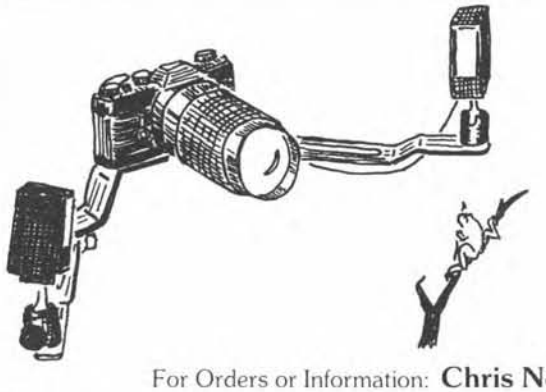
The Congress itself will be self-supporting, but in the meantime, during these all-important planning years, the organization will have considerable expenses—mostly printing and postage—yet it has, at the moment, no budget. The Committee has decided to raise the necessary funds by asking interested individuals to make a one-time contribution. Those persons donating 100 Dutch guilders (U.S. $35) would be named as "Sponsors," a designation that would appear in the formal program of the meeting; those able to contribute 1000 guilders would be designated "Benefactors." In the meantime, all such persons will receive copies of our *Newsletter* which will keep them informed of Congress planning activities. We hope that many colleagues will join with us in promoting herpetology on an international basis through the Congress. If you are able to do so your contribution can be made to one of our official accounts:

—POSTAL CHECKING ACCOUNT: Dr. M. S. Hoogmoed, Leiden, account number 5327161.

—BANK ACCOUNT: World Congress of Herpetology, Algemene Bank Nederland (A.B.N.), Leiden, account number 566274078.

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[1] Joint committee with the Herpetologists' League

[2] Joint committee with the American Society of Ichthyologists and Herpetologists

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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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THE AMERICAN SOCIETY OF ICHTHYOLOGISTS & HERPETOLOGISTS

AT

THE UNIVERSITY OF OKLAHOMA

Norman, Oklahoma

28 July - 3 August 1984

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Victor H. Hutchison, Department of Zoology, University of Oklahoma, Norman, Oklahoma 73019, U.S.A. Telephone: (405) 325-6721. •

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A teaching workshop on Amphibian Larval Biology will be held at the 1984 joint meeting of the American Society of Ichthyologists and Herpetologists, the Herpetologists' League, and the Society for the Study of Amphibians and Reptiles, University of Oklahoma, Norman, July 30, 1984. The workshop is designed as a minicourse for the non-expert on these organisms; no prior experience in herpetology or systematics is presumed. Among the people who may be interested in this workshop are general biologists, graduate students in herpetology outside of amphibian biologists, freshwater ecologists, developmental biologists and amateur herpetologists. The workshop will include the examination of museum specimens. A syllabus with annotated bibliography will be provided for all those who register. For more information contact:

Richard Wassersug
Department of Anatomy
Tupper Medical Building
Dalhousie University
Halifax, Nova Scotia
B3H 4H7 Canada

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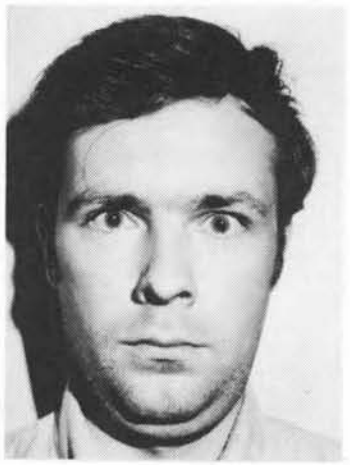
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SSAR BUSINESS

SSAR ELECTION RESULTS

The results of the 1983 SSAR Election are as follows:

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Treasurer: Henri Seibert
Board - Regular: Alan Savitsky
Board - Overseas: Timothy Halliday.

All three proposed amendments to the SSAR Bylaws (see *Herp. Review*, 14(1):5-6) passed.

The Society extends its gratitude to the Nominating Committee (James L. Vial, Chair) for its hard work, and to the outgoing President and Board Members for their service during their terms. ●

SSAR CONTRIBUTORS

Again we are happy to recognize those members of SSAR who have contributed during 1983 to the financial welfare of the Society. Their generosity is appreciated.

Contributing Members

Anderson, M. L.	Glenn, J. L.	Ruibal, R.
Bechtel, H. B.	Miller, L. R.	Sabeh, M.
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Hill, L. W.	Webb, R. G.
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Howell, K.	White, J.
Huff, T. A.	Wilkeson, C. A.
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LETTERS TO THE EDITOR

OF PROPOSALS AND NOTICES AND NEWSNOTES: A RESPONSE

Having worked through the governmental maze in the Endangered Species Program for slightly over 7 years now, I had thought that I was aware of Federal activities throughout the Program. Imagine my surprise at finding in Herpetological Review a Newsnote to the effect that there were 110 amphibians and reptiles proposed for addition to the U.S. List of Endangered and Threatened Wildlife (Casper, 1983; 14(3):61). Amazing, thought I! I knew of course that there was (is) an attempt to circumvent the Washington office from the decision making process as part of putting more authority into field offices, but how in the world could such a momentous proposal escape my notice, much less not knock the telephone right off my desk from the legions of angry fellow scientists afraid of having their entire research programs wiped out. Best read on, thought I recovering slightly, as someone has assuredly botched Basic Reading. And indeed they did.

Let me assure all herpetologists that the Fish and Wildlife Service (FWS) has not proposed any species in the December 30, 1982, *Federal Register*. What the Service did was to prepare a notice of review of 110 reptiles and amphibians that need to have their status assessed or that *no longer need* status reviews. In fact, the amphibians and reptiles were included along with a rather comprehensive review of all native vertebrates that should be considered for further research activities. It is likely, and indeed we hope, that nearly all these species will not be listed, not because in someone's eyes they might impede his (her) ability to keep a pet snake, but because the status of the species is such that it biologically does not merit Federal protection.

In the text of the Newsnote, Casper did indeed note that the vertebrate species listed in the Federal notice were "being considered" for listing, but even this is not entirely true since there were 5 taxa listed as extinct and a number of additional species were included that are not being considered because they had taxonomic problems, were hybrids, or had previously appeared on Federal notices but were no longer being considered because they were found to be more abundant than previously believed, or without threats. Only 9 of the taxa were believed to qualify under the extremely stringent requirements of the Endangered Species Act for listing, and indeed we may need some more work on some of them to refine our knowledge of distribution, threats, or other pertinent information.

The vertebrate notice was not the first wide ranging notice to be published by the Service; several plant notices have appeared the past few years and an invertebrate notice is scheduled shortly. The purpose of these notices is to let the public, and particularly the scientific community, know what species are under consideration so that we may obtain the best information available on their status. If individuals have data which they believe can help us to evaluate status, we need to know about it so that future notices can reflect an accurate assessment of species. The 1982 notice has already pinpointed at least one omission, as well as provided us with new data which will allow a more accurate revision of the various categories. For instance, the Lake Erie water snake *(Nerodia sipedon insularum)* should have been included in the notice, while it seems that the Arizona ridgenosed rattlesnake *(Crotalus w. willardi)* should now be regarded as category 3C (no longer in need of review as a Federal candidate). Future vertebrate notices will reflect appropriate changes based on data, not opinion, as the evaluation of the status of species moves from a pseudoscience to a challenging field in its own right.

The overwhelmingly most disturbing thing about Mr. Casper's apparently unreviewed Newsnote is that his personal opinion ("Persons working with the proposed *(sic)* taxa should be aware that listing often hampers captive propagation (or other research programs); . . ." was accepted on a page of a

Society publication that is not an editorial page, but a place to let the herpetological community know what is taking place that might be of interest. This could easily have been edited to reflect a non-biased (and I might add, accurate) account of the Fish and Wildlife Service's vertebrate notice. It is also this kind of detrital material that detracts from many of the amateur society publications and certainly has no place in *Herpetological Review*.

For his personal edification, Mr. Casper should in future learn about the program he criticizes before he pontificates about listing being a deterrent to research. He should contact the Fish and Wildlife Service Federal Aid Program which administers cooperative agreement funds to the States under Section 6 of the Act for research on endangered or potentially endangered species; he might learn that several million dollars have been spent on amphibians and reptiles alone (see *Herp. Rev.* (11(3):70-72). Or he might have contacted either the Washington or the FWS Regional offices of Endangered Species where he might learn that several hundred thousand dollars have been spent in direct grants-in-aid for research on potentially endangered or threatened species on non-glamorous amphibians and reptiles; or he might contact the Fish and Wildlife Service office in Albuquerque which has just reported spending several hundred thousand dollars on sea turtle research; or he might contact the Service's Denver Wildlife Research Center (DWRC) to learn of their endangered species research program and how biologists have been brought from other countries to learn about crocodilian biology taught by DWRC personnel in part through Section 8 of the Endangered Species Act; or he might contact the Division of Realty and learn that key properties on Key Largo, and in the U.S. Virgin Islands, San Joaquin Valley, and near Plymouth, Massachusetts, to name a few, have been purchased specifically for amphibians or reptiles as a direct result of listing; or he might contact the Division of Law Enforcement to learn of the vast smuggling and illegal trade in reptiles and parts and products thereof, and how listing tries to put a dent into it; or he might contact the Houston Zoo or Auburn Cooperative Wildlife Research Unit to learn of *real* research on captive propagation of amphibians and reptiles; or he might contact me to learn that the Fish and Wildlife Service has, through the listing of endangered and threatened species, sponsored or cosponsored numerous scientific conferences to discuss the needs for both basic and applied biological research. Enough, I have made my point although I have barely scratched the surface.

In the future, I would hope that *Herpetological Review* will maintain the highly professional standards that it has held in the past, albeit a curious mix of research reports, news, and information. To those who follow Federal endangered species activities, know the program before you criticize it; it is indeed many faceted and quite complex. However, much good is accomplished for scientific research and the understanding of both species and herpetological communities. And finally, when questions arise, consult those who know most about the Program, either myself or one of the biologists in the Fish and Wildlife Service's Field or Regional offices, or the SSAR Conservation Committee. A professional society does not need the gamesmanship implied by Casper. Copies of the 1982 Vertebrate Notice of Review (*Fed. Reg.* 47(251):58454-58460) may be obtained by writing to: Office of Endangered Species, U.S. Fish and Wildlife Service, Washington, D.C. 20240.

C. KENNETH DODD, JR.
Office of Endangered Species
U.S. Fish and Wildlife Service
Washington, D.C. 20240



REPLY TO DODD CRITICISMS

C. Kenneth Dodd, Jr.'s article "Of Proposals and Notices and Newsnotes: A Response" is highly critical of my Newsnote "New Federal Listings Proposed for Reptiles and Amphibians." His criticisms are based on faulty inferences, misinterpretation, and misinformation which makes his article unjustifiable and unwarranted. The shortcomings of Dodd's article are as follows.

Dodd claims that my Newsnote misrepresented the notice in the *Federal Register* (that I "botched Basic Reading") by claiming that 110 amphibians and reptiles were proposed for addition to the U.S. List of Endangered and Threatened Wildlife. Dodd goes on to say that the Fish and Wildlife Service (FWS) "has not proposed any species" but has "prepared a notice of review." In fact, my Newsnote clearly states in the opening sentence that "the FWS *published a review* of vertebrate wildlife *being considered for listing* as endangered or threatened species" (emphasis added). My next sentence stated that "52 amphibians and 58 reptiles are *listed in the proposed rules*" (emphasis added). This is an accurate count of the number of taxa listed in the *Federal Register*, vol. 47, no. 251, Proposed Rules *(sic)*, pp. 58454-58458. Dodd's claim that my Newsnote stated there were "110 amphibians and reptiles proposed for addition to the U.S. List of Endangered and Threatened Wildlife" is thus false.

Dodd goes on to refute this claim which I did not make, pointing out that not all of the 110 listed taxa were in the review category. This was already clearly stated in the third sentence of my Newsnote, which enumerated the number of taxa listed in other categories of the notice of review. The number of taxa in category 3B (not being considered for taxonomic reasons) was not enumerated because the original manuscript submitted to *Herpetological Review* reproduced the entire list of taxa in the Proposed Rules, including a complete description of the various categories, and as only 3 taxa were listed in category 3B it was unnecessary to include these in the brief introductory summary.

Dodd next defends the purpose of publishing the vertebrate notice, which is "to let the public, and particularly the scientific community, know what species are under consideration so that we may obtain the best information available on their status." This is the very reason I published the Newsnote, which encourages readers to contribute information to the FWS. I discovered the notice of review by accident 9 months after publication and found that herpetological and zoo circles were completely unaware of it. It seems strange that the FWS did not notify the zoological community of such an extensive notice requesting information from the public. Dodd's defense of the vertebrate review publication is unnecessary and irrelevant. No one disputes the dissemination of this information.

Dodd next takes issue with my statement that "listing often hampers captive propagation (or other research) programs," calling it "overwhelmingly disturbing," a "personal opinion," and "detrital material" with "no place in *Herpetological Review.*" In no way is my statement simply a personal opinion. It is

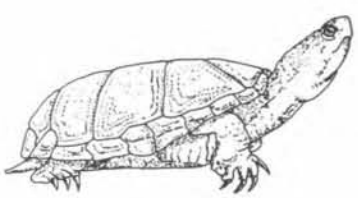
a well documented fact which the editor and most readers are well aware of (see Casper, G. 1982. *Biological Extinction*, vol. 1, no. 2, pp. 55-58). "Hampers" is a kind word for a result of legislation which has been directly responsible for severe population declines in many rare species. It is understandable that the FWS does not like to see this embarrassing aspect of federal legislation in print. However, it is unacceptable to censor such information from this or any scientific medium, as Dodd suggests. Dodd is well aware (at least in part) of the factual basis of my statement, for he says in his first paragraph that proposed listings would result in "legions of angry fellow scientists afraid of having their entire research programs wiped out."

Finally, Dodd suggests that I am unlearned and should correct this deficiency before "pontificating about listing being a deterrent to research." Dodd then praises several federally funded wildlife programs, apparently attempting to illustrate how beneficial listing can be. Dodd has misinterpreted my Newsnote as claiming that listing is a deterrent to research, when no such broad criticism was made. The Newsnote mentions an "aspect of listing" which hampers *some* research, especially captive propagation, and then emphasizes the *importance* of another aspect of listing — habitat protection. The positive aspects of listing are well known. For the record, I have worked towards strengthening these provisions, as well as having volunteered hundreds of hours collecting field data for the FWS.

The negative aspects of listing are nevertheless serious and are being increasingly criticized by the zoological community. While several of the programs Dodd mentions are commendable (though often painfully limited to too little and too late), others are undeserving or even harmful, such as recent activities of the FWS Division of Law Enforcement (see Casper, *ibid*). Dodd also mentions programs which for their success have been largely dependent on the expertise developed over several decades by private zooculturists, who are now being forced to give up their researches and species survival programs because of federal listing legislation and regulations.

I would hope that *Herpetological Review* will continue to report both good and bad news in the field of herpetology. Dodd's insupportable objections to basic news reporting are incompatible with mutual government and private efforts towards improving wildlife protection and continuing biological research.

GARY S. CASPER
1857 Third Street
White Bear Lake, Minnesota 55110, U.S.A. ●



MEETINGS

REPORT ON THE SYMPOSIUM ON "THE STRUCTURE, DEVELOPMENT AND EVOLUTION OF REPTILES" HELD AT THE ZOOLOGICAL SOCIETY OF LONDON ON 26TH AND 27TH MAY, 1983, IN HONOUR OF PROFESSOR A.d'A. BELLAIRS ON THE OCCASION OF HIS RETIREMENT

This International Symposium, held under the auspices of The Zoological Society of London, The Anatomical Society of Great Britain and Ireland and The British Herpetological Society, featured 27 speakers from Britain, Australia, Africa, Canada, Holland, Switzerland and the United States of America. The sessions were well attended by delegates from many parts of the world, and all seemed to enjoy the stimulating scientific sessions and the social discussions thereafter.

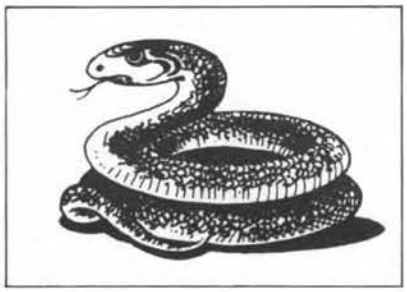
The contributors were each authorities in their particular field and many were former students, friends or collaborators of Professor Bellairs (St. Mary's Hospital Medical School, London). In part, this determined the nature of the subjects covered, but the latter was also influenced by Professor Bellairs' personal interests and by areas of current investigation in reptile biology. The symposium brought together investigators who are using reptiles in some particular field but who would not normally meet and interact given the somewhat restricted and specialized programmes of many scientific societies and meetings. The presentations were therefore a series of selected highlights in the fields of reptile morphology, development, physiological ecology and evolution. The programme was broad ranging and emphasised the inseparable relationships between form and function, evolution and development, ecology and physiology.

Sometimes investigators with opposing views contributed papers on related topics, e.g. S. V. Bryant (University of California, Irvine) and L. S. Honig (University of Southern California, Los Angeles) on limb development, and M. J. Benton (University of Oxford) and A. J. Charig (Department of Palaeontology, B. M. (N.H.)) on relationships between therapsids and archosaurs during the Triassic, which made for some interesting and lively discussions both during and after the symposium sessions. Many new data were presented and these were often extensive as in the case of G. J. W. Webb (University of New South Wales, Kensington) on sex ratios and survivorship in *Crocodylus johnstoni*, J. P. Loveridge (University of Zimbabwe, Harare) on thermoregulation in *Crocodylus niloticus*, R. A. Avery (University of Bristol) on the control of lizard growth, R. Presley (University College, Cardiff) on the development of the tympanic membrane, and J. M. F. Landsmeer (University of Leiden) on the morphology of the anterior limb in *Varanus*. Professor R. A. Coulson (Louisiana State University, New Orleans) gave an extremely interesting and amusing talk on how metabolic rate and anaerobic glycolysis determine the habits of reptiles, whilst Dr. R. E. H. Reid (Queen's University, Belfast) presented a well balanced account of dinosaur bone histology, illustrated with beautiful photomicrographs. He concluded that few inferences could be drawn about dinosaur endothermy or ectothermy on the basis of bone histology alone. Many new hypotheses were advanced on topics as diverse as: the control of snake epidermal shedding cycles by P. F. A. Maderson (Brooklyn College, City University of New York), the evolution of the long necked chelidae by P. C. H. Pritchard (Florida Audubon Society), the developmental evolution of cartilage and bone by B. K. Hall (Dalhousie University, Halifax), the pathogenesis of cleft lip and palate in reptiles, birds and mammals by M. W. J. Ferguson, the evolution of dental enamel and tooth attachment mechanisms by M. Zeichner-David (University of Southern California, Los Angeles) and J. W. Osborn (University of Alberta, Edmonton) respectively, the endocrinological control of reproduction in male reptiles by V. Lance (Tulane University, New Orleans), the genetic evolution of specialised sex chromosomes by K. W. Jones (University of Edinburgh), skull miniaturization in lizards by O. Rieppel (University Zürich), and the evolution of ornithopod dinosaurs by D. Norman (University of Oxford). Some contributors, e.g. G. L. Underwood (City of London Polytechnic) on the scleral ossicles of lizards, E. N. Arnold (Reptile Section, B. M. (N.H)) on the cloacal and hemipeneal muscles of lizards, and M. J. Benton on the relationships of the diapsidia, had systematic implications. Dr. F. E. Russell (University of Arizona, Tucson) provided a useful summary of snake venoms, whilst Dr. H. R. Bustard (FAO/UNDP Crocodile Breeding Project, India) illustrated the gharial conservation programme in India.

The meeting was a fitting tribute to Angus Bellairs whose interests in reptile biology are widespread and who closed the meeting with some comments on the evolution of snakes, Jacobson's organ and the intermandibular symphysis, as well as more general comments on herpetology and herpetologists. The meeting had opened with an appreciation of Professor Bellairs by the symposium organiser, Dr. Mark Ferguson, who included some anecdotes from Angus Bellairs' wartime and medical school services.

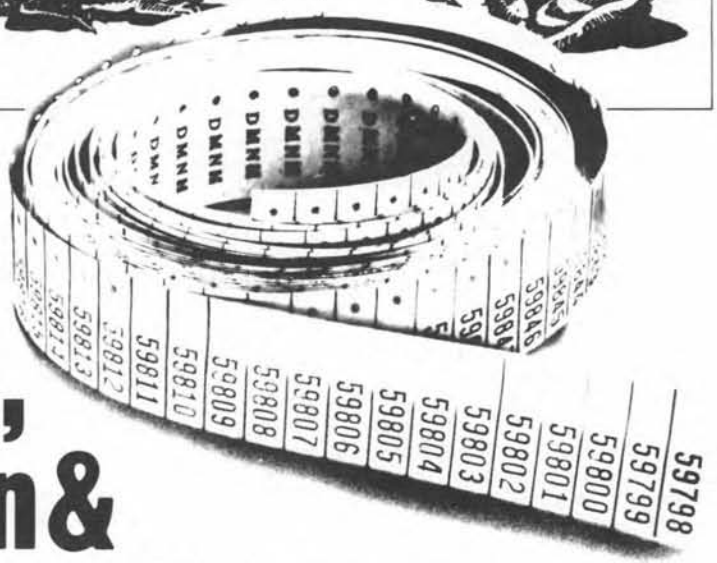
The papers presented at this symposium are being published as a Festschrift in honour of Professor Angus d'A. Bellairs. The volume is entitled "The Structure, Development and Evolution of Reptiles," Editor M. W. J. Ferguson, in the series Symposia of the Zoological Society of London, published by Academic Press. As Number 52, it should be available in March or April 1984.

M. W. J. FERGUSON
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FEATURES

NOW-IT-CAN-BE-TOLD DEPARTMENT: "WHO THE HELL WAS PERKINS?"

Pregill (*Herp. Review* 14(3):59, 1983) has perpetuated an understandable error on the first name of C. B. Perkins, late Curator of Reptiles at the San Diego Zoo, by referring to him as Cyrus. Perkins abetted this error and named his son, not a herpetologist, Cyrus. C. B. Perkins, as he signed himself, was known to friends and admirers as "Si." The nickname was derived from a character in a comic strip of his childhood, "Si Perkins and His Cat," he once told me.

Laurence M. Klauber (not Lawrence, in loco cit.) relied heavily on Perkins for meticulous editorial work, always acknowledged, and named the leaf-nosed snake *Phyllorhynchus decurtatus perkinsi* after his associate. Perkins, irreverent and self-critical, abhorred patronyms without exception and often protested the honor by remarking, "Some day people will ask, 'Who the hell was Perkins!' "

His full and correct legal name was perhaps one of the best kept secrets in the annals of Western American herpetology. One of the few times it appeared in print was in the Princeton University Yearbook for his Class of 1912. It was Clarence Basil Perkins.

H. S. ROBERT GLASER
Justus-Liebig-Universität
Karl-Glöckner-Str. 21-C, Biol.
D-6300 Giessen, West Germany ●

ADDITIONAL NOTES ON COLUBRID SNAKES OF THE GENUS *Tantilla* FROM TROPICAL AMERICA

Information on the systematics of the tropical members of the genus *Tantilla* has been accumulating relatively rapidly recently. A recent account of the genus (Wilson, 1982a) listed 46 species. Since that time, three more, *T. cuesta, T. excubitor,* and *T. tayrae,* have been described (Wilson, 1982b; in press). Subsequent to the preparation and submission for publication of several revisionary papers on various groups of *Tantilla* (Wilson and Meyer, 1971; Wilson, 1976; Wilson and Mena, 1980; Wilson, 1982b; Wilson, in press), various pieces of information about a number of tropical members of the genus have accumulated that merit publication, in the fashion done by Wilson, McCranie, and Porras (1977). This information is presented below.

Tantilla annulata Boettger

This species was recently reviewed by Wilson (1982b). Although the species is known to range at low and moderate elevations (sea level to 850 meters) from extreme southeastern Nicaragua to central Panamá on the Caribbean versant and from Costa Rica to Ecuador on the Pacific (not recorded from Colombia), it has not been reported from the biogeographically important Península de Osa of southwestern Costa Rica.

I have had the opportunity, through the courtesy of Roy W. McDiarmid and Joan Dudley, to examine two specimens of this species, collected by McDiarmid, from this area. One specimen (USNM 219604) was found on 7 July 1973 under a log in the forest at 60 meters elevation at the Osa Tropical Science Center, ca. 6.25 km SW Rincón de Osa, Prov. Puntarenas. The other (USNM 219605) was found on 13 July 1973 within the grounds of the Center as well, ca. 2.5 km SW Rincón de Osa. It was dug up by a bulldozer behind the hangar near the air field at 30 meters elevation.

Data on scutellation and color pattern for these two male examples agree well with that presented by Wilson (1982b) for Costa Rican *T. annulata.* Wilson (1982b) noted, however, that Costa Rican specimens have fewer average ventrals and subcaudals in both sexes than do those from Panamá. The subcaudal count for USNM 219604 (64) is two scales above the higher range value (62) for Costa Rican males and falls within that (61-65) for Panamanian males. The ventral count for USNM 219605 (148) is also two scales above the higher range value (146) for Costa Rican males and, similarly, lies within the range (147-151) for Panamanian males. The Osa Peninsula lies between the localities for most Costa Rican specimens and those for Panamanian specimens.

Tantilla jani (Günther)

I have been able to examine, through the courtesy of Robert L. Seib, a specimen of *Tantilla jani* that represents an elevational record for the species. Wilson (1982b) gave the elevational range of this species as "ca. 305-609 m," which, thus, barely established the species as occurring at moderate elevations (600-1500 meters) along the Pacific versant from eastern Oaxaca, México to south-central Guatemala. On 24 August 1982 Seib collected a single male specimen of *T. jani* (MVZ 177109) at Finca Monte Perla, 18.8 km NE (by road) of Cacaohatán [=Cacahoatán or Cacahuatán], Chiapas, México. The specimen came from an elevation of 960 meters, well within the Subtropical Wet Forest formation of Holdridge (1967), 351 meters above the previously-known highest elevation.

The specimen agrees in essential respects with the description given by Wilson and Meyer (1971), except that the middorsal pale stripe is comparatively muted, consisting of discrete basal spots only slightly paler than the surrounding ground color. The pale lateral stripe is similarly poorly distinguished. The ventral color in life was described as "pale greenish."

Tantilla lempira Wilson and Mena

Wilson and Mena (1980) described *Tantilla lempira* on the basis of three specimens from the upland pine *(Pinus oocarpa)* forests of south-central Honduras. Wilson (1982b) reported on an additional specimen from near the type locality (3.7 km N Zambrano, Depto. Francisco Morazán). Herein I report on one additional specimen from the type locality and a second from another locality at a higher elevation than previously known and from a different vegetation type.

The additional specimen from the type locality was collected by H. E. Lawler and L. Porras on 29 January 1980. This male specimen (LSUMZ 38833) has 138 ventrals and 52 subcaudals. All other scutellational features are in agreement with those of the type series. The specimen appears to be an adult and has a total length of 244 mm, a tail length of 58, and a relative tail length of 0.238.

The second specimen (NSU 5236) was collected at Agua Fria at the crest of the road from La Paz to Tutule over the Cordillera de Montecillos, elevation 1730 meters, Depto. La Paz by K. L. Williams and L. D. Wilson on 26 July 1980. The specimen came from beneath a pine log on a slope in a recently cut-over pasture. The undisturbed vegetation is *Pinus pseudostrobus* forest (Lower Montane Wet Forest formation of Holdridge, 1967). The elevation from which this specimen came is 280 meters higher than that of the type locality and in a different vegetation zone. Thus, the range of *T. lempira* extends into the *pinabetes* (= pineland cloud forest). The specimen is a juvenile female with the following characteristics: ventrals, 154; subcaudals, 44; total length, 111 mm; tail length, 18 mm; relative tail length, 0.162; umbilicus on ventrals 123-124.

Six specimens of *Tantilla lempira* are now known from three departments (El Paraiso, Francisco Morazán, and La Paz) in Honduras. The species is known to range from moderate to intermediate elevations of both versants of central Honduras. Two males have 138-143 ventrals ($\bar{x}$ = 140.5), 49-52 subcaudals ($\bar{x}$ = 50.5), and 190-192 ventrals + subcaudals ($\bar{x}$ = 191.0). Four females have 148-154 ventrals ($\bar{x}$ = 151.3), 36-44 subcaudals ($\bar{x}$ = 40.0), and 186-198 ventrals + subcaudals ($\bar{x}$ = 191.3).

Tantilla melanocephala (Linnaeus)

Wilson and Mena (1980) summarized information on the distribution of *Tantilla melanocephala* (pattern type A in their terminology) in Honduras. All specimens listed by them came from the Pacific versant of the country, with the exception of one from Pataste, Depto. Olancho, in or near the Guayape-Guayambre river valley.

Through the courtesy of Harold A. Dundee, I examined a specimen of this snake collected by him S of Villa de San Antonio, Depto. Comayagua. This specimen (TU 19749) represents the first specimen from the arid Comayagua Valley and the second of this otherwise Pacific versant form from the Caribbean versant.

The color pattern and scutellation of the specimen are typical for pattern type A.

Tantilla nigra (Boulenger)

Tantilla nigra remains known only from the holotype (BMNH 1946.1.8.69). It was described by Boulenger (1914) from a hill or ridge called Peña Lisa, near Condoto (5° 06'N, 76° 37'W), Depto. Chocó, Colombia. Recently, through the courtesy of Donald E. Hahn and A. F. Stimson, I received a description of the holotype and herein point out an error in the counts of ventrals and subcaudals. Boulenger (1914) gave counts of 143 and 63, respectively; counts provided by Hahn and Stimson (using the Dowling method to count ventrals) are 137 and 64. Boulenger's (1914) description is otherwise accurate.

Tantilla schistosa (Bocourt)

Wilson (1982b) recently revised this species on the basis of the study of 40 specimens from the length of the range extending from Oaxaca and Veracruz, México to Panamá. Some areas within the range are better represented than others. I have had the chance, through the courtesy of Edmond V. Malnate, to examine three additional specimens of this species, two from Guatemala and one from Honduras, from which areas Wilson (1982b) saw 9 and 1 specimens, respectively.

The second Honduran specimen (ANSP 28714) was collected 10-15 km W Yorito, Depto. Yoro in the approximate vicinity of the point of collection (Portillo Grande) of the other known specimen. ANSP 28714 is a male with 125½ ventrals and 39 subcaudals. These data conform to the pattern discerned by Wilson (1982b) with regard to ventrals but not subcaudals. He noted that relatively low numbers of ventrals (121-122 in males) exist in Guatemalan, Honduran, and southwestern Costa Rican specimens, as opposed to the remainder of the range (129-144). He also indicated that relatively low numbers of subcaudals (24-33) obtain in Belize, Honduras, Nicaragua, and Panamá. However, the count for ANSP 28714 falls within the higher range (33-42) for specimens from México and Guatemala.

The two Guatemalan specimens (ANSP 28712-13) are from Finca Volcán, Depto. Alta Verapaz and the data on ventrals (124 in male ANSP 28712 and 127 in female ANSP 28713) conforms to the above-mentioned pattern, as do the subcaudals counts (41 and 33, respectively).

Tantilla semicincta (Duméril, Bibron, and Duméril)

In his review of *Tantilla semicincta*, Wilson (1976) noted several differences between material of this species from Colombia and that from Venezuela. However, he had available only a single specimen from the latter country. I have recently had the opportunity to examine another Venezuelan specimen (UF/FSM 42350) from Punta Cardón on the Península de Paraguana in Est. Falcón. This specimen is similar in pattern to the one (USNM 107324) reported by Wilson (1976), but also resembles, to some extent, material from Colombia and acts to weaken somewhat the distinctions he noted between Colombian and Venezuelan material of the banded phase of this dichromatic species. The UF/FSM specimen has 14 black body bands and 7 on the tail (counted on the left hand side of the body). The black body bands are separated by pale bands ranging from 3 to 5 scales in length. The black bands on the body extend laterally to the upper half of the first dorsal scale row. The dark head cap is poorly distinguished from the pale nuchal band and does not extend posterolaterally onto the temporals or posterior supralabials (cf. fig. 3 in Wilson, 1976). The pale nuchal band extends on the midline from the posterior one-third of the parietals to the first middorsal scale.

In comparing Colombian material of *T. semicincta* to the single Venezuelan specimen available to him, Wilson (1976) stated that "USNM 107324 has well-defined dark crossbands . . . that are separated by pale bands about six scales in length (1 to 3 in Colombian specimens). The number of dark tail bands is 3, which is much lower than the number in Colombian specimens (4-13, $\bar{x}$ = 9.1). Also, the nuchal band is longer, occupying half of the parietals and one and one-half dorsal scales (as opposed to a maximum size of one-third of the parietals and one dorsal scale in Colombian specimens)." As mentioned above, these distinctions are somewhat muted by consideration of the characteristics of UF/FSM 42350. The length of the pale bands (3 to 5 scales) is intermediate, the number of dark tail bands falls within the range for Colombian material, and the length of the pale nuchal band is equivalent to the maximum condition seen in Colombian material. Although Wilson (1976) did not mention the fact, the dark body band count for USNM 107324 is 12, one lower than the lowest count for banded Colombian material. The band count for UF/FSM 42350 falls within the range for Colombian material.

In light of the intermediacy of pattern characteristics of UF/FSM 42350, it is of interest to note that the specimen is also from an intermediate locality (the Península de Paraguana) between those in Colombia and that for USNM 107324 (Caracas). It seems likely, therefore, that when additional material of this species from coastal Venezuela becomes available that the pattern conditions of material from Colombia and Venezuela will be shown to grade into one another and that the hesitance of Wilson (1976) to recognize the distinctions nomenclaturally was justified.

I have also examined another two specimens of this species (AMNH 109843-44), brought to my attention by Charles W. Myers, that are from Santa Marta, Depto. Magdalena, Colombia. Scutellational data for these two females fall within ranges published by Wilson (1976). Both are of the banded phase.

Tantilla taeniata (Bocourt)

Almost every specimen of *Tantilla taeniata* collected proves to provide new insights into the systematics of this as yet poorly-understood snake. UF/FSM 53616 is no exception. This specimen was collected at Santa Rosa, 1260 m elevation, Chiapas México and provides a new record for the state. In addition, this example helps to bridge the gap between the populations in Oaxaca and those in Guatemala (presently of unknown provenance within the country) (Wilson, 1982b). The elevation is the highest known for the species (previous upper limit, 1000 m - Wilson, 1982b).

The ventral count of 164 for this male specimen is 7 scales above the previous known upper limit for males; the subcaudal count of 71 is 4 scales above. The total underbody scale count of 235 is 18 scales above the previous limit.

The color pattern is typical for the species (Wilson and Meyer, 1971), except that the pale nuchal band is divided middorsally, as is the case with a few other known specimens.

Tantilla tayrae Wilson

This species was recently described by Wilson (in press) from a locality at a moderate elevation (760 m) on the slopes of Volcan Tacaná in Chiapas, México. The hypodigm consists of five specimens, four males and one female. The species was allocated to the *taeniata* section of the *taeniata* group and was thought to be most closely related to the also recently-described *Tantilla cuesta* (Wilson, 1982b).

In August of 1982 Robert L. Seib collected four additional specimens of *T. tayrae*. One specimen (MVZ 177105) is from the type locality and the other three are from a new locality nearby. These latter specimens (MVZ 177106-08) came from Finca Monte Perla, 1818 km NE (by road) Cacaohatán [= Cacahoatán or Cacahuatán], Chiapas, México. All three of these specimens came from an elevation of 960 meters.

The type series of *T. tayrae* exhibited a preponderance of males; the new series consists of three females and one male. One of the females is a juvenile. Much of the data on scutellation are in agreement with those of the type series. The ventral counts for the three females are 146½, 150½, and 154½ (all have half ventrals preceding the anal plate); for the male the figure is 143. Subcaudal counts for females are 47, 47, and 51. The known overall range in ventrals for male *T. tayrae* is 140-144 ($\bar{x}$ = 142.2) and for females 146-154 ($\bar{x}$ = 149.0). Subcaudals range from 46-49 ($\bar{x}$ = 47.2) in males and 44-51 ($\bar{x}$ = 47.3) in females. Ventral plus subcaudal figures range from 186-193 ($\bar{x}$ = 189.4) in males and from 190-201 ($\bar{x}$ = 196.3) in females.

The color and pattern of the four new specimens are in close agreement with that of some members of the hypodigm (see Wilson, in press, for a discussion of pattern variation). As noted by Wilson (in press), *T. tayrae* is unusual in exhibiting variation in diagnostic pattern characteristics.

Tantilla vermiformis (Hallowell)

Our knowledge of *Tantilla vermiformis* was recently summarized by Van Devender and Cole (1977) and Wilson (1982b). Wilson (1982b) mapped the known range of this species, which is composed of two populational segments, one around Lake Managua in Nicaragua and the other in the vicinity of Cañas and Los Angeles de Tilarán in northwestern Costa Rica. Recently, Wayne Van Devender brought to my attention the existence of another specimen from Costa Rica that helps to fill in the gap in the range between these two segments. The specimen (RWV 1330) was collected at the Santa Rosa National Park administration building within the park located in Prov. Guanacaste about 20 km S of the Nicaraguan border. The snake

was brought out by a fire that occurred in May of 1976.

The specimen is a female with 123 ventrals and 20 subcaudals and with the primary temporal not fused to the sixth supralabial. All these data fall within ranges seen in other Costa Rican material, although the last character is more typical of Nicaraguan specimens.

ACKNOWLEDGMENTS

I would like to thank a number of individuals for keeping me alerted concerning the accretion of noteworthy material of this genus; they are W. Ronald Heyer, Roy W. McDiarmid, Peter Meylan, Charles W. Myers, Robert L. Seib, and R. Wayne Van Devender. I am also grateful to Howard Lawler, Louis Porras, and Kenneth L. Williams for permission to report on specimens collected during field work in Honduras.

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AGGRESSION BETWEEN TWO *Drymarchon corais melanurus* IN CAMPECHE, MEXICO

Field observations of combat between snakes are rare and open to various interpretations. In the older literature, ritualized combat was often viewed as a territorial dispute between males, but since territorial defense has not been observed for any snake this interpretation is only speculative. Observations of combat in which the sexes of the individuals were not determined have sometimes been interpreted as courtship. Shaw (1951) suggested that homosexual behavior of one male directed toward another could initiate combat. In most cases, combatants do not bite or inflict damage on each other (Bogert and Roth. 1966), but Leloup (1964) indicated that combat between mambas *(Dendroaspis polylepis)* after being fed in captivity resulted in the occasional injury or death of one individual. Many of the observations of biting have been made on captive individuals and occurred soon after a feeding bout.

On 7 December 1974, one of us (Waide) observed two *Drymarchon corais melanurus* in the archeological ruins of Chicanna, 7 km west of Xpujil in southeastern Campeche, Mexico. Each individual had a firm grip on the other directly behind the head, and considerable blood was flowing from each wound (see Fig.). The snakes were first seen at about 1600 and observed at intervals thereafter for about 2.5 hours. During this period they moved less than 5 m and maintained their hold on one another. They demonstrated none of the entwining of bodies or ritualized movements characteristic of what has been called territorial combat, although their bodies occasionally overlapped. Each snake was approximately 2 m in length, but they could not be observed closely enough to ascertain sex. The last observation occurred just after dark when the two individuals were stretched out head to head with their tails pointing in opposite directions. One snake appeared to be ingesting the other, but light conditions were very poor and this observation is far from certain. At 0600 the next morning both snakes were gone.

Tinkle (1951) reported biting between two individuals of *Drymarchon corais couperi x melanurus* during courtship. Biting and releasing behavior by the male escalated to the point that damage was being inflicted. Although they were forcibly separated, the female later died, apparently of injuries received. That the activity Tinkle observed occurred in captivity and between individuals of different subspecies might call into doubt whether such behavior could occur in nature. Gillingham and Chambers (1980) observed no biting in four courtship episodes of a pair of *D.c. couperi* in captivity. Biting during courtship has been documented for other groups (*Elaphe;* Gillingham, 1979), but it is rarely of the violent nature described by Tinkle.

Aggression between conspecifics also occurs as the result of a mutual feeding response. Snakes that have been stimulated by the presence of prey occasionally attack other individuals in the same cage (Leloup 1964). Two Eastern garter snakes *(Thamnophis sirtalis)* observed feeding on the same frog in the field attempted to ingest one another upon disposing of the prey (Gillingham, pers. comm.).

If the observed aggressive encounter were initiated during courtship or as a mutual feeding response, the damage done to each individual indicates an escalation of aggression not generally associated with such activities. The lack of data on the sex and the history of the two individuals immediately prior to their encounter makes interpretation of the observation difficult. The ophiophagous nature of *Drymarchon* suggests that a mutual feeding response is a more likely explanation. In either case, the observation we report indicates that conspecific aggression to the point of severe injury does occur in nature, even though the motivation for this particular incident must remain obscure.

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LEGISLATIVE ALERT

AMERICAN ALLIGATOR RECLASSIFIED IN TEXAS

The American alligator *(Alligator mississippiensis)* has been reclassified under provisions of the Endangered Species Act of 1973 from a status of Threatened or Endangered to Threatened by Similarity of Appearance. The reclassification was published in the *Federal Register* on October 12, 1983, and became effective November 14. The change in status is based on evidence that the alligator is no longer biologically endangered or threatened within the State of Texas and brings the Federal classification in line with neighboring Louisiana. As such, the State of Texas may now institute comprehensive management plans for alligators which could include harvesting of the species in accordance with State laws. While Federal permits are no longer required for scientific or commercial activities within the State, the exportation of parts and products of Texas alligators is still controlled through the provisions of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Copies of the *Federal Register* document outlining the reclassification and detailing the basis for this action may be obtained by writing Mr. David Bowman, U.S. Fish and Wildlife Service, P.O. Box 1306, Albuquerque, New Mexico 87103, U.S.A. ●

PINE BARRENS TREEFROG DELISTED IN FLORIDA

The U.S. Fish and Wildlife Service recently published a final rule in the *Federal Register* (November 22, 1983) delisting the Florida population of the Pine Barrens treefrog. The frog was listed as Endangered in 1977 when information was provided to the Service that only 7 populations remained and that there was the potential of habitat destruction to these populations. After the species was listed, surveys were conducted in Florida by Paul Moler and in Alabama by Robert Mount in order to better understand the biological requirements of the treefrog preliminary to the development of a conservation plan. As a result of these studies, the frog was found to be more widely distributed than originally believed and there are presently over 150 populations known, many of which are on Federal or State lands. Delisting removes all Federal restrictions regarding the species although it remains protected in Florida by State law. Copies of the *Federal Register* document delisting this population can be obtained by writing Dr. Michael Bentzien, U.S. Fish and Wildlife Service, 2747 Art Museum Drive, Jacksonville, Florida 32207, U.S.A. ●



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BRITISH HERPETOLOGICAL SOCIETY MEETINGS 1984

The meetings are held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1 and start at 7.00 pm unless indicated otherwise. As always, SSAR members passing through London are most welcome.

FEBRUARY 29th
Mr. Brian Banks (Biological Sciences, University of Sussex): Breeding ecology of the natterjack in Britain in relation to conservation.

MARCH 13th
Annual General Meeting followed by Dr. Alan Charig (Chief Curator of Fossil Amphibians, Reptiles and Birds, Department of Palaeontology, British Museum (Natural History), London): Dinosaurs: myths and misconceptions. Mention will be made of the Surrey Dinosaur.

APRIL 25th
Dr. J. Riley (Department of Biological Sciences, University of Dundee): Relationship of parasitic pentastomid behaviour with reptiles. Reptiles can be infested by 'lungworms'.

MAY 17th
Mr. C. A. Snell (Greenwich Nature Conservation Society): Garden breeding and a wasteland reserve for herpetofauna in SE London.

JUNE 20th
Amphibia and Reptiles Worldwide. A discussion on care and breeding organized by the Captive Breeding Committee. Members are encouraged to bring live animals, preserved specimens and 35 mm slides for display and to illustrate discussions.

SEPTEMBER 29th
A joint Saturday meeting (date to be confirmed). A colloquium on amphibian and reptile husbandry organized by the Captive Breeding Committee (details in *BHS Bulletin* later).

OCTOBER 26th
Mr. C. J. Raxworthy (Department of Zoology, Bedford and Royal Holloway Colleges, University of London, Egham, Surrey): Herpetofauna of SW Morocco - results of a University of London Union Natural History Society Expedition 1983.

NOVEMBER 21st
Mr. M. P. Simmonds (Department of Zoology, Westfield College, University of London): Ecology of the feral African clawed toad *(Xenopus laevis)* in Britain. ●

THE FIRST MALCOLM SMITH DINNER OF THE BRITISH HERPETOLOGICAL SOCIETY

Hosted by the President of the British Herpetological Society, the Earl of Cranbrook, the first Malcolm Smith Dinner was held on Friday, 16th December 1983 in the Peers' Dining Room, House of Lords, Westminster. The event was so named after the Society's founding president, Dr. Malcolm Smith, author of the *Fauna of British India, including Ceylon and Burma*, Vols. I-III (reptiles) and the standard textbook for many years on British herpetofauna. Primarily a social event, the President's personal guests were Dr. R. F. Inger (President of the Herpetologists' League) and Mrs. Inger, and Miss A. G. C. Grandison (Head of the Amphibian Section, British Museum (Natural History), London). Other guests (BHS members) included Dr. R. A. Avery, Prof. A. d'A. Bellairs, Dr. H. R. Bustard, Mr. K. F. Corbett, Dr. J. F. D. Frazer, Dr. S. P. Gittins, Prof. G. A. D. Haslewood, Dr. K. G. Klemmer, Dr. M. R. K. Lambert (Chairman of the Society), Mr. T. E. S. Langton, Mr. J. Pickett, Dr. I. R. Swingland and Mr. V. F. Taylor. Before the dinner, Lord Cranbrook took his guests on a brief tour of the House of Lords showing where the Queen presides over the Opening of Parliament and the main room in the Lords (the Commons having declined) where President Reagan gave his historical address to the two Houses in 1982. After a reception, the 30 diners in all sat comfortably at either side of a long central table in the Peers' Dining Room with its splendidly gothic decor.

After toasting the Queen and the British Herpetological Society at the end of the dinner, Lord Cranbrook then gave a Presidential Address to the Society (an Abstract of this Address will appear in the *BHS Bulletin*). Dr. Inger briefly replied in his capacity as President of the Herpetologists' League outlining his shared experiences with Lord Cranbrook when working with him in Malaysia.

The function was much enjoyed by partici-

pants with the hopes that it would be repeated and the occasion was recorded under 'Dinners' in the 'Court and Social' of *The Times* the following day. Apart from being a social event, it is hoped that the Dinner will help to establish herpetology as a notable discipline in Britain (and for that matter elsewhere), as certainly enjoyed by entomology and ornithology as well as by mammalogy.

MICHAEL R. K. LAMBERT
British Herpetological Society
c/o Zoological Society of London
Regent's Park
London NW1 4RY
England

GEORGIA HERPETOLOGICAL SOCIETY

The Georgia Herpetological Society has been defunct since 1981. Very few members remain from the original GHS. Key members have moved and a case of 'burn-out' occurred among the remaining few. However, there is a strong nucleus of advanced and amateur herpetologists in the Atlanta area. A meeting was held in October to restructure and reorganize the GHS.

The state of Georgia needs an active and viable herp society and we plan of offer such. It will take time and a great effort for us to get back to where we were in the mid 70's. The GHS hopes to publish a bulletin and would like to exchange with other societies as in the past. Wish us luck, we'll need it.

Address any correspondence to:

Georgia Herpetological Society
Department of Herpetology
Atlanta Zoological Park
800 Cherokee Ave. SE
Atlanta, Georgia 30315, U.S.A.

THE BRITISH HERPETOLOGICAL SOCIETY

The British Herpetological Society was founded in 1947 with the broad aim of catering for all aspects of interest in reptiles and amphibians. Initiated by a small number of enthusiastic and well-known naturalists, including the first president and author of the standard textbook on British herpetofauna, Dr. Malcolm Smith, the Society expanded rapidly and today enjoys national status with many international connections.

Publications

British Journal of Herpetology, published bi-annually, contains papers of original research in herpetology.

British Herpetological Society Bulletin, published bi-annually, contains notices, news items, articles and original papers on all aspects of herpetology.

The Care and Breeding of Captive Reptiles, a book with papers on recent developments in breeding reptiles in captivity. Available to members at a reduced price of £3.00 + £0.50p postage. Purchase orders to the Chairman of the Captive Breeding Committee.

Conserving Sea Turtles by N. Mrosovsky. £5.00 + £0.75p postage and packing.

British Journal of Herpetology Vol. 1, a hardcover bound facsimile reprint. £10.00 + £1.00 postage and packing.

Information Sheets are produced on the care of reptiles and amphibians in captivity. These are continuously added to and updated, and include one on establishing Crested Newts in garden ponds.

Subscriptions

Ordinary members £10. Junior members £3. Institutions and Libraries £17.

All subscriptions become due on the first day of January each year. Members joining after 31 August may pay an additional £5 to receive the previous half's publications; otherwise membership will commence 1 January of the following year. Send to:

The Membership Secretary
The British Herpetological Society
c/o Zoological Society of London
Regent's Park
London NW1 4RY, U.K.

NEWSNOTES

CURATORIAL ASSOCIATE POSITION IN HERPETOLOGY

Full-time curatorial associate position in Herpetology will be available in the near future (March-April). Due to short deadline for notice, further details for the position have yet to be negotiated. Position collection management oriented. Interested individuals should contact and/or send curriculum vitae to: Dr. Pere Alberch, Museum of Comparative Zoology, Harvard University Cambridge, Massachusetts 02138; phone: (617) 495-2496, after Feb. 1, 1984.

SPACE AVAILABLE AT USFW REFUGE IN PUERTO RICO

THE U.S. FISH AND WILDLIFE SERVICE has space available at the Cabo Rojo National Wildlife Refuge for institutions or research groups interested in establishing an environmental field station in Puerto Rico. The Cabo Rojo NWR encompasses 587 acres of land in the semi-arid southwest and has a 42-room building. The site is close to salt flats, mangroves, shallow bays and reefs, and is within 15 mi of the Univ. of Puerto Rico, UPR Agricultural Experiment Station, UPR Marine Laboratories, 3 Commonwealth Forests and 1 Commonwealth Wildlife Area. One endangered species, the Yellow-shouldered Blackbird , is found at Cabo Rojo. For further information on the use of Cabo Rojo NWR write to SEAN FURNISS, Refuge Manager, Caribbean Islands NWR, P.O. Box 510, Boqueron, PR 00622-0510.

TURTLE TRADE DATA NEEDED

The U.S. Fish and Wildlife Service needs information on trade in adults and hatchlings of the flattened musk turtle, *Sternotherus depressus*, and the yellow-blotched sawback, *Graptemys flavimaculata*. We specifically need to know the prices that are being asked for these species and the sources of supply. Should anyone be able to assist, please contact either Mr. John Pulliam, U.S. Fish and Wildlife Service, 300 Woodrow Wilson Drive, Suite 3185, Jackson, MS 39213 or Dr. C. Kenneth Dodd Jr., Office of Endangered Species, U.S. Fish and Wildlife Service, Washington, D.C. 20240. These data are needed to assess the threat to these species from trade.

TURTLE TAGGING AT TORTUGUERO

The New York Zoological Society is sponsoring a sea turtle research program at Tortuguero National Park in Costa Rica. The program supports and augments sea turtle research sponsored by the Caribbean Conservation Corporation and is directed by Professor Archie Carr of the University of Florida. Departures from Miami are tentatively scheduled for July 13, July 27, August 10 and August 24. Each tour will be of 18 days duration, including four days in transit. For further information, contact:

John Behler, Curator of Herpetology
New York Zoological Society
185th Street and Southern Boulevard
Bronx, New York 10460, U.S.A.

GRANTS FOR WILDLIFE REHABILITATION

The Honors, Awards and Grants Committee of The National Wildlife Rehabilitation Association would like to announce the initiation of a small grants program. We expect $1000.00 to be available beginning July 1, 1984 which could be used to support a single $1000.00 project or several smaller projects that add up to $1000.00, depending on the qualifications of applicant. Funds will be available for a project in the field of wildlife rehabilitation *only*, applicants must demonstrate financial need, and applicants must submit a typewritten proposal which includes name(s) and resumé of personnel involved, objective of the project, a brief statement of literature review, a brief description of how the work will be carried out, and an itemized budget. An annual report on progress will be required.

The committee has also established three awards as follows:

Lifetime Achievement Award — This would go to an individual whose primary identification is that of a wildlife rehabilitator who has contributed to the field in a major way for many years. The awardee will receive a plaque, $100.00 and free conference registration. The award will be presented at the conference.

Significant Achievement Award — This would be to a person who has contributed something of significant merit to the field of wildlife rehabilitation within the last 2 years. Contribution can be a research finding, publication,

organization of a program, etc., as long as the major theme is that of wildlife rehabilitation. The awardee would receive the same benefits as for the Lifetime Achievement Award.

Keynote Award — This award would pay travel and lodging expenses for one keynote speaker for each annual conference. The speaker would be selected by the host committee for the annual conference.

Suggestions of individuals who might be appropriate awardees and proposals for grants should be submitted to:

Dr. G. E. Duke
Department of Veterinary Biology
College of Veterinary Medicine
295 Animal Science/
Veterinary Medicine Bldg.
1988 Fitch Avenue
St. Paul, Minnesota 55108, U.S.A. ●

PRICE INCREASE FOR BACK ISSUES OF *HERPETOLOGICA*

The Board of Trustees of the Herpetologists' League has voted to substantially increase the cost of back issues of *Herpetologica*, starting 1 January 1985. The exact increment will be determined this summer. Current prices are listed in *Herpetologica* 34(3):322. Address inquiries and orders to:

W. Ronald Heyer, Publications Secretary
The Herpetologists' League
Division of Amphibians and Reptiles
Natural History Building
Smithsonian Institution
Washington, D.C. 20560, U.S.A. ●

NEVADA HERP LITERATURE

I am interested in obtaining, for a special project, reprints of articles dealing wholly or in part with reptiles and amphibians in Nevada. Citations to obscure literature are most welcome.

Frederick H. Emmerson
The Utica Zoo
Steele Hill Road
Utica, New York 13501, U.S.A. ●

BLANCHARD PAPERS AVAILABLE

A number of published works of Frank N. Blanchard are available in limited quantity. All items, both bound and unbound, are in new condition.

There are *three* complete sets of his papers, each bound in two cloth-bound volumes. In addition to his papers, they include the biographical in memoriams about him. There is one cloth-bound volume of his collected papers, including all except the three long ones and the biographies.

In addition to the above sets, there are *two* cloth-bound copies of *A Key to the Snakes of the United States, Canada and Lower California*. Published as vol. 4, pt. II of Papers of the Michigan Academy of Science, Arts and Letters, 1925. 65 pages. And there is *one* copy of the same title published separately in 1939 with paper cover.

Also available are *two* copies of *A Revision of the King Snakes: Genus Lampropeltis*. Smithsonian Institution, Bulletin 114, 1921, 260 pages, paper cover.

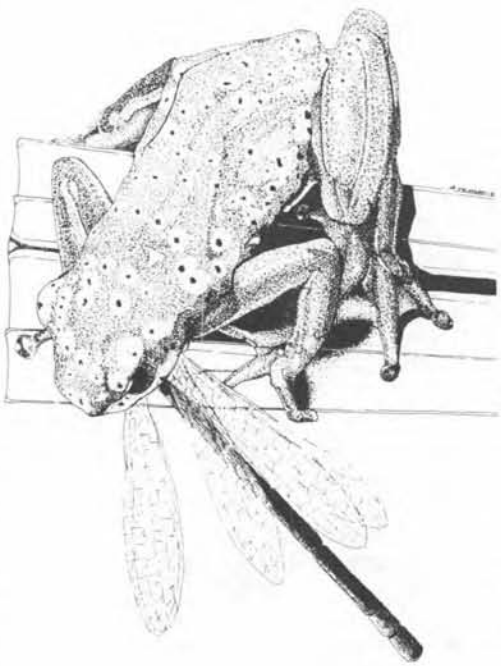
Also available are paper separates by Frank N. Blanchard. There are 38 titles, some with more than one copy. They range from 1-17 pages. If you are interested in purchasing any of the above, please make offers.

Dorothy Blanchard
7559 Second Street
Dexter, Michigan 48130 ●

NEW SOURCE OF WATERPROOF LABELS

In the process of curating a vertebrate museum one is always in need of chemical resistant waterproof labels. Traditionally these labels have been composed of 100% rag bond. Such paper is expensive and often difficult to obtain. I began a search for an effective alternative and found Nalgene "Poly-Paper" (Catalogue #6304-0811) used in combination with the Minolta EP 310 copier to be an adequate substitute. I stored the labels prepared by this manner in the following solutions: 95% Ethyl alcohol; 50% Isopropyl alcohol; 99% Isopropyl alcohol; 10% Formaldehyde; 37% Formaldehyde and distilled water. In none of the solutions did any fading or bleeding of the print occur during one year storage nor was there any destruction of the paper. I can recommend the above combination as an easy available source for personalized labels.

James D. Lane, Department of Biological & Environmental Sciences, McNeese State University, Lake Charles, Louisiana 70609, U.S.A. ●



Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Knoxville Zoo, Box 6040, Knoxville, Tennessee 33719.

COURTSHIP AND COPULATION IN THE TIMOR MONITOR, *Varanus timorensis*

Until recently, there have been few detailed descriptions of varanid courtship behavior (Carpenter and Ferguson, 1977). Courtship behavior has now been described in *Varanus komodoensis* (Auffenberg, 1978, 1981b). In this paper I describe courtship and copulation in a pair of captive Timor monitors *V. timorensis*.

MATERIALS AND METHODS

A pair of adult *V. timorensis* were secured from a dealer in September 1980. The male measured 19.5 cm snout-vent length (SVL) and 51.5 cm total length (TL) and the female 18.0 cm SVL and 46.5 cm TL. They were housed in a glass-fronted enclosure measuring 95 X 50 X 72 cm. The floor was covered with wood shavings, and two pieces of bark were provided for hiding. A single 75 W reflector lamp provided heat and light. The photoperiod was 12L:12D. The lizards were fed small laboratory mice, crickets, and canned dog food. Water was provided in a shallow container.

Courtship and copulation occurred frequently between 9 and 20 February 1981. Videotaping was sequenced intermittently during this time, and the descriptions presented here are based on analysis of the sequences. One sequence was selected for descriptive and temporal analysis. This was time-dated subsequent to the actual activity, so the sequence begins at 00:00:00. A second period of courtship activity occurred roughly 10 months later between 15 and 28 December 1981. Acts and act systems observed were similar to those recorded earlier.

OBSERVATIONS

For analysis and description the behavior was divided into three phases: courtship approach, courtship, and copulation.

PHASE I. COURTSHIP APPROACH. This was the shortest of the three phases, lasting 5 to 7 s. The male approached caudally and/or laterally, straddled the female and moved forward. Tongue flicking occurred as he moved. I considered this phase terminated when the male's snout was above the female's snout and he was straddling her.

PHASE II. COURTSHIP, MALE BEHAVIOR. This phase was often lengthy (detailed below). Several acts and act systems characterized male behavior.

Align Head: The male attempted to keep his head and snout in parallel alignment with the female. If she flexed her neck laterally he did likewise.

Arch Neck and Nudge: The male flexed his neck so that his snout was directed at the top of her head. Occasionally, he tongue-flicked or nudged the top of her head.

Base of Tail Lift: The male used either hindleg to lift the base of the female's tail (Fig. 1). If her hindleg was lying against the base of her tail it was lifted along with her tail. When the female appeared non-receptive, the male often switched frequently from the left side to the right side of the female, using first one hindleg and then the other. Because courtship was often prolonged, the male's claws produced abrasions and bleeding on the female's tail. *Base of Tail Lift* was one of the most common act systems during courtship.

Embrace: The male embraced and held the female with his forelegs just caudal to her forelegs. At other times rather than embracing her he supported himself with his forelegs as he straddled her.

Head or Neck Scratch: The male often scratched the head or neck of the female with one of his forelegs. This act system occurred in intense courtship or during the early stages of courtship.

Head Sway-Tactile Contact: During courtship the male made lateral swaying movements with his head (Fig. 1). Typically his chin or gular region made tactile contact just above the female's eyes. The deviation during swaying was about 10° to 15° from the longitudinal axis. This was a common act system during courtship. In all sequences there was variation in the speed of *Head Sway-Tactile Contact.* Head swaying was slower when the female remained quiescent than when she appeared non-receptive.

Rub Side of Face and Snout: The male gently rubbed the side of the female's face and snout with his snout.

Tactile Tail Contact: The tails of the two animals made tactile contact at three places: base of tail, approximately half the length of the tail, and near the tip. Often there was some intertwining of the tips, and they were intermittently in motion.

PHASE II. COURTSHIP, FEMALE BEHAVIOR. The female's behavior was characterized by fewer act systems.

Lateral Head Jerk: The female rapidly flexed her neck, jerking the head to left or right. Sometimes the angle of deviation from the longitudinal axis equaled or exceeded 90°. This act system was observed several times.

Move Ahead: The female, straddled by the male, moved forward, attempted to move forward, or, in some instances, moved out from under the male.

Move Back: The female backed out from under the male.

Passive Behavior: During all phases most of the behavior of the female was passive, i.e., she lay motionless.

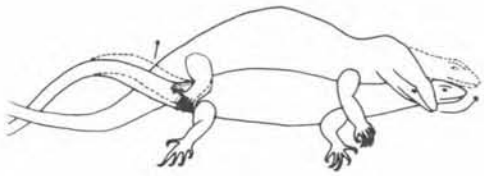


Figure 1. *Base of Tail Lift* and *Head Sway-Tactile Contact* in courtship of *V. timorensis.* Drawn from videotape frame.

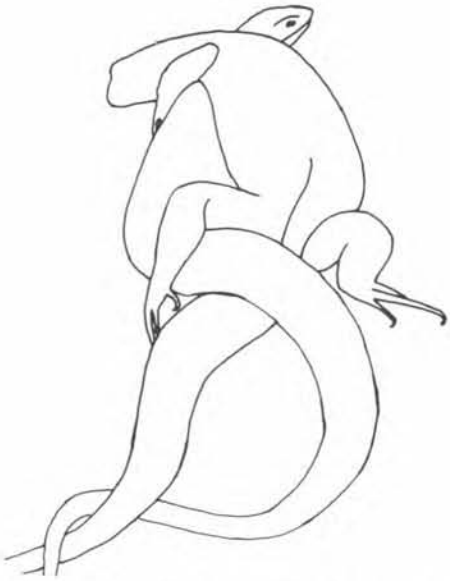


Figure 2. *Draping* during copulation in *V. timorensis.* Drawn directly from 35 mm transparency.

PHASE III. COPULATION. Like courtship this phase was often prolonged (detailed below).

Cloacal Twist: The male twisted his cloacal region below the female's to achieve intromission.

Draping: Sometimes, after achieving intromission the male was draped over the female (Fig. 2). He frequently appeared to be asleep and maintained this position for prolonged periods.

Rhythmic Pelvic Movements: These were movements of the male's pelvic region once intromission was achieved or after a long period of *Draping.* If initiated immediately, with the male alert, his head would be in parallel alignment with the female's head. If started during *Draping,* the male typically maintained the draped position.

Passive Behavior was characteristic of the female during copulation. Occasionally, she became restless, and then the male might resume *Lateral Head Sway-Tactile Contact.* On one occasion, the heads and necks of the two lizards were flexed at a 45° angle to the left as *Rhythmic Pelvic Movements* started. The female then flexed her head, neck, and anterior trunk about 60° to the right. The male then flexed his head, neck, and anterior trunk so that they were realigned.

TEMPORAL SEQUENCE OF BEHAVIORS ACCOMPANYING COPULATION. The following sequence was typical of the intensity and duration of other sequences.

00:00:00: The male was draped over the female *in copulo* at the beginning of the sequence. Intromission had been achieved from the left side.

00:10:16: The male began *Rhythmic Pelvic Movements* while still draped over the female. These pelvic movements occurred approximately once every 7 s.

00:12:40: Intromission was terminated.

00:12:51: The male, still straddling the female, was performing *Base of Tail Lift* and *Head Sway-Tactile* contact.

00:13:56: The male achieved intromission from the right side. They remained *in copulo* for approximately the next 17 min. *Rhythmic Pelvic Movements* occurred throughout, approximately once every 5 s.

00:30:48: Intromission was terminated.

00:30:52: Immediately, without dismounting, the male resumed courtship activity. An intense period of courtship followed with the male frequently adjusting his position and performing numerous courtship activities. While attempting to achieve intromission, the male switched from her right side to her left side 13 times in the next 10 min. *Base of Tail Lift* occurred intermittently and he frequently scratched her head and neck. *Head Sway-Tactile Contact* with gular or snout contact frequently occurred, as did *Rub Side of Face and Snout.* She frequently adjusted her position, and often performed *Lateral Head Jerk.* Sometimes the male restrained her with *Embrace.*

00:41:58: The female backed out from underneath the male.

00:44:40: The male located the female at the other end of the enclosure, mounted her, and resumed courtship activities.

00:47:40: Intromission was achieved from the right side.

00:48:30: Intromission was terminated and intense courtship resumed.

00:52:13: Intromission was achieved from the right side.

00:54:54: Intromission was terminated and was followed again by intense courtship.

00:57:10: Intromission was achieved from her right side. Intromission was followed by 10 *Rhythmic Pelvic Movements.*

00:58:10: Rhythmic Pelvic Movements ceased.

01:00:20: The male was draped over the female and appeared to be asleep. The female occasionally closed her eyes for brief periods but apparently remained awake.

01:35:02 The male was still draped over the female and still appeared to be asleep. A *Rhythmic Pelvic Movement* occurred. This was followed by a *Rhythmic Pelvic Movement* 22 s later and again after 11 more s. Thereafter they occurred every 5 s. The male remained draped over the female.

01:44:02: The male was awake. Intromission was terminated. The male immediately resumed courtship. Videotaping ceased.

DISCUSSION

The observations of Auffenberg (1978, 1981b) on *V. komodoensis* courtship were made in the field, near carrion, and often while monitors were aggregated for feeding. There are similarities between the behavior of my captive *V. timorensis* and wild *V. komodoensis.* There are also differences. In both species tactile and olfactory cues apparently play a prominent role. There is much tongue flicking and licking in both species, especially by the male. However, Auffenberg (1981b) observed some licking and flicking

by females also, but this was of less frequent occurrence than in males. The female *V. timorensis* was not observed to tongue flick or lick the male during the observed sequences.

Scratching of the female by the male is a common tactile cue in both species. In *V. komodoensis* most scratching is apparently on the back of the female while the male is beside her (Auffenberg, 1978, 1981b). In *V. timorensis* the male spent prolonged periods of time mounted on the female. Therefore, most scratching was aimed at the head and neck. In *V. komodoensis* scratching is believed to quiet the female (Auffenberg, 1978, 1981b). The same function appears to be true for *V. timorensis* as scratching was more frequent when the female was restless.

Nudging and rubbing of the female by the male is a common tactile/olfactory cue in both species. This is accomplished with the male's snout. *V. komodoensis* males nudge the side at the insertion of the hindlimb, sides of body, back, and sides of the face (Auffenberg 1978, 1981b). Since my male *V. timorensis* was most often mounted during courtship sequences, nudging and rubbing were mostly confined to the sides of the face and top of the head. Auffenberg (1981b) has suggested that pustules on the face of female *V. komodoensis* may be associated with tactile or olfactory cues. Murphy and Mitchell (1974) observed nudging in a brief courtship encounter of *V. gilleni*.

Infrequent biting of the female by the male was observed in *V. komodoensis* (Auffenberg, 1981b) and *V. bengalensis* (Auffenberg, 1981a). The male *V. timorensis* never bit the female on the body nor did he ever use a neck bite or shoulder bite hold to restrain her. Murphy and Mitchell (1974) did observe shoulder bite holding in *V. gilleni*. In both *V. komodoensis* and *V. timorensis* males may use their front legs to clasp females just behind their front legs. This restrains the female as would neck or shoulder bite holding.

A very common behavior in *V. timorensis* was *Base of Tail Lift*. This behavior occurred more or less continuously while the male was mounted and until intromission was achieved. This also is apparently a tactile cue. However, it could not be determined whether this was a cue that eventually stimulated the female to raise the base of her tail, or whether the male eventually lifted the base of her tail to the correct position for bringing the cloacal openings together. *Base of Tail Lift* was not observed in *V. komodoensis* (Auffenberg, 1981b), but is has been observed in *V. bengalensis* (Auffenberg, 1981a). Auffenberg (1981b) did observe a female *V. komodoensis* raise the base of her tail after a male repeatedly touched the area with his hind foot. This suggests that in *V. timorensis* it may be a cue that eventually causes the female to raise the base of her tail.

A common act in *V. timorensis* is *Head Sway-Tactile Contact*. This behavior was also observed in *V. gilleni* (lateral zig-zag motion of head) (Murphy and Mitchell, 1974), and in *V. bengalensis* (Auffenberg, 1981a). This is another act system which apparently maintains the quiescent state of the female. Its importance in *V. timorensis* seems to be related to male-female head alignment.

The reproductive season is long in *V. komodoensis* (approximately three months for successful coition) and extended pair-bonding of males and females may occur (Auffenberg, 1978, 1981b). In captive *V. timorensis* the reproductive season is short. Some aspects of *V. timorensis* courtship, e.g., duration and intensity, suggest the possibility of short-term pair-bonding, at least during the reproductive season.

ACKNOWLEDGMENTS

I thank Charles Carpenter for numerous courtesies, space, facilities, and for reading the manuscript. Ralph Axtell provided assistance and critically reviewed the manuscript. Financial support was provided by Illinois College. I am grateful to Dr. Loren Hill and the University of Oklahoma Biological Station for facilities and financial support.

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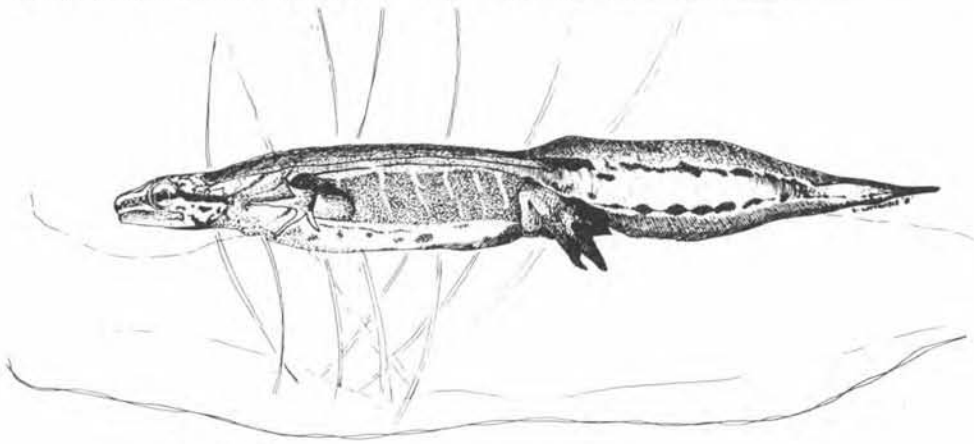
LOREN D. MOEHN
Biology Department
Illinois College
Jacksonville, Illinois 62650, U.S.A. ●

LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Longevity, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1982. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

Please submit Life History Notes in the standard format directly to the ***SECTION EDITOR*** to avoid delays in publication: Bern W. Tryon, Knoxville Zoological Park, Box 6040, Knoxville, Tennessee 33719.



ANURA

HYLA CRUCIFER CRUCIFER (Northern Spring Peeper). **REPRODUCTION.** Collins (1982. Amphibians and Reptiles in Kansas, 2nd edition: 75-76.) discusses breeding behavior of *Hyla c. crucifer* in Kansas but does not include information of the number of eggs laid by females. Below I present the first available information on the number of eggs laid by a female Kansas *H. c. crucifer*.

On 12 March 1983, Kelly J. Irwin and I collected three male and one female *H. c. crucifer* in a flooded roadside ditch in Cherokee County, Kansas (Sec. 11, T33S, R25N). The males were taken as they called from positions on grass clumps or reeds near the water line. The female was taken by KJI at the time that she emerged from a clump of submerged grass.

The four frogs were maintained together in a gallon glass jar containing ca. 20 mm of water. On 16 March 1983, eggs were observed in the jar, and all frogs and eggs were subsequently preserved. The female had a SVL of 30 mm. A count of the eggs revealed that 702 had been laid.

All specimens were deposited at the Museum of Natural History, University of Kansas. (♂♂ = KU 192722-24, ♀ = KU 192725, eggs = KU 192726.)

This field work was supported by a grant from the Nongame Wildlife Fund of the Kansas Fish and Game Commission (Contract #76). I would like to thank Kelly J. Irwin for

assistance in the field, and Joseph T. Collins for his suggestions and encouragement.

Submitted by **RAYMOND K. LORAINE,** Museum of Natural History, University of Kansas, Lawrence, Kansas 66045, U.S.A. ●

CAUDATA

ANEIDES FLAVIPUNCTATUS FLAVIPUNCTATUS (Speckled Black Salamander). **BEHAVIOR.** Salamanders employ a variety of defensive mechanisms, such as immobility, secretion of noxious substances, cryptic coloration, and antipredator poses (see Brodie, 1977. Copiea 1977:523-535).

During a mark-recapture study of salamanders near Willow Creek, Humboldt Co., California, it was observed that the majority of adult *A. flavipunctatus* fled vigorously upon exposure, while juveniles remained immobile. The same behavior has been documented for *A. aeneus* (Brodie, 1974. Herpetologica 30:79-85).

On one occasion (4 March 1983) however, a 26 mm *A. flavipunctatus* exhibited a defensive posture during toe clipping. The animal stood high on its outstretched legs and arched its back. It gently rocked back and forth, much like the sympatric *Ensatina eschscholtzi* (Stebbins, 1954. Univ. Calif. Publ. Zool. 54:47-124). The distal third of its tail undulated laterally in a slow rhythmic motion. The display continued for over one min, and was not discontinued until well after it was set back into the depression of its rocky cover.

This was the only such display witnessed for the species during 93 observations in the study plot and dozens of field observations elsewhere. It is believed that this display has not been previously reported for the species.

Submitted by **LAWRENCE L. C. JONES,** Department of Biology, California State University, Long Beach, California 90840, U.S.A. ●

SAURIA

CALLOPISTES MACULATUS (Chilean macroteiid). **DIET.** *Callopistes maculatus* is a large ground-dweller teiid of the central Chile scrublands (Donoso-Barros, 1966, Reptiles de Chile; Fuentes, 1976, Ecology 57:3-17). The food habits of *C. maculatus* are highly variable; while Donoso-Barros (ibid.) points out that "insects and small reptiles" comprise its diet, Fuentes (ibid.) shows that *C. maculatus* consumes vegetation — fruits — to a great extent (relative frequency of vegetation in the diet = 0.69 vs 0.30 of arthropods). To our knowledge, no studies have reported that *C. maculatus* includes carrion in its diet; this note documents small mammal carrion consumption by *C. maculatus*.

The observations were made during a period of small mammal snap-trapping, in December 1981; the study site was a scrubland patch in Los Dominicos (20 km E of Santiago;≈ 1,000 masl). On 3 occasions individual *C. maculatus* were found feeding on the body of a snap-trapped rodent; at each time, the lizards were observed from a distance without disturbing them. The lizards stopped feeding between 5 to 10 min after they were discovered; in all 3 cases, *C. maculatus* were eating the mid-body of the rodents, which were *Akodon olivaceus* (two times) and *Octodon degus*. We have no observations of *C. maculatus* preying on small mammals, such as *Gambelia wislizeri* apparently does upon *Perognathus longimembris* (Pietruszka, Wiens and Petruszka, 1981, J. Herpetol. 15:248-250).

Callopistes maculatus exhibits high metabolic demands, as expressed by its activity temperature of 40° C (Fuentes and Jaksić, 1979, Copeia 1979:546-548). Fruits are a supplementary food item when arthropod availability is insufficient to fulfill the energetic requirements (Fuentes, ibid); the consumption of carrion could be another such alternative. These observations suggest that *C. maniculatus* feeds opportunistically, taking advantage of the potential food items available.

Field work was supported by grant DIUC 75/81.

Submitted by **JAVIER A. SIMONETTI** and **JOSE L. YAÑEZ,** College of Forest Resources AR-10, University of Washington, Seattle, Washington 98195, U.S.A., and Museo Nacional de Historia Natural, Santiago, Chile. ●

SERPENTES

AGKISTRODON CONTORTRIX LATICINCTUS (Broad-banded Copperhead). **COMBAT.** In this note I report an observation of an apparent combat dance between two free-living broad-banded copperheads *(Agkistrodon contortrix laticinctus).* On 20 June 1979, I was camped on a vegetated sand and gravel bar on the Brazo River, just upstream from the State Highway 4 bridge crossing about 11 km north of Palo Pinto, Texas. At ca. 0930. The barking of my pet dog drew my attention to a small opening in the vegetation of the sandbar. In the opening were two large *A. c. laticinctus* performing a combat dance in which they were apparently so engrossed that neither my presence nor my dog's (which I had calmed) interrupted the behaviors. The two snakes had the posterior portion of their bodies in contact while the anterior one-third of their bodies were raised and swaying back and forth. Occasionally, one or the other lowered its body to the ground (Fig. 1), but during the swaying activity, both returned to a vertical position. After a short period of swaying and an occasional jerking motion, the heads appeared to make contact and the bodies became encoiled (Fig. 2). The "top" snake then pressed on the dorsal side of the opponent's head in an apparent effort to force the other snake toward the ground (topping). After ca. five min of repeating the above-mentioned behavior, the pair separated and crawled away in generally opposite directions.



Figure 1. *Agkistrodon contortrix laticinctus* in combat. One combatant has lowered itself to the ground.



Figure 2. Topping during combat of *Agkistrodon contortrix laticinctus.*

To my knowledge, there are no published accounts of combat behavior of *A. c. laticinctus* in the wild. The purpose of combat behavior in snakes is not well understood though suggested functions include territorial defense, definition of social dominance, competition for females, and competition for food items.

I would like to thank Dr. Charles C. Carpenter and Mr. Stanley Wilson for reviewing this note.

Submitted by **BRUCE G. STEWART,** Department of Science, Murray State College, Tishomingo, Oklahoma 73460, U.S.A. ●

BOTHROPS SCHLEGELII (Eyelash viper). **COLORATION.** Among neotropical pit vipers, the eyelash viper, *Bothrops schlegelii* (Berthold) represents an example of extreme variation with respect to color and pattern. The considerable polychromatism of these characteristics is unrivaled in other members of the pit viper assemblage. Several descriptions of overall pattern have been reported, although individuals may possess unique combinations of color and pattern. Known variants apparently do not conform to natural patterns of geographic distribution and can be ascribed to single clutches (Antonio, 1980. Herpetologica 36(3):231-233).

This report describes an unusual variant in which the common pattern of dorsal blotching is replaced and expressed as longitudinal striping. The individual in question, is a small

male (Fig. 1), CRE 3619 (Costa Rica Expeditions, Department of Biology, University of Miami), snout to vent length 360 mm, tail length 78 mm, from Venado de Guatuso, Alajuela Province, Costa Rica, elevation 252 m. The ventral scales number 159, the caudals 58, and the dorsal scale row formula is 21-19-17. These and other scale characteristics of this specimen lie within the known variation of other Costa Rican *B. schelgelii.*

The dorsal ground color on the head and body is pale grey infused with minute black punctations. These punctations may form aggregations appearing as larger flecks, evenly distributed over the dorsum and resulting in a fine reticulate pattern. Laterally the larger flecks are linked longitudinally to form small, faint, elongate strands, dashes or narrow lines. The dorsal markings of the head consist of three pairs of brown "dumb-bell" shaped blotches outlined sharply by a thin margin of black. The anterior pair, on frontorostral region, are fused posteriorly forming a bloated "V". The second pair are elongate (length about 3X width), begin just medial to the supraocular scales and diverge posteriorly, ending just anterior to the level of the oral rictus; when viewed from above, they appear parallel to the laterally adjacent postocular stripes. The postocular stripes are similar in coloration, being brown medially and outlined clearly by black. The third and posterior pair of these blotches begins medial to the terminal portions of the second pair, and also diverge posteriorly. They extend down the dorsum of the neck as two thin brown lines, contiguous with the paired, brown dorsal body stripes. These latter stripes are one and one-half to two dorsal scale rows wide and are also outlined by black. They are broken into a series of elongate blotches posterior to the level of the 10th ventral. They resume their unbroken appearance near the 17th ventral for the right stripe and the 28th for the left. Anteriorly, and at mid-body, each stripe occupies a single (longitudinal) scale row, lateral to the three most dorso-medial rows, which are distinctly grey. The six scale rows ventro-lateral to the brown stripes are also grey in color. The outermost dorsal scale rows, adjacent the ventrals, are either immaculate pale yellow or dark brown. Near mid-body, where the scale rows reduce from 21 to 19, the grey coloration of the flanks occupies five scale rows on each side rather than six as observed anteriorly. The brown dorso-lateral stripes and the medial grey region, at this level remain unchanged. However, posteriorly, at the level of reduction from 19 to 17 scale rows at approximately ventral 103, the dorsal grey and lateral brown stripes occupy slightly altered positions. At this level, the dorsal grey area covers the central scale row (most dorsal) and the medial 1/2 of the immediately adjacent row, on each side. The brown stripe includes the distal 1/2 of these latter two rows and 1/2 of the next lateral row; the remainder of which is grey, as are the four lateral contiguous rows, on each side. The two outermost rows on each side, adjacent to the ventrals, at this level are similar to those anteriorly.

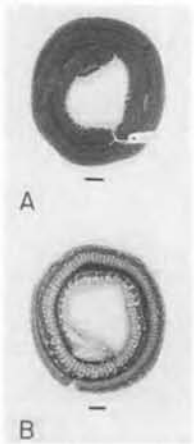


Figure 1. Dorsal (A) and ventral (B) views of *Bothrops schlegelii,* CRE 3916, indicating pattern of longitudinal stripes. Bar equals 10 mm.

In addition to those dorsally, there are also stripes along the lower aspects of each flank, at the junction of the ventrals and the dorsal scale rows. The coloration of these two linear stripes is dark brown, outlined above and below by a thin margin of pale yellow. In other specimens of *B. schlegelii* there are typically alternating patches of yellow and brown in a similar position along the lower flanks. With respect to the specimen on this report, the dark or brown patches appear to be fused in series, along the posterior 2/3 of the body, giving rise to a longitudinal stripe. The dorsal yellow outline of this stripe is restricted to the second dorsal scale row above the ventrals, while the row directly adjacent to the ventrals is characteristically brown. Likewise, the outermost 1/4 of each ventral is also pigmented brown. The medial (ventral) yellow margin of the stripes exists as a series of light spots, one per ventral, which viewed from a distance form an unbroken line. The very central portions of the ventrals about 1/4 to 1/3 their total widths, are pale yellow with an infusion of light brown punctations. These punctations gradually increase in density posteriorly. The anterior ventrals are nearly immaculate pale yellow, while the ventral portion of the tail is nearly tan in color.

While the fusion of dorsal blotches and the expression of longitudinal stripes has been reported for a variety of snake taxa, in pit vipers previous observations involve only rattlesnakes (*Crotalus* spp.) and the copperhead *(Agkistrodon contortrix)* of temperate North America (Gloyd, 1958. Bull. Chicago Acad. Sci. 10(12):185-195). This situation is presumed rare for *B. schlegelii* as this represents a single case, of 71 individuals examined from Costa Rica. It is also noteworthy in that the pattern of longitudinal striping is nearly complete along the entire length of the body, except for a short region anteriorly. This is rare in *Crotalus* as most reported aberrants exhibit fusion of only a few dorsal blotches (Schuett and Kraus, 1982. Herp. Rev. 13(1):17-18) restricting the striped pattern to a small portion of the body length.

Submitted by **STEVEN D. WERMAN,** Department of Biology, University of Miami, P.O. Box 249118, Coral Gables, Florida 33124, U.S.A. ●

CROTALUS VIRIDIS VIRIDIS (Prairie Rattlesnake). **COLORATION.** In October, 1979, nine *Crotalus viridis viridis* were collected 1 km south and 1 km east of Abarr, Yuma County, Colorado by Mr. Carl Allphin, now of Haxtun, Colorado. One of these specimens, a female, is entirely patternless except for a single black band at the base of the rattle (Fig. 1). The olive-gray ground color is typical of specimens from this population. Pattern melanin across the animal's dorsum is restricted to small dots which are discernible only upon reasonably close inspection (Fig. 2). H. K. Gloyd (1958, Bull. Chicago Acad. Sci. 10:185-195) described a similar pattern anomaly in a *C. atrox.*

In addition to the conspicuous absence of pattern melanin, the female *viridis* also lacks all of the usual cream-colored blotch borders and facial stripes. Despite the aberrancies of coloration, this specimen does not differ from the eight normal specimens in terms of scutellation or body proportions. The snake died in an *Arizona hinshawi (Salmonella arizona)* epidemic in January, 1980, before any attempts at breeding could be undertaken. It is now deposited in the U.S. Fish and Wildlife Service collection in Fort Collins, Colorado (USFWS 02435).

Eleven similar non-albinistic, patternless crotalids have been reported in the recent literature (Gloyd, 1958; Fitch, H. S., 1959, Herpetologica 15:21-24; Nickerson, M. A. and Mays, C. E., 1968, Wasmann J. Biol. 26:125-131; Irwin, K. J., 1979, Herp. Rev. 10:85; Holmback, E., 1981, Herp. Rev. 12:70; Quinn, H., 1981, Herp. Rev. 12:79-80). These include



Figure 1. Patternless *Crotalus v. viridis.*

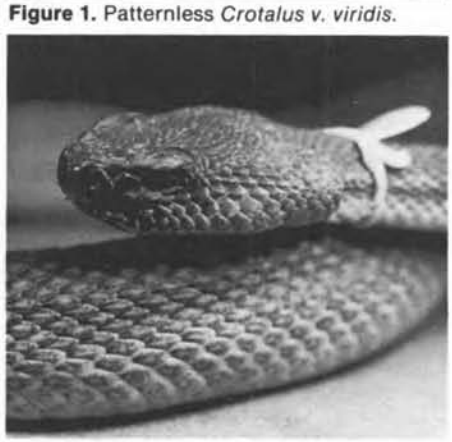


Figure 2. Close-up of patternless *Crotalus v. viridis.* Note small dots of melanin on scales.

five *Agkistrodon contortrix*, three *Crotalus viridis*, one *C. atrox*, one *C. scutulatus*, and one *C. lepidus*. Nickerson and Mays (1968) did not report the sex of the *C. viridis* they described; however, of the remaining ten specimens, nine are males.

The discovery of five patternless male copperheads in one population led Fitch (1959) to suggest that the trait might be a sex-linked recessive. That conclusion is not necessarily invalidated by the female described above, or by the nearly patternless female *C. scutulatus* described by Nickerson and Mays (1968). Pattern inheritance is sufficiently complex that superficially similar abnormalities may stem from mutations at a variety of loci. Additionally, so little is presently known about the genetics of color patterns that the possibility of different genetic mechanisms in different genera must also be considered.

Submitted by **STEVEN D. AIRD,** Department of Zoology and Entomology, Colorado State University, Fort Collins, Colorado 80523, U.S.A. ●

ELAPHE OBSOLETA (Black Rat Snake). **AUTOPHAGY.** In August 1982 a juvenile *Elaphe obsoleta* (345 mm total length) from Carbondale, Jackson Co., Illinois, was fed a 5-day old mouse. While swallowing the mouse, the snake took a loop of its own tail in its mouth. Attempts to induce the snake to release itself were unsuccessful. During the next 45 min, the snake ingested the mouse and ca. 10 cm of itself. The snake then yawned and withdrew its body, leaving the mouse in its stomach. The snake suffered no ill effects from this incident. However, on 10 November 1982 this snake was found dead in a "figure-eight" position, having swallowed itself again (Fig. 1). Why the snake committed autophagy the second time is unknown, but it and its litter mates had been hatched from eggs incubated at a low temperature (ca. 20-21° C) and often showed abnormal behaviors (e. g., lying on their backs).

Autophagy by snakes seems rare. Mitchell, Pague, and Early (1982, Herp. Review 13:47) described another incident of autophagy by an *E. obsoleta*. Their case differed from the one described above in that it apparently was induced by a sudden temperature change. I agree with these authors that early observations of autophagy may have contributed to the hoop snake myth. In the first incident described herein, the snake continuously moved in a roughly circular path. Similar movements by snakes swallowing themselves may have been the basis for the "rolling" of snakes in the myth.

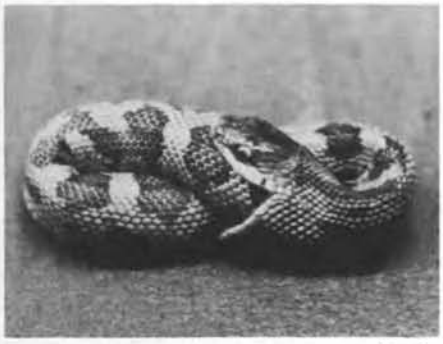


Figure 1. Results of autophagy committed a second time by a juvenile *Elaphe obsoleta*.

The first incident reported here shows that autophaging snakes can free themselves without losing ingested food.

The specimen is deposited in the herpetology collection of the Department of Zoology of Southern Illinois University at Carbondale (SIUC R-1796). I thank Gail Johnston for Fig. 1.

Submitted by **MICHAEL A. MORRIS,** Department of Zoology, Southern Illinois University at Carbondale, Illinois 62901, U.S.A. ●

LAMPROPELTIS TRIANGULUM ANNULATA (Mexican Milk Snake). **SIZE.** The largest known specimen of *L. t. annulata* was 99.1 cm (Conant, 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton-Mifflin). Our specimen, a male, was collected D.O.R., 25 August 1983, approximately 2115 hrs, shortly after a thunderstorm. The locality was near Hebbronville, 14.4 km S of the junction of highways 285 and 1017, on 1017, Jim Hogg County, Texas. It measured 104.4 cm (89.7 cm SVL, 14.7 cm TL), thus being the largest known specimen by 5.3 cm. It had been recently run over as there was still caudal reflex action evident. Despite being D.O.R., there is no obvious external or internal structural damage that could have increased the total length. The specimen was laid out flat, but not stretched, and measured prior to preservation. Aside from the large size, the specimen was typical for *L. t. annulata* in other features of color, pattern and scutellation (Williams, 1978. The Systematics and Natural History of the American Milk Snake, *Lampropeltis triangulum*. Milwaukee Public Museum). The specimen was deposited in the Texas Cooperative Wildlife Collection (TCWC 61627), Texas A&M University.

Submitted by **HUGH K. McCRYSTAL, ROBERT H. DEAN** and **JAMES R. DIXON,** Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843, U.S.A. ●

STORERIA DEKAYI DEKAYI (Northern Brown Snake). **COLORATION.** Hensley (1959, Pub. Mus. Mich. State Univ. 1(4):154) noted an albinistic specimen of *S. d. dekayi* from Pennsylvania. Smith (1961, The Amphibians and Reptiles of Illinois, Ill. Nat. Hist. Surv. Bull. 28) and Thrall (1971, Trans. Ill. Acad. Sci. 64(4):400) each reported single albino specimens of *S. d. wrightorum* from Illinois. Marion and Chandler (1983, Herp. Rev. 14(2):47) reported an albinistic individual of the latter subspecies from Alabama.

On 12 May 1975 the Baltimore Zoo received an albinistic *S. d. dekayi* that was collected at a vacant lot at Wicomico and Monroe Sts., Baltimore, Maryland. This specimen, a female ca. 20 cm total length, had a ground color of buffy-white with a double row of very light brown spots down the length of the back. Temporal bars and stippling on top of the head were of the same light brown color. The iris of the eye was bronzy and the pupil appeared dark red in strong light.

On 24 July 1975 this snake gave birth to seven live and two dead young. Two of the living young were colored exactly as the mother; all of the others were normal colored. The two albinistic young died after about two months and were not preserved. The mother died after 11 months in captivity and a notation on her record card indicates that she was preserved. However, I am unable to locate this specimen. It is believed that she may have been among a group of about 30 small preserved snakes that were stolen from the Baltimore Zoo's museum collection in 1978.

Submitted by **FRANK GROVES** Reptile Department, Baltimore Zoo, Baltimore, Maryland, U.S.A. ●

TESTUDINES

PSEUDEMYS RUBRIVENTRIS (Red-bellied Turtle). **PREDATION.** Bullfrogs *(Rana catesbeiana)* consume a diverse array of animal foods, including turtle hatchlings (Corse and Metter, 1980. J. Herp. 14:231-238). Reference to bullfrog predation on the young of snapping, stinkpot, painted and ornate box turtles was made by Ernst and Barbour (1972. Turtles of the United States). Recently, Metter (pers. comm.) indicated that the two turtles reported in his 1980 frog dietary paper were both newly hatched; one was a *Graptemys geographica*, the other a *Pseudemys scripta*. A 57 mm long specimen of *Terrapene carolina triunguis* was documented from the gut of an Oklahoma bullfrog (McCoy, 1967. Proc. Okla. Acad. of Sci. 46:44-45). Sherman Minton has seen bullfrogs eat *Graptemys* hatchlings in Indiana (pers. comm.) and Madeleine Linck watched a bullfrog taking newly released hatchling snapping turtles *(Chelydra serpentina)* at Great Meadows National Wildlife Refuge, Concord, Massachusetts (pers. comm.).

On 10 July 1983 at Crooked Pond, Plymouth, Plymouth Co., Massachusetts a pair of red-bellied turtle hatchlings *(Pseudemys rubriventris)* were discovered missing after confinement in a vinyl coated 1 x ½-inch wire mesh holding pen. This pen measured 120 x 120 cm and was staked at a water depth of 45 cm approximately 3 m from shore. Although this pen was covered with the same mesh to discourage birds and other predators from harming the occupants, a bullfrog had somehow gained access. I captured and palpated the frog and became suspicious when I felt a hard lump in his abdomen. The frog was sacrificed and dissected immediately, whereupon the two missing turtle hatchlings were discovered dead in its stomach. The frog, an adult male, was 120.2 mm in SVL while the hatchlings were 33.2 mm and 32.4 mm in CL. This represents the first report of frog predation on red-bellied turtles. All specimens de-

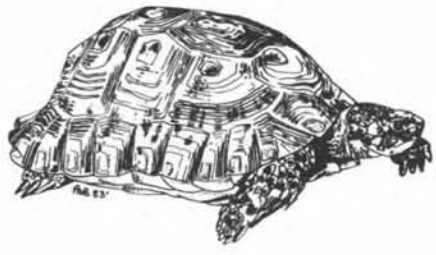
scribed herein are deposited in the Worcester State College collection (TEG 07831 - 07833).

Submitted by **TERRY E. GRAHAM,** Department of Natural and Earth Sciences, Worcester State College, Worcester, Massachusetts 01602, U.S.A. ●

TERRAPENE CAROLINA CAROLINA (Eastern Box Turtle). **SCUTATION/DEATH.** In early June 1983 an entire, mud encrusted Eastern box turtle shell was collected from the Bellefonte Nuclear Plant site in Jackson County, Alabama. The shell was originally collected for the purpose of obtaining a complete box turtle skeleton. The plastron was shut with the left front foot protruding from the side, and the bones were held together by patches of dried skin that remained attached. Upon cleaning the shell, an aberrant vertebral scute pattern was exposed. The first and fifth vertebral scutes were formed and positioned normally, but the three middle scutes were replaced with six malformed scutes arranged in an asymmetrical pattern. A slight dorsal ridge was broken into small sections on each vertebral scute. The right side of the shell contained the normal number of four costal scutes, while the left side had five due to the additional vertebral scute.

Of special interest concerning the removal of the skeleton was the discovery of a small (7 mm) pit viper fang embedded through a dried skin patch in the left shoulder area. The fang was unbroken and was apparently shed as the bite was inflicted. The high copperhead density in this region and the small fang length and diameter serve to indicate the bite was most likely delivered by a young Northern copperhead *(Agkistrodon contortrix mokeson),* probably a yearling. This evidence appears to indicate the turtle's death resulted from a venomous snake bite, with the left foot protruding from the shell due to the swelling that occurred prior to death. Whether the bite resulted from the box turtle inadvertently crawling over the snake or attempting to feed on it is purely conjectural.

Submitted by **JOHN H. MUIR,** P.O. Box 723, South Pittsburg, Tennessee 37380, U.S.A. ●



GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

ANURA

ACRIS CREPITANS BLANCHARDI (Blanchard's Cricket Frog). USA: TEXAS: Stephens Co: 0.6 km N Crystal Falls on FM 578 in Clear Fork of Brazos River. 23 October 1983. C. T. McAllister. Verified by R. Ward. North Texas State University Herpetological Collection (NTSUHC A75-80). First record for county and nearly fills distributional hiatus in Brazos River watershed (Raun and Gehlbach. 1972. Amphibians and Reptiles in Texas. Dallas Mus. Nat. Hist. Bull. 2). This species was recently reported from adjacent Young County (McAllister and Wooten. 1982. SSAR Herp. Review 13:24) and should inhabit additional northwestern branches of the Brazos River.

Submitted by **CHRIS T. McALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas 75216 and **ELIZABETH A. McALLISTER,** Department of Medical Technology, The University of Texas Health Science Center, Dallas, Texas 75235, U.S.A. ●

PSEUDACRIS STRECKERI ILLINOENSIS (Illinois Chorus Frog). USA: ILLINOIS: Scott Co: 2.8 km S intersection of US Hwy 54 and Hillview Blacktop. 1 May 1983. L. Moehn. Verified by L. Moehn. Southern Illinois University at Edwardsville (SIUE 2641). One male collected from a scattered chorus of approximately ten males. First record for county, helps fill hiatus between Morgan County (Smith, P. 1961. The Amphibians and Reptiles of Illinois. Ill. Natur. Hist. Surv. Bull. 28, 1-298.) and Madison County (Axtell, R. and N. Haskell. 1977. Chicago Acad. Sci. Nat. Hist. Misc. 202, 7 p.).

Submitted by **LOREN D. MOEHN,** Biology Department, Illinois College, Jacksonville, Illinois 62650, U.S.A. ●

CAUDATA

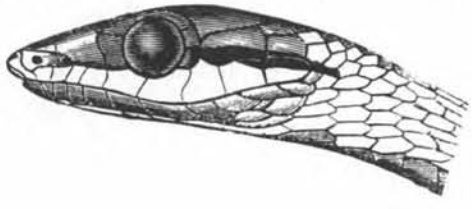
AMBYSTOMA MABEEI (Mabee's Salamander). USA: VIRGINIA: York Co: 4.3 km S Yorktown, on north side of James River, Harwood's Mill Reservoir watershed property. 27 May 1983. R. Hodge, B. Ensley, R. Cross and D. West. Verified by R. Hodge and C. Pague. Peninsula Nature and Science Center (PNSC 83-12). Third Virginia record, first record north of James River. Extends range ca. 60 km north (Mitchell and Hedges. 1980. Brimleyana 3:119-121). Six additional specimens found and released at the same locality from 25 May to 7 June.

Submitted by **BARRY ENSLEY,** 95 Kitty Drive, Grafton, Virginia 23692 and **ROBERT CROSS,** 12721-17 Nettles Drive, Newport News, Virginia 23606, U.S.A. ●

SAURIA

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). USA: ALABAMA: Mobile Co: Mobile, Church Street Cemetery. 25 November 1983. Harold A. Dundee. Verified H. A. Dundee. Tulane University (TU 19750). First coastal record for the state. Approximately 278 airline km SW nearest Alabama record in Eufaula (Mount, R. H. 1975. The Reptiles and Amphibians of Alabama. Auburn Univ. Press) and 198 airline km ENE of New Orleans, Louisiana where it has been established over 40 years. I have been collecting at this cemetery and elsewhere in Mobile for over 20 years, and this is my first encounter with the Mediterranean gecko there. This occurrence may be due to natural spread from nearby port facilities, or by introduction on construction materials or plants.

Submitted by **HAROLD A. DUNDEE,** Department of Biology, Tulane University, New Orleans, Louisiana 70118, U.S.A. ●



TRETIOSCINCUS BIFASCIATUS COLOMBIA: Isla Providencia (=Old Providence Island, in the western Caribbean about 150 km east of Nicaragua). Near Santa Isabel. 22 April 1969 (LACM 135548); Near Rocky Point 30 April 1969 (LACM 135549). Collected by N. J. Scott in rock cobble under mango trees. Verified by S. C. Ayala. Deposited in Los Angeles County Museum of Natural History. Peters and Donoso-Barros (U.S. Natl. Mus. Bull. 297(II):262) cited the range of *T. bifasciatus* as "northern South America, Dutch Leeward Islands and Magarita Island, Venezuela". The dorsal scales of the Providencia specimens are very weakly keeled, like those of *T. agilis* (Ruthven), but unlike *T. agilis* the large prefrontal scales are in broad contact. *Tretioscincus bifasciatus* is common in northern Colombia, and may have reached the island by rafting on floating vegetation from the Atrato or Magdalena rivers during winter floods, or in cargo transported by boat. It is not known whether *Tretioscincus* has established itself on Isla Providencia.

Submitted by **NORMAN J. SCOTT, JR.,** U.S. Fish and Wildlife Service, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131, and **STEPHEN C. AYALA,** 307 12th Street, Petaluma, California 94952, U.S.A. ●

SERPENTES

LAMPROPELTIS CALLIGASTER RHOMBOMACULATA (Mole Kingsnake). USA: VIRGINIA: Roanoke Co: Blue Ridge Parkway mile post 117.3, approximately 1 km SE Roanoke city limits. Elevation 340 m. 17 July 1980. W. H. Martin. Verified by Joseph C. Mitchell. U.S. National Museum (field number 110175). Known Virginia range lies entirely east of the Blue Ridge. This record is 3 km west of the Blue Ridge but the Blue Ridge is penetrated here by the Roanoke River valley.

Submitted by **W. H. MARTIN,** Rt. 3, Box 804, Harpers Ferry, West Virginia 25425, U.S.A. ●

NERODIA RHOMBIFERA RHOMBIFERA (Diamondback Water Snake). USA: TEXAS: Grimes Co: 1.6 km N Navasota (probably Navasota River or tributaries). 26 April 1948. J. M. Schmidt, K. P. Schmidt and R. F. Inger. Verified by A. Resetar. Field Museum of Natural History (FMNH 55007). New county record, fills distributional hiatus in the Trinity-Brazos area (Raun and Gehlbach. 1972. Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. 2).

Submitted by **CHRIS T. McALLISTER,** Renal-Metabolic Lab (151-G), Veterans Administration Medical Center, Dallas, Texas, 75216, U.S.A. ●

PITUOPHIS MELANOLEUCUS (Pine Snake). USA: ALABAMA: Crenshaw Co: 15.8 km N of Luverne, Junction of US 331 and Crenshaw Co 3.R18E; T10N; S7; NE¼; SW¼. 8 May 1983. P. N. Lahanas and J. C. Godwin. Verified by P. N. Lahanas and J. C. Godwin. Auburn University (AUM 32239). New county record, collected midway between the range of *P. m. melanoleucus* to the north and *P. m. mugitus* to the south (Mount, R. H. 1975. The Reptiles and Amphibians of Alabama. Alabama Agric. Exper. Sta., Auburn, AL) and may be intergradient.

Submitted by **JAMES C. GODWIN,** Department of Zoology-Entomology, Auburn University, Alabama 36849, U.S.A. and **PETE N. LAHANAS,** Department of Biology, University of Miami, P.O. Box 249118, Coral Gables, Florida 33123, U.S.A. ●

RHADINAEA FLAVILATA (Pine Woods Snake). USA: FLORIDA: Palm Beach Co: Boynton Beach, NE Jct. Old Boynton Rd. and Lawrence Rd. one adult male specimen, 27 March 1983; one unsexed specimen, 1 April 1983. Jeffrey A. Gottlieb. Verified by Richard C. Bothner. St. Bonaventure University collection (# 1732, 1704). First records for county and extend range 70 km southeast (Ashton and Ashton, 1981. Handbook of Reptiles and Amphibians of Florida, Part 1: The Snakes. Windward Publishing Inc., Miami, Fl.).

Submitted by **JEFFREY A. GOTTLIEB,** Department of Biology, St. Bonaventure University, St. Bonaventure, New York 14778, U.S.A. ●

TROPIDOCLONION LINEATUM (Lined Snake). USA: NEW MEXICO: Torrance Co: 16 km W Clines Corners. Date unknown. L. Anderson. Verified by W. G. Degenhardt. Museum of Southwestern Biology, University of New Mexico (UNM 6150). 5.6 km S Chilili, T7N, R7E (Chilili Land Grant). 2 June 1983. Paul C. Wiklund. Verified by M. A. Williamson and W. G. Degenhardt. (UNM 39935). 8.2 km N Mountainair, T4N R7E, Sect. 5. 10 September 1983. M. A. Williamson. (UNM 39934). Grassland to open woodland above 2000 m (Wheatgrass, Grama, Junipers, and some Pinyon). These specimens extend the known range 75 km S and 95 km W of previously reported localities (Williamson and Scott. 1982. SSAR Herp. Review 13(1):26) and are the first reported records for Torrance County. The distribution of this species in New Mexico is probably more widespread than supposed, and this snake should be looked for in other parts of New Mexico where moisture conditions allow its survival.

Submitted by **MICHAEL A. WILLIAMSON,** 7401 Central NE, Albuquerque, New Mexico 87108, U.S.A. and **WILLIAM G. DEGENHARDT,** Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87130, U.S.A. ●

MORE CORRECTIONS OF ERRONEOUS AMPHIBIAN AND REPTILE RECORDS FROM COLORADO

BUFO BOREAS (Western Toad). USA: COLORADO: Grand Co: 16 km SW Kremmling. 7 June 1958. T. P. Maslin and D. Davis. Identified by G. Hammerson, verified by H. M. Smith. Univ. Colorado Mus., Boulder, UCM 11010. Erroneously reported as *Bufo woodhousii* by Maslin (1959, Univ. Colorado Stud., Ser. Biol. 6:14). Negates only *B. woodhousii* record for county.

EUMECES MULTIVIRGATUS (Many-lined Skink). USA: COLORADO: Larimer Co: 6.4 km E Wellington. 13 June 1911. J. Henderson and R. M. Butters. Identified by G. Hammerson, verified by H. M. Smith. UCM 224. Erroneously reported as *Eumeces obsoletus* by Ellis and Henderson (1913, Univ. Colorado Stud. 10:80). Reported under museum specimens of *E. multivirgatus* and literature records for *E. obsoletus* by Maslin (op. cit., p. 46), as was a specimen (UCM 225, apparently lost) from Greasewood Lake, SE Osgood, Weld Co., collected by J. Henderson, 23 June 1912 (reported as *E. obsoletus* by Ellis and Henderson, loc. cit.). Maslin's listing of these specimens under the literature records for *E. obsoletus* is an obvious *lapsus*—he undoubtedly examined the specimens and listed them correctly under *multivirgatus.* Further evidence that Ellis and Henderson misidentified *E. multivirgatus* as *E. obsoletus* is provided by their figures 15 and 16, plate III, in which photographs of obvious specimens of *multivirgatus* are labeled *"Eumeces obsoletus."* Smith et al. (1965, Univ. Colorado Stud., Ser. Biol. 15:33, 40) based their records of *E. obsoletus* from Larimer and Weld counties on these erroneous published records. In summary, all reports of *E. obsoletus* from Larimer and Weld counties are based on *E. multivirgatus.*

PHRYNOSOMA CORNATUM (Texas Horned Lizard). USA: COLORADO: Archuleta, Boulder, Denver, and El Paso counties. Maslin (op. cit., p. 37) recorded *P. cornutum* from these counties and indicated that the specimens from Boulder and Denver possibly were escaped pets. Smith et al. (op. cit.) nevertheless mapped *P. cornutum* as occurring in Boulder and Denver counties, but they listed no additional specimens from that area. Texas horned lizards periodically are picked up by travelers and appear in cities along the base of the Front Range, but there is no evidence that any introduced populations are established north of the Arkansas River. The records from Archuleta and El Paso counties originated with Cope (1900, Rep. U.S. Natl. Mus. for 1898, p. 435) who listed specimens with identical museum numbers and collection data under both *P. douglassii* and *P. cornutum.* Most of these specimens are still in existence in the National Museum; they are *P. douglassii* and were correctly reported as such by Yarrow (1882, Bull. U.S. Natl. Mus. 24:68). In summary, populations of *P. cornu-*

tum have not been validly documented in any of the counties listed above.

COLUBER CONSTRICTOR (Racer). USA: COLORADO: Boulder Co: Boulder. 23 May 1905. Collector unknown. UCM 254 (apparently lost). Altona. 14 July 1912. N. deW. Betts. UCM 255. Both specimens were reported as *Masticophis flagellum* by Ellis and Henderson (op. cit., p. 105) and Maslin (op. cit., p. 57). Smith et al. (op. cit.) based their record of *M. flagellum* from Boulder County on these literature records. I have examined UCM 255; it is a juvenile *C. constrictor*. The reported length (295 mm) of UCM 254 is too small for even a hatchling *M. flagellum;* the specimen undoubtedly was another juvenile *C. constrictor*. Further evidence that Ellis and Henderson misidentified *C. constrictor* juveniles as *M. flagellum* is provided by their figures 32 and 33, plate VII, in which photographs of a juvenile *C. constrictor* are labeled *"Zamenis [=Masticophis] flagellum." Coluber constrictor* is abundant in Boulder County, but the nearest occurrence of *M. flagellum* is 140 km to the southeast.

THAMNOPHIS ELEGANS (Western Terrestrial Garter Snake). USA: COLORADO: County unknown: Rio Grande. June 1873. H. W. Henshaw. USNM 8418. Yarrow's (1875, Wheeler Survey, vol. 5) record of *Eutaenia (=Thamnophis) sirtalis dorsalis* from Rio Grande, Colorado, has been the basis for all of the numerous subsequent reports of *T. sirtalis* from the San Luis Valley in south-central Colorado (e.g. see Fitch, 1980, Cat. Am. Amph. Rep. 270.1-270.4). One of the two specimens (now USNM 8418) upon which Yarrow's record was based is still in existence; it is an example of *T. elegans* (Hahn, 1968, M.S. thesis, Louisiana State Univ., Baton Rouge; pers. observ.). Ruthven (1908, Bull. U.S. Natl. Mus. 61:140) evidently examined all specimens of *Thamnophis* in the National Museum (where Yarrow's specimens were deposited) and listed a specimen from Rio Grande,Colorado, as *T. ordinoides elegans (=T. elegans)*. He listed no records of *T. sirtalis* from southern Colorado. In summary, there are no adequately documented records of *T. sirtalis* from the San Luis Valley, Colorado.

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NEW HERPETOLOGICAL RECORDS FOR THE MEXICAN STATE OF AGUASCALIENTES

We herein report new records for the state of Aguascalientes. All specimens are in the private collection of Larry David Wilson (LDW) and will be deposited in the University of Kansas Museum of Natural History upon completion of a study on the amphibians and reptiles of the state. All specimens were collected and their identifications verified by us.

TOMODACTYLUS NITIDUS. Arroyo los Puercos, Sierra Fria, ca. 3 km N Congoya, 8 August 1979, LDW 5343. The nearest known locality is in Jalisco and is ca. 200 km SW of the Aguascalientes locality (Dixon, J. R., 1957, Texas J. Sci. 9:379-409 [map]). However, the species was believed to have been heard calling 1.6 km N Santa Rosa, Zacatecas, in the Rio Juchipila canyon (Baker, R. H., R. G. Webb, and P. Dalby, 1967, Amer. Midl. Nat. 77:223-226), a locality somewhat intermediate between the Jalisco and Aguascalientes localities.

DRYMARCHON CORAIS. 4.7 km W El Sauz, 5 August 1979, LDW 5294. The closest locality is in Jalisco and is ca. 200 km SW of the Aguascalientes record (McCranie, J. R., 1981, Cat. Amer. Amph. Rept. 267 [map]).

ELAPHE TRIASPIS. 3.5 km W El Sauz, 7 August 1979, LDW 5329. The nearest locality is Mezquital del Oro, Zacatecas (Boulenger, G. A., 1894, Catalogue of the snakes in the British Museum (Natural History), Vol. II, Taylor and Francis, London), and is some 105-110 km SSW of the Aguascalientes record.

SALVADORA BAIRDII. 4 km S Ciénega, Sierra de Laurel, 13 August 1979, LDW 5405. Fills in the geographic hiatus from states to the northwest and south (Smith, H. M. and R. B. Smith, 1976, Synopsis of the herpetofauna of Mexico, Vol. 3, John Johnson, N. Bennington, Vermont). The species was cited from Aguascalientes in a general list (Velasco, A. L., 1896, Geografia y estadistica del estado de Aguascalientes. Geografia y estadistica de la Republica Mexicana. Vol. 17, Secr. Fomento, México, D. F.), however, no actual specimens were heretofore known from the state.

TANTILLA BOCOURTI. Ciénega, Sierra de Laurel, 2 August 1979, LDW 5263; 4 km S Ciénega, Sierra de Laurel, 6 August 1979, LDW 5316; Mesa la Canoa, nr. El Ocote, 12-13 August 1979, LDW 5384, 5425-27. Fills in a geographic hiatus between specimens from Jalisco (McDiarmid, R. W., J. F. Copp, and D. E. Breedlove, 1976. Nat. Hist. Mus. Los Angeles Co., Contrib. Sci. 275:1-17 [map]) and Zacatecas (McCranie, J. R., 1977, Southwestn. Nat. 22:275).

THAMNOPHIS MELANOGASTER. 3.9 km N Las Negritas, 31 July 1979, LDW 5239-42; Palo Alto, 31 July 1979, LDW 5245; Arroyo los Puercos, Sierra Fria, ca. 3 km N Congoya, 8 August 1979, LDW 5342. Fills in a geographic hiatus as the species is known from surrounding states (Smith, H. M. and R. B. Smith, 1976, op. cit.). The name *Tropidonotus mesomelanus*, a synonym of *Thamnophis melanogaster*, was included in a general list for the state (Velasco, A. L., 1896, op. cit.), however, no specimens were previously known from the state.

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FIRST RECORD OF THE COLUBRID SNAKE, *Xenodon rhabdocephalus* (WIED), FOR VENEZUELA

A study of some Venezuelan specimens of the genus *Xenodon* deposited in the collections of the Museo de Biología de la Universidad Central de Venezuela (MBUCV), Estación Biológica de Rancho Grande (EBRG) and Museo de Historia Natural La Salle (MHNLS), revealed that five of them belong to the species *Xenodon rhabdocephalus* (Wied), not previously recorded in Venezuela. The identification of all specimens was determined by Alfredo Paolillo O. Locality and data for the five specimens follows:

MHNLS 7680, 1 ♀, San Martín de Turumbán, rio Cuyuni, Estado Bolívar, M. Lentino coll., 16/VIII/1979; MBUCV 1665, 1 ♂, Cerro Lema, Estado Bolívar, J. Steyermark coll., VIII/1961; EBRG 1574, 1 ♀, Rio Puruname, Atabapo, Territorio Federal Amazonas, P. Piñate coll., 5/VI/1982; EBRG 1136, 1 ♂, Cucurital, Caño Caname, Territorio Federal Amazonas, J. Cerda coll., 1/V/1979; MBUCV 8092, 1 ♂, Minas de Triana, rio Chicanán, Estado Bolívar, E. Rutkis coll., 26/VIII/1962.

Body scales consisted of 19-19-15 rows of dorsals, smooth, with one apical pit; 150, 148, 151, 137 and 143 ventrals respectively; anal entire; 47, 43, 46, 39 and 51 paired subcaudals respectively; 2 internasals; 2 prefrontals; frontal as large as the ocular diameter; nasal divided; loreal present; 1-1 preocular (3-3 in EBRG 1136); 2-2 postoculars (3-2 in EBRG 1136); 1+2/1+2 temporals (2+3/2+3 in EBRG 1136); 8-8 supralabials (8-9 in EBRG 1574); 4th and 5th supralabials in contact with the eye (3rd and 4th left side in MBUCV 1665, 5th and 6th left side in EBRG 1574); 10-10 infralabials (10-11 in EBRG 1574); 2 pair chin shields, anterior pair (in EBRG 1136 divided anteriorly) longer than the posterior pair, and in contact with the first five infralabials (six first left side in EBRG 1574); maxilla with 15+2, 16+2, 18+2, 13+2 and 16+2 teeth respectively, the two posterior ones elongated, nongrooved, and separated from the rest by a diastema. The cephalic coloration consists of a pair of wide supraocular bands that run obliquely to neck; latter bands creamish, edged with black; dorsum of head greyish brown with small darker spots; lateral brownish postocular band present; supralabials creamish, with fine spots and dark lines on sutures (especially under eye); infralabials and gular region creamish, with several brown spotted sutures, especially toward anterior region of head; dorsum has 15 (16 in MHNLS 7680) brownish, black edged bands of five to six scales in length, separated by lighter spaces delimited by light grey; dorsum of tail with 4 dark bands similar to dorsals (3 in MBUCV 1665 and not definite in EBRG 1136). Venter laterally with numerous dark brownish to blackish spots which resemble rings of two to three scales, but are substituted by a less pigmented area toward midline (EBRG 1136 has rings only in contact zone with dorsals, and has many brownish small spots on entire venter); tail less pigmented than venter.

Body measurements (Total length, snout-vent length; in mm): MHNLS 7680 (265,227); MBUCV 1665 (535,467); EBRG 1574 (222,190); EBRG 1136 (590,498); MBUCV 8092 (763,632).

The material examined undoubtedly belongs to the subspecies *rhabdocephalus*, and its morphological characteristics generally fall within the range of variation found by Dixon and Soini (1977) for the subspecies in the Peruvian Amazonia. The genus *Xenodon* is now represented in Venezuela by two species, *X. severus* (Linnaeus), broadly distributed in almost all the country (Roze, 1966; Lancini, 1979), and *X. r. rhabdocephalus* (Wied), whose preliminary distribution had been indicated here. Previously, *X. r. rhabdocephalus* was known in Central America and South America south to Bolivia and Brasil (Peters and Orejas-Miranda 1970). Hoogmoed (pers. comm.) has also examined some specimens from Guyana, Surinam and French Guiana.

I thank E. Williams (MCZ), A. Lancini (MCNC) and F. Bisbal (EBRG) for the loan of material from their collections; W. Heyer provided me with information about specimens from USNM; M. Hoogmoed gave museum data of specimens deposited in Europe; J. Dixon critically read the manuscript.

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REESTABLISHMENT OF THE COQUI, *Eleutherodactylus coqui* THOMAS, IN SOUTHERN FLORIDA

The leptodactylid frog, *Eleutherodactylus coqui* Thomas, is endemic to Puerto Rico where it is common and widespread at low and middle elevations (Thomas, 1965). It occurs in a variety of habitats, finding shelter in leaf axils, litter, tree cavities, and bromeliads. The coqui has been introduced into southern Florida, primarily in Dade County, on several occasions (King and Krakauer, 1966; G. Hendrix, pers. comm.), but did not become established until it was introduced at Fairchild Tropical Garden in South Miami (Austin and Schwartz, 1975). This population persisted for several years without dispersing from the site of introduction. It was apparently extirpated by a severe freeze in January, 1977 (Wilson and Porras, 1983). In this note, we report the reestablishment of *E. coqui* in Dade County, and we discuss the method of introduction.

In 1976, a bromeliad nursery on SW 304th Street in Homestead began to import bromeliads from Puerto Rican nurseries in Rio Piedras and Mayaguez, both low elevation locales, and in Aibonito, a mountain town at mid-elevation. Nursery stock from Puerto Rico is shipped via containerized cargo trailers, cooled to 18°C, to southern Florida ports. The cargo trailer is driven to the nursery site where it is unloaded. Unlike nursery stock from other tropical countries, stock from Puerto Rico is not fumigated to kill potential pests that might accompany the shipment. When plants are unloaded at the nursery, a variety of live animals often emerge with the plants. Such shipments may be a source of introduction for a variety of exotic animals into southern Florida.

Male coquis were first heard calling at the Homestead nursery in 1977, and this population has increased and persisted to the present. We have monitored this population for several years. Two voucher specimens (UF 54087; UF 54088) have been deposited at the Florida State Museum, Gainesville, and their identities as *E. coqui* confirmed (P. Meylan, pers. comm.). On most nights, it is possible to hear dozens of males calling within the nursery, so that the total population must number in the hundreds. The population is maintained in part by frequent importations of plants from Puerto Rico that bring in additional frogs. However, some degree of on-site reproductive input also occurs because we have observed coquis with egg clusters on five separate occasions.

In addition to the Homestead nursery, other bromeliad growers in the South Florida area also import stock from Puerto Rico. We have confirmed the presence of *E. coqui* at nurseries on SW 258th Street, SW 248th Street, and possibly SW 80th Street. Coquis have also been dispersed deliberately by nursery employees who have released them at their homes, and by accidental transport in bromeliads sold by the nurseries.

Although *E. coqui* has occurred in the Homestead area since 1976, it has not moved far from the sites of introduction. The immediate surroundings are suburbs set in pineland that is dominated by slash pine *(Pinus elliottii)* and various understory shrubs and grasses. Southern Florida is subject to a prolonged dry season in winter and spring, and experiences occasional freezes during some winters (Wilson and Porras, 1983). We believe, based on the environmental requirements of *E. coqui* in Puerto Rico (Pough et al., 1983), that exposure to droughts and freezes in southern Florida would be lethal to coquis. The coqui has survived seven dry seasons and several severe freezes at the Homestead nursery where overhead sprinkling moderates the effects of such perturbations. The lack of dispersal from nurseries provides evidence that natural southern Florida habitats do not provide conditions suitable to survival of *E. coqui.* The coqui seems unlikely to disperse naturally in southern Florida, but it will probably persist there in nurseries and similar areas in which it is protected from cold and dessication.

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THE NORTHWESTERN LIMIT OF DISTRIBUTION OF *Rhineura floridana* WITH COMMENTS ON THE DISPERSAL OF AMPHISBAENIANS

New locality records extend the known range of the amphisbaenian *Rhineura floridana* across the Suwannee River, an important zoogeographic barrier, and suggest a mechanism for insular distribution of amphisbaenians. *Rhineura floridana* inhabits well-drained soils throughout much of northern peninsular Florida. Recent accounts of its distribution (Gans, 1967; Zug, 1968) shows its northwesternmost occurrence to the south and east of the Suwannee River.

A single *R. floridana* (UF 39647) was collected in Hamilton County, ca. 19.2 km by road NE White Springs. This locality is more than 25 km N of the previous northernmost record, at Lake City, Columbia Co., and lies north and west of the Suwannee River. It extends the known range of *Rhineura* to within 18 km of the Georgia border and makes the single record from Georgia (MCZ 4655; Georgia, no specific locality) more credible.

Previously, the westernmost collecting locality for *Rhineura* was Seahorse Key, Levy Co., Florida (Zug, 1968). A new, more westerly



Figure 1. Locality records for *Rhineura floridana* along the Suwannee River. New records represented by triangles, existing records represented by squares. Shaded area indicates regions of well-drained soils (Caldwell and Johnson, 1982). The records for Seahorse Key and Sumner occur on isolated Pleistocene dunes. The stippled portion of the inset map represents the overall range of *Rhineura*.

locality is 3.2 km S Jena, Dixie Co. (UF 39648), 40 km west of the Suwannee River (Fig. 1).

Eleven other specimens of *Rhineura* were collected in the area between the Jena and White Springs localities during April 1973, during a major flood of the Suwannee River. One specimen (UF 39649) was taken ca. 1.6 km south of the Suwannee River, near the town of Suwannee Springs (Suwannee Co.). Ten others (UF 39650-39659) were collected from long-leaf pine/turkey oak scrub on the south side of the Suwannee River, about 5 km north of Alton, Lafayette Co. All eleven *Rhineura* were found dead in quiet waters in recently flooded areas, apparently drowned. None was seen swimming.

It seems likely that amphisbaenians in general may not swim or do so very poorly. Gans et al. (1965) and Broadley et al. (1976) found amphisbaenians of two other genera, *Ancylocranium* and *Monopeltis*, drowned in shallow water. Laboratory tests with a living *Rhineura* (Meylan, unpublished observations) indicate complete inability to swim. An *Amphisbaena manni* sustained lateral undulatory locomotion in water and this species could be called a weak swimmer.

Although *Rhineura* apparently does not swim, overwater dispersal might occur by rafting. However, expatriation by rafts from the sandy, friable soils in which these burrowers live seems unlikely. The possibility that amphisbaenians are transported within floating logs or stumps seems unlikely, too, because they are truly fossorial. I have found only one record of amphisbaenians occurring in logs (Hoogmoed, 1973). In that account the logs were so rotten they could hardly be expected to float. Thus, swimming and rafting do not appear to account for the dispersal of *Rhineura* across water. Other more plausible explanations are available. *Rhineura* could have reached the island of Seahorse Key, FL, during periods of glaciation, when ocean levels were far lower than at present, and the island was contiguous with the mainland. The presence of *Rhineura* on both sides of the Suwannee River can best be explained by changes in the course of the river through time. Stream capture and water diversion, as well as natural bridge formation, are frequent in the karst topography of northern Florida (Vernon, 1951). It is likely that the Suwannee has not long occupied its present valley, but flowed through what is now the Waccasassa Flats and entered the Gulf of Mexico where the Waccasassa River does today (White, 1970).

The data presented here suggest that *Rhineura floridana* is not well disposed to dispersal across water. Its distribution in northwest Florida is best explained in terms of historical changes in the land surface rather than the ability of this species to disperse. The admittedly limited evidence indicates that amphisbaenians in general may have limited overwater dispersal capabilities. If these findings can be corroborated, a land-bridge or vicariant origin for amphisbaenians on islands would be suggested.

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TECHNIQUES

A METHOD FOR NOCTURNALLY LOCATING LIZARDS

Locating animals for nocturnal observations is often difficult. In order to monitor the nightly activity of the ringtail *(Bassariscus astutus)* Trapp (1972) utilized a microlamp collar consisting of a "grain-of-wheat" lamp plus four disc batteries connected in parallel and inserted into the transparent sleeve of a plastic medical bracelet. Jackson (1959) introduced and Phinney et al. (1967, 1969) elaborated upon the use of fluorescent pigment to mark and relocate large numbers of fish. The pigments used by Phinney (1967) consisted of a solid solution of fluorescent dyes in a melamine-sulfanamide-formaldehyde resin. This mixture was sprayed upon the fish using a compressed air gun and subsequent relocation of the animals was made through the aid of ultraviolet light.

Each of these methods is certainly an effective means of marking and relocating animals under dim or dark light conditions. However, neither method would work satisfactorily when applied to small reptiles since a collar with lamps and batteries would be far too heavy and the application of fluorescent dyes requires a mucous covered skin. Here we describe a novel method of marking small reptiles which does not require batteries, lamps or moist skin and is not only effective but procedurally simple.

While determining the nocturnal locality of adult anoline (*Anolis* sp.) lizards in Puerto Rico, 20 individuals were marked, released and subsequently relocated using Cyalume® lightstick (American Cyanamid Company, Bound Brook, New Jersey) a phospho-luminescent liquid. Activated Cyalume® was extracted from its sealed plastic container using a hypodermic syringe and 23 ga. needle. The liquid was then injected into 1.8 x 30 mm micropipette sections, one end of which was sealed with Seal-Ease® (Clay Adams, Parsippany, New Jersey) tube sealer. The other end was similarly sealed following tube filling. Experimental animals were captured and marked with these glowing tubes between one-and-a-half and two hours before nightfall. Duco® cement (E. I. du Pont de Nemours

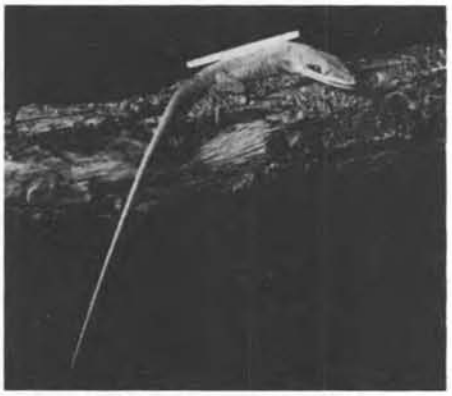


Figure 1. Adult anoline lizard with glowing tube attached to dorsum.

and Company, Inc., Wilmington, Delaware) was used to attach each tube longitudinally to the lizard's dorsum (Figure 1); the glue was allowed 5 minutes to dry, after which the animals were released. In the remaining light hours lizards were observed interacting normally with no apparent behavioral restraints due to the marking device (Figure 1). Approximately 2 hours after nightfall individuals were easily located at their perch sites from a distance of up to 30 m., and individuals could be located as late as 6 hrs after nightfall.

This method is apparently harmless to the animal since in all cases the device was sloughed off in 24 hrs. with no visible damage to the lizard's body. This method of marking small lizards could be applicable to other reptiles. Larger lizards and snakes could be similarly marked and more than one glow tube could be used for individual identification.

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A "NEW" LIVE TRAP AND A COMPARISON WITH A PIT-FALL TRAP

Amphibian and reptile live traps are legion (Thomas, 1977; Scott, 1982). Because of economic and time constraints inherent in a recent study of herpetofauna populations in the Lower Coastal Plain of Mississippi, we had to design a trap that was efficient in capturing the smaller, more secretive herpetofaunal elements and could be easily and inexpensively constructed.

Basically the trap is of the funnel-trap type (hereafter called a "pipe-trap"). It is light in weight, fairly rigid, and easy to store. We constructed the pipe-traps with the intent of capturing small animals and excluding larger ones. The pipe-trap (Figure 1) consisted of: (1) a cylinder of aluminum window screening, (2) three disks of plywood or fiberboard, (3) a short length of lath, and (4) a short length (about 20 cm) of 1.9 cm (internal diameter) PVC pipe. The front and second disks and the lath were stapled to the screen cylinder. Cost per trap (in 1981) was about 75 cents if all new material had been used.

Our pipe-traps had a diameter of 15 cm (6 in.) and a length of 51 cm (20 in.). To remove captured animals, the wire was unfolded from around the rearmost disk, the disk removed, and the animals were shaken out or removed by hand through the access port in the second disk. Snakes that appeared to be too large (especially *Coluber constrictor priapus* and *Lampropeltis getulus holbrooki*) to enter the pipe were commonly captured.

The traps were used in conjunction with drift fences made of 61 cm x 20 m (1981) and 61 cm x 40 m (1982) strips of heavy vinyl sheeting. Approximately the lower 10 cm of the strips were buried. In 1981 the top edge of the strips was stapled to angled stakes so that only the top edge was in contact with the stakes. In 1982 heavy (70-100 lb. test) monofilament fishing line was stretched from end support stakes and the vinyl strips were taped or riveted to these lines. This latter methodology was superior. In 1981 the layout of the fencing and traps was of the standard "V" pattern. In 1982 the layout was changed to a "W" pattern and two pitfall traps (25 cm diameter, 30 cm deep plastic trash containers) were incorporated into the design with one pitfall and one pipe trap used at each end of the "W". In both years additional 61 cm x 1 m vinyl strips were used at both ends to funnel animals into the traps. For pipe-traps a shallow trench was dug behind the vinyl sheeting so that when the pipe-trap was laid in the trench and the pipe pushed through a hole in the sheeting the pipe was flush with the ground. Earth was tamped around the juncture of pipe and sheeting. Animals were evidently funneled by the sheeting to the pipe opening which they entered, crawled through, and then fell into the trap. The cage part of the pipe-traps was covered with vegetation to reduce desiccation mortality of trapped animals.

Table 1. A comparison of black versus white PVC pipe in terms of herptiles captured in 420 trap-days in southern Mississippi in 1981.

Order	Total Number Captured	Number Per Trap-Day	Number Captured in Traps With PVC Pipe Colored: Black	White
Caudata	9	.021	7	2
Anura	7	.017	4	3
Squamata	104	.248	75	29
Suborder Lacertilia	89	.212	63	26
Suborder Serpentes	15	.036	12	3
Total Captures	120	.286	86	34

Table 2. A comparison of pit-fall traps and pipe-traps in numbers of herptiles captured versus the number expected (3/5 of the traps were pipe traps) in southern Mississippi in 1982.

Order	Total	Captures of Herptiles: Pipe-Trap OBS.	Pipe-Trap EXP.	Pit-fall OBS.	Pit-fall EXP.
Caudata	23	19	14	4	9
Anura	45	13	27	32	18
Squamata	515	425	309	90	206
Suborder Lacertilla	447	366	268	81	179
Suborder Serpentes	68	59	41	9	27
Total Captures	583	457	350	126	183

In 1981 total effort was 420 pipe-trap days from 1 April to 30 June. In 1982 we trapped from 1 March to 7 September (except for 9 July to 18 August when hot weather necessitated closing the traps) for a total of 12,060 trap days (7236 pipe-trap and 4824 pit-fall trap days). In both years we trapped equally in habitats ranging from mesic hardwood bayheads to xeric pine uplands.

In 1981 we used both white and black colored PVC pipe equally for the pipes. Pipe-trap captures were not equal (Table 1). More salamanders, lizards, and snakes were captured in pipe-traps with black pipes [χ^2 (Caudata, Anura, Lacertilia, Serpentes) = 23.4, $P<.001$]. Only the toads (*Bufo* sp.) showed little difference and this might be attributed to a small sample size (n = 7). We hypothesize that the black PVC pipe may act as an attractor by more closely simulating an earthen hole than white PVC pipe.

In 1982 we used only black PVC pipe in the pipe-traps. The increased trapping effort resulted in many more herptile captures (Table 2). When corrected for the disparity in numbers of trap types employed (3/5 were pipe-traps), capture rates between pipe-traps and pit-falls were not similar (Table 2). All observed numbers of captures differed significantly from the expected (χ^2 Caudata = 4.6, $.05>P>.025$; χ^2 Anura = 18.1, $P<.001$; χ^2 Lacertilia = 89.5, $P<.001$; χ^2 Serpentes = 19.9, $P<.001$). Salamanders, lizards and snakes were more likely to be captured in the pipe-traps whereas frogs and toads were much more likely to be captured in pit-fall traps. The difference in trapability is probably a reflection of behavior differences. Salamanders, lizards, and snakes are probably more prone to entering burrows than frogs and toads. The "hopping" type of locomotion by anurans may make them more apt to land in a pit-fall than the more dexterous sala-

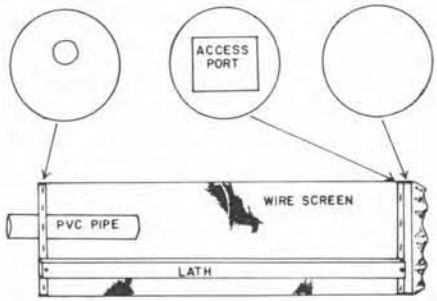


Figure 1. Drawing showing the component parts of the live trap and the sequence of plywood disks.

manders and lizards. Also, the pipe-traps caught large numbers of insects which remained alive and these may have acted as bait, especially for lizards.

We thank E. Harrison and H. Pearson for comments on an early draft of this manuscript. Data were collected during the course of cooperative agreements 40-7B82-1-22291 and 40-7B82-2-22248 with the U.S. Forest Service, Southern Forest Experiment Station, Range Management Research. This project was endorsed by the U.S. Man and the Biosphere Program (MAB-3) contributing to grazing land objectives. The assistance of the personnel of the Biloxi District Ranger Office, DeSoto National Forest, is again gratefully acknowledged.

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BOOK REVIEWS

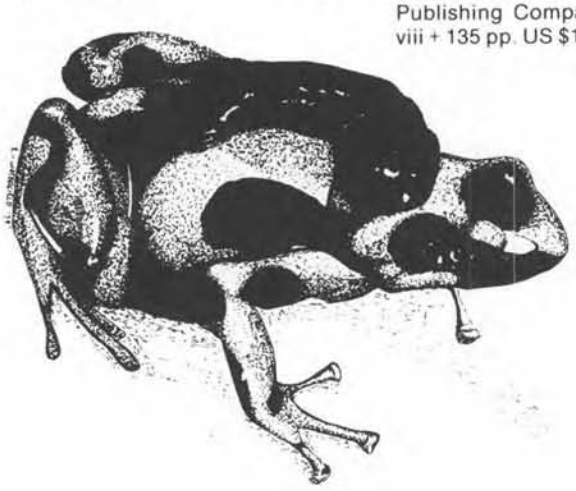
Mammal-Like Reptiles and the Origin of Mammals, by T. S. Kemp. 1982. Academic Press. 363 pp. $49.50.

Although the synapsids have been extinct for more than 190 million years, a remarkably detailed fossil record of them remains. The first members of the group date from the Lower Pennsylvanian, more than 300 million BP and in the course of their history, radiated widely to become for a time dominant members of the terrestrial fauna. The pattern of evolution of these mammal-like reptiles consisted of three phases: adaptive radiation of the pelycosaurs through the early Permian; radiation of the non-cynodont therapsids in the late Permian; the Triassic radiation of the cynodonts. Each of these three radiations commenced from a single lineage that had originated during the previous phase and followed a broadly comparable course. The fact that many features of the evolutionary pattern occurred independently three times in succession implies to the author that there may be underlying rules governing the process of macroevolution.

This fascinating story is spelled out in detail by a comprehensive description of the fossil record, showing step by step the steady accumulation of mammalian features that eventually became integrated into the mammal. Kemp discusses those structures and processes which do indeed characterize a mammal and the means by which this homeostatic complex could have developed. There are 117 figures in the book, most of which depict the skull, postcranial skeleton, teeth, or other features that are of significance. A revealing book for those who have not kept up on their palaeoherpetology.

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Herpetology of Europe and Southwest Asia: a Checklist and Bibliography of the Orders Amphisbaenia, Sauria and Serpentes, by Kenneth R. G. Welch. 1982. Robert E. Krieger Publishing Company, Malabar, Florida, vii-viii + 135 pp. US $14.50. ISBN 0-89874-533-0.



As Mertens & Wermuth's (1960) Die Amphibien und Reptilien Europas becomes more and more outdated, a modern treatment of the European and adjacent herpetofauna is most welcome.

Unfortunately the main title of Welch's publication on Europe and Southwest Asia promises more than what it keeps: neither the amphibians nor the other orders of reptilia (Testudines and Crocodylia) are treated. For those who have a professional interest in the area mentioned and who are to work in the future in herpetological systematics, the book is an essential publication. However, it must be used with great care and reservation: this as a serious warning to uncritical readers.

The publication is apparently aimed at those who have no ready access to scientific libraries where such standard publications as "Das Tierreich," the "Zoological Record" or the "Handbuch der Reptilien und Amphibien Europas" would be available, and it contains 18 chapters, two appendices, a bibliography, two indices (one to genera and one to species) and subspecies, and the acknowledgements.

Chapter one gives surprisingly little information about the area covered, without a map, and similarly short is the information on the classification followed. With the acknowledgements I miss indications to the scientific institutions the author was associated with.

The check-list is arranged according to families, the taxa in alphabetical order. The distribution data are sometimes vague: with *Elaphe longissima longissima* the account does not indicate that it occurs in West Germany (Schlangenbad, Passau (Mertens & Wermuth, 1960)). The distribution of *Chamaeleo chamaeleon chamaeleon* lacks Portugal (Crespo, 1972), Sicily (u.a. Schreiber, 1912) and Kreta (Wettstein, 1953).

The bibliography (pages 92-126) contains many titles about behaviour, pathology, parasitology, physiology, toxicology and vivarium-keeping, which have no direct context. On the other hand, there are several major regional publications missing: u.a. Europe (Schreiber, 1912; Mertens, 1972,) Austria (Luttenbergger, 1978) Balearic Islands (Eisentraut, 1950), Spain (Salvador, 1974), Switzerland (Stemmler, 1981), Turkey (Baran, 1976, 1978). The publication by Boehme (ed.) 1981 apparently is too recent to have been considered for inclusion in this book.

Several monographic treatments are also missing from the book: Anguidae (Petzold, 1971), *Natrix natrix* (Kabisch, 1974), Elapidae, Hydropheidae, Viperidae and Crotalidae (Klemmer, 1963), and *Vipera berus* (Frommhold, 1969). The student of the unique Lacertid fauna of the many islands and islets in the Mediterranean will be surprised to find that list incomplete, for example: Lanza (1976), Lanza, Adriana & Romiti (1971), Lanza & Capolongo (1972), Lanza & Brizzi (1974, 1977), Brizzi & Lanza (1975) are not covered.

More careful proofreading would have been most beneficial, especially within the bibliography.

The bibliography is thus by no means a comprehensive treatment of the Herpetofauna of Europe and Southwest Asia, but a very important step forward towards a more mature

version. The relatively low price and the neat professional presentation of the book may induce many professionals and amateurs as well to buy their copy.

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A Review of the Colubrid Snakes of the Genus *Tantilla* of Central America, by Larry David Wilson, 1982. Milwaukee Public Museum Contributions in Biology and Geology, No. 15. [ii], 77 pp., 23 figs., 6 tables. Available from the Milwaukee Public Museum, 800 West Wells St., Milwaukee, Wisconsin, 53233. $10.00, plus $1.00 for shipping and handling. A 10% discount offered to libraries and institutions.

". . . traditionally considered to contain species difficult of identification," *Tantilla* has been the focus of attention for some 14-15 years by Larry David Wilson, whose first contribution to knowledge of the genus appeared in 1970. Since then a dozen or so accounts have been undertaken, of which the present is the most recent to be published and the most voluminous.

Monographs are always welcome, and the expected revision of *Tantilla*, for which the present article is a prelude, is exemplary, for the genus has been in a somewhat chaotic state despite its wide distribution throughout most of the continental Americas and its numerous taxa, numbering some 48 species according to Wilson - the second-most speciose (to *Atractus* with some 70 species) genus of snakes in the Western Hemisphere.

The difficulty of the genus, taxonomically, is not so much a matter of inherent problems of reliable correlation of phenotype with gene pool but of (1) inadequate material (many species are quite rare in collections), (2) premature (hence inaccurate) extrapolations from scant material (of which the present reviewer is as guilty as anyone else), and (3) the inevitable bias derived from published accounts.

Wilson is ideally suited temperamentally for sane screening of information now accessible on the annoyingly controversial species of this genus. As thoroughly documented by the present article, all materials known to exist in collections anywhere in the world have been exhaustively ferreted out and their conventionally studied characters recorded; hence the problem of inadequate samples has been diminished although not eliminated. In addition, Wilson has viewed his massive accumulation of data with a coldly impassive eye (not always true of previous workers), drawing conclusions only as overwhelmingly justified.

Thus the taxonomic treatment in the present account is conservative but thoroughly sound as far as it goes, admitting no subspecies and no species that are not clearly substantiated. Order is restored to serve as a secure basis for future work with larger and more geographically representative samples.

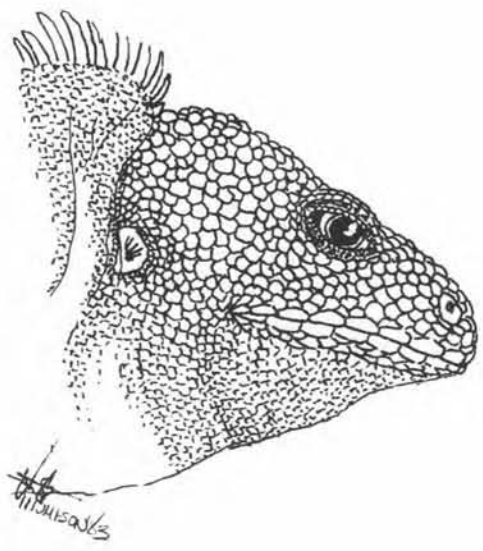
Summarizing knowledge of all 17 Central American species of the genus, the review is the final authority for that entire region, and also has an important bearing upon understanding of the adjacent faunae of Mexico and South America. A key to the species, and for each species a description, summary of variation, spot distribution map, list of specimens, localities, synonymy, illustrations of total appearance, scutellation or pattern, brief notes on natural history, and tabular comparative summaries of variation are given. It is a model review, seemingly leaving little for the projected generic monograph save theoretical considerations of phylogeny and relationships.

The most startling conclusion is that *T. alticola*, until 1977 (when Wilson et al. reported it from Costa Rica) thought to be restricted to Colombia, actually occurs as far north as Nicaragua and is a senior synonym of *T. costaricensis*, as well as the Colombian *Homalocranium coralliventre* and a lectoparatype of *T. jani*.

Another major alteration of current concepts is the rejection of all of the several subspecies of *T. schistosa* previously recognized, including *phrenitica* and *taylori*, on grounds of over-riding variation. Finally, two new species, *T. cuesta* and *T. excubitor*, both from Guatemala, are described as new. Thus Wilson has authored, or shared authorship (with Mena) of three valid Central American species of *Tantilla*—more than any other author (Barbour 1, Bocourt 2, Boettger 1, Boulenger 1, Cope 2, Günther 2, Hallowell 1, Linnaeus 1, Mertens 1, Smith 1, Stuart 1), although the roster approaches a catalog of workers in Central American herpetology.

The revision is indispensable for anyone working with *Tantilla* or with the herpetofauna of Central America. It will vastly simplify evaluation of new material from that area.

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Lizards in Captivity, by Richard H. Wynne. 1981, 189 pp., ill. $7.95. THF Publications, Inc., P.O. Box 427, Neptune, N.J. 07753-0427.

This book attempts to provide the amateur enthusiast with factual, readable information on the diversity of lizards and their care in captivity. The book contains an abundance of interesting photos, including 58 color and 67 black-and-white illustrations. There is a brief introduction, a general description of lizards, and a list of families. Nineteen families are recognized, and one or more species or genera from each family are dealt with briefly. Each account contains the common name, scientific name, distribution, length, description, habitat, type of cage, temperature range, food and water, special needs, young, and related species. The accounts comprise about 95 pages of text. In addition, there are notes on housing, food and nutrition, care of young and eggs, diseases, field work, and a glossary and bibliography.

While the objectives of this book are laudable and in large measure fulfilled, there are inaccuracies and inadequacies which could mean the difference between success and failure for the amateur lizard lover. Therefore, these shortcomings warrant consideration.

One of the most frequent causes of failure in maintaining lizards in captivity is the lack of an appropriate thermal environment (Avery, 1979). Wynne attempts to forestall this problem for the novice by including the preferred temperature range in each generic or species account. I took Wynne's temperature data from ten accounts, converted Fahrenheit to Centigrade, and compared this information with corresponding data in Brattstrom (1965) which were collected in nature. In all cases, Wynne's upper temperature limit falls below the maximum voluntary temperature for the species in Brattstrom. In two cases *(Iguana* and *Crotaphytus),* Wynne's value is nearly 10 degrees below that recorded by Brattstrom. Moreover, in six cases *(Basiliscus, Crotaphytus, Dipsosaurus, Gambelia, Iguana* and *Ophisaurus)* Wynne's upper value is less than the mean preferred temperature for the species calculated by Brattstrom. Wynne does not mention a source of information for his temperature data. Comparative data probably exist for some of the other, more exotic species treated in the text, but I made no attempt to search the literature. Suffice to say that some of Wynne's other preferred temperature ranges are suspect.

The disparity between Wynne's recommended temperatures and those apparently preferred by lizards in nature is a matter of concern. Moreover, the preferred temperature of a lizard will vary as a function of the state of digestion, reproductive condition, general health, and perhaps other factors as yet not identified (Regal, 1980). The solution to this problem is obvious and simple: create a thermal gradient by suspending a heat lamp of suitable wattage at one end of the cage. Such a gradient will enable the lizard to voluntarily find its optimum temperature as dictated by its changing physiological state.

Wynne points out the need to provide captive lizards with a source of ultraviolet light (p. 154) when kept indoors. He recommends the use of special bulbs designed for houseplants and home aquaria. However, Regal (1980) states that "Gro-lux" lights, commonly used for houseplants, are not effective. Unfortunately, Wynne does not mention "Vita-Lite" (Duro-Test Corp.) which has been a recommended product in several studies dealing with maintenance of captive lizards.

Wynne advocates maintaining captive lizards outdoors (p. 149), but neglects to caution the hobbyist about several problems. Space, time, and money are required to build a proper outdoor facility. Adequate shelters must be provided to protect lizards from unexpected frosts, torrential rains, and high temperatures. Rarely do these shelters duplicate the protective microenvironment afforded by deep burrows which in nature permit desert species to escape thermal extremes. Consequently, captive lizards may become stressed and die as a direct or indirect result of exposure. An outdoor facility must also be dog and cat proof as these animals roam some neighborhoods at will. The aforementioned factors pose serious problems for the novice and experienced collector alike.

Wynne makes recommendations on how to breed lizards in captivity (p. 159), but these are inadequate as far as temperate zone species are concerned. He prescribes an abundance of food rich in calcium and vitamins, a simulated natural habitat, and minimal disturbance. I agree. However, many experienced hobbyists are well aware that hibernation (brumation) is usually essential to bring temperate zone lizards into breeding condition in spring. Wynne fails to mention, let alone discuss, the importance of winter dormancy to successful captive propogation. Facilities to hibernate lizards are not always available to the amateur. However, a basement or unheated room in the house has often proved satisfactory.

Although Wynne considers diseases and their treatment (p. 165), he neglects to mention several rather common ailments caused by bacteria, including respiratory infections, enteritic infections, and salmonellosis. *Salmonella* is especially important since it is considered a potential human pathogen (Marcus, 1971). Amateur hobbyists would have benefitted greatly if Wynne had cited one or more references on disease treatment such as Murphy (1975), for example. Wynne discusses calcium-phosphorus imbalance, which he calls "rubber jaw." However, novice owners of *Iguana* and *Ctenosaura* might not be alerted to the problem since in these iguanines the initial symptoms usually are swollen limbs and tail. The owner is reluctant to believe that anything is wrong with his pet except that it may be fed too much.

Wynne suggests the use of moist earth or sphagnum moss to hatch lizard eggs (pp. 160-161). How moist is moist? That may depend on the species. Wynne should have encouraged the hobbyist to experiment with measured proportions of water and hatching medium to obtain the highest possible hatching success.

A few minor annoyances caught my eye, such as the notion that mealworms "clog the intestines" (p. 156), and that earthworms may comprise the natural diet of *Corytophanes* (p. 55).

Finally, it is unfortunate that this book did not discuss conservation. In fairness, Wynne does indicate the endangered status of some *Cyclura* (p. 49), and urges the collector (p. 177) to never overcollect. However, the author could have done more (without increasing pages) by noting those forms (e.g. *Heloderma, Phrynosoma*) that have state and/or federal protected status. Wynne should have encouraged collectors to contact state wildlife agencies concerning lizards and the law. Also, as measures to minimize the impact of collecting, Wynne could have urged collectors to treat the microhabitat with care and to collect juvenile lizards rather than reproductive adults.

In sum, this is an interesting and stimulating book for the amateur, but unfortunately it lacks substance and accuracy in places. I hope the author will consider my critical comments should he contemplate a revised edition.

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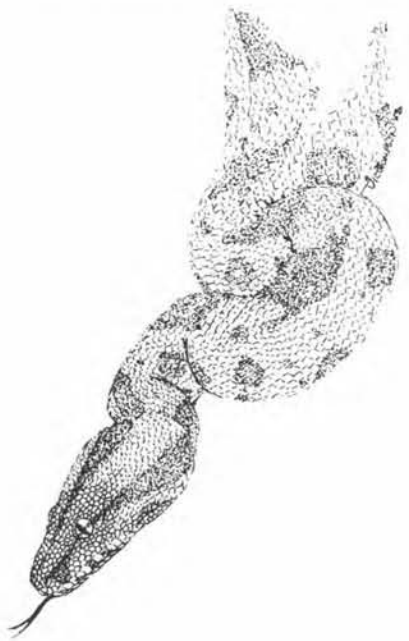
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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted must be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white 8 X 10, glossy prints, and should be accompanied by a descriptive caption. The name and address of the contributor should be taped or penciled on the back of each print. Return of photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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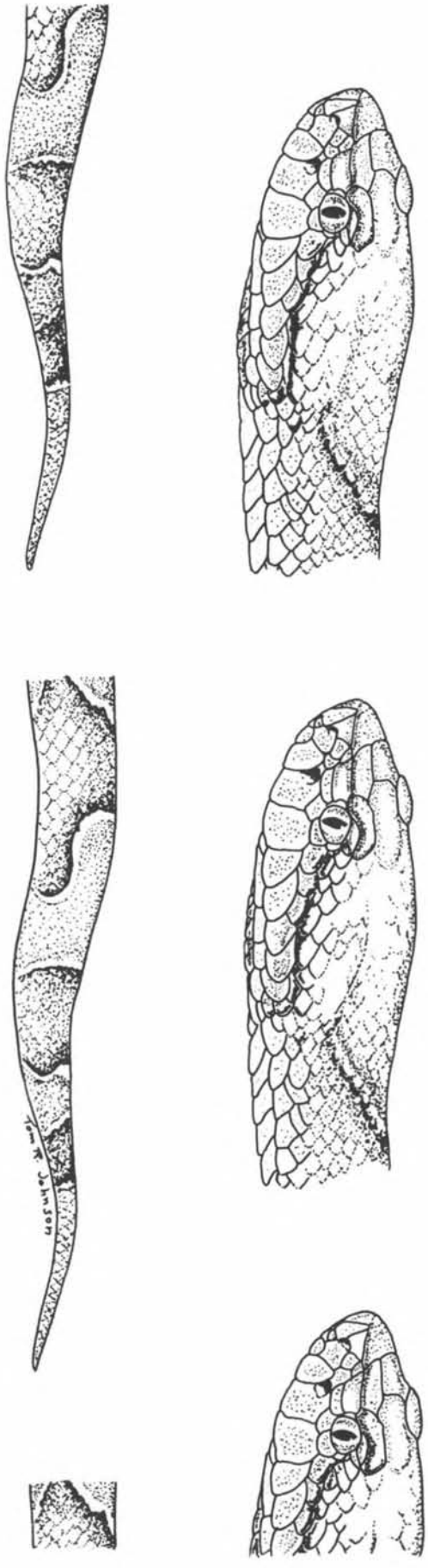
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1. Members living outside the United States and not having direct access to U.S. currency may now pay their dues on their VISA or MASTERCARD accounts. Simply send to the Treasurer your account number (in full) plus expiration date and the dollar amount to be charged.

2. We have members and would-like-to-be members who reside in countries where foreign exchange is prohibited. Some of these members are already being supported by friends in the United States, but there are others who need a sponsor. Donations of $22 (student) and $27 (regular) will provide a year's membership.

3. The last set of Catalogue accounts includes an announcement of subscription renewal for the next set. This announcement is inserted in *all* packets and is simply a reminder. If you have already paid your Catalogue subscription together with your SSAR membership dues, there is no need to duplicate the payment! ●

EXHIBITORS WANTED FOR 1984 JOINT SSAR-HL-ASIH MEETING

On 28 July through 4 August 1984, the Herpetologists' League, the Society for the Study of Amphibians and Reptiles and the American Society of Ichthyologists and Herpetologists will be sponsoring a meeting at the University of Oklahoma in Norman, Oklahoma. This will be the largest such meeting ever held and will be the first joint meeting for these organizations in 5 years.

I have been asked by the local committee to locate possible exhibitors for this event and as such would be interested in being contacted by anyone who might wish to participate. The following information provides some details concerning the meeting:

Attendance expected: 1000
Registrants: Biologists, college professors, zoo and museum personnel, state and federal wildlife officials, graduate students in biology, serious lay persons with interests in fish, amphibians and reptiles.
Previous Exhibitors: Publishers, used book companies, biological supply companies, manufacturers of animal collecting and housing equipment, artists (with animal themes—especially fishes, amphibians and reptiles), tee-shirt sales, travel services.
Additional Appropriate Exhibitors: Veterinary products, photographic supplies (especially macro and telephoto for nature photography), teaching tools, and other supplies.
Exhibit Locations: In corridors adjacent to meeting rooms. Participants will be exposed to exhibits many times as they go to and from sessions.
Cost: $100 for each table (4x6 feet) or equivalent for space (up to 6x12 feet). Artists who sell materials created by themselves will be charged $50 or the equivalent in donated art or crafts; such persons are expected to be engaged actively in their work at the exhibit area.
Shipment and Care of Exhibits: Exhibits may be shipped (prepaid) in returnable containers to ASIH-HL-SSAR, c/o Department of Zoology, University of Oklahoma, Norman, Oklahoma, 73019 to arrive no later than 20 July 1984 with instructions for setting up. Exhibits will be returned (shipment collect) by 15 August 1984. Where possible, exhibitors are encouraged to have their exhibits attended by an employee who can bring the materials with them. Exhibitors in attendance will be charged a much reduced registration fee unless they plan to attend the free meals and social events.

If you are interested in exhibiting, please contact me at the address below.

Neil B. Ford, Ph.D.
Assistant Professor of Biology
(Exhibit Chairman: ASIH-HL-SSAR
Joint Meeting, 1984)
University of Texas at Tyler
3900 University Boulevard
Tyler, Texas 75701, U.S.A.
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PROPOSALS FOR ANNUAL MEETING SYMPOSIA OR WORKSHOPS

To be considered for approval by the SSAR/HL joint Meetings Committee, proposals for symposia, workshops, and other special presentations at Annual Meetings must be received by the Committee chair at least 18 months prior to 1 August of the year in which the program is to be held. Further information can be obtained from the Committee chair, Lynne Houck (Department of Biology University of Chicago, 1103 E. 57th Street, Chicago, Illinois 60637, U.S.A.). Proposals for the 1985 meetings are due by 1 February 1984. ●

SSAR THANKS ACADEMIC PRESS

Academic Press has enthusiastically supported our annual meeting for the past several years through financial contributions and donation of their herpetological publications. Their generosity has enabled addition and expansion of activities which have contributed immeasurably to the enjoyment of the meeting by all those in attendance.

SSAR expresses its gratitude to Academic Press for their continuing support of our meetings and the goals of our society. It is through such gestures that these meetings have become an international forum for the dissemination of herpetological information. ●

AUCTION ITEMS NEEDED

The 4th annual SSAR auction/social will be held in conjunction with the SSAR/ASIH/HL meetings at the University of Oklahoma, Norman, in 1984. The objects of the auction are to provide financial support to the local meeting committee while giving participants an opportunity to purchase auction items at bargain (?) prices while socializing in a convivial atmosphere.

In the past, most auction items have been books along with a few herp-oriented art objects (sculptures, paintings, photographs). These are all excellent objects to auction, but those wishing to donate for the affair at Norman might observe the following requests: 1) donate only *one* copy of a book (multiple copies are boring for bidders and the auctioneer), 2) consider donating *more* art objects, 3) consider donating tastefully humorous herp-oriented items, and 4) be sure to donate ichthyological (=fishes, for those with narrow herpetological interests) items out of consideration for the better half of the ASIH.

Please donate something. Bring it (them) to the meeting, or mail it (them) in advance to Victor Hutchison, Department of Zoology, University of Oklahoma, Norman 73019. Much thanks.

..... THE AUCTIONEER ●

1983 SSAR GRANTS-IN-HERPETOLOGY AWARDS

The Society for the Study of Amphibians and Reptiles is pleased to announce the following awards in the 1983 Grants-in-Herpetology Program:

GRADUATE STUDENT RESEARCH:

Paul J. Watson, Section of Neurobiology and Behavior, Cornell University. "Chemical communication and sexual selection in the red-spotted newt, *Notophthalmus viridescens* (Rafinesque)." $450.

Robert A. Newman, Department of Biology, University of Pennsylvania. "The genetic basis of traits affecting larval survival of *Scaphiopus couchi*, a desert anuran (Pelobatidae)." $275.

Joyce S. Tsuji, Department of Zoology, University of Washington. "Latitudinal comparison of thermal acclimation of metabolism in lizards." $250.

REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS:

Kevin N. Brewster, Wisconsin Herpetological Society. "Reptilian ecology of endangered prairie habitat in Wisconsin." $250.

Steve Hammack, North Texas Herpetological Society. "A pictorial guide to the amphibians and reptiles of Dallas and Tarrant Counties, Texas." $200.

HERPETOLOGICAL CONSERVATION:

Peter W. Stangel, Department of Zoology, University of Georgia. "A proposed study of the breeding biology and larval ecology of the spotted salamander, *Ambystoma maculatum*." $400.

SSAR extends it congratulations to all recipients of awards and encourages the submission of proposals for next year's program. SSAR also expresses its thanks to the 1983 Grants-in-Herpetology Committee, composed of: Linda R. Maxson (Chairperson), Robert Mount (Conservation Research), Malvin L. Skaroff (Regional Herpetological Society Projects), Donald C. Forester (Graduate Student Research), and Dale L. Marcellini (Herpetological Research in Zoos). ●

SSAR GRANTS-IN-HERPETOLOGY

The Society for the Study of Amphibians and Reptiles is pleased to announce that proposals are now being accepted for the 1984 Grants-In-Herpetology Program. This Program is designed to provide financial support to deserving individuals or organizations engaged in research on or conservation of amphibians and reptiles. All applicants (or their advisor or sponsor) must be a member of SSAR. Grant proposals will be considered in the following areas:

1. GRADUATE STUDENT HERPETOLOGICAL RESEARCH. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only, with a letter of support from the student's major advisor or committee chairperson.
2. HERPETOLOGY-ORIENTED CONSERVATION. Proposals should address research on endangered or threatened species at the state, national or international levels, or address research or critical herpetological habitats. Proposals may be received from individuals only.
3. REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS. Proposals may address any herpetological research endeavor or project, provided said endeavor or project concerns herpetology within the implied geographic limits of the regional society. Proposals may be submitted by regional herpetological societies or by individual members of the society. If the latter, a sponsoring letter from the current societal president or an advisor should accompany the proposal.
4. HERPETOLOGICAL RESEARCH IN ZOOS. Proposals may address any herpetological research endeavor which is conducted at a zoo. A letter from the represented zoo or supporting institution should accompany the proposal.
5. FIELD WORK (Auto Mileage). Proposals may address any area of herpetological research and may be submitted by any member of SSAR. Funding will only be granted for expenses associated with auto travel for collecting (or observing) study animals. (Two awards of $215.)

Each proposal should include the following information: A) *Background & Objectives* of the proposed project, in terms of its relevance to herpetology, B) *Methods* of carrying out the research or conducting the project, C) *Budget for the project*, which should not exceed $430 in each category, and D) *Curriculum Vitae* and *Letter of Support* (if applicable). The proposal must be typed double spaced and must *not* exceed 5 pages, excluding cover page, abstract, budget, curriculum vitae, and bibliography.

Successful applicants will be expected to submit to SSAR a written report of their research or project, within a reasonable time after the project year is completed. They are also encouraged to submit for publication the results of their research or project, preferably to *The Journal of Herpetology* or *Herpetological Review*.

Members of the SSAR Grants-In-Herpetology Committee will evaluate all proposals, projects or programs. Committee members are: Linda R. Maxson (Chairperson), Robert W. Murphy (Graduate Student Research), John B. Iverson (Conservation), Malvin L. Skaroff (Regional Society Projects), James P. Bacon (Zoo Research), and Donald C. Forester (Field Work).

Individuals submitting proposals must designate to which of the five areas their proposal applies. All proposals must be typewritten and submitted in duplicate no later than *13 APRIL 1984 to:*

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The editor would like to acknowledge the following individuals who reviewed manuscripts for *HR* during the past year. Their service to the Society is greatly appreciated.

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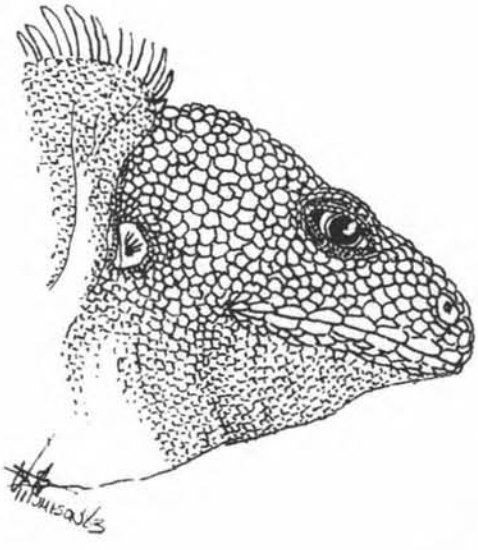
The present and past editors of *HR* would also like to express their gratitude to Joseph T. Collins, who recently resigned as section editor for Geographic Distribution in order to pursue other interests. J. T. Collins has contributed in so many ways to the Society that it is difficult to adequately thank him. At this time, therefore, we simply offer our sincere thanks for a job well done. ●

HERPETOLOGY POSITION AVAILABLE

A curatorial position is available in the Department of Ichthyology and Herpetology, Royal Ontario Museum, Toronto, Ontario. Appointment will be at senior Assistant Curator or Associate Curator level. Ph.D. graduate in herpetology with field, research, collection, and communications skills and experience. This is a tenure stream, permanent position.

Starting date - July 1, 1984. Closing date for receipt of applications and all documents - March 15, 1984.

For further details, write Dr. E. J. Crossman, Chairman, Search Committee, Dept. of Ichthyology and Herpetology, Royal Ontario Museum, 100 Queen's Park, Toronto, Ontario, Canada, M5S 2C6. ●



26th ANNUAL MEETING OF SSAR HELD AT THE UNIVERSITY OF UTAH



The 1983 Annual Meeting of the Society for the Study of Amphibians and Reptiles was held jointly with the Herpetologists' League in Salt Lake City, Utah, during 7-12 August on the campus of the University of Utah. Local Committee Chairman John M. Legler provided excellent facilities for the nearly 400 members and guests attending from 11 countries. All meeting and exhibit rooms were located in the University Union Building and most attendees were housed in nearby campus dormitories.

SSAR Board of Directors Meeting

The annual meeting of the Board was held on Sunday, 6 August, under the chairmanship of Ralph Axtell. All Board members, except Thomas H. Fritts, were present plus other officers, editors, committee chairs, and a number of visitors. The Board met for over 10 hours and discussed annual reports submitted by each Society officer, editor, committee, and coordinator plus a number of other items. The complexity of the Society continues to increase. SSAR now issues seven publication series, has 11 standing committees, and several coordinators and representatives. In addition to the decisions announced at the business meeting on 9 August (see below), the Board acted upon the following: (1) an additional category, Field Travel for Research, was added to the Grants-in-Herpetology program; (2) a proposal to hold the 1985 meeting at San Diego State University is still under consideration; (3) two symposia, "Predator-Prey Relationships in Lower Vertebrates: Ecology, Behavior, Morphology, and Physiology" and "The Biology of Whiptail Lizards," were approved for the 1984 meeting in Norman; (4) "Larval Amphibia, a Tutorial Workshop" received approval to be held at Norman; and (5) SSAR will sponsor presentation of David Dennis' (new and expanded) slide show "Herpetologists Past and Present" during the 1984 meeting.

Opening Ceremonies

The meeting began officially at 0900 hr on 8 August. On behalf of SSAR and HL, John Legler welcomed members of both organizations and introduced Cedric R. Davern, University of Utah Academic Vice President, who conveyed greetings from the University and wishes for a successful meeting. Robert F. Inger, President of Herpetologists' League, introduced the League's Distinguished Speaker, Roger Conant, who presented a special lecture entitled: "Some Comments and Conclusions on the Genus *Agkistrodon* and its Allies (A summary of the joint work done by Roger Conant and the late H. K. Gloyd)."

Featured Symposium and Regional Herpetological Societies Conference

This year's featured symposium, "Biogeography of the Herpetofauna of Mexico: Perspectives and Approaches," was organized by Larry David Wilson in honor of Hobart and Rozella Smith. The two day program consisted of 22 papers presented by experts from Mexico and the USA.

The 7th Regional Herpetological Societies Conference addressing "Education and Conservation Projects of Regional Herpetological Societies" was sponsored by the SSAR Regional Herpetological Society Liaison Committee. The program, consisting of seven semi-popular lectures, was organized and chaired by Janice J. Perry.

Special Activities, Exhibits, Social Events, and Tours

The Local Committee arranged a number

of special activities including tours of the Brigham Young University Museum in Provo, Veteran's Administration Hospital Venom Laboratory, and Hogle Zoo in Salt Lake City. A number of family tours were also conducted, including trips to the Mormon Temple and Tabernacle, Trolley Square (a shopping center in the old Salt Lake City Trolley barn), Kennecott Copper Mine, and Park City (an old mining town that is now a ski resort).

A display of live amphibians and reptiles occurring in Utah was available for viewing and photography. Several commercial exhibitors and publishers had their products available for inspection. A "Video Techniques Workshop" was organized by John Legler and Helen Lacy at the University's videotape studio. The studio's staff and Legler demonstrated techniques for the use of videotape presentations for teaching and research.

Several excellent social events were held during the week-long meeting. The regional herpetological societies held a well-attended social on Sunday. One of the most popular events of our annual meeting, the traditional social and auction, occurred on Monday with Joseph T. Collins continuing as auctioneer. The sale of herpetologically related art, publications, and other items helped to support local meeting expenses. A Tuesday afternoon picnic was held at the Fort Douglas Military Reservation adjacent to campus. An authentic Mexican meal and strolling Mariachis contributed to an extremely enjoyable evening. An excellent barbecue dinner was held Wednesday night at Snowbird Ski Resort, located in the Wasatch Mountains at an elevation of 2469 meters (8100 ft).

Business Meeting

The annual business meeting of SSAR was called to order by President Ralph Axtell at 1655 hr on 9 August. President Axtell welcomed SSAR members and visitors.

Secretary James Jacob announced that (1) SSAR's newest publication series, *Recent Herpetological Literature*, would now be managed and edited by George Pisani at The University of Kansas; (2) members who are currently scanning journals for titles to be submitted to the *Recent Literature* series should now send all information to Pisani; (3) a list of journals being scanned will appear soon in *Herpetological Review;* (4) members having access to journals which are not being scanned currently were encouraged to contribute titles; (5) air-mail shipment of society publications to non-U.S. members will soon be available for an additional fee; (6) a constitutional amendment will appear on this year's ballot which, if approved, will make the SSAR Publications Secretary an appointed member of the Board of Directors (see *Herpetological Review* 14:4 for details of amendment); (7) George Pisani will be presented with a bound collection of letters from Society members expressing their gratitude for his years of devoted service to the Society; and (8) members who would like to serve on Society committees or host annual meetings were encouraged to contact Jacob, Ralph Axtell, or Carl Gans.

Treasurer Henri Seibert announced that (1) membership for 1982 showed a net increase of 4.3%; (2) the Society's financial status is much improved over the past few years but there will, however, be an increase in dues and subscriptions for 1984 with regular memberships being $22, students $17, and institutional subscriptions $40; and (3) the Board of Directors approved a 1984 budget of $86,055.

Journal of Herpetology Editor Rodolfo Ruibal reported that (1) the time between receipt and final acceptance of manuscripts submitted to the *Journal* is 5-6 months; (2) approximately 50% of the manuscripts submitted are rejected; (3) James L. Vial will assume the duties of Managing Editor for the *Journal* beginning with Volume 18; and (4) the Society is indebted to the members of the Editorial Board and to Stanley Salthe for his service as Managing Editor over the past few years.

Herpetological Review Editor Martin J. Rosenberg announced that (1) the backlog of accepted manuscripts has been reduced; (2) articles are now appearing in 6-10 months; and (3) members with news items or meeting announcements should contact the Editor.

Herpetological Circulars Editor Neil Ford announced that the silver anniversary year membership list (current to 31 December 1982), a brief history of the Society, and a list of herpetological societies (regional, national, and international) has been published as Circular No. 13 and is being sold for $4. Copies are available from the Publications Secretary, Douglas Taylor.

Linda Maxson, Chair of the Grants-in-Herpetology Committee, announced the names of the winners in each category for 1983 and the titles of their proposals (see *HR* 14(3)).

President Axtell announced that Charles R. Crumley was the winner of the 1983 Kennedy Award for the best student paper published in the *Journal of Herpetology* in 1982, for his paper entitled "A cladistic analysis of *Geochelone* using cranial osteology."

Victor Hutchison, Chairman of the Local Committee for the 1984 meeting at the University of Oklahoma, provided an excellent preview of facilities available and activities planned for the Norman meeting. Contact Hutchison for details.

The report of the Nominating Committee was presented by James Vial, Committee Chair. The nominees for SSAR office in 1984 are:

President-elect:
George Pisani and Herbert Dessauer

Secretary:
James Jacob (unopposed)

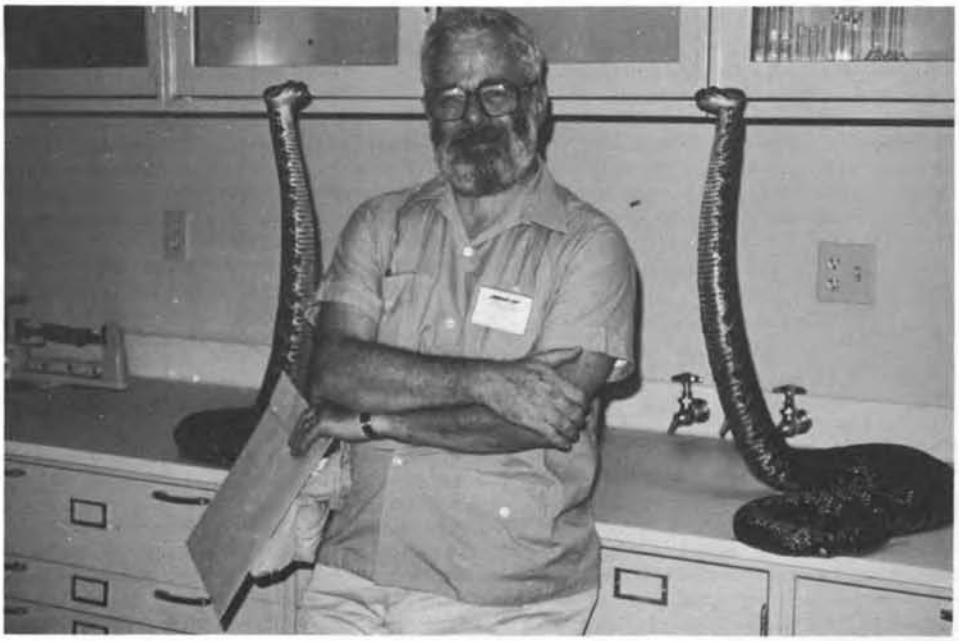
Treasurer:
Henri Seibert (unopposed)

Board of Directors:
Alan Savitzky, Samuel Sweet,
Timothy Halliday and Ricardo Martori

No additional nominations were received from the floor. James Dixon moved to close nominations (Joseph Collins seconded) and the motion passed with a voice vote. The ballot for 1984 appeared in the September issue of *Herpetological Review*.

There being no new business, President Axtell yielded the floor to Daniel Wilhoft, Chairman of the joint SSAR/HL Resolutions Committee, who presented the following resolutions:

1. *Whereas,* we owe the Local Committee Chairman a great debt of gratitude for his work and dedication which has provided us with an extraordinarily well organized, informative and very enjoyable meeting,
Be It Resolved, that we extend our thanks to the Local Committee Chairman, John M. Legler, whose personal involvement in all aspects of the organization of the meeting resulted in a high level of success and achievement.



President-elect Gans accepting advice on various herpetological matters from his colleagues. (Photo taken at the Veteran's Administration Hospital Venom Laboratory, Salt Lake City.)

2. *Whereas*, we are greatly indebted to the Local Committee for its helpful and efficient contribution to a very successful meeting,
Be It Resolved, that we extend our gratitude to Barbara Bannon, Dan Beck: Hogle Zoo; Jeff Bennion, Sharon Brady: Dancing; Dennis M. Bramble, Michael R. Bruno, Chris Carson: Graphics; Alice Chamberlin, Gloria Cuellar: Socials and Tours; Orlando Cuellar: Socials; Sharon Emerson, Heidi Fain, LaMar Farnsworth: Hogle Zoo; Robert Flint, Mary Fowler, James L. Glenn: Live Exhibit; Katrina Heiner: Secretary; Harold F. Hirth: Poster Session Setup; Jim Hodges, Dave Jensen, Robert Larson: Hogle Zoo; Austin Legler, Avis Legler: Tours; Ed Legler, Gretchen T. Legler, Michele Lemieux: Curatorial; Kerry Matz: Graphics; Jim Mayfield, Chris Moellentine, Mark T. Nielsen, Joyce Nikolai, Louis Porras, Tom Randaggo: Hogle Zoo; J.W. Sites, Jr.: BYU Museum; Taki Skedros, John Skedros: Socials; Anne Spikes: Tours; Maurine Vaughan: Typing; Tim Wahlberg, Dan Wahlberg, Dean Walker, Richard B. Young: Audio Visual.

3. *Whereas*, the Symposium: Biogeography of the Herpetofauna of Mexico: Perspectives and Approaches has contributed to our enthusiasm and knowledge of the sub-tropical herpetofauna,
Be It Resolved, that we express our appreciation to Larry Wilson for bringing together such a distinguished group of contributors.

4. *Whereas*, the meetings were honored by the attendance of Hobart and Rozella Smith,
Be It Resolved, we express our sincere gratitude to both of them for their contribution to our knowledge of Mexican herpetofauna.

5. *Whereas*, the Symposium: Education and Conservation Projects of Regional Herpetological Societies has provided timely and encouraging information relative to herpetological conservation,
Be It Resolved, that we thank Janice Perry for organizing the symposium and the participants for their contributions.

6. *Whereas*, we were the beneficiaries of a fascinating and provocative discussion of the Genus *Agkistrodon*, and its allies,
Be It Resolved, that we express our profound gratitude to Roger Conant not only for his distinguished lecture but also for reminding us of the significant contributions of the late Howard K. Gloyd.

7. *Whereas*, recent heavy rains and flooding in the Salt Lake City area raised fears that the upcoming SSAR/HL meetings might be washed away, and *whereas* our local chairman, John M. Legler, used a little-known and bizarre Australian Aboriginal chant to stop said rains just in time,
Be It Resolved, that John Legler be designated as the official "rain-preventor" for all future meetings, and that said chant be performed in public prior to all social events.

8. *Whereas*, this meeting has been characterized by an astounding abundance of T-shirts, visors, and signs using an excellent logo of a *Chelid* turtle,
Be It Resolved, that John Legler be commended for removing *Chelid* turtles from their previously obscure position in herpetology so that they may now be acknowledged as familiar and fascinating animals.

9. *Whereas*, the Society officers who retired last year have proven their devotion to the Society by promoting its aims,
Be It Resolved, that we thank: Kraig Adler for serving as President; Jim Murphy for serving as Immediate Past President; Jim Bacon and Bob Thomas for their service as Directors.

Papers and Posters Presented:

One hundred and seventy-five papers were presented during the five-day meeting in three consecutive sessions. Titles are presented below in order of session. Extra copies of the Program Booklet, which includes abstracts for most of the papers, are available from Dr. John M. Legler (see announcement below).

AVAILABLE WHILE THEY LAST: ABSTRACTS AND VISORS FROM 1983 SSAR MEETING

There exists a small supply of bound meeting books for the 1983 SSAR/HL Meeting at the University of Utah (containing 182 abstracts). Also there are a few official sun visors left. Both items bear the chelid turtle logo of the meeting. While they last, these items are available at the following prices (near cost):

Meeting Book	$4.40
Visor	$4.60

[Price is postpaid within U.S.A. - Canada. Foreign postage should be figured and paid for individually. Make checks payable to "HL/SSAR".] Mail to:

John M. Legler
Department of Biology
The University of Utah
Salt Lake City, Utah 84112, U.S.A.

POSTER SESSION

BAST, R. E. and R. A. Gibson, *Cleveland State University*
Characterization of the Vitellogenin from the Common Garter Snake *(Thamnophis sirtalis)*.
COOPER, W. E. and L. J. Vitt, *Auburn University; University of California at Los Angeles*
Conspecific Odor Detection in the Broad-Headed Skink *(Eumeces laticeps)*.
HARDY, D. L., *University of Arizona*
Envenomation by *Crotalus scutulatus scutulatus* in Arizona.
JOHNSON, L. F. and J. S. Jacob, *Memphis State University*
Pituitary Activity and Reproductive Cycle of Male *Cnemidophorus sexlineatus*, Six-Lined Racerunner, in West Tennessee.
JOHNSTON, G. F., *Southern Illinois University*
Morphology of the Labial Teeth of Anuran Tadpoles.
KWIAT, G. A. and D. H. Gist, *University of Cincinnati*
Annual Reproductive Cycle of an Ohio Population of the European Wall Lizard, *Podarcis muralis*.
LEGLER, J. M., *University of Utah*
The Chelid Turtles of Australia.
LIEB, C. S., *University of Texas, El Paso*
The *Anolis* Fauna of Mexico: A Preliminary Arrangement of Species Groups.
MACEY, R., *University of California, Santa Cruz*
The Effects of Ecology and Geography on a Hybrid Zone Between Two Subspecies of *Ensatina eschscholtzi*.
MAGNUSSON, W. E., A. P. Lima and M. C. Carvalho, Jr., *Instituto Nacional de Pesquisas da Amazonia, Manaus*
Seed Dispersal by Teiid Lizards in Amazonia.
MIHELY, P. A., *Ohio University*
Comparative Appendicular Anatomy of the Lizard Families Agamidae and Iguanidae.
SEIDEL, M. and S. Inchaustegui, *Marshall University*
Morphological Variation in Hispaniolan *Pseudemys*.
WRIGHT, J. W. and J. O. Hernandes N., *Los Angeles Natural History Museum; UNICOMA, Mexico, D. F.*
Los Cerones: Erpetologos Naturales de Mexico.
ZUG, G. R., A. S. Rand, A. H. Winn, and B. Bock, *National Museum of Natural History; Smithsonian Tropical Research Institute*
Skeletochronology of Panamanian *Iguana iguana*: A Test of Annual Periosteal Growth.

CONTRIBUTED PAPER SESSIONS

Session 1, Chairperson: J. E. Juterbock

TORDOFF, W. III, *California State College, Stanislaus*
Habitat Requirements of the Limestone Salamander, *Hydromantes brunus* (Caudata, Plethodontidae).
HERRINGTON, R. E. and J. H. Larsen, Jr., *Washington State University, Pullman*
Habitat Selection and Utilization by the Larch Mountain Salamander, *Plethodon larselli*.
JONES, L. L. C., *U.S. Fish and Wildlife Service*
Utilization of Rocky Habitat by Salamanders in Northwestern California.
JONES, T. R. and J. P. Collins, *Arizona State University*
The Status of the Salamander, *Ambystoma tigrinum stebbinsi* Lowe, in Southeastern Arizona.
BENESKI, J. T. JR., E. J. Zalisko and J. H. Larsen, Jr., *Washington State University, Pullman*
Demographics of a Long-toed Salamander *(Ambystoma macrodactylum columbianum)* Population During the Spring Breeding Migration.

Session 2, Chairperson: Bruce R. Bury

BERRY, K. H. and A. P. Woodman, *Bureau of Land Management, Riverside, California*
Shell Wear in Desert Tortoises *(Gopherus agassizii)*: Its Use in Determining Adult Age Groups and Analyzing Population Data.
TURNER, F. B., P. A. Medica, and C. L. Lyons, *University of California, Los Angeles; REECO, Las Vegas, Nevada*
Reproduction and Survival of the Desert Tortoise in Ivanpah Valley, California.
CONGDON, J. D., D. W. Tinkle, G. L. Breitenbach and R. C. VanLobenSels, *Savannah River Ecology Lab and University of Michigan*

Nesting Ecology and Nest Predation in *Chelydra serpentina.*
CONGDON, J. D., D. W. Tinkle, G. L. Breitenbach and R. C. VanLobenSels, *Savannah River Ecology Lab and University of Michigan*
Nesting Ecology and Nest Predation in *Chrysemys picta.*
CONGDON, J. D., D. W. Tinkle, G. L. Breitenbach and R. C. VanLobenSels, *Savannah River Ecology Lab and University of Michigan*
Nesting Ecology and Hatching Success in the Turtle, *Emydoidea blandingi.*

Session 3, Chairperson: Walter Tordoff III

JUTERBOCK, J. E., *The Ohio State University, Lima*
Dusky Salamanders as Boy Scouts: Are Males 'Always Prepared' for Reproduction?
SEMLITSCH, R. D. and J. H. K. Pechmann, *Savannah River Ecology Laboratory*
Diel Cycle of Migratory Activity for Several Species of Pond-Breeding Salamanders.
LAYNE, J. R., Jr., *Miami University, Oxford, Ohio*
Diel variation in Critical Thermal Maxima and Minima in Salamanders.
LANNOO, M. J., K. Hoff and R. J. Wassersug, *Department of Anatomy, Dalhousie University, Halifax, N. S.*
Kinematics of Pelagic Prey Capture by *Ambystoma* Larvae.
BEMIS, W. E. and D. Darda, *University of Chicago; University of California, Berkeley*
Development and Evolution of the Salamandrid Frontosquamosal Arch.

Session 4, Chairperson: James L. Christiansen

CONGDON, J. D. and J. W. Gibbons, *Savannah River Ecology Laboratory*
Relationships of Reproductive Characteristics to Body Size in *Pseudemys scripta.*
MORREALE, S. J., J. D. Congdon, and J. W. Gibbons, *Savannah River Ecology Laboratory*
Movements and Activity Levels of the Slider Turtle *(Pseudemys scripta)* with Relation to Reproductive Strategies.
WILHOFT, D. C. and E. C. Hotaling, *Rutgers University, Newark, New Jersey*
Egg Position and Weight of Hatchling Snapping Turtles *(Chelydra serpentina)* in Natural Nests.
CRASTZ, F., *Universidad de Panama*
Mechanism of "Arribadas".
RAYMOND, P. W. and L. M. Ehrhart, *University of Central Florida, Orlando*
The Effects of Beach Restoration on Loggerhead Turtle *(Caretta caretta)* Nesting in South Brevard County, Florida.
EWERT, M. A., *Indiana University, Bloomington*
Embryonic Aestivation in Turtle Eggs.

Session 5, Chairperson: Rodolpho Ruibal

WILLIAMS, T. A. and J. H. Larsen, *North Central College, Naperville, Illinois; Washington State University, Pullman*
Caudal Morphology of the Genus *Ambystoma.*
SESSIONS, S. K. and J. Kezer, *University of California, Berkeley; University of Oregon*
Evolution of the Plethodontid Genus *Aneides:* A Cytological Perspective.
SEVER, D. M. and L. D. Houck, *St. Mary's College, Notre Dame, Indiana; University of Chicago*
Preliminary Observations on Spermatophore Formation and Decapping in *Desmognathus ochrophaeus.*
ANDERSON, K., *New York University, New York, New York*
Nucleolar-Organizer Regions in Holarctic *Hyla* Chromosomes.
BUSACK, S. D., *University of California, Berkeley*
Biochemical Divergence in a Mediterranean Herpetofauna: Preliminary Results in a Test of Vicariance Biogeography.
JOGLAR, R., *University of Kansas, Lawrence*
Phenetic Analysis of the *Eleutherodactylus* (Anura: Leptodactylidae) of Puerto Rico.

Session 6, Chairperson: Justin Congdon

IVERSON, J. B., *Earlham College, Richmond, Indiana*
Preliminary Studies of the Population Dynamics of *Kinosternon flavescens* in the Nebraska Sandhills.
MACCULLOCH, R. D. and D. M. Secoy, *Royal Ontario Museum; University of Regina*
Demography, Growth and Food of *Chrysemys picta bellii* in Saskatchewan.
KOZUBOWSKI, M. M. and A. W. Smits, *University of Kansas, Lawrence*
Hemodynamic Responses to Graded Hemorrhage in *Chrysemys scripta.*
SMITS, A. W. and M. M. Kozubowski, *University of Kansas, Lawrence*
Blood Volume Regulation and Body Fluid Compartmentation in *Chrysemys scripta.*
LONG, D. R., *Texas Tech University, Lubbock*
Lipid Utilization in the Reproductive Effort of Female *Kinosternon flavescens.*
LAMB, T. and J. Congdon, *Savannah River Ecology Laboratory*
Ash Content: Comparisons Between Turtle Eggshell Types.

Session 7, Chairperson: Robert M. Winokur

ZUG, G. R., H. A. Wynn and C. Ruckdeschel, *National Museum of Natural History; Cumberland Island, Georgia*
Age Determination of *Caretta caretta* by Incremental Periosteal Growth.
NIELSEN, M. T., *University of Utah*
Cloacal Bursae in Recent Turtles: The Mucosal Lining.
BRUNO, M. R., *University of Utah*
Nictitating Membranes and Associated Ocular Glands in Recent Turtles.
BRAMBLE, D. M., J. H. Hutchison, and J. M. Legler, *University of Utah; University of California, Berkeley*
Kinosternid Shell Kinesis.

Session 8, Chairperson: Kraig Adler

CORN, P. S., *Colorado State University*
Size, Color and Mating Success of Male Chorus Frogs, *Pseudacris triseriata.*
FORESTER, D. C., *Towson State University, Towson Maryland*
Sexual Selection in the Spring Peeper: Bigger is Not Necessarily Best.
SULLIVAN, B. K., *Arizona State University, Tempe*
Female Choice in Woodhouse's Toad *(Bufo woodhousei australis).*
WOOLBRIGHT, L. L., *State University of New York, Albany*
Sexual Dimorphism in *Eleutherodactylus coqui* (Anura: Leptodactylidae).

Session 9, Chairperson: James F. Berry

HUTCHISON, J. H., *University of California, Berkeley*
Two New and Unusual Genera of Paleocene Emydidae from Wyoming.
ROSE, F. L. and J. L. Dobie, *Texas Tech University; Auburn University*
***Chrysemys-Pseudemys-Trachemys:* A Taxonomic Dilemna.**
LOVICH, J. E., C. H. Ernst, and S. W. Gotte, *George Mason University, Fairfax, Virginia*
Geographic Variation in *Chinemys reevesii* and the Status of *Geoclemys grangeri* (Schmidt).
CHRISTIANSEN, J. L., *Drake University*
Raccoon Removal and Turtle Nesting Success in Eastern Iowa.

Session 10, Chairperson: Ronald W. Heyer

PERRILL, S. A., *Butler University*
Male Mating Behavior in *Hyla regilla.*
ZWEIFEL, R. G., *American Museum of Natural History*
Call Differentiation in Australian Microhylid Frogs.
SCOTT, N. J., Jr., A. L. Aquino, D. Norman and L. West, *University of New Mexico, Servicio Forestal, Paraguay; U. S. Peace Corps, Paraguay*
It's A Frog Eat Frog World: Food Habits of the Anurans of the Paraguayan Chaco.
SWEET, S. S., *University of California, Santa Barbara*
Mechanics of a Natural Extinction Event: *Rana boylii* in Southern California.

Session 11, Chairperson: Orlando Cuellar

ANDERSON, R. A., *University of California, Los Angeles*
Ecology of Foraging of *Cnemidophorus tigris.*
JONES, T. R., *Arizona State University*
Factors Affecting Home Range Size in the Iguanid Lizard *Sceloporus undulatus.*
van BERKUM, F. H., *University of Washington, Seattle*
Thermal Sensitivity of Sprint Speed in Anoline Lizards.
CARPENTER, G. C., *University of Wyoming*
Chemical Communication in the Western Banded Gecko *(Coleonyx variegatus).*
CROWLEY, S. R., *University of New Mexico, Albuquerque*
Aggressiveness and Vocalization in the Leopard Lizard *(Gambelia wislizenii):* the Influence of Temperature.
SELCER, K. W., *Texas Tech University, Lubbock*
Reproduction and Associated Lipid Utilization of the Introduced Mediterranean Gecko, *Hemidactylus turcicus.*

Session 12, Chairperson: Rick Shine

TORDOFF, W. III, *California State College, Stanislaus*
Population Biology of the Limestone Salamander, *Hydromantes brunus* (Caudata, Plethodontidae).
ROBERTS, J. D., *University of Western Australia*
Calling Tactics in the Frog *Heleioporus eyrei* (Myobatrachidae).
HEYER, W. R., *Smithsonian Institution*
Zoogeography of the *Eleutherodactylus guentheri* cluster (Anura: Leptodactylidae) in the Atlantic Forests of South America.

CHANNING, A. and W. McAllister, *University of the Western Cape, South Africa; University of Guelph, Canada*
Pattern Polymorphism in *Hyperolius marmoratus* (Anura: Hyperoliidae).
DUTTA, S. K., *University of Kansas*
Distribution and Morphological Variation in the *Rana limnocharis* Complex in Asia.
LEWIS, D. L., G. T. Baxter, K. M. Johnson and M. D. Stone, *University of Wyoming*
A Status Report on the Wyoming Toad *Bufo hemiophrys baxteri.*

Session 13, Chairperson: George R. Zug

CAROTHERS, J. H., *University of California, Berkeley*
Sexual Dimorphism and Sexual Selection in Some Herbivorous Lizards.
CHENG, H. Y., *Tulane University, New Orleans*
Predation, Tail Regeneration and Reproduction in Two Sympatric Geckos *(Sphaerodactylus)* in Hispaniola.
LEVINSON, L., *Nassau Community College, Garden City, New York*
A Comparison of Anoline Toepad Ultrastructure.
LUKE, C. A., *University of California, Berkeley*
Convergent Evolution of Lizard Toe Fringes.
BAUER, A. M., *University of California, Berkeley*
Allometry in Scansor Number and Surface Area in Lizards of the Genus *Gekko*.

Session 14, Chairperson: William S. Brown

BURY, R. B. and P. S. Corn, *U. S. Fish and Wildlife Service*
Morphological Variation in Racers, *Coluber constrictor*, from Colorado and Utah.
SHINE, R., *University of Sydney*
Ecology of Australian File-Snakes *(Serpentes: Acrochordidae).*
DIXON, J. R. and R. H. Dean, *Texas A & M University*
The *Hypsiglena torquata - ochrorhyncha* Controversy Revisited.
AIRD, S. D., *Colorado State University, Fort Collins*
Genetic Variation in Rattlesnake Venom Proteins.
McDONALD, H. S., *Stephen F. Austin State University, Nacogdoches*
Induced Immobility in Racers *(Coluber)* and Similar Diurnal Hunters.

Session 15, Chairperson: Sharon Emerson

BLACK, D. G., *Monash University, Melbourne*
Encephalization of Australian Lizards.
REILLY, S. M., *Southern Illinois University, Carbondale*
Thermal Ecology of the Highland Chameleons of Kenya.
TSUJI, J. S., *University of Washington*
Inverse Acclimation in Temperate and Tropical *Sceloporus* Lizards.

Session 18, Chairperson: Samuel B. McDowell

SAVITZKY, A. H., *Old Dominion University*
Vertebral Protrusion in Snakes: Evidence for a Novel Defensive Mechanism.
SCHUETT, G. W., D. L. Clark and F. Kraus, *Central Michigan University; University of Michigan*
A Moving Tale: Feeding Mimicry in the Rattlesnake *Sistrurus catenatus*.
SOMERS, A. B. and R. W. Van Devender, *A.S.U., Boone, North Carolina*
Relative Palatability of "mimetic" salamanders to garter snakes.
CADLE, J. E., *Smithsonian Institution*
Phylogenetic Relationships of African Back-Stabbing Snakes, Genus *Atractaspis.*

Session 15, Chairperson: Alan E. Leviton

BROWN, C. W., *George Mason University*
A Study of Variation in Eastern Timber Rattlesnakes, *Crotalus horridus*.
MACKESSY, S., *University of California, Santa Barbara*
Changes in Rattlesnake Venom Composition: Ontogenetic Aspects.
OTTLEY, J. R. and R. W. Murphy, *Brigham Young University; University of California, Los Angeles*
Rattle-Loss in Insular Rattlesnakes: A Question of Natural Selection or Chance?
GRAVES, B. M., and D. Duvall, *University of Wyoming*
The Role of Skin Lipids in Den Location by Neonatal Prairie Rattlesnakes and Mouth-gaping in Non-feeding Context.
de QUEIROZ, A., *Oakland, California*
Effects of Prey Type on the Prey-Handling Behavior of the Bullsnake, *Pituophis melanoleucus*.

Session 16, Chairperson: Marvalee H. Wake

MOK, W. Y. and C. M. Carvalho, *Instituto Nacional de Pasquisas da Amazonia, Manaus, Brazil*
Occurrence of *Mycobacterium chelonei* in *Bufo marinus* and *Bufo granulosus*.
GREEN, D. M., *University of California, Berkeley*
Chromosome Number Reduction and Homosequentiality in the 24-Chromosome Frog *Rana dybowskii* from Korea and Related Species.
ROMANO, M. A., D. B. Ralin and C. W. Kilpatrick, *Miami University, Oxford, Ohio*
The Tetraploid Treefrog *Hyla versicolor*: Evidence for a Single Origin from the Diploid *H. chrysoscelis*.
HESS, J. B., *Central Missouri State University, Warrensburg*
Frequency Changes of the Green-Spot Allele in Colorado Chorus Frogs.
MAXSON, L. R. and C. W. Myers, *University of Illinois, Urbana; American Museum of Natural History*
Albumin Evolution in Dendrobatid Frogs: A Preliminary Report.

Session 17, Chairperson: Laurie J. Vitt

VANGILDER, L. D., *Savannah River Ecology Laboratory*
Behavior and Body Temperatures of the American Alligator During Winter.
GUILLETTE, L. J., and S. L. Nazaran, *Wichita State University, Wichita, Kansas*
Uterine Shell Glands and Shell Formation in Several Lizard Species.
MOODY, S. M., *Ohio State University, Athens, Ohio*
Endolymphatic Sacs in Lizards: Phylogenetic and Functional Considerations.
SULLIVAN, R. M., *University of South Alabama, Mobile*
Paleocene Fossil Anguid Lizards and the Phylogeny of the Subfamilies Odaxosaurinae, Glyptosaurinae and Anguinae (Reptilia, Anguidae).

Session 18, Chairperson: Robert F. Inger

DEGANI, G. and E. Nevo, *Migal, Galilee Technological Center, Kiryat Shmona, Israel*
Osmotic of Blood and Plasma in Tadpoles and Juveniles *Pelobates syriacus*.
WYGODA, M. L., *Seton Hill College, Greensburg, Pennsylvania*
Low Evaporative Water Loss is Common in Arboreal Frogs.
EMERSON, S. B., *Field Museum of Natural History*
Skull Shape in Frogs - A Preliminary Survey.
MILLER, K., J. Franzese and W. R. Graf, *Franklin and Marshall College*
The Effect of Body Size on Fast-Start Locomotor Performance by African Clawed Frogs, *Xenopus laevis*.
RUIBAL, R. and V. Shoemaker, *University of California, Riverside*
Dermal Bony Scutes in Anurans - Osteoderms or Scales?

Session 19, Chairperson: Frederick B. Turner

BROOKS, G. R., *College of William and Mary*
Movement of Individuals within Populations of *Anolis lividus*.
CUELLAR, O., *University of Utah*
The Natural Behavior of the Lizard *Cnemidophorus tigris*.
MOEHN, L. D., *Illinois College, Jacksonville, Illinois*
Aggressive Behavior and Assessment Strategy in the Broadhead Skink *Eumeces laticeps*.
STEWART, J. R., *University of Tulsa*
Female Temperature Preference: An Ecological Advantage to Egg Retention in Viviparous Lizard.
HUEY, R. B. and P. E. Hertz., *University of Washington; Barnard College*
Is a "Jack-of-All-Temperatures" a "Master of None"?

Session 20, Chairperson: James L. Vial

PLUMMER, M. V., *Harding University*
Growth and Maturity in Green Snakes *(Opheodrys aestivus)*.
DUVALL, D. and M. B. King, *University of Wyoming*
Migration and Predatory Ecology of *Crotalus viridis viridis*.
GREGORY, P. T., *University of Victoria, Victoria, B.C.*
Phenology of Communally Denning Garter Snakes *(Thamnophis)* in Central British Columbia.
BREITHAUPT, B. H. and D. Duvall, *University of Wyoming*
The Oldest Record of Ophidian Aggregation.
DETTERLINE, J. L., J. S. Jacob and W. E. Wilhelm, *Memphis State University*
A Comparison of the Endoparasites of the Cottonmouth *(Agkistrodon piscivorus)* with Three Sympatric Species of Watersnakes *(Nerodia)* from Alabama.

Session 21, Chairperson: Joseph A. Tihen

VIAL, J. L. and J. R. Stewart, *University of Tulsa*
Acyclic Reproduction in a Viviparous Anguid Lizard.
McDOWELL, S. B., *Rutgers University, Newark*

The Cervicomandibularis Muscle of Colubroid Snakes.
VITT, L. J. and W. E. Cooper, *University of California, Los Angeles; Auburn University*
Sexual Dimorphism in the Broad-Headed Skink: Indirect Evidence for Sexual Selection.
HARRIS, D. M., *University of Michigan*
A Re-Evaluation: Do the Macroteiid and Microteiid Lizards Comprise a Monophyletic Group?

Session 22, Chairperson: Sherman A. Minton, Jr.

REYNOSO, M. F., *Universidad Autónoma de Baja California Sur*
The Herpetofauna of Isla Espiritu Santo, Baja California Sur, Mexico.
VOGT, R. C., *Universidad Nacional Autonoma de Mexico*
Community Analysis of a Tropical Herpetofauna in Veracruz, Mexico.
INGER, R. F. and H. B. Shaffer, *Field Museum of Natural History*
Faunal Sampling in the Western Ghats.
SUBBA RAO, M. V., K. Rao, K. and S. Eswar, *Andhra University, Visakhapatnam, India*
Some Rare and Common Herpetiles of Andhra Pradesh.

Session 23, Chairperson: James R. Dixon

ALDRIDGE, R. D., *St. Louis University*
Relationship Between Snout-Vent Length, Clutch Size and Number of Atretic Follicles in Snakes.
FORD, N. B., *University of Texas at Tyler*
Reproductive Characteristics of Five Species of Garter Snakes, *Thamnophis*.
GIBSON, A. R., R. E. Bast and P. Bryan, *Cleveland State University*
Noninvasive Monitoring of Female Reproduction in the Common Garter Snake *(Thamnophis sirtalis)*.
MINESKY, J. J. and R. D. Aldridge, *St. Louis University*
Frequency of Reproduction in the Queen Snake *(Regina septemvittata)*.
SEIGEL, R. A. and H. S. Fitch, *University of Kansas*
Variation in Clutch Size in Four Species of Snakes in a Fluctuating Environment.

Session 24, Chairperson: John W. Wright

PAPENFUSS, T. J., *University of California, Berkeley*
Opportunities for Research in Amazonian Peru.
JENSSEN, T. A. and D. L. Marcellini, *Virginia Tech, Blacksburg, Virginia; National Zoological Park*
Competitive Interference between the Puerto Rican Lizards *Anolis cooki* and *Anolis cristatellus* (Squamata: Iguanidae).
RAY, D. and A. Ch. Rai, *University of North Bengal, Darjeeling*
Annual Testicular Cycle of Indian Salamander *Tylototriton verrucosus* Anderson (Urodela: Amphibia).

Session 25, Chairperson: Dennis M. Bramble

BERRY, K. H. and A. P. Woodman, *Bureau of Land Management, Riverside, California*
A Comparison of Death Rates in 14 Desert Tortoise *(Gopherus agassizii)* Populations in California.
TAYLOR, H. L., *Regis College, Denver*
Zones of Intergradation Involving the Teiid Lizard, *Cnemidophorus tigris*, in Southwestern Utah and Northwestern Arizona.
LEVITON, A. E. and M. L. Aldrich, *California Academy of Sciences; AAAS*
John Anderson (1883-1900): Victorian-Era Herpetologist.
WALKER, J. M., *University of Arkansas*
Comparison of Reproductive Characteristics in Parthenogenetic and Gonochoristic Populations of *Cnemidophorus lemniscatus* in Suriname.
GRAHAM, T. E., *Worcester State College, Worcester, Massachusetts*
Status of the Endangered Red-Bellied Turtle, *Pseudemys rubriventris*, in Southeastern Massachusetts.
LEGLER, J. M. and R. M. Winokur, *University of Utah and University of Nevada, Las Vegas*
Vascular Papillae in the Buccopharyngeal Mucosa of *Carettochelys insculpta* (Cryptodira; Carettochelyidae).

FEATURED SYMPOSIUM

Biogeography of the Herpetofauna of Mexico: Perspectives and Approaches.

A Symposium in Honor of Hobart M. Smith and Rozella B. Smith

Organized by Larry David Wilson

Session 1, Chairperson: Larry D. Wilson

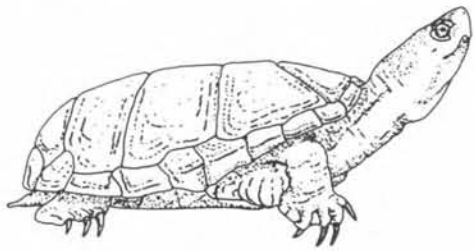
WILSON, L. D., *Miami-Dade Community College*
Introduction and Dedication.
DUELLMAN, W. E., *University of Kansas*
The Herpetology of Mexico: The Hobart M. Smith Era.
SMITH, H. M. and R. B. Smith, *University of Colorado, Boulder*
National Responsibility for Maturation of Mexican Herpetology.
KEZER, J., *University of Oregon*
Carlos and Miguel Ceron of Cuautlapan, Mexico: Their Contributions to the Mexican Collections of Hobart Smith and Edward Taylor.

Session 2, Chairperson: Wilmer W. Tanner

FLORES-VILLELA, O. A., *Universidad Nacional Autónoma de Mexico*
The History of Mexican Herpetology.
CASAS-ANDREU, G., *Universidad Nacional Autónoma de Mexico*
The Current Status of Herpetological Research by Mexican Scientists.
SAVAGE, J. M., *University of Miami*
Vicariance and Dispersal Events, Refugia and Historical Origins.

Session 3, Chairperson: Wilmer W. Tanner

DIXON, J. R. and F. S. Hendricks, *Texas A & M University*
Distribution of the Herpetofauna of the Lowlands of the Western Gulf Coast of Mexico and Adjacent Texas.
MORAFKA, D. J., G. A. Adest and G. Aguirre L., *California State University; University of California, San Diego; Instituto de Ecologia, Mexico*





Hobart Smith enjoying good food and good conversation at the outdoor meal and social, which featured strolling Mariachis.



Participants in the featured symposium at the 26th Annual Meeting of the SSAR presented in honor of Hobart M. and Rozella B. Smith, titled "Biogeography of the Herpetofauna of Mexico: Perspectives and Approaches."

The Differentiation of North American Deserts: A Biochemical Phylogenetic Evaluation of a Geofloral Model Utilizing Squamate Taxa.

CASAS-ANDREU, G., *Universidad Nacional Autónoma dė Mexico*

Biogeography of the Herpetofauna of the West Mexican Province: A Preliminary Proposal for Subdivision into Biotic Districts.

Session 4, Chairperson: Roger Conant

MURPHY, R. W., *University of California, Los Angeles*

Biogeography of the Baja California Herpetofauna; Re-evaluations and Further Considerations.

LINER, E. A., *Houma, Louisiana*

The Biogeography of the Herpetofauna of the Northern Sierra Madre Oriental of Mexico.

McCRANIE, J. R. and L. D. Wilson, *Miami, Florida; Miami-Dade Community College*

The Biogeography of the Herpetofauna of the Pine-Oak Woodlands of the Sierra Madre Occidental.

BRATTSTROM, B. H., *California State University, Fullerton*

Biogeography of the Revillagigedo Islands, Mexico.

JOHNSON, J. D., *Texas A & M University and El Paso Community College*

A Biogeographic Analysis of the Herpetofauna of the Northwestern Portion of Nuclear Central America.

SÁNCHEZ-HERRERA O., *Universidad Nacional Autónoma dė Mexico*

The Valley of Tehuacan-Cuicatlan as a Biotic Province of Mexico.

Session 5, Chairperson: Richard G. Zweifel

PAPENFUSS, T. J., D. B. Wake and J. F. Lynch, *University of California, Berkeley; Smithsonian Institution, Edgewater, Maryland*

Biogeography of Mexican Lungless Salamanders.

BEZY, R. L., *Natural History Museum of Los Angeles County*

Systematics and Biogeography of the Xantusiid Lizard Genus *Lepidophyma* in Mexico.

GOOD, D. A., and J. W. Wright, *University of California, Berkeley; Natural History Museum of Los Angeles County*

Evolution and Biogeography of Gerrhonotine Anguid Lizards.

WEBB, R. G., *University of Texas, El Paso*

Preliminaries Concerning the Systematics of the *Sceloporus poinsetti* Complex.

BERRY, J. F., *Elmhurst College, Elmhurst, Illinois*

Biogeography of the *Kinosternon scorpioides* Complex (Testudines: Kinosternidae) in Mexico.

WRIGHT, J. W., *Natural History Museum of Los Angeles*

Evolution and Biogeography of the *Cnemidophorus* of Mexico.

REGIONAL HERPETOLOGICAL SOCIETIES SYMPOSIUM

Education and Conservation Projects of Regional Herpetological Societies

Organized and Chaired by Janice Perry

ROMNEY, E. and D. Jensen, *Utah Herpetological Society*

Meeting the Challenges of a Small Herp. Society.

BISHOP, M., *Greater San Antonio Herpetological Society*

Herpetofauna and the Locals.

LAMBERT, M. (presented by K. Adler), *British Herpetological Society*

Current Activities of the British Herpetological Society in Relation to Europe and the Commonwealth.

BLACK, J., *Oklahoma Herpetological Society*

Oklahoma Rattlesnake Roundups.

BADER, R., *Virginia Herpetological Society*

Establishing the Range of the Pine Barrens Tree Frog, *Hyla andersoni* in North Carolina.

De LISLE, H., *Southwestern Herpetologists Society*

Herps, Sex and Bureaucrats: The Problems of Captive Reptile Reproduction for Fish and Game Officials.

COLLINS, J., *Kansas Herpetological Society*

Kansas Herpetological Society - Ten Years of Progress.

SSAR Committees for 1983-1984

Following the Salt Lake City meeting, President Axtell appointed the following committees, coordinators and representatives for the current year, to report to the Board at the Norman meeting in August of 1984. Individuals with important matters pertaining to these activities should contact the relevant committee chair. Addresses for committee chairs are included on the inside rear cover of each issue of *Herpetological Review*.

Grants-in-Herpetology: Linda R. Maxson (Ch), James P. Bacon, Don C. Forester, John B. Iverson, Robert W. Murphy, Malvin L. Skaroff.
Conservation: Patricia Riexinger (Ch), John L. Behler, William S. Brown, Kenneth Dodd, Jr., Renė E. Honegger, Paul E. Moler.
Kennedy Student Award: J. Eric Juterbock (Ch), Robert E. Gatten, Jr., Ken R. Marion, John S. Mecham, Laurie J. Vitt.
Nominating: Diane M. Secoy (Ch), James R. Dixon, Stephen R. Edwards, Ernest A. Liner, Daniel C. Wilhoft.
Regional Society Liaison: Jeffrey H. Black (Ch), Harold DeLisle, James D. Fawcett, Joseph C. Mitchell, John Simmons, Tom Vermersch, George D. Whitney.
Zoo Liaison: Peter J. Tolson (Ch), Jonathon A. Campbell, Mike Goode, John D. Groves, Hugh Quinn, Susan Schafer, R. Wayne VanDevender.
Long-range Planning: James L. Christiansen (Ch), Kraig Adler, Joseph T. Collins, James S. Jacob, Henri C. Seibert.
MEETINGS (SSAR/HL): Lynne Houck (Ch), Ronald A. Brandon, William Cooper, Arthur C. Echternacht, James S. Jacob.
Herpetological Resources (SSAR/HL/ASIH): Roy W. McDiarmid (Ch), Pere Alberch, Alan E. Leviton, Scott Moody, Charles W. Myers, Linda Trueb.
RESOLUTIONS (SSAR/HL): Robert A. Thomas (Ch), Others to be appointed at Norman meeting.
Common and Scientific Names Coordinator: Joseph T. Collins.
Translations Coordinator: Robert D. Aldridge.
Representative to Association of Systematic Collections: Max A. Nickerson.

James S. Jacob
SSAR Secretary ●





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1984 ANNUAL MEETING

The 1984 annual meeting of SSAR will be held jointly with the American Society of Ichthyologists and Herpetologists (ASIH) and the Herpetologists' League (HL) at the University of Oklahoma, 28 July - 3 August. The call for papers, advanced registration forms, and more detailed information will be mailed to members of the sponsoring societies in early March.

Symposia and Workshops with their organizers are: Predator-Prey Relations in Lower Vertebrates (Martin E. Feder and George Lauder); Biology of *Cnemidophorus* (John W. Wright); Management of Captive Populations of Endangered Amphibians and Reptiles (SSAR, Peter J. Tolson); Tutorial Workshop in Amphibian Larval Biology (Richard Wasserzug).

Introductory Session Presentations will include the ASIH Presidential Address (Marvalee Wake), HL Distinguished Herpetologist Lecture (David Wake), and the ASIH Distinguished Fellow Lecture (John E. Randall, "On the Importance of Marine Sanctuaries to Ichthyological Research").

Accommodations will be in motel-style dormitories; each room has two single beds and each two rooms share a bath. ($9.50 per person, double; $16.00, single; linens furnished.) Cafeteria-style, all-you-can-eat meals will cost $10.75/day. Blocks of rooms at discount rates will be available at local motels (2-3 miles from campus). Campgrounds are available on Lake Thunderhead (Little River State Park) about 12 miles east of Norman. Childcare facilities will be available.

Transportation by air should be arranged to Oklahoma City. Travel from the airport to and from Norman (20 miles) has been contracted with Metro Limousine Service at $6.00 per person each way.

Paper and Poster Sessions. Due to the expected attendance, oral presentation of papers will be limited. Members are urged to give poster presentations. Authors will be scheduled in the program to be present at their posters and discussion. Deadline for the receipt of abstracts will be 25 April 1984 and will be rigidly enforced. Awards for best student papers will be given by ASIH and HL and, for best poster presentation, by HL.

Live Exhibits (SSAR, Oklahoma Herpetological Society). Many of the species of amphibians and reptiles found in Oklahoma will be on display throughout the meeting. Facilities for photography of the animals will be available in the exhibit area.

Art and Photography Exhibit (SSAR). All members of the three societies are urged to bring their own herpetological and ichthyological art work (paintings, drawings, sculptures) and photographs ready for hanging or display in the Stovall Museum gallery.

Commercial Exhibits. Publishers, manufacturers and suppliers of items of interest to the membership are invited to participate as exhibitors. Detailed information and sample contract forms may be obtained from Neil B. Ford, Department of Biology, University of Texas at Tyler, Tyler, TX 75701.

Auction (SSAR). All members are solicited for herpetological and ichthyological books or other appropriate items to be auctioned to raise funds for support of the meeting. All contributors will receive receipts; gifts are tax-deductible. Any funds not needed for support of the annual meeting will be divided among the three sponsoring societies. Send your duplicate books or other items directly to the meeting chairman or bring them to the meeting!

Social Events. There will be a free social for all registrants on Sunday evening, 29 July. The Oklahoma Zoological Society and Oklahoma City Zoo will host an open house and barbecue on the evening of 30 July. On Wednesday, 1 August, there will be a picnic featuring Oklahoma Indian dance ceremonies for entertainment; the picnic will be followed by the auction. On Thursday, 2 August, a roast bison banquet preceded by a social hour and sponsored by ASIH will be held; all registrants are invited to attend. Tours for families and partners of members have been planned to areas of interest (Cowboy Hall of Fame, Indian City, Museum of Plains Indians, etc.).

Additional information may be obtained from Victor H. Hutchison, Department of Zoology, University of Oklahoma, Norman, Oklahoma 73019, U.S.A. Telephone (405)-325-6721. ●

1983 INVENTORY AVAILABLE
&
REQUEST FOR INFORMATION FOR THE 1984 EDITION
INVENTORY OF LIVE REPTILES AND AMPHIBIANS IN CAPTIVITY

The 1983 edition contains an inventory of living specimens held in 198 reptile and amphibian collections (75 public and 123 private) from ten countries. Information is current as of 1 January 1983 with 366 genera, 911 species, and 1,191 forms represented. Information on reproduction includes 367 taxa along with a 40 page bibliography on breeding. Published by the author. 1983. 254 pp., $25.00 ($20.00 paperbound) plus $1.50 postage.

This inventory is an ongoing project with corrections, updates, and expansions being planned over the next several years. All institutions worldwide holding live reptiles and/or amphibians are asked to submit inventories and breeding information current up to January 1st of each year. Private collectors are also welcomed to submit information, but emphasis is on those collections which have breeding potential, have had breeding success in the past, or hold species which are rare or difficult to obtain. I hope to compare annual inventory data, as well as producing the inventory and breeding information.

I am now preparing to receive information current as of 1 January 1984. If you keep live reptiles and/or amphibians in captivity, please respond with the information requested below.

(1) A complete inventory of all reptiles and amphibians held in your collection current as of January 1st. Sexes should be included and can be listed "male/female/unknown sex".

(2) A list of all species which bred and produced young during 1983, including numbers of young for each species.

(3) Any miscellaneous breeding information (use the information presented in the 1983 edition as a guide). Include detailed information for all species which you feel should be listed.

(4) A listing of any publications, including books, museum bulletins, journals, magazines, etc., with reference to reproduction in reptiles and amphibians. References pertaining to the care of individual species as well as more general articles relating to temperature, light cycle, hibernation, etc. are of interest.

Deadline for receipt of information is March 1st.

All orders and information should be sent to:

Frank L. Slavens
P.O. Box 30744
Seattle, Washington 98103, U.S.A.

IN MEMORIAM

DR. EDWARD ELKAN 1895-1983

Dr. Edward Elkan, who was recognized internationally for his work on the pathology and diseases of reptiles and amphibians, died at the age of 88 on 4th July 1983.

A fund in memory of Dr. Elkan has been established and will be used to perpetuate his name and work. A number of commemorative ventures have been proposed and will be considered in due course. The most pressing requirement, however, is to ensure that Dr. Elkan's unique collection of microscope slides and other pathological specimens is properly collated, mounted and maintained. Much of the material is already housed at the Royal College of Surgeons: Dr. Elkan passed it on to me before he died and was anxious that it should remain intact and serve as a working collection. This will be supplemented with a number of Dr. Elkan's drawings, reprints and reference books. It is our intention that the "Edward Elkan Reference Collection of Lower Vertebrate Pathology" should be widely used for study by herpetologists, pathologists and research workers from a range of disciplines.

All colleagues, friends and admirers of Dr. Elkan are invited to contribute to this Appeal. Cheques should be made payable to "The Edward Elkan Memorial Fund" and forwarded to the address below. Comments or suggestions concerning the Fund will be welcomed and should be submitted in writing. In order to minimise expenditure an acknowledgement will only be sent if specifically requested. However, a full list of subscribers will be compiled and affixed to the Collection. Reports of the Fund's progress will also appear regularly in the herpetological literature.

Return donations, comments, or suggestions to:

J. E. Cooper
Royal College of Surgeons of England
35-43 Lincoln's Inn Fields
London WC2A 3PN, England ●

MEETINGS

AUSTRALASIAN HERPETOLOGICAL CONFERENCE

The Royal Zoological Society of New South Wales, the Australian Society of Herpetologists and the Australian Museum will sponsor the Australasian Herpetological Conference on 28-31 August 1984 at the Australian Museum, Sydney, Australia. Participation in the conference is welcomed from both professional and amateur herpetologists. Publication of the Proceedings is planned.

The following symposia will be offered at this meeting: Ecological Biogeography of the Australasian Herpetofauna; Physiological Ecology of Aquatic Reptiles; Rare and Endangered Australasian Frogs and Reptiles; Population Ecology of Frogs and Reptiles; Reproduction and Development of Frogs and Reptiles; Phylogeny of Australasian Elapid Snakes; and Chromosomes and Evolution of Australasian Frogs and Reptiles. There will also be a workshop on Husbandry and Captive Breeding, to take place at the Taronga Zoo.

The registration and conference dinner fees for this meeting are approximately $50 and $25, respectively. A formal call for papers will be made in late 1983. For further information, or to be placed on the mailing list, write to:

The Organising Committee
1984 Australasian Herpetological Conference
Zoology A.08, University of Sydney,
N.S.W. 2006, Australia ●

ANNUAL MEETING OF THE AUSTRALIAN SOCIETY OF HERPETOLOGISTS

The Annual General Meeting of the Australian Society of Herpetologists will be held at "Yarrawood" on the Nepean River near Richmond, on Friday evening 31 August - Sunday 2 September, 1984, immediately following the Australasian Herpetological Conference. The ASH meeting is open to Society members and other interested herpetologists. Non-members wishing to attend should contact:

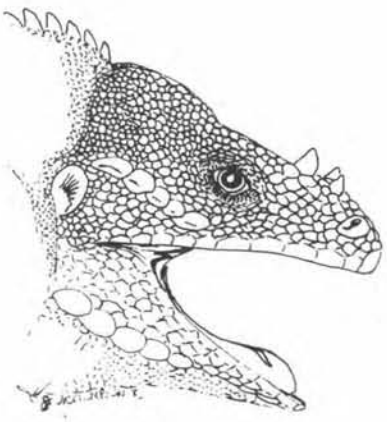
Dr. Gillian Courtice
Department of Physiology
University of New South Wales
Kensington, N.S.W. 2033, Australia ●

SPRING ESHL MEETING

The spring meeting of the Eastern Seaboard Herpetological League will be held on Saturday, 17 March 1984 at the College of William and Mary, Williamsburg, Virginia. The meeting will be sponsored by the Virginia Herpetological Society. All amateur and professional herpetologists are invited to attend the bi-annual meetings of the ESHL, held each March and October.

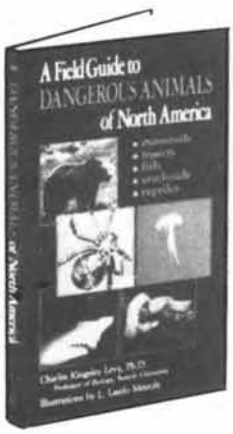
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DUELLMAN Henry S. Fitch in perspective.
V. FITCH A bibliography of Henry S. Fitch.

- **Part II. Reproductive Biology and Population Dynamics**

BROWN & PARKER Growth, reproduction and demography of the racer, *Coluber constrictor mormon*, in northern Utah.
PLATT Growth of bullsnakes *(Pituophis melanoleucus)* on a sand prairie in south central Kansas.
GREGORY Communal denning in snakes.
SEIGEL Parameters of two populations of diamondback terrapins *(Malaclemys terrapin)* on the Atlantic Coast of Florida.
BURKETT An ecological study of the cricket frog, *Acris crepitans*.
PLUMMER Female reproduction in an Arkansas population of rough green snakes *(Opheodrys aestivus)*.
RAND Clutch size in *Iguana iguana* in central Panama.
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HERPETOLOGICAL ACTIVITIES IN THE PEOPLE'S REPUBLIC OF CHINA

Two recent events have signaled a renewed interest in the study of amphibians and reptiles in mainland China. In 1982 a new quarterly journal, *Acta Herpetologica Sinica*, was initiated, published by the Chengdu Institute of Biology, a division of Academia Sinica located in Chengdu, Sichuan Province, in central China. Technically, this new quarterly is successor to another series of the same name, also issued by the Chengdu Institute but in a pamphlet-length format at irregular intervals (old series, vols. 1-6, 1979-1982). The biological coverage of the new series is quite broad. In the two most recent issues available to me (for March and June 1983) there is an article on the use of electrophoretic techniques to differentiate populations of toads and, in a separate article, use of the same techniques to compare snake venoms; karyotype studies of toads and salamanders; an EM study of intestinal cells of anurans; a study of the physiological ecology of a species of *Agkistrodon;* herpetofaunal analyses of several Chinese provinces; and descriptions of many new genera and species of amphibians and reptiles. A section for short communications is included at the end of each issue. All papers are in Chinese, but each major article has a detailed abstract in English. The format and typography of the new journal are highly professional; drawings are numerous and excellent in quality, and photographs are reproduced separately on glossy paper. Issues measure 18.8 by 26.5 cm and each is approximately 80 pages long. In short, this is a major new herpetological publication, although restricted in geographical emphasis, but nevertheless of broad interest to herpetologists everywhere.

The second event of importance is the establishment of the Chinese Society of Herpetology. This officially took place at Chengdu during the first National Herpetological Congress, sponsored by the Zoological Society of China on 15-20 December 1982. Some 89 people attended this historic meeting, coming from 25 provinces, cities and autonomous regions throughout China. Of 144 papers (60 of which were given orally), 52 dealt with systematics and faunal analysis, 28 were on morphology, 10 karyology, 11 physiology, 23 ecology and 17 on venoms and prevention and cure of snakebite. At the meeting it was decided that future work of the society's members would be centered in four main areas: systematics, morphology, ecology and venomology. The society plans to hold meetings biennially, the next scheduled for Canton in December 1984. Officers of the new society were elected, with Chang Mengwen, author of the book "Amphibiens urodèles de la Chine" (1936), as Honorary President; Hu Shuqin, widow of the well-known Liu Ch'engchao and herself a specialist on amphibians and reptiles, as President; and Ding Hanpo and Zhao Ermi as Vice Presidents. Dr. Zhao was elected General Secretary, in which capacity he is responsible for running the society, and he also serves as Editor of the *Acta*. The society's address is: Chengdu Institute of Biology, P.O. Box 416, Chengdu, Sichuan, People's Republic of China.

KRAIG ADLER
Cornell University

●

A LEATHERBACK RETURNS TO FLAGLER COUNTY: A NEW NORTHERN NESTING RECORD FOR THE U. S. ATLANTIC COAST

The first reliable record of a nesting leatherback, *Dermochelys coriacea*, on the mainland coast of North America occurred on 6 June 1947 at Flagler Beach, Flagler County, Florida (Pritchard, 1971). The event was witnessed and photographed by Ross Allen and party and recorded by Archie Carr in the *Handbook of Turtles* (1952). In the years following, leatherback nestings were reported regularly from the Florida Atlantic coast; there were 11 records in 1957 (Caldwell, 1959). All sightings, however, were from southeast Florida, below Cape Canaveral which is 130 km (80 miles) south of coastal Flagler County.

On 29 May 1983, a leatherback nested, once again, on a beach in Flagler County. The miner's-type head lamps that had dramatically illuminated the 1947 night nesting (10:45 PM, see photographs in Carr 1952) were not needed for this event. The May 1983 turtle, shown in the accompanying figure, emerged in daylight, about 3 PM, near the south boundary of a private beachside campground. The over-curvature carapace measurements were 147 cm in length and 109 cm in width.

As the nesting progressed, a crowd of over 50 onlookers gathered around the turtle. Because egg poaching is traditional in the area, nest relocation was judged necessary by Valinda Ann Nichols, a Florida Park Service Ranger who was at the scene. There were 95 eggs in the clutch, 11 were notably undersized.

The precise location of the 1983 nesting was 4.7 km *north* of Florida Route 100, in the town of Beverly Beach, Flagler County. The 1947 nesting, in the city of Flagler Beach, was approximately 5.5 km *south* of Route 100; hence, a distance of about 10 km separated nestings that occurred 36 years apart. It is impossible that the 1983 turtle was a hatchling of the 6 June 1947 nest; all of the 80 eggs in that clutch were either eaten (pers. comm.) or preserved for scientific study (Carr, 1952). The 29 May 1983 nesting in Beverly Beach is the furthest north on the U.S. Atlantic coast that a leatherback nesting has been definitely documented.

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A daylight nesting of a leatherback, *Dermochelys coriacea*, on 29 May 1983 in Beverly Beach, Flagler County, Florida. Photograph by Peggye A. Pitts, Washington Oaks State Gardens, Florida Division of Recreation and Parks.

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AN INVENTORY OF PHENOTYPIC ABERRANCIES IN THE EASTERN DIAMONDBACK RATTLESNAKE *(Crotalus adamanteus)*

Color and pattern aberrancies in *Crotalus* have been recorded for many species and occur independently of phylogeny and distribution. Reports are generally more numerous for species that have extensive distributions sympatric with human populations. Phenotypic aberrancies reported for *Crotalus adamanteus* (Hensley, 1959; Leach, 1976; Loftin, 1959; Love and Love, 1979; Murphy and Shadduck, 1978; Shupe, 1977) appear seldom when compared to congeners having comparable demographics: *Crotalus atrox* (Anonymous, 1967; Dyrkacz, 1981; Gloyd, 1958; Holmback, 1981; Karges, 1979; Klauber, 1972; Mitchell, 1974; Nickerson and Mays, 1968), *Crotalus horridus* (Dyrkacz, 1981; Gloyd, 1935; Hensley, 1959; Klauber, 1972; Nickerson and Mays, 1968), *Crotalus viridis* (Chace and Smith, 1968; Dyrkacz, 1981; Gloyd, 1935 and 1958; Hensley, 1959; Irwin, 1979; Klauber, 1972; Nickerson and Mays, 1968; Schuett and Kraus, 1982), and nine albino specimens of *Crotalus durissus terrificus* cited by Klauber (1972). Taxa that have been documented in numbers less than or equal to *C. adamanteus* are: *Crotalus d. durissus* (Villa, 1981; Villa and Rivas, 1971), *Crotalus l. lepidus* (Quinn, 1981), *Crotalus ruber lucasensis* (Gloyd, 1935), *Crotalus s. scutulatus* (Gloyd, 1958; Nickerson and Mays, 1968), and *Crotalus viridis oreganus* (Klauber, 1972; Switak, 1967). Here we note five color aberrant *C. adamanteus* and three other pattern aberrant specimens all from naturally occurring populations. Two of the amelanistic partial albino (Bechtel, 1978; Bechtel, 1980) individuals may have originated from the same gene pool.

Specimen #1. On 22 September 1980 an amelanistic partial albino *C. adamanteus* (Fig. 1) was captured and donated to Santa Fe Community College Teaching Zoo, Gainesville, Florida. The specimen (total length = 715 mm, mass = 242.3 g, total length of five-segmented rattles = 32 mm) was discovered crossing a dirt road in Alachua County, Florida. Scutellation fell within the normal range (McCranie, 1980) for males: 27 dorsal scale rows at midbody; 167 ventrals; 27 subcaudals; 13 supralabials; 18 infralabials.

Three colors are apparent on this specimen: Khaki-tan dorsal diamonds and markings; cream-white ground color; and yellow bordering the diamonds mid-dorsally. The cornea and pupil appear red against a gold iris. The tongue is red. Although the coloration of this specimen is aberrant, the pattern remains normal. This specimen appears hypomelanistic (Bechtel and Bechtel, 1981) and is currently being maintained in captivity for future breeding and histochemical tests (Bechtel and Bechtel, 1980) to determine the etiology of the mutation.

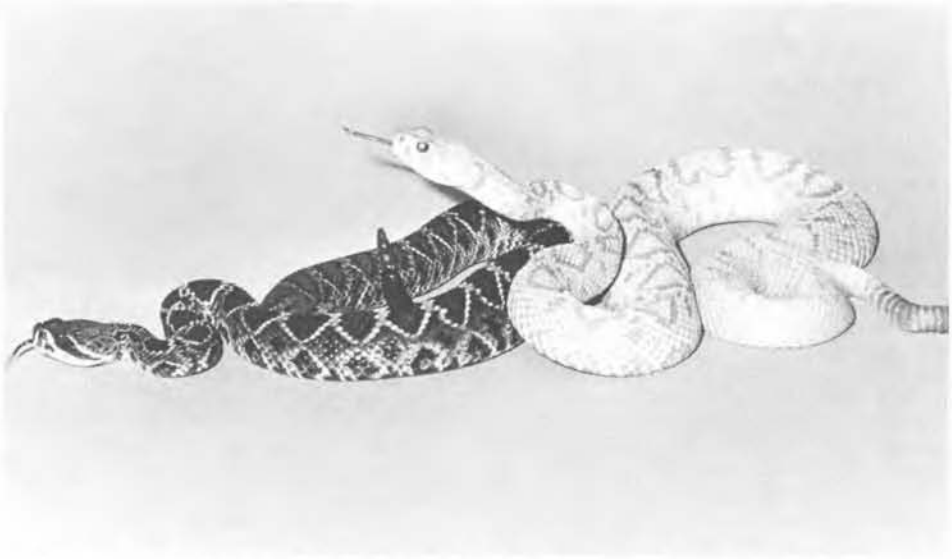


Figure 1. A typical *Crotalus adamanteus* and an amelanistic partial albino (specimen #1 in text). Both specimens are from Alachua County, Florida.

Specimen #2. In January 1973 a decapitated amelanistic partial albino *C. adamanteus* was donated to the Florida State Museum (Peter Meylan, pers. comm). The specimen is now represented only by two 35 mm color slides. This snake appears to have been a young of the year as evidenced by the presence of a button and number 2 rattle (Klauber, 1972). This Alachua County, Florida, specimen exhibits the exact phenotypic aberrancy as specimen #1 and was killed near the same locality.

Specimen #3. An amelanistic partial albino *C. adamanteus* was captured as a juvenile near Tarpon Springs, Pinellas County, Florida, in 1967 (Henry Molt, pers. comm.). This specimen is represented by a 35 mm color slide and appears to have a flesh-white ground color with dorsal diamonds and markings of light yellow and white. The general lack of pigmentation appears more profound in this individual than in the two previously described specimens. The pattern appears to be normal but the eyes are pink.

Specimen #4. On 25 February 1982 a "blue" *Crotalus adamanteus* was captured crossing SR 222 north of Gainesville in Alachua County, Florida. The specimen was donated the same day to Santa Fe Community College Teaching Zoo where it is currently being maintained alive. This specimen was measured (total length = 655 mm, mass = 227 g) on 27 June 1982 and scutellation (McCranie, 1980) fell within the normal range for females: 29 dorsal scale rows at midbody; 177 ventrals; 22 subcaudals; 13 supralabials; 16 infralabials.

This specimen lacks all yellow pigmentation. The resulting colors are reduced to gradations of blue and grey where yellow and brown pigmentation would normally occur on the dorsum. The venter is grey-white. Black pigment remains as it normally occurs and the eyes appear black. Although the pattern is normal the gross appearance is of a very dark individual.

Specimen #5. In April 1981 a blue variant (Vic Morgan, pers. comm.) was captured in Duval County, Florida. This specimen lived six months in captivity and is represented by three 35 mm color slides (Barry Mansell, pers. comm.) of the living individual. The colors in this specimen were almost identical to specimen #4 except they generally appeared to be of a lighter tint, presenting more bluish hues. The eyes appear black. This specimen was apparently a young of the year and exhibited a normal pattern.

Specimen #6. A pattern aberrant *C. adamanteus* (Andrew Koukoulis, pers. comm.) is represented by a color transparency of the living specimen with no further data available. The pattern scheme of this individual is both fragmented and longitudinally fused. Anteriorly the dorsal diamonds are irregularly broken, predominantly along the midline. These nonconforming and asymmetrical fragments indiscriminately fuse anteriorly, but consistently merge posteriorly to form middorsal stripes. These irregularly margined paravertebral stripes involve approximately 75% of the snake's total length, but again abbreviate on the tail to form blotches. Normal *C. adamanteus* coloration is incorporated into this pattern anomaly.

Specimen #7. A mounted pattern-aberrant *C. adamanteus* was examined in the collection of E. A. Griffis. The specimen (total length 0.9 m) was killed approximately 11 km north of Fargo, Clinch County, Georgia, in October 1980 and taken to Mr. Griffis for identification. Scutellation was as follows: 29 dorsal scale rows at midbody; 177 ventrals; 12 supralabials and 16 infralabials (approximated as some scales were obscured in the mounting process); 17 subcaudals (approximated as some obliteration had occurred via a bullet which passed through the tail).

The pattern of this specimen was reduced to a dark middorsal, longitudinal stripe involving 7 scale rows anteriorly and 6 scale rows

posteriorly. Lateral to this dark brown stripe was a lighter yellow stripe to either side involving only one scale row. The remaining dorsal scales were darker than the yellow stripes, but lighter than the middorsal stripe. The tail appeared dark brown and the venter was light brown but darkened posteriorly.

Specimen #8. A mounted pattern-aberrant *C. adamanteus* was examined in the collection of J. Creighton. The specimen (total length 1.3 m) was captured in March 1978 near Plant City, Hillsborough County, Florida, and lived six months in captivity. Scutellation fell within the normal range (McCranie, 1980) for females: 29 dorsal scale rows at midbody; 175 ventrals; 23 subcaudals; 14 supralabials; 15 infralabials.

The pattern aberrancy in this specimen is demonstrated by dorsal blotch fusion at midbody. The striping consists of a brown middorsal stripe of 3 to 5 scale rows bordered on either side by a scale row of black and then a scale row of yellow. These longitudinal stripes comprise approximately 30% of the total body length. The venter is light brown. Normal coloration is present.

In addition to the preceding eight specimens, Mr. Ross Allen (pers. comm.) related to us the occurrence of an albino *C. adamanteus* in 1940 from Ocala National Forest, Marion County, Florida. This specimen was "almost shot in half" and was estimated to be 1.2 m in total length. Mr. Allen also indicated that he had seen two additional specimens exhibiting pattern anomalies, both from Marion County, Florida. The dorsal pattern of these snakes appeared as longitudinal stripes, with one specimen having the stripes present for approximately ½ of the total length while the other exhibited total length striping.

In *C. adamanteus* bicephalism has been reported (Klauber, 1972; Murphy and Shadduck, 1978), but anomalies in color and pattern appear more frequently. In these individuals, the aberrancy occurs either in color or pattern but usually not both. Exceptions are two specimens reported by Loftin (1959) and Love and Love (1979). These two patternless individuals appear solid green or solid white respectively. The anomaly of both color and pattern statistically represents a lower frequency of occurrence than either aberrancy considered singly as color and pattern are inherited separately (Bechtel and Bechtel, 1978). No examples of Gloyd's linked albinism (Chace and Smith, 1968) have been demonstrated in *C. adamanteus*.

Specimens #1, 2, and 3 reported here and the specimen noted by Hensley (1959) are amelanistic partial albino. Deviation of appearance may be due to abnormal melanogenesis and chromatogenesis or different modes of inheritance (Bechtel, 1978; Bechtel and Bechtel, 1981). Specimens #4 and 5 which lack yellow pigment appear similar to the grey individual reported by Leach (1976).

The three pattern-aberrant *C. adamanteus* described in this study (#6, 7, and 8) demonstrate a gamut of paravertebral striping and dorsal blotch fusion which has been previously reported only once in this species (Shupe, 1977). Specimen #6 in this study exhibits a fragmented pattern and presents a most radical departure in paravertebral striping. Specimen #7 shows the more common format of longitudinal striping as does the *C. adamanteus* (UF 48986) reported by Shupe (1977). Specimen #8 which exhibits fusion of the dorsal diamonds at midbody, is peculiar in that longitudinal striping in *Crotalus* usually occurs anteriorly. This dorsal pattern fusion, occurring over a limited area of the body, can not be attributed to geographic variation in the number of diamonds (Christman, 1980).

Paravertebral striping and dorsal blotch fusion appears to be the most common pattern aberrations in *Crotalus* and have been described in *C. atrox* (Anonymous, 1967; Gloyd, 1958; Karges, 1979; Nickerson and Mays, 1968), *C. horridus* (Gloyd, 1935; Nickerson and Mays, 1968), *C. s. scutulatus* (Gloyd, 1958; Nickerson and Mays, 1968), *C. viridis concolor* (Schuett and Kraus, 1982) and *C. v. viridis* (Gloyd, 1935, 1958). Additionally Klauber (1972) mentions specimens of *C. l. morulus, C. t. aquilus, C. r. ruber, C. v. oregonus, C. v. helleri,* and *C. m. stephensi* in which anterior longitudinal stripes were present. Gloyd (1935) regarded this pattern deviation as atavistic to a "striped ancestral stage in the evolution of rattlesnake patterns". The evolution and incorporation of rhombs and diamonds on the dorsum of present-day *Crotalus* implies the advantage of cryptic color and pattern.

Specimens #1 and 2 reported in this study, plus a verbal account of a 1.2 m "white rattlesnake" killed in the same vicinity in 1980, may indicate that this genotype is periodically manifested when chance breeding occurs between two recessive gene carriers. Similar occurrences are documented: two albino *Crotalus horridus* (Ditmars and Toomey, 1923) "captured on the same ledge" at Sheffield, Massachusetts; two striped *Crotalus horridus* (Nickerson and Mays, 1968) "collected no more than 200 yards apart" in Jo Daviess County, Illinois; dorsal blotch fusion in four *Crotalus viridis concolor* (Schuett and Kraus, 1982) from "within an area of ca. 100 m^2." In these populations the frequency of heritable aberrations could be quite high if environmental and gene pool parameters allowed for periodic survival of some individuals to maturation and a higher than normal inbreeding coefficient.

ACKNOWLEDGMENTS

The authors are indebted to H. B. and E. Bechtel for their review of the original manuscript and their many helpful suggestions. In addition to those cited via personal communication in the text, we thank for various courtesies the late R. Allen, J. Creighton, J. Davis, W. H. Gleason, A. Koukoulis, E. Leach, J. R. McCranie, P. Meylan, and J. B. Murphy. Andrew Manis kindly provided the photograph and Lu Ann Antonio typed the manuscript. Upon death specimen #1 and #4 will be deposited in the vertebrate collection of the Florida State Museum.

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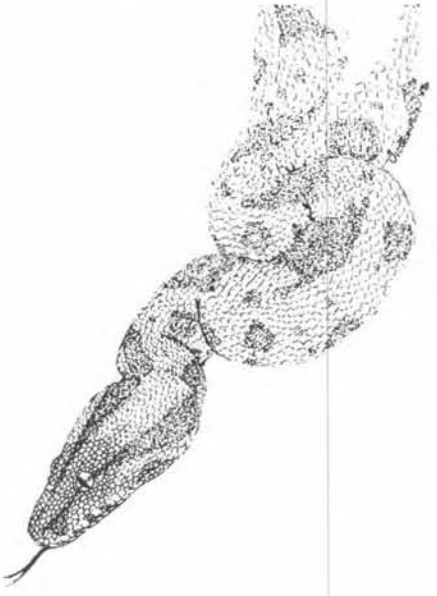
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Authors' Note: On 14 September 1983 a 1.2 m amelanistic partial albino *Crotalus adamanteus* was captured approximately 4.5 km from the locale of specimen #1 in this study. Scutellation (McCranie, 1980) follows that of normal specimens (30 dorsal scale rows at midbody, 176 ventrals, 15 supralabials, 18 infralabials) with the exception of 19 subcaudals which is one less than the low range figure for females. Color follows that of specimens #1 and #2, with 16 dorsal diamonds present. This pattern terminated 25 cm anterior to the vent with the remaining caudal portion patternless. Three distal tail rings occur at the tail tip. Thirteen rattle segments varied little in individual width. The occurrence of this additional specimen supports the existence of a population in Alachua County, Florida which frequently produces this recessive trait.

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Another Specimen of *Anarbylus*

Following the appearance of the description of *Anarbylus switakii* in California, (Fritts, et al., J. Herp. 16(1):39), we examined our holdings of *Coleonyx* sp. in the Natural History Museum of California State University, Sacramento, since our herpetology classes have on occasion visited and collected in the areas mentioned. One specimen (RLL 1293, SSC 663) fits Fritts' description. It is a male, 7.6 cm SV, with markings similar to those described, and tail missing. This specimen has been confirmed as *Anarbylus switakii* CAS 156171) by Robert C. Drewes of the Herpetology Department of the California Academy of Science. The lizard was collected from under rocks by Carol Butler and Robert L. Livezey, 12 April 1965, 23.3 miles west of Calexico, Imperial County, California on a dirt road 2.2 miles west of Highway 98 at an elevation of 470-500 feet. The collection of this animal predates the collection of previously reported *A. switakii* by some ten years. Have you checked your jars lately?

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A SEA TURTLE NESTING AT ISLAND BEACH STATE PARK, OCEAN COUNTY, NEW JERSEY

In recent years reliable observations have substantiated reports of loggerhead nesting along the Del-Mar-Va Peninsula and the southern New Jersey coast. Confirmed nesting reports are available for Ocean City, Worchester County, Maryland in 1972 (Graham, 1973), Delaware Seashore State Park in 1973 (Mohr, 1973), and Ocean City, Ocean County, New Jersey in 1972 (Anon. 1972).

Several authorities including D. Ehrenfeld (pers. comm.), J. Frazier (pers. comm.), and Conant (1975) concur that sea turtles occasionally nest along the southern New Jersey coastline. But they state that such nestings should be regarded as unusual events, and further studies are needed to determine the actual status of the New Jersey population —if it is a discrete population — and what kind of management program is needed.

The following data are therefore of interest:

On July 29, 1979 at 0300 h a sea turtle was observed nesting at Island Beach State Park, Ocean County, New Jersey. The specimen was observed by John Krejsa, a park ranger. His description of a turtle with a shell length of three and one-half feet or more, brownish in color and having what seemed to be a very large head, strongly suggests that it was a loggerhead, which is indeed the species to be expected.

On August 2, 1979 the nest site was visited by the author and representatives of federal and state agencies. The site, 11.30 m above the high water mark and 47 m from the dune line, was located behind a small rise of sand running parallel with the shore line.

The nest chamber 20 cm beneath the surface was 25 cm in depth, 20 cm in breadth, and contained 129 spherical white eggs averaging 38 cm in diameter.

The number of eggs in the clutch and their size are entirely compatible with figures for loggerheads given by Graham (1973), Mohr (1973), Anon. (1972), and Carr (1952).

The eggs were carefully returned to the chamber and the nest was closed.

Because the eggs had been laid three days earlier and the likelihood of damage was great due to the jostling that would ensue, no attempt was made to remove any for artificial incubation.

Three days later the nest was destroyed by a storm that washed out much of the beach where the nest site was located. Because a management protocol had not been developed in time no attempt was made to save the eggs.

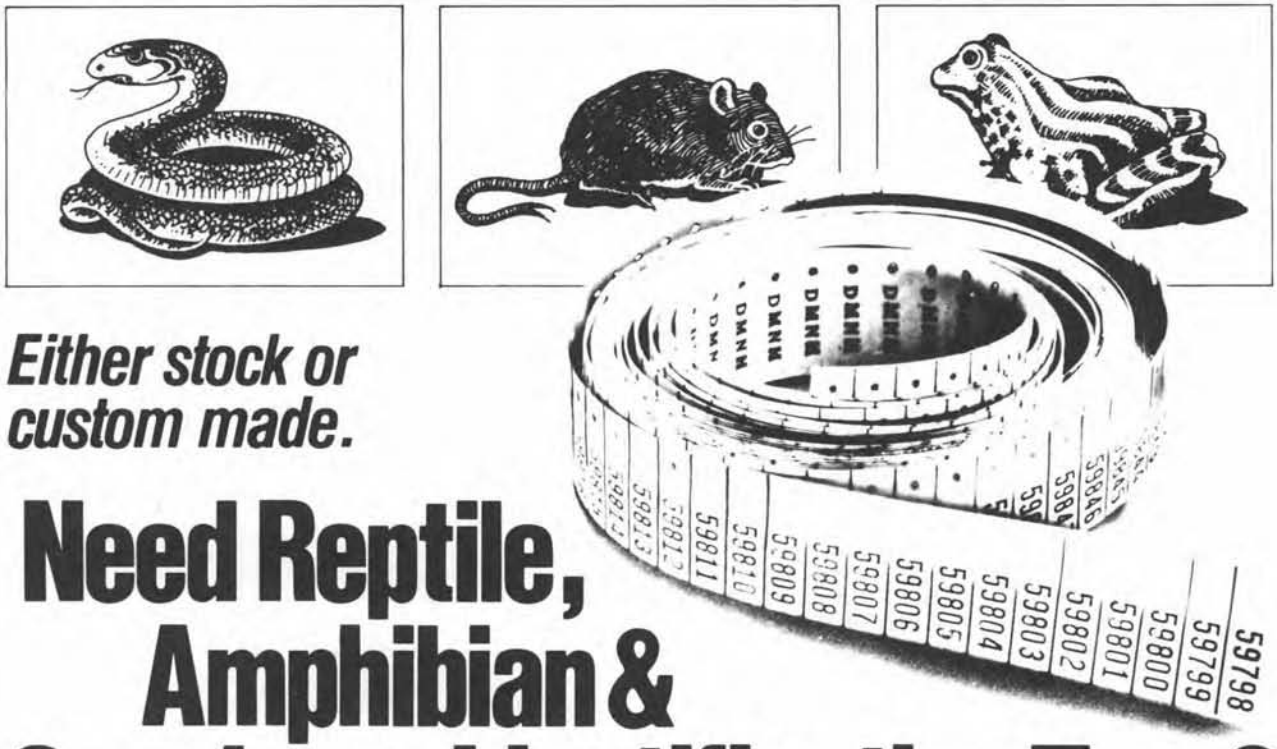
This nesting was 80 km north of the Ocean City, New Jersey site cited by Pritchard (1979) as the northern most latitude recorded for any sea turtle nesting.

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LEAST SANDPIPER PREDATION ON *Bufo americanus* AND *Ambystoma maculatum* LARVAE

The quantitative effects of predation on populations of larval amphibians are poorly understood. Several authors (Turner, 1962; Calef, 1973; Cecil and Just, 1979) cite predation as a factor in larval mortality, but do not identify predators or the effects of predation with certainty. The difficulty in accurately censusing larval populations (Turner, 1962) and documenting predation (Turner, 1960) under natural conditions contribute to our lack of understanding. Recent laboratory studies to investigate survivorship have provided some insight (Brockelman, 1969; Calef, 1973). The present report documents predation by the Least Sandpiper *(Calidris minutilla)* on larval *Bufo americanus* and *Ambystoma maculatum*.

On 20 May 1982 I observed 21 Least Sandpipers foraging along the edge of an abandoned gravel pit 2.0 km south of Rockport, Essex Co., Massachusetts. While the flock was feeding several individuals left the group and moved to a shallow pool (2 m x 1 m; maximum depth 3 cm) located 3 m from the gravel pit. On the previous day approximately 360 *B. americanus* tadpoles and 10 *A. maculatum* larvae were censused in this pool. The sandpipers began to feed in an excited fashion, making rapid directed movements into the shallow water with their bills. The activity apparently attracted more sandpipers, until a total of 16 were eventually feeding in the pool. After approximately five minutes, the sandpipers began to disperse and continued foraging along the edge of the gravel pit. An immediate search of the water and substrate revealed no larvae.

In Massachusetts the Least Sandpiper is primarily a coastal species, preferring the extensive flats of salt marshes and beaches. It is also found along inland waterways, particularly those with open muddy shores. The Least Sandpiper is infrequently attracted to the swamps and woodland ponds in which *A. maculatum* and *B. americanus* reproduce. In the present case, however, abundant rainfall during April and May created numerous, ephemeral pools on the sandy flats surrounding the gravel pit, a habitat typically utilized by Least Sandpipers. Some *B. americanus* and *A. maculatum* bred in these shallow pools instead of customary breeding ponds.

Turner (1960) suggests that conditions appropriate for bird predation on amphibian larvae are the result of extreme reductions in water levels. Karlstrom (1954) for instance noted that when Robins *(Turdus migratorius)* fed on *Bufo boreas halophilus* tadpoles, the water was barely deep enough to cover the tadpoles' backs. In this case, reduced precipitation coupled with warm spring temperatures resulted in early drying of breeding ponds. In the present case, drainage and evaporation reduced water levels in the pools, and at the time of predation, water depths were generally less than 2 cm. The large (1-2 cm long) black *B. americanus* tadpoles were conspicuous against the gravel substrate and were easily seen by the birds. Water in these shallow pools disappeared within one to two weeks, indicating that the larvae probably would not have survived.

Although mortality in the present case was complete, the number of *B. americanus* tadpoles and *B. maculatum* larvae consumed represent only 2 to 3% and 0.05%, respectively, of the total populations within the study site (Stangel, 1982, unpublished). Predation by birds on amphibian larvae may be primarily opportunistic, the result of greatly reduced water levels. The effect of avian predation on populations of larvae is probably small, since those larvae most likely to be preyed upon are also highly susceptible to death from desiccation.

ACKNOWLEDGMENTS

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TERRESTRIAL MOVEMENTS OF AN EASTERN TIGER SALAMANDER, *Ambystoma tigrinum*

It has only recently become possible to directly follow fossorial, migratory species, such as salamanders, with radioisotope tags (Shoop, 1965, 1968; Shoop and Doty, 1972; Williams, 1973; Douglas and Monroe, 1981; Semlitsch, 1981). Mean distances (47-252 m) traveled by metamorphosing juveniles and adults of five species of ambystomatid salamanders suggest that both adults and juveniles remain near the breeding site once they emigrate. These distances traveled by ambystomatids are shorter than those reported for migrating *Taricha* and *Notophthalmus* (Twitty, et al., 1964, 1966, 1967; Gill, 1979; Healy, 1975).

In this report I add to the data on distance traveled by emigrating, post-breeding individuals and activity centers during the nonbreeding season for *Ambystoma tigrinum*.

METHODS

A terrestrial drift fence of aluminum flashing (440 m circumference) with 40-liter pitfall traps positioned at 10-m intervals completely surrounded a Carolina bay breeding site. A detailed description of the study site, Rainbow Bay, can be found in Semlitsch (1981, 1983). Pitfall traps were checked daily and captured individuals were measured (snout-vent length), sex determined, toe-clipped for individual recognition, and released on the opposite side of the fence.

On 6 March 1982 an emigrating male (No. 353, 102 mm SVL) and female (No. 7029, 98 mm SVL) were tagged with radioactive tantalum-182 wire (1.5 mm X 6 mm, 18 ga, 40±10 μCi). Both individuals were released at 1800 EST approximately 3 m outside the drift fence, adjacent to the pitfall trap where captured. Individuals were monitored with a Ludlum Thyac III survey meter (with a NaI crystal, 4-6 m detection range).

RESULTS AND DISCUSSION

There was 13.4 mm of rain the night of 6

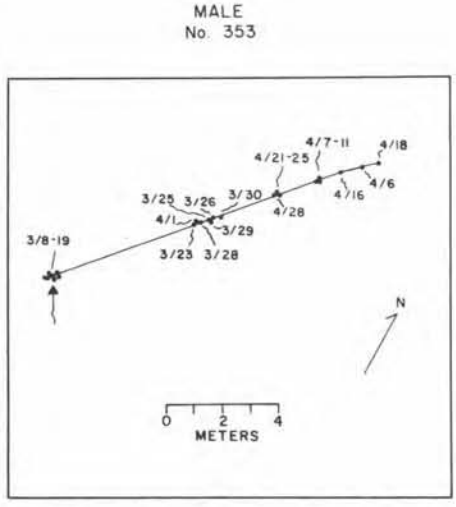


Figure 1. Pattern of movement within the home range of *Ambystoma tigrinum* in South Carolina. Points indicate observations but some observations in the same location are not noted and numbers indicate dates. The arrow indicates the point of entry to the home range from the breeding site.

March and consequently both salamanders moved from their release points. Male No. 353 was found on 8 March, in a pine plantation, 162 m from the release point. Female No. 7029 was lost and not captured at the breeding site again.

The male remained in a relatively small area (12 cm x 37 cm) from 8-19 March (Fig. 1). On 18 March it rained 39.0 mm and between 19-23 March it moved 5.1 m. It remained in the second area (13 cm x 80 cm) until 1 April. Subsequently, between 1-28 April it made several additional moves (1.7-4.6 m). On 28 April the salamander was lost. The wire tag was found in a tunnel, apparently as a consequence of it burning through the skin and falling out.

Between 6 March and 28 April, I excavated the male several times to record its underground location. It was found an average of 12 cm below ground in tunnels averaging 28 mm in diameter.

On 4 November 1982 the male was subsequently captured entering Rainbow Bay and exited the breeding site again on 6 March 1983, 20 m from where it exited a year earlier.

In conclusion, *A. tigrinum* had a similar pattern of terrestrial movement and home range as other ambystomatids studied. Ambystomatid salamanders make several long migratory movements in a few days after emigrating from a breeding site, they remain in burrow systems within a small home range during the non-breeding season, and then reverse their direction of departure 180° to return to the breeding site.

ACKNOWLEDGMENTS

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A CHARACTER FOR DIFFERENTIATING THE SYMPATRIC LIZARDS, *Anolis cooki* AND *Anolis cristatellus*

Anolis cooki and *Anolis cristatellus* are medium-sized Puerto Rican lizards of similar appearance and habits, with the range of *A. cristatellus* broadly overlapping that of *A. cooki*. *Anolis cristatellus* is ubiquitous on Puerto Rico from sea level to mid-elevations in forest and open habitats, but *A. cooki* is found only in the lowlands of the extreme southwest end of the island (Heatwole, 1976; Williams, 1972). The species are sympatric from the peninsula of Cabo Rojo east to the Reserva Forestal de Guanica and on the islet of Caja de Muertos.

Both species are "trunk" anoles (sensu Rand and Williams, 1969). In sympatry they do not significantly differ in cloacal or preferred body temperatures (Huey and Webster, 1976; Hillman and Gorman, 1977), nor in microhabitat preference (Jenssen, Marcellini, Pague, and Jenssen, unpubl. data). In the field the two species are difficult to distinguish, especially the females and juveniles. Even though *A. cooki* and *A. Cristatellus* are karyotypically distinct (Gorman, Thomas, and Atkins, 1968), there are no diagnostic osteological characters (Pregill, 1981). The reported external morphologic features which have been used to distinguish the species (Table 1) are by themselves equivocal, not applicable to all age and sex classes, or are very difficult to use under field conditions.

While conducting a behavioral ecology study at Cabo Rojo, we found that the tail length (TL) to snout-vent length (SVL) ratio was significantly greater for *A. cooki* than *A. cristatellus*, with *A. cooki* tails being 15-18% longer for a given SVL (Fig. 1). The TL/SVL ratios averaged 2.02 and 1.90 for 111 male and 47 female *A. cooki*, respectively, and 1.67 and 1.62 for 83 male and 43 female *A. cristatellus*, respectively. As long as a lizard had not previously lost part of its tail, the regression relationships of Figure 1 provided an accurate field measurement with which to make species identification.

Table 1. External morphological features that have been used to distinguish *Anolis cooki* and *Anolis cristatellus*.*

Morphologic features	*A. cooki*	*A. cristatellus*
Snout-Vent Length (mm) Mean (Range), No.		
Male	58.6 (29-70), 159	65.1 (25-76), 172
Female	42.2 (25-46), 71	47.3 (30-53), 79
Body Weight (g) Mean (Range), No.		
Male	5.50 (.69-9.70), 132	8.35 (.46-12.40), 159
Female	2.03 (.45-3.70), 69	3.00 (.75-4.0), 75
Scales		
Size of dorsals	Larger (45-68)	Smaller (32-44)
No. of 4th toe lamellae	Low	High
Shape of ventrals	Keeled	Non-keeled
Dewlap color	Orange-red	Orange-yellow

*Weight and snout-vent length data are from Jenssen et al., (unpublished); other features from Gorman, Thomas and Atkins (1968).

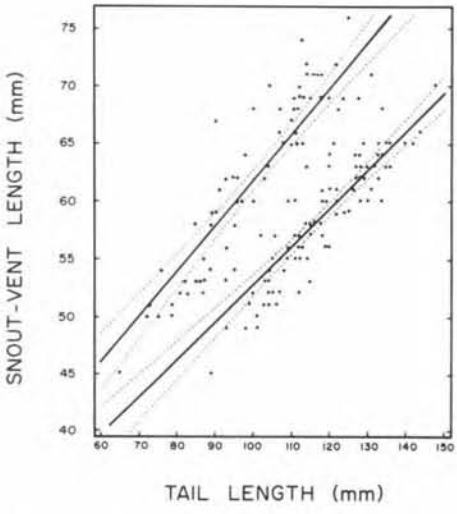


Figure 1. Relationship of snout-vent length to tail length, showing the linear regression lines for 158 *A. cooki* (dots) and 126 *A. cristatellus* (stars). Sex and age classes for each species are combined. Dashed lines give the 95% confidence intervals for the regression lines.

ACKNOWLEDGMENTS

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TECHNIQUES

AN ADDITIONAL RESTRAINT TECHNIQUE FOR VENOMOUS SNAKES

Some published restraint techniques for venomous snakes have included the use of a plastic tube for removal of eye caps (Murphy, 1971), and force-feeding (Radcliffe, 1975), and taping of the head for surgery or any other procedure which must restrain the head but leave the reptile's body free. Taping has many problems, however, such as the danger of affixing a piece of tape about a snake's mouth. The animal's fangs may break through the tape, making it dangerous to work too closely to the snake's head. Above all, the snake may experience excessive stress through all steps of this procedure. The method described here was developed while drawing blood samples from snakes via cardiac puncture. It is simple, effective, and inexpensive. This device will reduce the hazards of restraining a venomous snake as well as eliminate much of the stress the animal is subjected to during restraint.

The necessary materials for the construction of this device include a one-quart round freezing container with lid, and a two-and-one-half inch Bulldog paper clip. It is constructed by cutting a hole in the center of the plastic lid with a razor blade. The hole should correspond roughly to the diameter of the snake's neck. Then cut a radius from the hole through the outer ring of the lid. A piece of tape should be put around the hole in the lid to prevent the snake from injury should it struggle while being restrained. Also, cut a rectangular notch one-half inch deep and two-and-one-half inches wide into the upper edge of the bowl portion of the plastic container. The clip will keep the slit in the plastic lid from separating while the snake is restrained, while the notch will accommodate the clip when the body of the container is fitted to the lid.

To place the snake into the restraint device, first pin and pick up the animal. Venomous snakes should be anesthetized at or prior to this point, unless anesthesia will interfere with the subsequent experimental procedures. A second person then places the plastic lid around the snake's neck, wrong side facing forward, separating the lid by pulling upward on one side of the lid and downward on the other (Fig. 1). If the lid is separated by pulling outward, it will have a tendency to crack or split and may pinch the specimen. Once the snake is secured in the lid, the metal clip is placed over the lip of the lid, covering the slit to prevent it from accidentally opening and allowing the snake's head to slip free. The bottom part of the container is then attached, matching up the notch in the container with the metal clip on the lid. The animal can now be placed onto a table for surgery (Fig. 2).

This technique is not without flaws. The device, with the snake enclosed, should be supported until it can be placed on a table. The weight of the container might otherwise cause injury to the snake if it were dropped. Also, it is necessary to pin the snake.

Despite these difficulties, the device has advantages. Since the snake's head is completely enclosed, the container will catch any venom the snake may discharge while restrained. Also, the plastic container is translucent, so the animal can be viewed throughout the procedure. Additionally, once in the restraining device, many snakes will calm down considerably. The reasons for this are currently unknown, but it is easier to work on an animal which does not struggle.

This restraint technique was initially designed for use on viperids. Their distinct heads and relatively thin necks provide less opportunity for slipping through the hole in the lid. The device can be used for snakes of other families, even non-venomous species, but it is most effective on those with a well-defined neck. We have used this method successfully on the following genera: *Crotalus* (6 specimens), *Agkistrodon* (48), *Masticophis* (5), *Nerodia* (19), and *Elaphe* (12). The only species with which we were unsuccessful was *Micrurus fulvius*.



Figure 1. Demonstrating the method of placing the snake's head into the lid of the restraining device.



Figure 2. Once inside the restraining device, the snake should be supported to prevent any injury which could result from the animal thrashing about.

ACKNOWLEDGMENTS

We would like to express our gratitude to Bern W. Tryon for observing the technique, expressing his opinions, and reviewing the manuscript.

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A SIMPLE RESTRAINING DEVICE FOR LARGE TURTLES

Handling large, aggressive turtles, such as adult snapping turtles *(Chelydra serpentina)*, particularly under field conditions, can be traumatic for the animal, and potentially dangerous for the researcher. Operations such as counting growth markings on carapacial scutes (Gibbons, 1968; Hammer, 1969; Castanet and Cheylan, 1979), affixing marginal scute tags (Loncke and Obbard, 1977) or radio transmitters (Obbard and Brooks, 1981), require the animal to remain quiet long enough to allow the completion of the procedures accurately. Anesthetization, while now considered fairly safe (Marcus, 1981), requires close supervision over several hours, and professional veterinary training for proper administration, and therefore is impractical for most population ecology studies. Ideally in field studies, captured turtles should be held as briefly as possible before release.

A simple, rugged restraint would greatly facilitate field and laboratory applications of tagging and related activities. Plastic restraint devices suitable for clinical use (Hauser and Mulder, 1981), are difficult to build, and they restrain the animal by clamping over the posterior marginal scutes, making access to these scutes impossible. Other turtle restraints (Graham, 1981), have the disadvantage of obscuring portions of the posterior carapace, and are not suitable for large turtles. Here we describe a simple, inexpensive wooden restraint device suitable for hard-shelled turtles of 15 to 30 cm carapace length. This restraint permits access to the hind limbs and posterior carapace.

The restraint consists of a trapezoidal, plywood head box, and a pair of clamps assembled from plywood and 0.7 cm bolts 9.0 cm in length, secured by wingnuts (Fig. 1). The restraint components are mounted on a 0.62 by 0.58 m piece of 1.5 cm thick plywood, and the whole assembly is painted with waterproof exterior latex paint. Pieces of 5.3 cm wide nylon furniture webbing, 1.0 m in length, are passed under the upper plates of the plywood clamps. Tightening the wingnuts clamps the nylon webbing into place. In use, the clamp on one side of the restraint is tightened prior to placing the animal on the restraint. The other end of the straps may be left loose, to be pulled over the turtle's carapace and through the loose strap clamp once the turtle is in position, or they may be left between the plates of the loose clamp, pulled over the head box, ready to be quickly tightened down.

The turtle is placed into the restraint by angling the body down until the turtle's head is inside the head box, the anterior portion of its carapace in contact with the roof of the head box, allowing the animal to rest on its limbs and plastron on the plywood base. With the head covered, in most cases the animal usually quiets quickly, and will allow manipulation of its hind quarters. The defensive behavior of snapping turtles it to raise the carapace in the direction of perceived threat (Dodd and Brodie, 1975). This defensive reaction tightens the restraining straps. It is necessary, therefore, to allow the animal to settle its plastron against the base of the restraint before finally tightening the clamps holding the straps, otherwise the straps will be slack when the turtle lowers itself from the defensive posture, and the animal will be free to move suddenly.

The straps are secured by tightening the wingnuts on the loose clamp while maintaining tension on the strap by pulling the free end. The operation of the restraint device is speeded by having two people available, one to position the turtle, and one to manipulate the straps and clamps, but we have found that a single person can successfully restrain large snapping turtles with little difficulty after practice. A wide variety of sizes of animal can be accommodated by moving the straps, bolts or wooden clamps, to new positions. Further restraint may be required for delicate procedures or for particularly active animals, and can be provided by additional nylon webbing straps across the midcarapace.

While not autoclavable, and therefore unsuited to clinical use, the ease of construction and use make this restraint ideal for procedures requiring access to the posterior portions of a large turtle's carapace, or procedures requiring the turtle to remain motionless for an extended period.

ACKNOWLEDGMENTS

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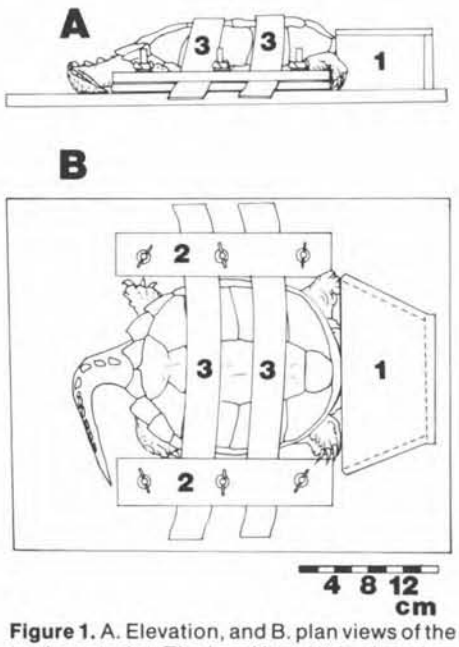


Figure 1. A. Elevation, and B. plan views of the turtle restraint. The head box (1) is closed on three sides, above and below, and opens toward the center of the plywood base. The two strap clamps (2) are pieces of plywood, held together by wingnuts. Nylon furniture webbing (3) is passed between the plates of each clamp to span the distance between them, over the turtle's carapace.

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A TECHNIQUE FOR PARTITIONING HATCHING AND MORTALITY ESTIMATES IN LEAF-BREEDING FROGS

The estimation of mortality of the early developmental stages of anurans is a difficult problem in population biology. Despite a rapidly expanding literature on the population ecology of post-hatching and post-metamorphic anurans, Turner's (1962) statement that virtually no data exist on embryonic mortality in nature is still fairly accurate. Bragg and Bresler (1951) estimated survival of *Bufo cognatus* embryos by considering empty capsules to be viable, hatched eggs. More recently, Howard (1978) estimated embryonic mortality in *Rana catesbeiana* by periodically removing small samples from monitored clutches. Mindful of the problem of monitoring the larger clutch sizes associated with many temperate anurans, Turner (1962) suggested that opportunities for assessing early mortality are excellent in the tropics, where many species deposit small egg

clutches, which make direct counts feasible. Greer and Wells (1980) measured clutch mortality directly by counting the eggs of *Centrolenella fleischmanni*. M. Crump (pers. comm.) measured prehatching survivorship in the leaf-breeding hylid, *Hyla bokermanni*, by counting remaining embryos over short time intervals and by scanning nearby litter for larvae unable to reach the water. Unfortunately, these methods require assumptions which often seriously compromise mortality estimates or are so time consuming that obtaining adequate sample sizes is often unfeasible. Therefore, I describe here a unique method of estimating prehatching survivorship which is potentially useful on any frogs utilizing aerial clutch deposition sites under which the described apparatus can be positioned (e.g. Neotropical phyllomedusine hylids, *Hyla ebraccata*, hylids in the *Hyla parviceps* group (Duellman and Crump, 1974), most centrolenids, many Old World rhacophorids and hyperoliids, and *Litoria iris* from New Guinea). This technique permits: 1) effective partitioning of hatching and mortality estimates with minimal assumptions, and 2) application to a large sample size over a short period of time.

The method utilizes a cup placed beneath the clutch whose survivorship is to be monitored (Fig. 1). We used a seven fluid ounce #806A COZY cup (Solo Cup Co., Urbana, Illinois 81601) because it was readily available and lightweight (ca. 6 grams). However, any inexpensive lightweight cup of approximately the same size would be satisfactory. I suspended cups with malleable copper wire. The wire should be light enough to avoid weighing down the leaf, but firm enough to provide a secure attachment. Twenty-four gauge wire was suitable for this purpose. In cases where the additional weight to the clutch substrate proved a problem, I sank wooden dowels (1.3 cm diameter - lengths variable) from which the cups were suspended into the streambank. A circular wire basket (Fig. 1B) suspends the cup in a vertical position. A small wire loop (Fig. 1A) secures the cup to this suspension basket and allows the investigator to empty the cup with little disturbance to the suspension. The entire apparatus is secured by a wire (Fig. 1D) extending from the basket itself to the substrate of the monitored clutch, or to a dowel or some other stable object. The cup has an overflow drain (Fig. 1C) which releases rainwater in excess of that necessary to keep recently hatched larvae alive. This drain consists of a ring of small holes (ca. one millimeter in diameter) punched about six millimeters above the base of the cup. Holes should be large enough to drain the cup effectively and avoid weighing down the clutch substrate, yet small enough to prevent the loss of hatched larvae.

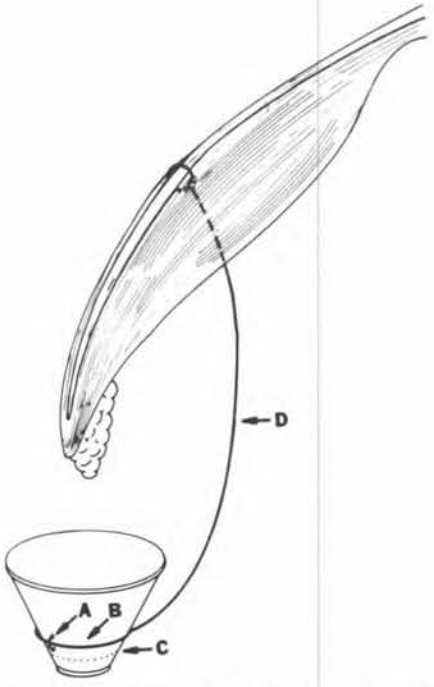


Figure 1. Hatching cup positioned for monitoring survivorship in a clutch of *Centrolenella fleischmanni* (diagrammatic). A. Securing wire loop B. Suspension loop C. Overflow "valve" D. Attachment wire

The "hatching cup" catches recently-hatched larvae as they fall from the monitored clutch. When hatching of a monitored clutch began, I emptied the cup of larvae once daily until the entire complement had hatched. The difference between the number of larvae caught by the cup and the initial egg count for a clutch is a direct measure of mortality in that clutch.

During 1980 and 1982, I used this technique to measure mortality in nearly 300 clutches of populations of the glass frog, *Centrolenella fleischmanni*, in Monteverde, Puntarenas Province, Costa Rica. Once cups were positioned, I was able to effectively monitor 30-50 clutches daily in less than an hour. The technique failed in only four cases. In each case, error could be attributed to dislocation of the cup suspension: three were displaced because wind tore the suspension from a frail substrate, and one because the cup and its suspension collapsed after its substrate was swept away by rising stream water.

I was also concerned about the possibility that the cup apparatus itself might affect the clutch environment by somehow influencing the pattern of mortality in monitored clutches. This effect is important if one wishes to assess patterns of mortality in a population by generalizing from a sample of monitored clutches, but it would be unimportant in comparisons between samples of clutches all monitored with this technique. I tested the effect that cup proximity might have by comparing 12 pairs of equal-sized clutches. One clutch of each pair was monitored with a gallon jug placed on the ground (or stream edge) beneath the clutch. Pairs were selected for similarity of their clutch deposition sites, particularly with respect to surrounding and overlying canopy, and at approximately equal heights above the substrate. Two pairs were eliminated from the comparison because disturbance resulted in loss of larvae part-way through the monitoring period. I was unable to reject the hypothesis of equal mortality between cup-monitored vs. jug-monitored clutches (X^2=0.54; $p>0.05$), which suggests that the proximity of the cup had no effect on the pattern of mortality observed in monitored clutches. However, future investigators are cautioned to consider cup proximity in context of the existing predator set. One should insure that proximity does not facilitate access or visibility to clutch predators, and that small predators do not remove larvae that have hatched into the cup. I was able to test the latter of these possibilities during 1982 by placing small cellophane funnels in the hatching cups monitoring 20 clutches in a manner that prevented access by small arthropod predators, but larval hatching into the cup was unimpeded. A comparison with 20 equal-sized control clutches under similar conditions showed no differences in the mortality patterns of clutches (X^2=3.22; $p>0.05$), which suggests that removal from the cups was an unimportant source of error in the population being studied. However, at this site, observed predators were few (Hayes, 1983) and predation levels were low (Hayes unpubl. data). This implies that a site-specific test of this effect is necessary, because high predation levels will skew mortality estimates. This is a basic consideration because the method is potentially most useful where mortality from clutch predators is high.

ACKNOWLEDGMENTS

The idea for this technique was developed during the Organization for Tropical Studies (OTS) course 79.3 and executed during 1980 under a RIAS grant from OTS. Work in 1982 was supported by an NSF doctoral dissertation improvement grant (DEB-8200275). The Allan Hancock Foundation at the University of Southern California also supported the work in part. C. Guyer deserves special thanks for suggesting the addition of the overflow drain to the cups. D. Krempels drew the figure. M. A. Donnelly, C. Guyer, D. M. Krempels, M. M. Miyamoto, M. J. Rosenberg, J. M. Savage, S. D. Werman and an anonymous reviewer provided suggestions on the manuscript.

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NEWSNOTES

REPOSITORIES SOUGHT FOR CONFISCATED SNAKES

The Management Authority of Hong Kong would like to know the name and address of any institution which might be interested in looking after live snakes of endangered species, especially *Python* species, which might become available in the course of enforcement in relation to CITES.

Interested institutions, which are expected to pay for the transport costs, are invited to contact the Hong Kong Management Authority, either directly (see the Directory under United Kingdom) or through the Secretariat, c/o UICN, avenue du Mont-Blanc, CH-1196 Gland, Switzerland. ●

SCIENCE SOFTWARE NEWSLETTER

The Center for Environmental Studies at Arizona State University is interested in publishing a newsletter dedicated to computer (particularly microcomputer) software and applications for the natural sciences. The newsletter would be published quarterly and would contain 1) a listing and short review of recent scientific software, with availability and compatibility specifications; 2) one or more articles on microcomputer techniques — how to download software for different systems, how to choose between a minicomputer and a network of micros, etc.; 3) a forum for advertising "custom" software — a place where scientists who have written software for specialized modeling or applications (for microcomputers, minis, or mainframe) can list and describe programs for free use, exchange or sale. We are currently assessing the level of interest in such a publication among the scientific community, as an aid to obtaining necessary funding. If you are interested in seeing such a publication, would like further information regarding it, or would be willing to serve as a reviewer for new software and documentation, please call or write me at the address below.

DIANA J. GABALDON, Ph.D., Center for Environmental Studies, Arizona State University, Tempe, Arizona 85287, U.S.A. (602) 965-3051. ●

LSU - NIH ALBINO BULLFROG

The Louisiana State University Amphibian Culture Facility, with support from the Research Resources Division of NIH, LSU Sea Grant, and the Louisiana Agricultural Experiment Station has been operating since 1968 in developing management procedures for *Rana catesbeiana*.

The functions of the facility are to (1) develop laboratory and commercial-scale culture facilities, (2) define and implement culture technology for sustained maintenance of defined strains through successive generations, and (3) develop high quality lines of *Rana catesbeiana* for use in research. The laboratory has been involved in establishing culture systems in universities, medical schools, zoological parks, and private industry internationally.

For the past three years the facility has worked to develop an albino colony of bullfrogs. The colony is now well established and the numbers exceed our capacity for maintenance. We are therefore searching for people with appropriate facilities to accept, maintain and establish a small breeding population. Anyone with the capability and interest in long-term management of a colony should contact the facility. Information concerning culture methodology will be provided.

Dudley Culley or Barbara Carr
Amphibian Culture Facility
Louisiana State University
Rm. 249 Ag Coliseum
Baton Rouge, Louisiana 70803, U.S.A.
(504) 388-6051 ●

MALAGASY GROUND BOA STUDBOOK

A regional studbook for the Malagasy Gound Boa, *Acrantophis dumerili*, is in its final stages of completion. Any institution, organization, or individual that would like to list their captive specimens in this species registry, that have not already been contacted or responded to the survey, is urged to contact:

Rick Hudson
Department of Herpetology
Fort Worth Zoo
2727 Zoological Park Drive
Fort Worth, Texas 76110, U.S.A.
(817) 870-7072 ●

ASSOCIATION OF PACIFIC SYSTEMATISTS

At the Association of Systematics Collections (ASC) annual meeting in Honolulu in May 1982, members and invited participants at the ASC symposium proposed the formation of an association of Pacific systematists, to be further discussed in 1983 at the XV Pacific Science Congress. On 9 February 1983, at the XV Pacific Science Congress in Dunedin, the audience of systematists at the Symposium on Biological Collections in the Pacific unanimously resolved that an Association of Pacific Systematists be formed.

Mr. J. S. Dugdale was named as interim President and Dr. S. H. Sohmer as interim Secretary-Treasurer.

We are now soliciting membership in the Association, and we hope that this communication will elicit response from those who had originally indicated interest and others who have not yet had the opportunity to do so. Annual dues have been set at U.S. $5.00. The Association will be an organization for and of systematists in the Pacific. News concerning research efforts and opportunities in the Pacific will be a prime focus. The first tangible result of membership will be a Newsletter. The dues will help defray the cost of handling and mailing.

The initial aims of APS are:

1. to promote and facilitate communication among Pacific systematists including producing and distributing a newsletter,
2. to represent Pacific systematists as a group with respect to opinions on relevant issues,
3. to carry out other functions as may be considered desirable.

Please write and send membership dues to:

S. H. Sohmer, Chairman
Department of Botany
Bernice P. Bishop Museum
P.O. Box 19000-A
Honolulu, Hawaii 96819, U.S.A. ●

SAPO NATIONAL PARK IN WEST AFRICA LIBERIA'S FIRST NATIONAL PARK

Sapo National Park is the first to be established of three proposed national parks and four nature reserves selected in late 1978 and early 1979 with the assistance of the I.U.C.N. and the World Wild Life Fund. The park is situated in southeastern Liberia and covers a total land area of 505 sq. miles of primary lowland rainforest. Sapo is 440 miles, by road from Monrovia, Liberia's capital city. There are also regular local air services from Monrovia to Greenville in the South and to Zwedru in the North. The park is not yet penetrated by motor roads.

The new national park supports species of large and small mammals which are also distributed throughout the forest region of the country. Over ten species of primates are found in Sapo. Many species of reptiles and approximately 300 species of birds also inhabit Sapo.

The Park is presently protected by a staff numbering twenty-two. Four are trained Liberian graduates of the College of African Wildlife Management in Tanzania, two are U.S. Peace Corps volunteers and the others are ex-hunters and farmers who are well-acquainted with the forest environment in that part of the country.

The official establishment of Sapo National Park in May 1983 is a major breakthrough for wildlife conservation practices in Liberia and its development may stimulate the creation of the other national parks and nature reserves. Emphasis in the early management of the park is being placed on research on the biological resources of the region, under the direction of the Forestry Development Authority.

For further information contact:
Division of Wildlife and National Parks
Forestry Development Authority
P.O. Box 3010
Monrovia, Republic of Liberia
West Africa ●

HERPETOLOGICAL COLLECTION AT UNIVERSITY OF ILLINOIS

The University of Illinois at Urbana-Champaign is pleased to announce that its valuable herpetological collection is intact and once again under the care of a Curator of Amphibians and Reptiles. Linda R. Maxson has been appointed as Curator of this collection and will be happy to respond to all reasonable requests for loans and/or information at the following address:

University of Illinois
Museum of Natural History
1301 West Green Street
Urbana, Illinois 61801, U.S.A. ●

EPA PUBLISHES ENVIRONMENTAL EVENTS CALENDAR

The U.S. Environmental Protection Agency Region V will once again publish an Environmental Events Calendar, to appear on the 1st and 15th of each month and distributed free to all interested parties.

The calendar will list meetings, hearings, seminars, workshops, conferences and other environmentally-oriented events in EPA Region V (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin). All sponsoring organizations are invited to send pertinent information, including contact person, to:

R. John Rapsys, Editor
Environmental Events Calendar
Office of Public Affairs, 5PA-14
U.S. EPA Region V
230 S. Dearborn Street
Chicago, Illinois 60604, U.S.A.
(312) 886-3450 ●

ERRATUM

Please note the following correction in the feature article "Morphologic evidence of toxic saliva in colubrid snakes: A checklist of world genera," by Donald M. McKinstry (Herp. Review 14(1):12-15). In Table 5 "Duvernoy's Gland Type[53]" *should read* "Gland Type[53]." ●

Publications Exchange Sought

Because of currency restrictions, herpetologists in certain countries cannot purchase SSAR membership. These persons often seek to exchange an SSAR membership for subscriptions to periodicals which they can purchase. The editors have been advised of one such person who wishes to exchange the journal *Aquarien Terrarien* for an SSAR membership paid in his name. Persons interested should correspond with:

Herbert Rössler
Ferdinand-Freiligrath Strasse 51
DDR -4308 Thale (Harz)
German Democratic Republic ●

TRITURUS GROUP FORMING

For some time it has been clear to us that there are many people in Europe, and some in America, who are actively working on European newts, but that many of us know little or nothing about one another's interests. To rectify this situation, we have invited a number of workers to participate in an information service designed to enable *Triturus* enthusiasts to communicate and collaborate with one another. We feel that better communication is important at this time because we have found that previously disparate studies of *Triturus* show great promise of coming together to provide a detailed understanding of the biology and evolutionary history of the genus.

We have so far sent out 65 letters and questionnaires and have, to date, received 41 replies. We are very encouraged by the enthusiasm with which this scheme has been welcomed.

In June or July of 1984, it is hoped to hold a conference on the Evolutionary Biology of *Triturus*, to be organised by Professor Herbert Macgregor and Dr Tim Halliday at Leicester University, England.

Anyone interested in the *Triturus* information scheme or in this conference should contact:

Tim Halliday
Department of Biology, The Open University
Milton Keynes MK7 6AA, England ●

LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Longevity, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1982. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

Please submit Life History Notes in the standard format directly to the ***SECTION EDITOR*** to avoid delays in publication: Bern W. Tryon, Houston Zoological Gardens, P.O. Box 1562, Houston, Texas 77001.

ANURA

ACRIS CREPITANS BLANCHARDI (Blanchard's Cricket Frog). **ANOMALIES.** We report on two specimens of *Acris crepitans blanchardi* with anomalous characters. The first, taken on 15 October 1973 at Lake Lotawana, Jackson County, Missouri, lacked the left eye and orbit (Figure 1). This was apparently a congenital defect.

The second specimen, taken on 17 April 1982 along Shoal Creek, 3 km NNW of the junction of I-44 and MO Hwy 43, Newton County, Missouri, had a bloated appearance (Figure 2). The skin of this specimen was dissected back, and it was found that the bloated condition was due to gas released into the subcutaneous area, distending the skin. The gas apparently emanated from a herniated portion of the small intestine at the right lateral lumbar region. The herniation was probably induced by trauma at the time of capture. The bloated condition was first observed about an hour later and superficially resembled hydrops - an excessive accumulation of fluids in the subcutaneous lymphatic spaces, as pictured in *Xenopus laevis* in Elkan and Reichenbach-Klinke (1974. Color Atlas of the Diseases of Fishes, Amphibians and



Figure 1. *Acris crepitans blanchardi* from Jackson County, Missouri, lacking left eye and orbit.



Figure 2. *Acris crepitans blanchardi* from Newton County, Missouri, with bloated appearance due to the accumulation of gas in the subcutaneous region.

Reptiles. T.F.H. Publ., Inc. Ltd: p 191, fig. 300). In reality the malady is similar to that reported for *Triturus vulgaris* (Elkan, 1960. Some Interesting Pathological Cases in Amphibians. Proc. Zool. Soc. Lond., 134:275-296), except that in the *Acris*, the gas from the herniated intestinal tract was escaping into the subcutaneous area. In the *Triturus*, the gas from the fermentation of stomach contents expanded the stomach through the thoracic wall as well as the overlying skin.

The first specimen of *Acris* was deposited in the vertebrate collection of the University of Missouri - Kansas City, but has been lost. The second specimen is deposited in the Bobby Witcher Memorial Collection (BWMC 2027), Avila College, Kansas City, Missouri.

Submitted by **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th St. and Rainbow Blvd., Kansas City, Kansas 66103, and **ROBERT POWELL,** Department of Natural Sciences, Avila College, 11901 Wornall Rd., Kansas City, Missouri 64145, U.S.A. ●

SAURIA

EUMECES SEPTENTRIONALIS (Northern Prairie Skink). **AGONISTIC BEHAVIOR.** Intraspecific aggression has not been reported for *Eumeces septentrionalis* (Ferguson. 1977. pp. 265-334 *in:* Gans, C. and D. W. Tinkle, eds. Biology of the Reptilia, Vol. 7. Ecology and Behavior), with the exception of cannibalism of young by adults (Breckenridge. 1943. Amer. Midl. Nat. 29:591-606). Stamps (1977. pp. 265-334 *in:* Gans and Tinkle, op. cit.) pointed out that exclusive occupancy of burrows by individuals of this species does not necessarily imply active site defense (Breckenridge, op. cit., was cited in regard to exclusive burrow occupancy but contains no mention of this topic). The purpose of this paper is to report observations of agonistic behavior by captive prairie skinks.

Two adult *E. septentrionalis* were collected in western Hennepin Co., Minnesota in 1978. Skink A, captured 23 May, is still alive at present and is presumably a female based on lack of orange chin coloration at the time of capture. Skink B, slightly shorter and more slender than A, was captured 23 August; unfortunately this specimen was disposed of without being sexed when it was discovered dead of unknown causes on 24 May 1981. The skinks were maintained in a glass cage 56 cm x 30.5 cm x 31.8 cm with a substrate of wood chips, a wooden box and rock slabs for shelter, and a water dish. An incandescent bulb was positioned outside one end of the tank to provide warmth, and a diet of *Tenebrio* larvae and assorted small invertebrates was supplied.

For some time the two skinks were not observed to interact, although they often basked in close proximity or actual contact and they were sometimes found in close proximity beneath the same shelter. Early interactions were associated with feeding and usually occurred shortly after the introduction of food into the cage. Sudden movements by one individual discovering and ingesting a prey item would stimulate the other skink to begin foraging in the same area or contest the same prey item (see Greenberg. 1976. Herpetologica 32:349-352). Attention seemed focused on food rather than the conspecific. This focus seemed to shift during later interactions:

23 September 1979 - B made repeated lunging attempts at removing a prey item from A, caused A to retreat, and then made several lunges at A's tail. Later, when B was chasing a prey item, A approached from the rear, apparently interested in the same item. B turned toward A and A retreated.

14 October 1979 - A attempted to remove a prey item from B.

12 March 1980 - A tugging match, with A and B at either end of a *Tenebrio* larvae.

18 April 1980 - Mutual snapping at conspecifics' heads during feeding, interlocking of jaws, and brief struggle.

22 April 1980 - Shortly after introduction of food, A bit tail of B and chased B around the cage perimeter. Later, after introduction of another prey item, B began biting at neck of A and occasionally at A's side or tail, but because of smooth scalation, was not able to get a good grip. When biting, B approached A perpendicularly from the side. A occasionally snapped back, turning so that it was facing B perpendicularly from the side. Later, A initiated aggressive behavior against B after B made a sudden motion similar to a feeding lunge.

The observations reported here are admittedly nonquantitative and occurred in an artificial setting. They nevertheless demonstrate the existence of agonistic actions in the behavioral repertoire of *E. septentrionalis*. It is interesting that neither skink established a clear dominance over the other.

Submitted by **PHILIP A. COCHRAN,** Center for Limnology, University of Wisconsin, Madison, Wisconsin 53706, U.S.A. ●

SERPENTES

CEMOPHORA COCCINEA COPEI (Northern Scarlet Snake). **COLORATION AND REPRODUCTION.** An amelanistic partial albino *Cemophora coccinea copei* was received by the AZP 30 June 1983 for identification. The snake was found and killed by Mrs. L. M. Scarborough 6.5 km N of Riverdale, Clayton County, Georgia, 9 June 1983 at 1015 hr; air temperature was ca. 26° C. Upon death, the snake was placed in 70% isopropyl alcohol. The snake, an adult female 280 mm total length (S-V = 230.5 mm), had nine fully developed eggs ($\bar{x}$ = 14.2 mm) in the oviducts. Wright and Wright (1957. Handbook of Snakes of the United States and Canada, Cornell Univ. Press. Vol. 1, p. 114) reported on an albino *Cemophora* from North Carolina, although this reference was overlooked in the reviews of Hensley (Mich. State Univ. Biol. Ser. 1 [4]) and Dyrkacz (1981. SSAR Herp Circ. 11). The coloration, in alcohol, conforms to that cited by Wright and Wright (1957, p. 114) with 18 reddish-pink body saddles and three tail saddles. Wright and Wright (1957, p. 115) reported 3-8 eggs for *Cemophora*, so the nine eggs reported herein would constitute a maximum clutch record for the species. The preserved snake and eggs will be deposited in the vertebrate collection of the Museum of Natural History, University of Georgia.

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Atlanta Zoological Park, 800 Cherokee Ave. SE, Atlanta, Georgia 30315, U.S.A. ●

DIADOPHIS PUNCTATUS ARNYI (Prairie Ringneck Snake). **COLORATION.** An acarotenoidic *Diadophis punctatus arnyi* was captured, along with four normally pigmented individuals under the same rock, at Drywood Creek along MO Hwy 43, 9.5 km S. of the Vernon County line, in Barton County, Missouri, on 18 April 1982. The specimen, a male measuring 273 mm in total length, lacks nearly all orange, yellow, and red pigmentation typical of the subspecies. In life, the nuchal collar was obscure with only a trace of orange pigmentation being visible (Figure 1). The venter totally lacked carotenoid pigments and was light metallic gray, patterned irregularly with small black spots (Figure 2). The specimen has been deposited in the Bobby Witcher Memorial Collection (BWMC 1750), Avila College, Kansas City, MO.

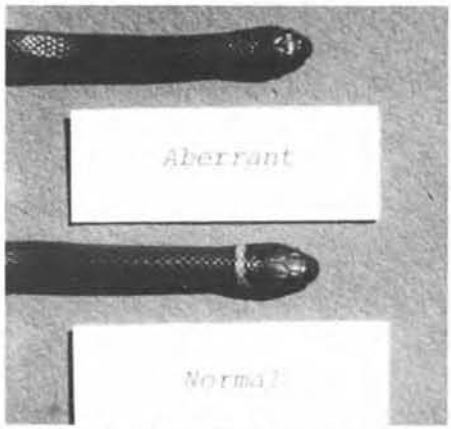


Figure 1. Nuchal areas of BWMC 1750 and a normal *Diadophis punctatus* from Barton County, Missouri.

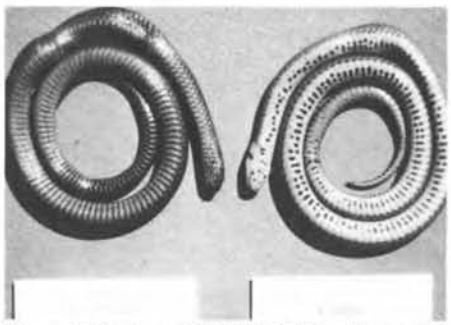


Figure 2. Venters of BWMC 1750 and a normal *Diadophis punctatus* from Barton County, Missouri.

Snakes lacking carotenoid pigments are not unknown, although most reports are probably camouflaged as "partial albinos." Dyrkacz (1981. Recent Instances of Albinism in North American Amphibians and Reptiles. SSAR, Herp. Circ. No. 11) cited four occurrences of albinism for *Diadophis punctatus*. At least two of these (Groves, 1974 and Bryant, 1974) were amelanistic, but still retained some of the yellow coloration of carotenoid pigments. A third specimen (Bradshaw, 1966) lacked virtually all pigmentation, being both amelanistic and acarotenoidic. Other examples of snakes lacking carotenoid pigments include two *Farancia a. abacura* with white venters (Wright and Bishop. 1915. A Biological Reconnaissance of the Okefinokee Swamp in Georgia, Part II. Snakes. Proc. Acad. Nat. Sci., Phila., Vol. 67:139-192), and a specimen of *Carphophis amoenus* (BWMC 1266) from Macon County, North Carolina, which in life lacked the pink ventral coloration typical of that species.

Submitted by **MARTIN L. JOLLEY** and **ROBERT POWELL,** Department of Natural Sciences, Avila College, 11901 Wornall Rd., Kansas City, Missouri 64145, U.S.A., and **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th St. and Rainbow Blvd., Kansas City, Kansas 66103, U.S.A. ●

DRYMARCHON CORAIS CORAIS (Yellowtail Cribo) **REPRODUCTION.** Amaral (1976. Brazilian Snakes: a Color Iconography. Melhoramentos) gives the clutch size as 8 to 12. Whitecar (1983. personal communication) gives 24 as the largest clutch size he observed in captivity. On 27 March 1983 the author's specimen deposited a clutch of 27 nonadherent eggs of which 20 were fertile. Two infertile eggs were also subsequently passed 19 May and 24 May. This clutch, taken as 27 or 29, represents the largest reported for this taxon.

Submitted by **HENRY COHEN,** 24 St. Johns Pl., Buffalo, New York 14201, U.S.A. ●

ECHIS COLORATA (Palestine Saw-scaled Viper). **WATER ECONOMY.** Since 1971, hatchlings from 17 clutches of *E. colorata* eggs have been maintained for varying periods of time in the Columbus Zoo. It has been observed that neonates feed more readily when kept under drier conditions and higher temperatures than those suited to many other forms. In 1981, hatchlings from three clutches were housed from date of hatching in individual containers, and kept at approximately 32° C. In an effort to provide dry conditions, the animals were kept on a substrate of #16 sieve sand, and provided with no access to standing water. The original plan was to have provided water bowls at intervals as the animals seemed to require them. No such requirement has yet been evident. The original group has been reduced to five, although no deaths have occurred while in the conditions described. Other animals have been removed from the collection through sale, trade or breeding loan to other institutions. The five animals retained in the collection (three hatched 1-5 July 1981, two hatched 28 June 1981) have now been maintained without access to standing water for a period in excess of 665 days. The animals have been fed one or two appropriately-sized mice at 7-21 day intervals. Growth has exceeded that of previously reported progeny, which were maintained at lower temperatures (Goode. 1979. Herp. Review 10(3)). Ecdysis and waste elimination have also been consistent with that of other progeny of the species in this collection.

Submitted by **MIKE GOODE,** Columbus Zoo, Columbus, Ohio 43065, U.S.A. ●

LAMPROPELTIS CALLIGASTER CALLIGASTER (Prairie Kingsnake). **COLORATION.** During the summer of 1978, one of us (B.C.) obtained an amelanistic *Lampropeltis c. calligaster* collected in Kansas City, Wyandotte County, Kansas. It is a partial albino with xanthophores, and exhibits pink eyes, a ground color of creamy white, and a hint of normal pattern with slightly more yellowish coloration (Figure 1). The specimen is a male, and at this time measures about 122 cm in total length. In a review of albinism (Dyrkacz, 1981. Recent Instances of Albinism in North American Amphibians and Reptiles. SSAR, Herp. Circ. 11:31p), albinistic *L. calligaster* were listed from Georgia (Collins, 1960) and several from Texas (Reported by J. B. Murphy).



Figure 1. An amelanistic, partially albinistic specimen of *Lampropeltis c. calligaster* exhibiting trace of pattern at time of shedding. Wyandotte County, Kansas.

The specimen from Kansas was loaned to the Dallas Zoo from February 1979 through February 1983 in an unsuccessful attempt to breed it with one of the specimens from Texas. It is currently back in the private collection of its owner, but further attempts will be made to enter it into a breeding program. Upon death, the specimen will be deposited in the Museum of Natural History, University of Kansas, Lawrence.

Submitted by **BOB CLARK,** 2501 West Memorial Rd., Suite 111, Oklahoma City, Oklahoma 73120, **ELIZABETH I. SMITH,** 1319 South Pearl St., Independence, Missouri 64055, and **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th St. and Rainbow Blvd., Kansas City, Kansas 66103, U.S.A. ●

LAMPROPELTIS MEXICANA THAYERI (Gray-banded Kingsnake). **COLORATION.** A melanistic *Lampropeltis mexicana thayeri* was hatched from a clutch of 5 eggs on September 5th, 1982. The remaining 4 hatchlings exhibited normal coloration. The parents were siblings of a brood of 8 normal patterned offspring from an adult melanistic female and normal patterned male, the original collected stock. This stock was collected in the Galeana area of Nuevo Leon, Mexico.

The melanistic offspring is overall black (including eyes) with underlying *"leonis"* type banding evident when held up to light. It is behaving normally and readily feeding on lizards *(Eumeces)* and pink mice.

Considering the 1:4 ratio of the F_2, and based on several other wild caught and captive bred melanistic specimens I am aware of, it would seem that this trait fits the classic Mendelian 1:2:1 ratio. Further reproduction, such as melanistic to heterozygous melanistic, will be carried out for more understanding of the recessive trait. One point of interest is that of the few *L. m. thayeri* that have been collected, several have been melanistic. The speciman was determined to be a male and is being maintained in the collection of the author.

Submitted by **STEVEN T. OSBORNE,** Animal Technician in Herpetology, Oklahoma City Zoo, Oklahoma City, Oklahoma 73111, U.S.A. ●

NERODIA ERYTHROGASTER TRANSVERSA (Blotched Water Snake). **REPRODUCTION.** The Pathology Museum of the University of Kansas Medical Center, Kansas City, Kansas, has in its possession an exhibitory preparation containing the heads and neck regions of an adult and 28 newborn *Nerodia erythro-*

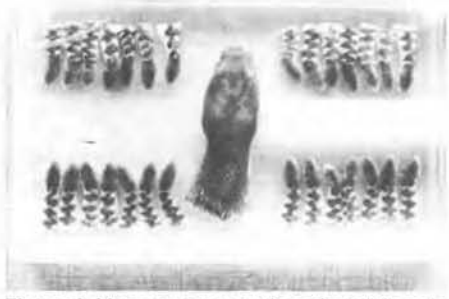


Figure 1. Museum preparation of adult female and 28 newborn *Nerodia erythrogaster transversa* from Linn County, Kansas.

gaster transversa (Figure 1). The adult was shot at a farm pond, 13 km North of Pleasanton, Linn County, Kansas, by David V. Connell (Pathology Museum Curator, Retired) in September 1973. Most of the juveniles were collected in a large tub as they exited the body, apparently stimulated to activity and birth by associated trauma. Prior to fixation the female was dissected to obtain all of the litter.

Fitch (1970. Reproductive Cycles of Lizards and Snakes. Univ. Ks., Mus. Nat. Hist., Misc. Publ. No. 52: p161) reports an average litter size of 16.0 from 20 litters recorded for the species *N. erythrogaster*. They ranged in numbers from 5 to 27. A litter size of 28 is apparently the maximum recorded for this species.

Submitted by **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th St. and Rainbow Blvd., Kansas City, Kansas 66103, U.S.A. ●

NERODIA SIPEDON SIPEDON (Northern Water Snake). **REPRODUCTION.** Ectopic pregnancy, in which the embryo develops outside of the normal reproductive tract, has been reported for a number of vertebrates including humans, non-human primates and a variety of domestic animals (Benirschke, Garner and Jones. 1978. Pathology of Laboratory Animals, Vol. 1. Springer-Verlag, New York). Because normal parturition is not possible, such embryos may be retained intro-abdominally.

Retention of eggs by *Lissemys punctata punctata* has been reported by Duda and Gupta (1978. Intra-abdominal retention of eggs by the soft-shelled turtle *Lissemys punctata punctata*. SSAR Herp. Review 9(2): 46), and Hoffman (1970. Observations on gestation in the garter snake, *Thamnophis sirtalis sirtalis*. Copeia 4:779-780) reported several instances of extra-uterine embryos in the coelomic cavity of the Eastern garter snake. This paper is the first report of an ectopic pregnancy in another well-studied viviparous natricine genus, *Nerodia*.

As part of a study on the home range and movement of *Nerodia sipedon sipedon* at the Thunderbird Recreation Area (Walworth County, Wisconsin), a female *N. s. sipedon* (750 mm SVL, 390 g) was captured by hand 28 June 1982. Dried blood on the lower labial, upper labial and ocular scales suggested that the snake had been traumatized some period prior to capture. The snake was retained for routine processing and died soon thereafter. A necropsy was performed (UF 53664, UF 53665).

The snake was gravid, with 20 embryos in the right uterine horn and seven embryos in the left uterine horn. In addition, three fully developed extra-uterine fetuses were found at the extreme caudal end of the coelomic cavity. The embryos were coiled inside translucent membranes (presumably the chorion, the allantois and the shell membrane) and joined serially to one another. Coagulated blood surrounded the fetuses. Adjacent to this region, on the right side, there was a separation of ribs and a triangular gap in the costal musculature. The fetuses were intact but compressed and semi-mummified. Their integument was caseated and slightly discolored.

Since normal parturition for this subspecies usually occurs in late August or early September, it is probable that there was retention of the fetuses for approximately 10 months. There was no indication of active resorption or encapsulation of the fetuses or their membranes.

Despite the lack of detailed histopathology, the degenerating fetuses may have contributed to the death of this animal. Indications of trauma mentioned earlier and the close proximity of a service road to the collection site suggest possible external causes of death.

I would like to extend a special thanks to Dr. R. A. McCabe and Dr. E. R. Jacobson for their help with this note, and to the Wilkie Bros. Foundation for its support.

Submitted by **HARRY M. TIEBOUT, III,** Department of Zoology, University of Florida, Gainesville, Florida 32611, U.S.A. ●

PYTHON MOLURUS BIVITTATUS (Burmese Python). **MORPHOLOGY.** While two-headed snakes are well known (Frye, 1981. Biomedical and Surgical Aspects of Captive Reptile Husbandry, Chapter 13), few instances are documented of two-headed large constrictors or this anomaly occurring in captively reproduced serpents.

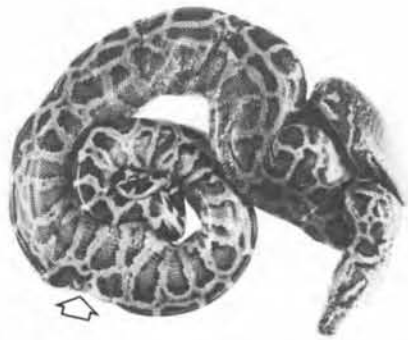


Figure 1. Dorsal view of two-headed Burmese python embryo. Note the ectopic location of ventral scalation (arrow).



Figure 2. Ventral view of two-headed Burmese python embryo.

Figure 3. Radiograph of two-headed Burmese python embryo.



On 12 June 1981 a full term derodymus embryo was found dead in the egg of a captive bred, maternally incubated clutch of Burmese python eggs. The egg failed to hatch and was slit by the authors after palpation revealed internal movement. Upon later return, no movement was noted and a dead embryo was extracted. It measured 58 cm in total length with cervical union occurring 9 cm below the base of the skulls. A small patch of ventral scales was apparent on the dorsal surface at the level of the umbilicus. Interestingly, another egg in this same clutch yielded twins.

Submitted by **BOB CLARK,** 8100 North Classen, Suite 101, Oklahoma City, Oklahoma 73114 and **TIM TYTLE,** Department of Radiological Sciences, Oklahoma Memorial Hospital, P.O. Box 26307, Oklahoma City, Oklahoma 73126, U.S.A. ●

SONORA SEMIANNULATA (Groundsnake) **COLORATION.** *S. semiannulata* is highly polymorphic in color; consequently, a plethora of pattern descriptions have been reported. The most thorough descriptions for the entire species complex were presented by Wright and Wright (1957. Handbook of Snakes of the United States and Canada. ix + 1105 pp.). In addition, Echternacht (1964. Herpetologica 20:211-212) reported an albino.

A melanistic *Sonora* was captured in Taney County, Missouri on 21 May 1981. The majority of cephalic and dorsal scales were thoroughly and densely pigmented giving the individual an overall glossy black appearance. The supra- and infralabials, chin shields and mental were lightly stippled with black pigment as were a few dorsal scales. Light stippling of black pigment occurred on the ventrals and subcaudals giving the entire venter a dusty appearance. The iris and tongue were black.

The specimen (UMC 562 S) is an adult female with a total length of 272 mm and a snout-vent length of 228 mm. Scutellation includes 156 ventrals, 40 subcaudals, scale rows 17-15-15, preoculars 1-1, postoculars 2-2, temporals 1-2 on both sides, supralabials 7-7, infralabials 7-6; the loreal is present and the anal is divided.

Submitted by **BRIAN MILLER,** Department of Biological Sciences, University of Missouri-

Columbia, Missouri. Present Address: Department of Zoology, Washington State University, Pullman, Washington 99164-4220, U.S.A. ●

TESTUDINES

CLEMMYS MUHLENBERGI (Bog Turtle). **REPRODUCTION.** Behler and King (1979. The Audubon Field Guide to North American Reptiles and Amphibians. Alfred A. Knopf, N.Y. p. 456.) list the range for single clutch size in *Clemmys muhlenbergi* as 1-6 eggs and Ryan (1981. Bull. Maryland Herp. Soc. 17(3): 102-6) reported six eggs from a record sized (105.8 mm) female *C. muhlenbergi* from Pennsylvania.

An adult pair of *C. muhlenbergi* obtained by the AZP 12 May 1967 has produced fertile eggs for nine consecutive years (Herman, D. W. 1980. Animal Keeper's Forum. AAZK. 7(19):198). No more than three eggs per clutch was recorded during this period. On 8 June 1983, six eggs were found deposited at a depth of 49 mm in a *Sphagnum* moss mound in a naturally planted bog used to house the adults. No measurements were recorded as the eggs were left in the nest for incubation. A dial thermometer (° C) was placed in the nest cavity to record the daily range in temperature of the eggs. The nest temperature recorded during incubation ranged from 24-32° C although the ambient temperature for the Atlanta area ranged between 20-37° C.

The six eggs hatched between 1 August and 3 August 1983 after 54-56 days. The neonates were weighed and measured within 48 hours of emerging from the eggs. A triple beam balance and vernier calipers were used to record the following data from the six neonates.

Carapace Length (mm)	24.5-26.4	$\bar{x}$= 25.4
Carapace Width	19.5-21.0	$\bar{x}$= 20.2
Plastron Length	19.4-21.4	$\bar{x}$= 20.4
Plastron Width	11.0-12.6	$\bar{x}$= 12.0
Shell Height	12.3-13.2	$\bar{x}$= 12.8
Weight (g)	3.52-4.50	$\bar{x}$= 4.00

The neonates are being housed in a 10 gal aquarium with *Sphagnum* moss substrata and a 25 mm water depth to prevent drowning. Chopped minnows and earthworms, calcium dusted crickets, and Frog Brittle ® (NASCO, Fort Atkinson, WI) make up the diet. UV is provided four min daily with a 275 W sunlamp with timer.

The six eggs reported herein equals the maximum single egg clutch for *Clemmys muhlenbergi* and the six live neonates betters by one the previous high for the species (Ryan, op. cit.).

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Atlanta Zoological Park, 800 Cherokee Ave. SE, Atlanta, Georgia 30315, U.S.A. ●

TRIONYX FEROX (Florida Softshell). **REPRODUCTION.** The production of more than one clutch of eggs annually by *T. ferox* has been presumed, but not reported as a result of direct observation. A female (carapace length 41 cm) was donated to the Columbus Zoo 3 November 1973. The specimen was noted to have been collected in Ware County, Georgia in June 1973, and to have laid an indeterminate number of eggs while in the possession of the donor. An additional four eggs were laid 4 November 1973. The female was subsequently housed with an exceptionally large male (carapace length 37 cm) which had been received by the zoo 26 July 1962.

The female laid a clutch of 24 eggs on 19 July 1979, eight of which were large, yellow and presumably infertile. The infertile eggs ranged from 31 to 33 mm ($\bar{x}$=32.3 mm) along the long axis and from 29 to 31 mm ($\bar{x}$=29.8 mm) along the short axis. The 16 normal eggs ranged from 29 to 33 mm ($\bar{x}$=30.7 mm) along the long axis and from 28 to 31 mm ($\bar{x}$=29.1 mm) along the short axis. Fifteen of these eggs hatched between 27 August and 15 September 1979, after 39 to 58 days incubation at approximately 30° C.

A second clutch of 13 eggs was laid 1 August 1979, which included no infertile eggs, but one which was cracked during laying and is excluded from the data. The twelve eggs ranged from 28 to 31 mm ($\bar{x}$=30.0 mm) along the long axis and from 27 to 31 mm ($\bar{x}$=29.0 mm) along the short axis. Eleven of these hatched between 4 and 8 October 1979, after 64-68 days incubation. The 26 hatchlings from both clutches had carapace lengths of 47-51 mm within five days of hatching, and no apparent difference occurred in size between the two clutches.

The age of the male is further noteworthy. Assuming copulation to have occurred in spring or early summer of 1979, at the time of insemination the male had been in the collection for a time near or exceeding the published longevity record for the form (Bowler. 1977, SSAR Herp. Circ., 6). As the animal was noted to have been "large" at the time of accession, the actual age of the animal at the time of copulation may have well exceeded twenty years.

Submitted by **MIKE GOODE,** Columbus Zoo, Columbus, Ohio 43065, U.S.A. ●

GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Ellen J. Censky, Section of Amphibians and Reptiles, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

ANURA

PSEUDACRIS TRISERIATA (Chorus Frog). USA: MINNESOTA: Wabasha Co: McCarthy Lake Wildlife Management Area west of County 84 (T-109N, R-10W, Sec. 1). 8 July 1983. Philip A. Cochran with Joseph A. Cochran. University of Wisconsin-Madison, Zoological Museum (UWZH 22557). One of three individuals discovered beneath sections of logs in a sandy prairie area, the only damp substrate for 100-200 m from possible breeding areas in an intermittent tributary of the Old Channel of the Zumbro River and a nearby pond. First published record for Wabasha Co (Breckenridge, 1944, Reptiles and Amphibians of Minnesota. Univ. Minnesota Press; Minnesota Dept. of Natural Resources, 1979, Guide to the Reptiles and Amphibians of Southeast Minnesota - Region 5).

Submitted by **PHILIP A. COCHRAN,** Center for Limnology, University of Wisconsin, Madison, Wisconsin 53706, U.S.A. ●

TESTUDINES

CHRYSEMYS PICTA (Painted Turtle). USA: MINNESOTA: Wabasha Co: County 84 south of McCarthy Lake Wildlife Management Area (T-109N, R-8W, Sec. 7). 8 July 1983. Philip A. Cochran with Joseph A. Cochran. University of Wisconsin-Madison, Zoological Museum (UWZH 22558). Road-killed adult, probably originating from a pond visible 100-200 m to the west. First published record for Wabasha Co (Breckenridge, 1944, Reptiles and Amphibians of Minnesota. Univ. Minnesota Press; Ernst, 1973, J. Herpetology 7:42-47; Minnesota Dept. of Natural Resources, 1979, Guide to the Reptiles and Amphibians of Southeast Minnesota - Region 5), but many specimens

were also collected and observed during the course of fieldwork in 1975 and 1976 in Half Moon Lake and the Weaver Bottoms, nearby backwaters of the Upper Mississippi River.

Submitted by **PHILIP A. COCHRAN,** Center for Limnology, University of Wisconsin, Madison, Wisconsin 53706, U.S.A. ●

CLEMMYS GUTTATA (Spotted Turtle). USA: FLORIDA: St. Johns Co: Trestle Bay Swamp, 8.4 km E SR13A on C214, R29E, T7S, Sec. 29. 23 March 1982. Tim Williams. Verified by K. A. Vliet. Univ. Florida, Florida State Museum (UF 52599). Adult female. Putnam Co: behind Army Corps of Engineers, R26E, T10S, Sec. 2. March 1982. Frank Brandt. Verified by P. A. Meylan. (UF 52600). Adult male. Specimens extend known range of species ca. 25.4 km SSE in St. Johns County and ca. 12.25 km NE in Putnam County from previously reported specimens (Banicki, 1981, Florida Sci. 44(4): 253-254).

Submitted by **KENT A. VLIET,** Department of Zoology, University of Florida, Gainesville, Florida 32611, U.S.A. ●

SAURIA

CNEMIDOPHORUS TIGRIS (Western Whiptail). CALIFORNIA: Santa Clara Co: ca. 3-4 miles SE of Los Gatos (Limekiln Canyon, alt. ca. 2000 ft., Soda Springs Canyon, alt. ca. 1600 ft.); 1½ miles SW of New Almaden (Hicks Road, alt. ca. 700 ft.); ca. 9 miles S of Palo Alto (SW flank of Black Mountain, alt. ca. 2800 ft.). Verified from photograph (see Figure 1) by Robert Stebbins. All were along chaparral margins. The Los Gatos, New Almaden and Black Mountain populations were under, respectively, *Baccharis pilularis consanguinea, Artemisia californica* and *Ceanothus cuneatus.*

These 1981, 1982 and 1983 sightings in the Santa Cruz Mountains extend the known range of this polytypic southwestern species about 30 miles westward from the inner Coast Range locations given by Stebbins (1954). I saw only 1 to 3 individuals at each site, and only in the period from late May to early July. The species seems to be uncommon here. I have botanized all but the Black Mountain area repeatedly since 1965 without seeing *C. tigris,* and other naturalists in this densely populated region appear to have missed it also. It seems to prefer open shade where the



ubiquitous Western Fence Lizard *(Sceloporus occidentalis)* is absent or uncommon.

Submitted by **JOHN S. MOORING,** Biology Department, University of Santa Clara, Santa Clara, California 95053, U.S.A. ●

OPHISAURUS ATTENUATUS ATTENUATUS (Western Slender Glass Lizard). USA: MISSOURI: Wayne Co: Specimen DOR on St. Rt. 143, 1.0 km south entrance to Sam A. Baker State Park. 29 May 1976. Collected by M. J. Lodato and P. J. Lodato. Verified by Dennis Harris, University of Michigan Museum of Zoology (UMMZ 174765). First record for Wayne County and extends Missouri range ca. 100 km southeast from nearest published locality (Anderson, 1965 *Reptiles of Missouri,* Univ. Missouri Press, and Holman, 1971, *Ophisaurus attenuatus,* Cat. American Amphib. Rept.).

Submitted by **MICHAEL J. LODATO,** 925 Park Plaza Drive, Evansville, Indiana 47715, U.S.A. ●

PHRYNOSOMA DITMARSI (Rock Horned Lizard). MEXICO: SONORA: ca. 23 km (airline) SE Highway 16 bridge over the Río Yaqui near Tonichí (ca. 165 km (airline) SE Hermosillo, Sonora at an elevation of approximately 1050 m. Collected at approximately 1400 hrs. on 14 March 1983 by Robert H. Perrill. A first-year subadult (5 cm TL) was photographed by the author, but lacking a Mexican scientific collecting permit, the specimen was not collected. The species identification was verified by Charles H. Lowe from photographs which were accessioned to the University of Arizona's herpetological photo specimen voucher file (UAZ 44950 PSV). For the first time *Phrynosoma ditmarsi* has been found in the Río Yaqui drainage system in southeast central Sonora. The only previously recorded collection sites of *P. ditmarsi* have been in the Río Sonora drainage of northeastern Sonora (Lowe, C. H., M. D. Robinson and V. D. Roth, 1971, J. Ariz. Acad. Sci. 6:275-277; Lowe, C. H. and C. W. Howard, 1975, Southwest. Nat. 20:265-270). The lizard was found on a steep, south-facing slope with widely scattered rocky outcrops. It moved from the partial shade of *Fouquieria macdougalli* (Mexican tree ocotillo) and was caught on a fallen branch of *Ceiba acuminata* (Kapok). The habitat was in short-tree forest (Gentry, 1942, Rio Mayo Plants, Carnegie Institute of Washington Publication 527) secondly Sinaloan Deciduous Forest (Brown, D. E., C. H. Lowe and C. P. Pase, 1980, A Digitized Systematic Classification for Ecosystems with an Illustrated Summary of the Natural Vegetation of North America, USDA Forest Service, Rocky Mtn. Forest and Range Exp. Sta., Gen. Tech. Rep. RM-73:1-93) with *Acacia cochliocantha* (boatspine acacia), *Lysiloma watsonii* (feather tree), *Bursera fagaroides elongata* (elephant tree) and *Ipomoea arborescens* (tree morning glory) among the dominant plant species. Except for a few scattered oaks *(Quercus albocincta* and *Q. chihuahuensis)* this locality is quite different from the other known habitats of *P. ditmarsi* which are primarily open oak or oak-pine woodlands with two dominant oak species, some shrubs, and many perennial grasses (op. cit.) This report establishes the occurrence of *P. ditmarsi* in a second river drainage and an unrecorded plant community, as well as extending the range by ca. 150 airline kilometers south-southeast from the nearest previously recorded locality.

Submitted by **ROBERT H. PERRILL,** Arizona-Sonora Desert Museum, Route 9, Box 900 Tucson, Arizona 85743, U.S.A. ●

SERPENTES

COLUBER CONSTRICTOR (Racer). USA: WISCONSIN: Crawford Co: State Highway 179, about 1/3 km east of the Kickapoo River (T-8N, R-4W, Sec. 7/8). 29 July 1983. Philip A. Cochran with John D. Lyons. University of Wisconsin-Madison, Zoological Museum (UWZH 22560). Road-killed adult, found where road cuts along north side of wooded bluff, with immediate roadsides vegetated by grasses and brush. First published record for Crawford Co (Vogt, R. C. 1981. Natural history of amphibians and reptiles of Wisconsin: Milwaukee Public Museum, Milwaukee, 205 pp.).

Submitted by **PHILIP A. COCHRAN,** Center for Limnology, University of Wisconsin, Madison, Wisconsin 53706, U.S.A. ●

ELAPHE GUTTATA EMORYI (Great Plains Rat Snake). USA: UTAH: Uintah Co: 2 mi. N Jones Hole Campground, along Green R. 27 July 1982. G. H. Clemmer. U.S. Biological Survey collection/Fort Collins, CO (BS/FC 02000). The new record is just west of the Utah-Colorado border and is the northernmost record of isolated populations west of the continental divide (Conant, R. 1975. A Field Guide to Reptiles and Amphibians). This specimen extends the range of the species about 100 km NE of the nearest Utah locality "about 15 miles down river from Ouray, Unita County" (Stebbins, R. C. 1954. Amphibians and Reptiles of Western North America), and about 160 km NW of three localities in eastern Garfield County, Colorado (Hammerson, G. A. 1982. Amphibians and Reptiles in Colorado. Colo. Div. Wildlife, DOW-M-I-27-82. 130 pp.).

Submitted by **R. BRUCE BURY,** Denver Wildlife Research Center, 1300 Blue Spruce Drive, Fort Collins, Colorado 80524, U.S.A. ●

LEPTOTYPHLOPS DULCIS DISSECTUS (New Mexico Blind Snake). USA: COLORADO: Baca Co: 39.5 km S, 3 km E Pritchett, Sand Canyon (E½ SW¼ NW¼ Sec. 9, T35S R48W). 1317 m. 11 June 1983. 12:00-13:00 MDT. Three live specimens collected and

identified by D. Jaggi, M. Cage, M. C. Mulvany, P. S. Mulvany, R. Guese, Y. Cage and S. Sasman. Verified by Geoffrey A. Hammerson. University of Colorado Museum, Boulder (UCM 55594-55596). Found under sandstone rocks on steep SW-facing slopes below cliffs. These specimens corroborate the state record for this species which is based on a shed skin (Lapin, B. P. and G. A. Hammerson. 1982. Geographic distribution: *Leptotyphlops dulcis*. SSAR Herp. Review 13(3):82). The new locality is 19.5 km E, 2.5 km S of the state record locality.

Submitted by **DAVE JAGGI, MATT CAGE, MARK C. MULVANY, RAY GUESE, YOUNG CAGE and STEVE SASMAN,** Colorado Herpetological Society, P.O. Box 15381, Denver, Colorado 80215, and **PATRICK S. MULVANY,** Oklahoma Herpetological Society, 7315 East 81st Place, Tulsa, Oklahoma 74133, U.S.A. ●

NERODIA SIPEDON (Northern Watersnake). USA: WISCONSIN: Green Co: Sugar River, immediately downstream from Ten Eyke Road bridge crossing (T-2N, R-9E, Sec. 35). 16 June 1983. P. A. Cochran with J. D. Lyons and F. J. Rahel. University of Wisconsin-Madison, Zoological Museum (UWZH 22559). At least two other individuals were sighted. First published record for Green Co (Vogt, R. C. 1981. Natural history of amphibians and reptiles of Wisconsin. Milwaukee Public Museum, Milwaukee, 205 pp.). This probably reflects a lack of collecting effort, as not even the ubiquitous *Chelydra serpentina* or *Chrysemys picta* have been recorded from Green Co (Vogt, op. cit.). We collected and released a specimen of the former at this site on the same day as the watersnake.

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FIRST SPECIMEN OF *Ambystoma tremblayi* FOR ALGONQUIN PARK, ONTARIO

The presence of Tremblay's salamander *(Ambystoma tremblayi)* has been documented for a number of locations in southern Ontario (Uzzel, 1964; Weller, Sprules, and Lamarre, 1978; Weller *et al.*, 1979). The northernmost record for the province is that of a single individual captured in Algonquin Provincial Park in 1974 (Brunton and Weller, 1979). This record was based solely on the length and coloration of an animal that was not preserved. Considering the great difficulty of distinguishing Ontario members of the *A. jeffersonianum* complex from morphology alone (Servage, 1979), it was desirable to confirm the occurrence of *A. tremblayi* in this area.

A large salamander of the *A. jeffersonianum* complex was captured by J. Murphy at the Algonquin Park Museum (45° 33'N 78 38'W) early in the summer of 1981. It was sent to the University of Guelph for determination. In this complex the ploidy can be determined by chromosome counts (Servage, 1979) or by erythrocyte measurements (Austin and Bogart, 1982). Triploid specimens can be referred to *A. tremblayi* by examining the pattern of electrophoretic separation of glutamate oxaloacetic transaminase, malate dehydrogenase, and superoxide dismutase isozymes (Servage, 1979; Bogart, *in press*). Chromosome counts from the Algonquin Park specimen, using Kezer and Sessions (1979) technique as modified by Servage (1979), indicated that is was a triploid (3n=42). The electrophoretic patterns of malate dehydrogenase isozymes confirmed that it was *A. tremblayi*. The specimen is deposited in the herpetological collection of the Royal Ontario Museum (ROM 11052).

The Algonquin Park Museum is located approximately 4 km E of the site of the previous Algonquin record. It is situated at an elevation of 472 m and is surrounded by mixed forests of Sugar Maple *(Acer saccharum)*, Yellow Birch *(Betula alleghaniensis)*, Beech *(Fagus grandifolia)*, spruces *(Picea* spp.), Balsam Fir *(Abies balsamea)*, and other species. Blue-spotted salamanders *(A. laterale)* were also identified from this location on the basis of electrophoretic patterns and chromosome counts. The Algonquin records extend the known range of *A. tremblayi* by approximately 50 km to the northeast.

I would like to thank J. P. Bogart for assistance in the lab and for reviewing this manuscript; thanks also to the staff of the Algonquin Park Museum.

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THE STATUS OF *Clemmys muhlenbergii* (SCHOEPFF) IN CONNECTICUT

Several authors have mentioned the probable occurrence of *Clemmys muhlenbergii* in Connecticut, including Babcock (1919), Lamson (1935), and Barton and Price (1955). Warner's (1975) records from western Connecticut are unsubstantiated by specimens. Ernst and Bury (1977) and Bury (1979) map Connecticut localities that Nemuras (1975) based on "reports from reliable individuals," literature reports, and one voucher specimen. The only adequately documented locality in Connecticut for this species is Roxbury, Litchfield County (Robinson, 1956), and the voucher specimen (YPM 2215) cannot now be found in the Yale University collection (F. Sibley, pers. comm.).

Recent intensive field work by the authors and William Zovickian has resulted in documentation with museum specimens and/or photographs of *C. muhlenbergii* from the following localities: FAIRFIELD CO: Bethel (photograph); Ridgefield (AMNH 119267-69); LITCHFIELD CO: Salisbury (UCS 5795, 7156-57, 7382); Sharon (AMNH 120255, UCS 7138, photographs). Bog turtles were not sacrificed to document localities. Road killed individuals, empty shells and, in two instances, individuals that died in captivity were utilized. The collection sites are in or near the calcareous valley system of extreme western Connecticut. A positive distribution correlation between *C. muhlenbergii* and calcareous wetlands in the State was suggested by Dowhan and Craig (1976).

Current rapid development in upper Fairfield County (Danbury and Ridgefield) has severely affected or destroyed populations of this species by filling, damming, and channeling of wetlands. Many species of turtles are killed on roads that dissect the wetlands, including an occasional *C. muhlenbergii*.

Without some measure of habitat protection, *C. muhlenbergii* could be extirpated from Connecticut in the near future. The State of Connecticut and conservation organizations should implement a vigorous program to locate viable populations of bog turtles. Measures must be taken to safeguard the immediate habitat and external factors which might influence the quality of the habitat, such as water supply. In some areas, management of habitats to favor bog turtles will be warranted. Calcareous wetlands comprise a small portion of the total area of the State and support a unique floral and faunal assemblage. Protection of these habitats

would enhance other rare species' survival. Detailed studies concerning the life history and ecology of this species at its northeastern range limit should be undertaken and compared to studies done in the more central and southern portions of its range.

ACKNOWLEDGMENTS

We acknowledge access to the collections of the American Museum of Natural History (AMNH), University of Connecticut, Museum of Natural History (UCS), and Yale University Peabody Museum (YPM). For generously sharing information with us we are grateful to W. Zovickian, L. Whitham, and E. Briggs. Field work was conducted under a scientific collector's permit issued to MWK by the State of Connecticut, Department of Environmental Protection. MWK acknowledges support from The Nature Conservancy, Connecticut Chapter.

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UPDATE ON THE LIST OF AMPHIBIANS AND REPTILES KNOWN FROM HONDURAS

Twelve years have passed since the Honduran amphibian checklist appeared (Meyer and Wilson, 1971). The lizard, turtle, and crocodilian checklist was published ten years ago (Meyer and Wilson, 1973); the work on the snakes of Honduras has just appeared (Wilson and Meyer, 1982). Field work has continued throughout this time and a number of species have been added to the country's herpetofauna or described as new from the country, bringing the total to 208. As such, the time is ripe for producing a summary list of the amphibians and reptiles now known to occur in Honduras.

The species are listed in alphabetical order under each order. Each name is followed by a number in parentheses which refers to a numbered reference in the Literature Cited section in which that species was reported for Honduras.

ORDER GYMNOPHIONA (2 species)
Dermophis mexicanus (6)
Gymnopis multiplicata (6)
ORDER CAUDATA (11 species)
Bolitoglossa dofleini (6)
Bolitoglossa dunni (6)
Bolitoglossa mexicana (6)
Bolitoglossa occidentalis (6)
Bolitoglossa rufescens (6)
Bolitoglossa schmidti (6)
Bolitoglossa striatula (6)
Chiropterotriton barbouri (6)
Chiropterotriton nasalis (6)
Oedipina cyclocauda (6)
Oedipina stuarti (6)
ORDER ANURA (43 species)
Agalychnis callidryas (6)
Agalychnis moreleti (6)
Bufo cavifrons (6)
Bufo coccifer (6)
Bufo haematiticus (2)
Bufo leutkeni (6)
Bufo marinus (6)
Bufo valliceps (6)
Centrolenella fleischmanni (6)
Eleutherodactylus biporcatus (6)
Eleutherodactylus bransfordi (8)
Eleutherodactylus gollmeri (6)
Eleutherodactylus laticeps (6)
Eleutherodactylus merendonensis (6)
Eleutherodactylus milesi (6)
Eleutherodactylus mimus (6)
Eleutherodactylus noblei (6)
Eleutherodactylus ridens (6)
Eleutherodactylus rugulosus (6)
Gastrophryne elegans (6)
Hyla bromeliacea (6)
Hyla loquax (6)
Hyla microcephala (6)
Hyla picta (6)
Hyla salvadorensis (6)
Hyla staufferi (6)
Hypopachus variolosus (6)
Leptodactylus fragilis (as *L. labialis*) (6)
Leptodactylus melanonotus (6)
Leptodactylus pentadactylus (6)
Leptodactylus silvanimbus (5)
Phrynohyas venulosa (6)
Physalaemus pustulosus (6)
Plectrohyla dasypus (4)
Plectrohyla guatemalensis (6)
Ptychohyla spinipollex (6)
Rana macroglossa (6)
Rana palmipes (6)
Rana pipiens (6)
Rana warschewitschi (6)
Rhinophrynus dorsalis (6)
Smilisca baudini (6)
Smilisca phaeota (6)
ORDER TESTUDINES (9 species)
Chelydra serpentina (7)
Chrysemys ornata (7)
Dermatemys mawei (7)
Kinosternon leucostomum (7)
Kinosternon scorpioides (7)
Rhinoclemmys annulata (7)
Rhinoclemmys funerea (7)
Rhinoclemmys pulcherrima (7)
Staurotypus triporcatus (7)
ORDER CROCODILIA (2 species)
Caiman crocodilus (7)
Crocodylus acutus (7)
SUBORDER SAURIA (50 species)
Ameiva festiva (7)
Ameiva undulata (7)
Anolis allisoni (7)
Anolis biporcatus (7)
Anolis capito (7)
Anolis crassulus (7)
Anolis cupreus (7)
Anolis humilis (7)
Anolis johnmeyeri (9)
Anolis laeviventris (7)
Anolis lemurinus (7)
Anolis limifrons (7)
Anolis loveridgei (7)
Anolis pentaprion (7)
Anolis sagrai (as *A. sagrei*) (7)
Anolis sericeus (7)
Anolis sminthus (7)
Anolis tropidonotus (7)
Barisia moreleti (7)
SUBORDER SERPENTES (91 species)
Basiliscus plumifrons (7)
Basiliscus vittatus (7)
Celestus montanus (7)
Cnemidophorus deppei (7)
Cnemidophorus lemniscatus (7)
Cnemidophorus motaguae (7)
Coleonyx mitratus (7)
Corytophanes cristatus (7)
Ctenosaura similis (7)
Enyaliosaurus bakeri (7)
Enyaliosaurus palearis (7)
Enyaliosaurus quinquecarinatus (7)
Eumeces managuae (1)
Eumeces sumichrasti (7)
Gonatodes albogularis (7)
Gymnophthalmus speciosus (7)
Iguana iguana (7)
Laemanctus longipes (7)
Lepidophyma flavimaculatum (7)
Mabuya mabouya (7)
Polychrus gutturosus (7)
Phyllodactylus palmeus (7)
Phyllodactylus tuberculosus (7)
Sceloporus malachiticus (7)
Sceloporus squamosus (7)
Sceloporus variabilis (7)
Sphaerodactylus continentalis (7)
Sphaerodactylus dunni (7)
Sphaerodactylus rosaurae (7)
Sphenomorphus cherriei (as *Scincella cherriei*) (7)
Thecadactylus rapicauda (7)
Adelphicos quadrivirgatus (10)
Agkistrodon bilineatus (10)
Amastridium veliferum (10)
Boa constrictor (10)
Bothrops asper (10)
Bothrops bicolor (10)
Bothrops godmani (10)
Bothrops nasuta (10)
Bothrops nigroviridis (10)
Bothrops nummifera (10)
Bothrops ophryomegas (10)
Bothrops schlegeli (10)
Chironius grandisquamis (10)
Clelia clelia (10)
Coniophanes bipunctatus (10)
Coniophanes fissidens (10)
Coniophanes imperialis (10)
Coniophanes piceivittis (10)
Conophis lineatus (10)
Crisantophis nevermanni (10)
Crotalus durissus (10)
Dendrophidion nuchalis (3) (as *D. clarki*) (10)
Dendrophidion percarinatum (10)
Dipsas bicolor (10)
Dryadophis dorsalis (10)
Dryadophis melanolomus (10)
Drymarchon corais (10)
Drymobius chloroticus (10)
Drymobius margaritiferus (10)
Elaphe flavirufa (10)
Elaphe triaspis (10)
Enulius flavitorques (10)
Erythrolamprus mimus (10)
Ficimia publia (10)
Geophis hoffmanni (10)
Hydromorphus concolor (10)
Imantodes cenchoa (10)
Imantodes gemmistratus (10)
Lampropeltis triangulum (10)
Leptodeira annulata (10)
Leptodeira nigrofasciata (10)
Leptodeira septentrionalis (10)
Leptodrymus pulcherrimus (10)
Leptophis ahaetulla (10)
Leptophis mexicanus (10)
Leptophis modestus (10)
Leptophis nebulosus (10)
Leptotyphlops goudoti (10)
Loxocemus bicolor (10)
Masticophis mentovarius (10)
Micrurus diastema (10)
Micrurus nigrocinctus (10)
Micrurus ruatanus (10)
Ninia atrata (10)
Ninia diademata (10)
Ninia sebae (10)
Oxybelis aeneus (10)
Oxybelis fulgidus (10)
Oxyrhopus petola (10)
Pelamis platurus (10)
Pliocercus elapoides (10)
Pliocercus euryzonus (10)
Pseustes poecilonotus (10)
Rhadinaea godmani (10)
Rhadinaea kinkelini (10)
Rhadinaea montecristi (10)
Rhinobothryum bovalli (10)
Scaphiodontophis annulatus (10)
Scolecophis atrocinctus (10)
Sibon anthracops (10)
Sibon carri (10)
Sibon dimidiata (10)
Sibon nebulata (10)
Spilotes pullatus (10)
Stenorrhina degenhardti (10)
Stenorrhina freminvillei (10)
Storeria dekayi (10)
Tantilla lempira (10)
Tantilla melanocephala (10)
Tantilla schistosa (10)
Tantilla taeniata (10)
Tantillita lintoni (10)
Thamnophis fulvus (10)
Thamnophis marcianus (10)
Thamnophis proximus (10)
Tretanorhinus nigroluteus (10)
Trimorphodon biscutatus (10)
Tropidodipsas sartorii (10)
Typhlops tenuis (10)
Ungaliophis continentalis (10)
Xenodon rabdocephalus (10)

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BOOK REVIEWS

Japan's Schlangen (Volume 1), by Max Mori. 1982. Igaku-Schoin, Ltd., Tokoyo. 80 pp. ¥ 10,000. (approximately $42.00).

This slim book is the first volume of a projected three-volume review of the snakes of Japan, including the Riukiu Archipelago and islands of the Yaeyama group. According to the author's foreword the completed work will be a color atlas of Japanese snakes, and also a guide for "quick, simple, and correct diagnosis" of the species covered. In my opinion, this first volume falls far short of both goals.

The species accounts (given in both Japanese and German) include information under the following general headings: classification, size, diagnostic characteristics, color, venom, and distribution. The style throughout is stilted and pedantic, and the content is not particularly informative. The sections on diagnostic characters are especially discursive and poorly organized. In comparison with the terse, highly functional diagnoses of modern field guides, these rambling descriptions seem hardly "diagnostic." Although they may accomplish the author's stated goal of correct diagnosis, they could not be expected to work either quickly or simply.

A large portion of the volume (19 pages) is occupied by the color photographs, which for the most part are embarrassingly bad. Seven species are covered: *Rhabdophis tigrinus, Opheodrys semicarinatus, Amphiesma pryeri, Agkistrodon blomhoffi, Trimeresurus okinavensis, Trimeresurus flavoviridis,* and *Elaphe climacophora.* Color variants of *Rhabdophis tigrinus* and *Trimeresurus flavoviridis,* and a juvenile *Elaphe climacophora,* are thrown in for good measure.

For each species or variant a suite of three to nine photos, all of a single individual, is presented. The photographs are of living snakes, some of them showing the wear and tear of unhappy captivity. The pictures include full-body photos, and closeups from top, bottom and side of the head, midbody, and anal region or tail. There is no apparent uniformity to the style or scale of photographs presented for each species. Some of the photos were posed with the aid of fingers, which also figure prominently in the pictures, and for others the snakes were apparently anesthetized. The backgrounds are a variety of terrarium bottoms and table cloths.

Even conceding the difficulty of obtaining high-quality portraits of living, wriggling subjects (admittedly Isabelle Hunt Conant set a very high standard for such endeavours), there is no excuse for publishing photographs that are not sharply focused. Not only are many of the photographs fuzzy, but the color renditions are of extremely variable quality. I found it curious to encounter both poor photographic technique and inferior color printing in a book produced in Japan, a country that typically leads in both technologies.

It is customary to write, toward the end of an unfavorable review, "this book has little to recommend it." In this case, however, the book has nothing to recommend it, not even a reasonable price.

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Dinosaurs, Asteroids and Superstars: Why the Dinosaurs Disappeared, by Franklyn M. Branley with illustrations by Jean Zallinger. 84 pp. 1982. Thomas Y. Crowell Junior Books (NY). $9.50 ISBN 0-690-04211-6.

While I don't expect that *HR* will be deluged with reviews of books for youngsters, it's certainly not inappropriate that we review some since the herpetological interests of many of us extend to childhood and the progeny of herpetologists sometimes share said interests.

This is a fine book, both in content and form. It will, I feel, appeal most to youngsters between 8 and 14 years old. The text is well designed with easily read fonts and adequate line leading. The general readability and appearance of the book are further enhanced by the use of a good glossy paper. Ms. Zallinger's drawings are skillful, simple and interesting, and are nicely employed to break up passages of text. The book shows evidence of careful editing, and I did not notice any typographical or grammatical errors. The index is adequate, and a small list of further reading suggestions is provided.

The author gives very good and relatively unbiased accounts of contemporary theories regarding the great extinctions of the late Cretaceous. The major historical theories are also reviewed and evidence contradicting them is concisely presented. I found very little material to quibble over. On page 18, the author writes that "Dinosaurs were indifferent mothers." Evidence accumulated for crocodilians in the past few years documenting rather intense maternal care makes that generalization less acceptable for late Cretaceous Archosauria than it was considered 8 years ago. Similarly, I feel that the implication that the decreasing thickness of eggshells seen through the Cretaceous is a sign of reproductive decline (page 20) is somewhat premature. Paleontologists really do not know that much about the evolution of egg structure in dinosaurs, and assigning most nests accurately to genus would be an awesome accomplishment. Contemporary reptile eggs are not very thick walled.

These are really minor flaws. The author concludes with the fact that all young readers of active imagination and curiosity will find so intriguing: we do not know why the spectacular age of the great reptiles came to so precipitous a conclusion. In the long run, it is this same intrigue that most scientists find so fascinating in their professions.

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Lizards of Western Australia I. Skinks, by G. M. Storr, L. A. Smith, and R. E. Johnstone. University of Western Australia Press, 1981. 200p ill. $23.00. Obtainable from International Scholarly Book Services, PO Box 1632, Beaverton, Oregon 97075.

This is the first in the series of a projected 3-volume handbook on the lizards of Western Australia. The dragon lizards, monitors and geckos will appear in later volumes. Australia is blessed with a plethora of skinks; there are 15 genera and 130 species in western Australia alone and the purpose of this handbook is to make it possible for any interested person to identify each species. There are keys to the genera and to the species and there is a brief diagnostic description of each species, a map showing the distribution within the western portion of Australia only, and oftimes an illustration of the head scalation. It is good to have such an excellent guide to this remarkable diversity of lizards especially when the senior author alone is responsible for the description of nearly half of the species listed. Study on the comparative ecology and behavior of these many closely related forms should be enhanced by the availability of this publica-

tion. The center contains 20 color plates, each with 6 or 8 excellent color photographs of the individual species and at the end there is a glossary and a bibliography. An excellent contribution.

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A Guide to Field Identification - Reptiles of North America, by Hobart M. Smith and Edmund D. Brodie, Jr. Golden Press (Western Publishing Company, Inc., Racine, Wisconsin), 240 pp., 1982. $6.95.

My immediate reaction upon seeing this book was: "What?! Yet another field guide to the herps of North America?" After all, in recent years (since 1966) we have witnessed the appearance of four other field guides in three series, However, in the course of preparing this review, my opinion of Smith and Brodie's book changed considerably. This book is a companion volume to *A Guide to Field Identification - Amphibians of North America* (1978) by Dr. Smith and both are part of the Golden Field Guide Series. Both authors are well-known herpetologists; Dr. Smith is one of a very few "deans of American herpetology."

This field guide is directed toward an audience of lay people and amateur herpetologists but it can also be useful to professional herpetologists as a convenient source of information concerning North American reptiles (north of Mexico) occurring outside of the area of their immediate expertise.

The book is organized into three main sections, viz.: (1) an introduction to the group discussed and to the use of the book, as well as basic information on snakebite and treatment; (2) an identification guide to North American species; (3) basic information about reptilian biology and maintenance of reptiles in captivity. The information in the first section is written to be intelligible to any literate adult, with technical terminology minimized and otherwise explained. Sections on ethics and the growing value of observation vs. "collecting" are especially important. The coverage of snakebite and treatment is simplified but emphasizes remaining calm and movement of the victim to a medical facility without delay.

The section on identification is set up in a very useful fashion. The infrataxa within each major reptile group are discussed in a decreasing hierarchical order. At each level, general introductory remarks are provided and, for the purposes of identification: (1) illustrations of key characteristics and the animals themselves; (2) range maps; (3) species and subspecies descriptions; and (4) keys (this is the order the authors suggest for their use in identification). The illustrations are line drawings and paintings and are, simply speaking, superb. They were executed by David Dennis and Sy Barlowe and represent the outstanding feature of this book. Mr. Dennis is a major talent in the world of herpetological illustration. The line drawings are intended as visual explanations of the characters used in the keys and use a pale yellowish green color as a visual key to highlight the field marks (analagous to the Peterson series "arrows"). The paintings of the various species are of uniformly high quality, although the definition of some is better than in others. The only fair comparison of these paintings is with those in Stebbins' 1966 *Field Guide to Western Reptiles and Amphibians.* Comparing species by species, Dr. Stebbins' paintings exhibit an almost excruciating detail which is not matched by some of Mr. Dennis' work but this detracts in no serious way from their beauty and utility. The range maps are another matter. Although it is a definite plus to have these maps placed alongside their respective species accounts, some maps showing subspecies ranges are so small as to be practically useless (e.g., those of *Coluber constrictor, Holbrookia maculata,* and *Lampropeltis zonata*). The lack of state boundaries, impossible to use on maps which are smaller than the size of a postage stamp, further hinders their utility. Finally, precise overlap of some color components (to make orange, for example) is lacking, presenting confusion regarding subspecies range limitations in maps of such a small scale. The maps are, most assuredly, the weakest aspect of this book. The species and subspecies descriptions are precise and succinct. The keys are likewise and stress easily-observed features. Together, this quartet of identification guides, barring the weaknesses of the range maps, provides a facile method for determining identity, unequaled by those used in other recently-published field guides.

The final section on reptilian biology and care in captivity is written in a simple and pleasing fashion and is highlighted by a straightforward discussion of "the human factor" in destruction and endangerment of reptilian life.

At the beginning of this review, I expressed my initial sceptical attitude toward the publication of another North American field guide. In light of my own scepticism and perhaps that of others who will see the book, I think it useful to carry out a comparison of the recently-published field guides to reptiles and amphibians of North America north of Mexico or some segment thereof. In so doing, I constructed a chart (Table 1) that provides a comparison of salient features of such field guides, beginning with Robert C. Stebbins' 1966 field guide mentioned above. Of course, the more recently-published a field guide is, the more current it will be, but I feel there are other overriding features of field guides that may make an older field guide preferable for field use to a newer one, especially given the relative stability of our knowledge of the reptiles and amphibians north of the U.S.-Mexican border. I have tried to assess the relative utility of five recently-published guides by comparing them to what I consider to be "ideal" characteristics of such guides. An "ideal" field guide should have:

1. A descriptive title. Cochran and Goin's title "The new field guide of reptiles and amphibians" gives no indication of the area covered.
2. Reasonable cost. Even in the days of inflated book prices, Conant's and Stebbins' cloth-bound guides are comparatively expensive.
3. Professionally done illustrations (preferably paintings, line and stippled drawings, and line drawings, where pertinent; if not paintings, then excellent quality photographs in which the subject is positioned to show field identification marks) placed alongside the species accounts. Cochran and Goin's photographs do not even function well as portraits of the species in most cases.
4. Sufficiently larger and detailed distribution maps showing subspecies ranges and outlying populations or records, supplemented by sufficiently detailed written statements. As noted above, Smith and Brodie's maps are too small and confusing to be useful in many cases and Cochran and Goin's book contains no maps and has descriptions that are too poorly drawn in most cases to make up for the poor photographs. Behler and King's maps do not show subspecies ranges.
5. A variety of identification techniques, including at least visual keys, good illustrations, and sufficiently detailed written descriptions. Cochran and Goin's book is the worst of those compared herein in this regard.
6. Ancillary information on other aspects of the species' biology, as space permits. Conant's, Stebbins', and Smith and Brodie's guides are notable in this respect.
7. A glossary of pertinent technical terms. Cochran and Goin's is probably the most useful as it is more detailed and divided into sections that head each of the major group divisions of the book.
8. Size small enough to fit in a jacket pocket. All the guides correspond to this characteristic.

Based on these features, I tried to establish an overall rating for each of the guides listed in Table 1 between 0 and 8. Whereas no guide was an "ideal" one, the Smith and Brodie guide and the Stebbins one are the best of any of those considered, followed closely by Conant's. The Cochran and Goin and Behler and King guides never seem to have "caught on," perhaps with good reason, according to my rating, although the Cochran and Goin book is far the inferior of the two.

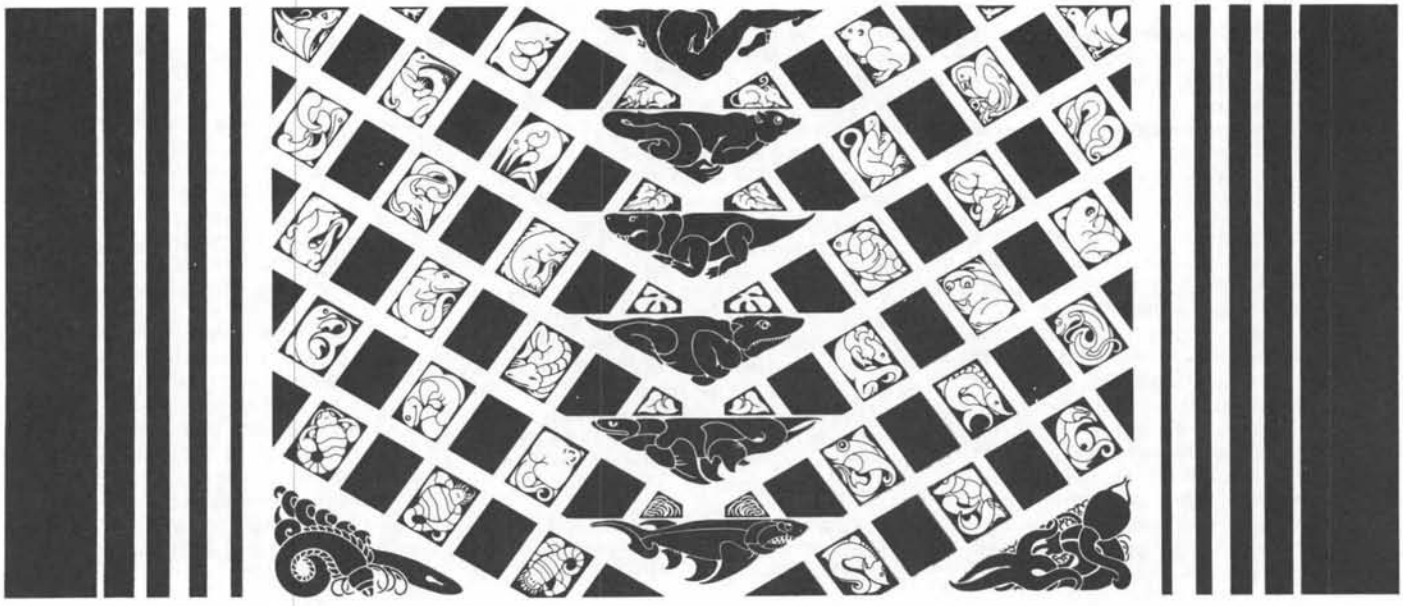
In the final analysis, Smith and Brodie's field guide, when combined with its sister volume on the amphibians, provides a valuable tool for field identification of North America's herpetozoans in a less bulky and only slightly less useful format than the Conant and Stebbins companion volumes. The book considerably enhances the growing reputation of Dr. Brodie (even though a reformed ophidiophobe) and adds another chapter to the history of Dr. Smith, one of the most remarkable men in herpetology.

Table 1. Comparison of salient characteristics of five recently-published field guides to the North American herpetofauna

Guide No.	Title	Author(s)	Year of Publication	Area of coverage	Cost	In Print	Illustrations: Photographs: Color	Photographs: Black & White	Photographs: Color & B&W	Ink Drawings: Line	Ink Drawings: Stipple & Line	Colored Paintings	Placement: Alongside Sp. Acct.	Placement: Separate Section
1.	A Field Guide to Western Reptiles and Amphibians	Robert C. Stebbins	1966	States of U.S. west of eastern borders of New Mexico, Colorado, Wyoming, and Montana (including Alaska); Canada west of eastern borders of Saskatchewan and Mackensie Territory	$13.95	Yes	-	-	-	+	+	+	-	+
2.	The New Field Book of Reptiles and Amphibians	Doris M. Cochran and Coleman J. Goin	1970	United States (including Hawaii)	$ 7.95	Yes	+	+	-	+	-	-	-	+
3.	A Field Guide to Reptiles and Amphibians of Eastern and Central North America	Roger Conant	1975	U.S. and Canada east of western boundary of Texas, Oklahoma, Kansas, Nebraska, S. Dakota, N. Dakota, Manitoba, and Keewatin	$13.95	Yes	-	+	-	+	+	-	-	+
4.	The Audubon Society Field Guide to North American Reptiles and Amphibians	John L. Behler and F. Wayne King	1979	United States (excluding Hawaii) and Canada	$12.95	Yes	+	-	-	+	-	-	-	+
5.	A Guide to Field Identification-Reptiles of North America	Hobart M. Smith and Edmund D. Brodie, Jr.	1982	United States (excluding Hawaii) and Canada	$ 6.95	Yes	-	-	-	+	-	+	+	-

Guide No.	Distribution Maps: Presence or Absence	Distribution Maps: Placement: Alongside Sp. Acct.	Distribution Maps: Placement: Back of Book	Distribution Maps: Size: Variable	Distribution Maps: Size: Marginal	Distribution Maps: Subsp. ranges Distinguished	Written Distribution Statement Included	Method of Identification: Visual Key	Method of Identification: Written Key	Method of Identification: Written Descrip.	Additional Information in Species Accounts: Similar Species	Additional Information in Species Accounts: Behavior	Additional Information in Species Accounts: Habitat	Additional Information in Species Accounts: Breeding	Additional Information in Species Accounts: Food	Glossary	Overall Rating (0-8)side
1	+	-	+	+	-	Yes	Yes	+	-	+	+	+	+	±	±	+	7.5
2	-	N.A.		N.A.		N.A.	Yes	-	-	+	-	-	-	-	-	+	4
3	+	-	+	+	-	Yes	Yes	+	-	+	+	±	+	-	±	+	7
4	+	+	-	-	+	No	Yes	+	-	+	-	-	+	+	-	+	5
5	+	+	-	-	+	Yes	No	+	+	+	-	-	For Genus or Family	For Genus or Family	For Genus or Family	+	7.5

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The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted **must** be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white, 8 X 10, glossy prints, and should be accompanied by a descriptive caption and exposure data. The name and address of the contributor should be taped or penciled on the back of each print. Please DO NOT send photographs before corresponding with the editors about them. Return of the unsolicited photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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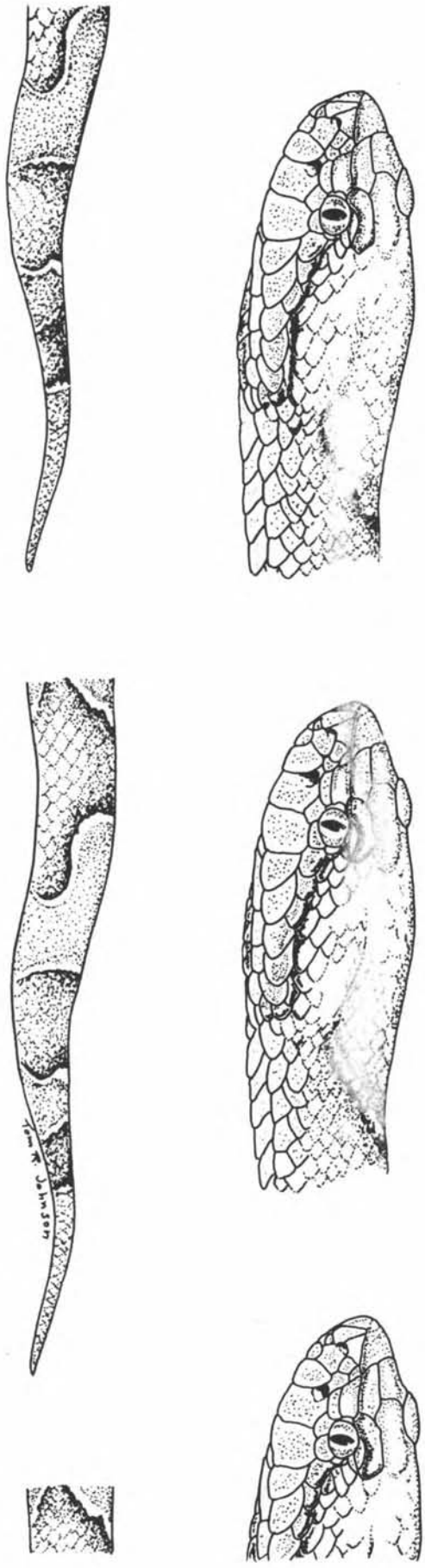
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SSAR BUSINESS

1983 SSAR HERP CONSERVATION DIRECTORY AVAILABLE

The SSAR Conservation Committee has prepared a directory of state wildlife agency or commission employees who are responsible for nongame, significant habitat, or natural heritage programs. It includes the names of individuals who have been designated as contacts on issues concerning threats to herpetofaunal resources. The Committee hopes the "herp" conservation directory will serve as an aid to those needing to address amphibian and reptile conservation issues.

Copies are available, gratis, from: John L. Behler, Chairman, SSAR Conservation Committee, c/o Department of Herpetology, New York Zoological Society, 185th St. & Southern Blvd., Bronx, New York 10460 USA. ●

1983 SSAR GRANTS-IN-HERPETOLOGY AWARDS

The Society for the Study of Amphibians and Reptiles is pleased to announce the following awards in the 1983 Grants-in-Herpetology Program:

GRADUATE STUDENT RESEARCH:

Paul J. Watson, Section of Neurobiology and Behavior, Cornell University. "Chemical communication and sexual selection in the red-spotted newt, *Notophthalmus viridescens* (Rafinesque)." $450.

Robert A. Newman, Department of Biology, University of Pennsylvania. "The genetic basis of traits affecting larval survival of *Scaphiopus couchi*, a desert anuran (Pelobatidae)." $275.

Joyce S. Tsuji, Department of Zoology, University of Washington. "Latitudinal comparison of thermal acclimation of metabolism in lizards." $250.

REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS:

Kevin N. Brewster, Wisconsin Herpetological Society. "Reptilian ecology of endangered prairie habitat in Wisconsin." $250.

Steve Hammack, North Texas Herpetological Society. "A pictorial guide to the amphibians and reptiles of Dallas and Tarrant Counties, Texas." $200.

HERPETOLOGICAL CONSERVATION:

Peter W. Stangel, Department of Zoology, University of Georgia. "A proposed study of the breeding biology and larval ecology of the spotted salamander, *Ambystoma maculatum*." $400.

SSAR extends its congratulations to all recipients of awards and encourages the submission of proposals for next year's program. SSAR also expresses its thanks to the 1983 Grants-in-Herpetology Committee, composed of: Linda R. Maxson (Chairperson), Robert Mount (Conservation Research), Malvin L. Skaroff (Regional Herpetological Society Projects), Donald C. Forester (Graduate Student Research), and Dale L. Marcellini (Herpetological Research in Zoos). ●

SOCIETIES

CALIFORNIA CONFERENCE ON HUSBANDRY AND PROPAGATION

The Northern California Herpetological Society is hosting a conference on "Captive Propagation and Husbandry of Reptiles and Amphibians." The conference will take place on Saturday, 15 October 1983, and will consist of presentations by eight speakers. The keynote speakers will be Dr. Fredric Frye and Dr. Murray Fowler. Others on the agenda include Ron Tremper, Dr. Richard Ross, and Terry Lilley. For further information contact:

Northern California Herpetological Society
706 Arnold Street
Davis, California 95616 ●

CALL FOR PAPERS

The fall meeting of the Texas Herpetological Society is scheduled for November 2, 1983, at the University of Texas at Tyler, Tyler, Texas. Two paper sessions will be held:

I. Texas Herpetofauna, Now: Topics dealing with studies of the Texas herpetofauna, i.e. Ecology, systematics, natural history, etc.

II. Texas Herpetofauna, The Future: Topics dealing with endangered species, habitat destruction, protection laws, etc.

Talks will be limited to 20 minutes and can deal with any aspect of the Texas herpetofauna. Deadline for titles is September 1, 1983.

A tour of the new herpetarium at the Caldwell Zoo will be held at 6 PM on November 1 and a Texas style barbeque will be held after the meeting on November 2. Dr. Charles Carpenter, University of Oklahoma will be the speaker and will talk on "Ritualization in Reptiles."

Submit paper titles to: Dr. Neil Ford, Department of Biology, University of Texas at Tyler, Tyler, Texas 75701. ●

LEHIGH VALLEY HERPETOLOGICAL SOCIETY

In January of 1982, a small group of reptile and amphibian enthusiasts from the Allentown-Bethlehem-Easton (PA) area met and formed what at that time was called the Lehigh Valley Reptile and Amphibian Club. Several meetings were held at irregular intervals during 1982. In late 1982 a constitution and by-laws was adopted, and the group was reorganized as the LEHIGH VALLEY HERPETOLOGICAL SOCIETY. Since January 1983 regular monthly meetings have been held on the fourth Monday of each month at the Guthsville Rod and Gun Club in Guthsville, PA (near Allentown).

Current officers of the LEHIGH VALLEY HERPETOLOGICAL SOCIETY are:

President — Mike Jones
Vice-President — Cliff Swoyer
Secretary — Len Knapp
Treasurer — Dan Kohler

All persons living within the general Lehigh Valley Area, and who are interested in reptiles and amphibians, are invited to join our group. Dues rates are $5.00 per year for student members, $10.00 per year for adult members. For further information write to:

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TEN-YEAR INDEX
JOURNAL OF HERPETOLOGY

A comprehensive index covering volumes 1-10 (1968–1976), compiled by J.P. Kennedy and June Moreland, recently has been published. The 75-page booklet, measuring 7 by 10 inches to match the *Journal* format, is **cross-indexed by author/title, by subject and by taxonomic name.** Prices: $7 postpaid in USA; overseas $8 postpaid (includes $1 to cover extra postage). Checks may be made payable to SSAR. Payment in USA funds; International Money Orders acceptable.

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Send orders to Douglas H. Taylor, Department of Zoology, Miami University, Oxford, Ohio 45056, USA. A complete list of society publications and membership information can be obtained from Dr. Taylor. Currently, SSAR issues seven series: *Journal of Herpetology, Herpetological Review, Facsimile Reprints in Herpetology, Herpetological Circulars, Contributions to Herpetology, Catalogue of American Amphibians and Reptiles* and *Recent Herpetological Literature.*

INSTITUTIONS

HERPETOLOGY AT THE SAN DIEGO NATURAL HISTORY MUSEUM

In 1960 Lawrence M. Klauber donated his herpetological collection of 35,000 specimens and his vast library of over 20,000 books and reprints to the San Diego Society of Natural History, whence they were housed in the Society's Natural History Museum in Balboa Park. At the time of Klauber's death in 1968, the number of specimens of amphibians and reptiles at the museum was over 50,000. The full history of the collection, though, predates the Klauber era to when the Society was founded in 1874. It is a history punctuated by colorful, sometimes scandalous, anecdotes about the collectors and curators of their time. A number of changes in staff and policy have occurred in recent years, however, especially since the late 1970s. There have been three curators since 1978, the most recent of these being Gregory Pregill, who arrived in September, 1981. Because this turnover has been somewhat confusing to the herpetological community, it seems appropriate to review the status of the collection, and the research developments underway by the current staff. In addition, a few propitious comments on certain historical events will reveal, in part, the strengths and taxonomic emphasis of the collection that affect its use.

For many years the collections of amphibians and reptiles at the San Diego Natural History Museum were synonymous with the life of Lawrence M. Klauber, yet he himself did not begin his herpetological studies until 1920 when he was 37 years old. Klauber was a herpetologist by avocation, his livelihood being derived from his training as an electrical engineer. He joined San Diego Gas and Electric as a salesman in 1911 and retired as Chairman of the Board in 1954. Klauber conducted most of his research and maintained his collections in the basement of his home. For its part, the San Diego Society of Natural History started amassing specimens of amphibians and reptiles in the early 1890s, largely through the encouragement of Frank Stephens and Charles R. Orcutt, both noted naturalists of the Southwest. Orcutt died in August, 1929, while on a field trip to Haiti, and a year later the museum obtained his scientific library and those of his collections of natural history specimens that were in San Diego at the time. Stephens was very active in the early years of the Society, was appointed as the first Director of the Museum in 1917 (then located downtown), and served the Society in one capacity or another until 1935 when he retired at the age of 86. He died two years later. From 1924 until his retirement Stephens held the title of Emeritus Curator of Vertebrates. Although his own principal inquiry was mammalogy, he still took an interest in building a herpetology collection. By 1930 the museum's collection of amphibians and reptiles numbered 2189 specimens. After that date the majority of specimens coming into San Diego from collectors and donors was given to Klauber, who by then held the title of Honorary Curator of Herpetology. As early as 1928 Klauber foresaw that someday his collection and that of the museum would merge, and he assigned specimen numbers accordingly so that they would not have to be recataloged at a future date. Consequently, all specimens originally in the LMK collection have the same numbers in the herpetological collections of the San Diego Natural History Museum.

Klauber's legendary interest in rattlesnakes resulted in an enormous series of *Crotalus*, and substantial numbers of most species of reptiles native to the Far West and northern Mexico. His collection had many contributors. Among the more significant ones were Cyrus Perkins and Charles Shaw, the successive curators of reptiles at the San Diego Zoo, a position now held by James Bacon. Perkins traveled widely during the 1930s in Mexico, South America and the Pacific. Shaw brought in many specimens from throughout the Southwest during the 1940s and 1950s. Shaw in fact curated the museum's herpetological collection for a time during WW II when the U.S. Navy temporarily annexed the museum for a hospital and the museum's collections were stored in various places around San Diego. The herpetology collection was displaced to the zoo, located adjacent to the museum in Balboa Park. The museum had moved to a new building there, its present quarters, in 1932.

After 1960, following the merger of the two collections, the Department of Herpetology was overseen nominally by various people. Richard Etheridge, now Professor of Zoology at San Diego State University, had arrived there as an assistant professor in 1961 and supervised the collection for a time thereafter. Allan J. Sloan was the assistant curator. Sloan helped to move and integrate the Klauber collection into the museum, and responded to the day-to-day needs of the department for several years. In 1973 Thomas H. Fritts became the first full-time resident curator in the Department of Herpetology who had completed formal graduate training. Fritts and his assistants did much to modernize the collection by updating nomenclature, relabeling jars, and initiating a species index. They also began building the osteology collection and involved graduate students from San Diego State University in various tasks and field work. Fritts resigned in 1978 and was succeeded by Crawford Jackson, who served as curator for two years. When Jackson vacated the position in 1980 the collection was managed by curatorial assistants Mark Dodero and Ann Fetzer. They left the museum to resume their studies when the present curator arrived, although Mark still remains active in departmental field work.

Currently the staff includes Pregill and two curatorial assistants, James E. Berrian and Van Wallach. Jim is responsible for cataloging and overseeing the species index. Van Wallach's expertise in snake taxonomy has him maintaining that part of the collection although he mainly functions as a research assistant. The department benefits regularly from the steady contribution of several volunteers who assist in typing, cataloging, and organizing the departmental library and correspondence file.

The collection contains approximately 64,000 specimens, which may be broken down taxonomically as follows:

Amphibians (Apoda, Caudata, Anura) - 17 families, 55 genera, 150 species

Turtles - 9 families, 34 genera, 80 species

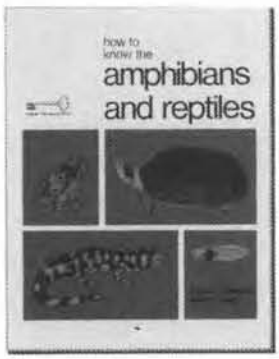
Lizards (includes amphisbaenians and *Sphenodon*) - 15 families, 110 genera, 320 species

Snakes - 9 families, 130 genera, 300 species

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These taxa also encompass nearly 2000 skeletons in roughly the same diversity, and several hundred preserved hemipenes representing 70 species of snakes (mostly *Crotalus*) and lizards. A compilation of our 56 holotypes and several hundred paratypes has been completed and will soon be published in the Society's *Transactions*. Computer entry for at least some aspects of the collection is anticipated to begin early in 1983.

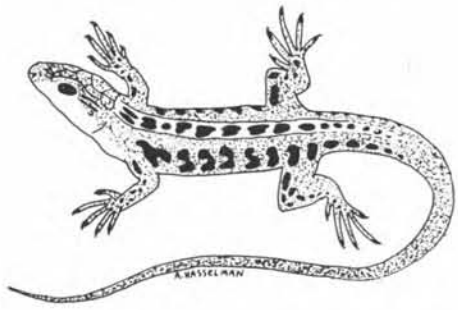
The collection emphasizes the regional fauna, reptiles in particular, yet it is flavored with series of taxa from various places of interest to former and recent curators and contributors. During WW II various military personnel contributed a nice series of Pacific skinks, for example, and Cyrus Perkins assembled a sizeable collection of reptiles from the Galápagos Islands. The osteology collection has become more cosmopolitan as a result of the exotic species available on occasion from the San Diego Zoo. Current research interests have also expanded our skeletal holdings through the accumulation of ontogenetic series of many species from the Southwest and the West Indies.

The present research programs are mainly in systematics and biogeography. Jim Berrian, however, is also conducting a demographic study of reptiles in the high desert near Anza Borrego, in addition to pursuing his interest in the relationships of the leaf-toed geckos, *Phyllodactylus*. We anticipate that the population study will continue to provide data indefinitely. Over 100 can traps have been placed in a one-hectare plot that transects microhabitats ranging from sandy washes to rocky hillsides. For several years now, Van Wallach has been studying in detail the soft anatomy of snakes, giving attention to the morphology of the trachea and lungs. He has examined representatives of 350 genera and about 835 species for a major treatise on the subject and its bearing on snake phylogeny. Pregill is continuing his work on the West Indian herpetofauna, its systematics, paleontology and zoogeography. This research has benefited from recent support by the National Science Foundation and National Geographic Society, primarily for research assistants, laboratory equipment and field work in the West Indies.

This department enjoys an adjunct relationship with the Department of Zoology at San Diego State University. Professors Richard Etheridge and Richard Estes and their graduate students routinely collaborate with us on the systematics and paleontology of squamates, and other areas of mutual interest.

We anticipate that within six months the alcohol collection will have been moved to a renovated facility on the museum grounds. The move is in compliance with the regulations of the San Diego Fire Department. Relocation of the alcohol collection will result in the disadvantages of a collection segregated from the departmental offices, but it may adumbrate the creation of space for the growing osteology collection and for visitor and student work areas. The department is equipped with a wet lab, microscopes, photographic equipment, some recording equipment, map and kodachrome-slide libraries, and field and collecting gear. The herpetological research library contains approximately 32,000 volumes. The department welcomes visiting researchers and inquiries about specimens. Loans are made to individuals with institutional affiliation.

GREGORY PREGILL
Natural History Museum
P.O. Box 1390
San Diego, California 92112



Society for the Study of Amphibians and Reptiles

announcing a new book

TURTLES OF VENEZUELA

by Peter C. H. Pritchard and Pedro Trebbau

This new book will be the first in-depth treatment of a major South American turtle fauna. It covers all turtles known from Venezuela including the mata mata and other side-necks (11 species), tortoises, pond and land turtles (6 species) and the sea turtles (5 species), together comprising fully half of the turtle species described from the South American continent. There is an extensive discussion of zoogeography of South American turtles and an illustrated key to species (in both English and Spanish). Each species account consists of a synonymy followed by a diagnosis; a detailed description (including shell, soft parts, color and sexual dimorphism); and sections on size and growth, distribution and geographic variation, habitat, feeding, reproduction, economic importance, and vernacular names. There is also a comprehensive bibliography and list of locality records.

The book is beautifully illustrated. There are 48 full-page plates in color, 26 of which are original watercolors and the remainder a collection of 160 photographs of both turtles and their habitats. In addition, there are two distribution maps for each species: a spot map showing the detailed Venezuelan distribution and a map showing the continent-wide range.

The book is about 350 pages, 8½ x 11 inches (or 21.5 x 28 cm) bound in cloth, price US$45 postpaid. A special leatherbound patron's edition, in two volumes, is US$300 postpaid. **Publication date: November 1983.** A 4-page ad with sample color plates was published in the December 1982 issue of *Herpetological Review,* or may be obtained on request from Dr. Douglas Taylor, Department of Zoology, Miami University, Oxford, Ohio 45056, USA.

Orders may be placed with Dr. Taylor. Please make checks payable to "SSAR"; payments must be in USA funds or by International Money Order. A complete list of Society publications and membership information can be obtained from Dr. Taylor. The Society publishes *Journal of Herpetology, Herpetological Review, Facsimile Reprints in Herpetology, Herpetological Circulars, Contributions to Herpetology, Catalogue of American Amphibians and Reptiles* and *Recent Herpetological Literature.*

Society for the Study of Amphibians and Reptiles
BALLOT

This is the official ballot of the SSAR to elect officers for 1984. All SSAR members are urged to vote. This ballot must be received no later than 15 December 1983. Please use the attached self-addressed envelope.

For President-elect (vote for one):

- ☐ Herbert Dessauer
- ☐ George Pisani

For Secretary (unopposed):

- ☐ James S. Jacob
- ☐ _____

For Treasurer (unopposed):

- ☐ Henri C. Seibert
- ☐ _____

For Board of Directors (Class of 1986 vote for one from each category):

REGULAR

- ☐ Alan Savitzky
- ☐ Samuel Sweet

OVERSEAS

- ☐ Timothy Halliday
- ☐ Ricardo Martori

PROPOSED AMENDMENTS TO SSAR BYLAWS

The proposed amendments appeared on pp. 4 & 5 of *HR*, 14(1), 1983. Please refer to that issue for a complete description of the three amendments.

1. ☐ **for** ☐ **against** the proposed amendment to Article II, Section 3, which would specify a term of office of one year for the Publications Secretary; the term of office was not previously stated.

2. ☐ **for** ☐ **against** the proposed amendment to Article II, Section 6d, which adds membership on the SSAR Board of Directors as being one of the duties of the Publications Secretary.

3. ☐ **for** ☐ **against** the proposed amendment to Article III, Section 1, which adds the Publications Secretary to the SSAR Board of Directors.

REMOVE THIS PAGE FROM *HR* TO VOTE

The Candidates

HERBERT DESSAUER, Professor of Biochemistry, Department of Biochemistry, Louis iana State University School of Medicine, New Orleans, Louisiana; Ph.D., Louisiana State University (1951). Research interests: (a) influence of photoperiod on seasonal cycles of lizards and snakes, (b) evolution of *Anolis,* New Guinea *Litoria* and snakes, especially the natricines, and (c) population genetics of closely related species in zones of contact. He is a Reasearch Associate of the American Museum of Natural History and of the L.S.U. Museum of Zoology. He was a member of the 1969 ALPHA HELIX Expedition to New Guinea, panels of the National Science Foundation in Systematic Biology and Advanced Science Education, and the National Committee for Resources in Herpetology. SSAR activities: Board Member (1981). Publications: 110.

TIMOTHY HALLIDAY, Senior Lecturer in Biology, the Open University, Milton Keynes, England. Research interests: Studies of the sexual behaviour and evolutionary biology of European newts (*Triturus*) since 1968, and of the breeding dynamics of toads (*Bufo bufo*) and frogs (*Rana temporaria*) since 1977. Member of the British Herpetological Society, Societas Europea Herpetologica, Herpetologists' League, and European editor of the journal *Animal Behaviour.* SSAR activities: Member of the Editorial Board of the *Journal of Herpetology* (1975).

JAMES S. JACOB, Associate Professor of Biology, Memphis State University, Memphis, Tennessee; Ph.D., University of New mexico (1977). Research interests: Comparative morphology and physiology of reptiles and amphibians. SSAR activities: Chairman of Memphis Local Committee (1981), Secretary (1982-present), Chairman of Longrange Planning Committee (1983), Meetings Committee member (1983). Publications: 15.

RICARDO A. MARTORI, Instructor (Prof. Asst.), Departmento de Ciencias Naturales, Facultad de Ciencias Exactas, Fisicoquimicos y Naturales, Universidad Nacional de Rio Cuarto, Rio Cuarto, Cordoba, Argentina; Born: 1 Jan. 1944 in Cordoba, Argentina; B.S. University of Texas, Austin with additional study and research at the Universidad Nacional de Cordoba; Research interests: Distribution and Ecology of the Reptiles and Amphibians of Argentina, especially aspects of feeding biology; SSAR activities; Member in good standing for three years; Publications: 5, all on the ecology and distribution of Argentine amphibians and reptiles.

GEORGE PISANI, Director of Laboratories and Instructor, University of Kansas Division of Biological Sciences. Research interests: Natural history of North American snakes; reproductive biology of snakes. Member of Herpetologists' League since 1964. Charter member of Kansas Herpetological Society. Member of Associaton of Systematics Collections and Sigma Xi. Editor of *ASC Newsletter.* SSAR activities: Member of OHS/SSAR since 1962; editor of *Herpetological Review* for 6 years and *Herpetological Circulars* for 7 years; editor and originator of SSAR's latest venture into a literature referencing service. Publications: 25 (13 refereed), and has edited about 10 books for ASC.

ALAN H. SAVITZKY, Assistant Professor, Department of Biological Sciences, Old Dominion University, Norfolk, Virginia; Ph.D., University of Kansas (1979). Research interests: Systematics and evolutionary morphology of snakes, especially the parallel evolution of specialized feeding and defensive structures; venom delivery systems, hinged dentitions, crushing dentitions, and morphological correlates of aquatic foraging. Member of American Society of Ichthyologists and Herpetologists, American Society of Zoologists, Herpetologists' League, Society of Systematic Zoology. Board of Governors, ASIH (1982-1986). Associate editor, *Contributions to Herpetology* (1982-present). Research Associate, National Museum of Natural History (1983-1986). Publications: 17

HENRI C. SEIBERT, Professor of Zoology, Ohio University, Athens; Ph.D., University of Illinois, Urbana (1937). SSAR activities: Board of Directors (1962 to date); Publications Secretary (1966-1976); Treasurer (1970 to date). Publications: dozens.

SAMUEL S. SWEET, Assistant Professor of Biological Sciences and Curator in Herpetology, University of California, Santa Barbara; Ph.D., University of California, Berkeley (1978). Research interests: Systematics and evolutionary morphology in hemidactyliine plethodontid salamanders (Texas and Appalachians) and analysis of clinal and geographic variation in southwestern snakes; variation and selection in intergrade zones in *Pituophis* and the quantification of cryptic and mimetic color patterns in reptiles; currently compiling a detailed regional book on the herpetofauna of southwestern California. Publications: about 20, including abstracts.

NEWSNOTES

JOSEPH GRINNELL MEDAL

George A. Bartholomew, Professor of Biology at the University of California at Los Angeles, has been selected to receive the **JOSEPH GRINNELL MEDAL IN VERTEBRATE ZOOLOGY** in honor of his distinguished research achievements in scientific natural history. The Grinnell Award commemorates the 75th anniversary of the founding of the Museum of Vertebrate Zoology, University of California, Berkeley, where Grinnell served as its first director and pioneered the development of natural history as a scientific discipline. The award will be presented at a formal ceremony on Friday, 11 November 1983 in Berkeley. ●

HABITAT SYMPOSIUM

A symposium, WILDLIFE 2000: MODELING HABITAT RELATIONSHIPS OF TERRESTRIAL VERTEBRATES, will be held 7-11 October 1984 at Fallen Leaf Lodge (Stanford University's Sierra Camp near Lake Tahoe). It will provide for scientists and managers an up-to-date synthesis of issues in the development, testing, and application of models that predict responses of wildlife to habitat changes. Technical presentations will be given in six non-overlapping sessions. Posters will also be presented; some will be included in the symposium proceedings to be published promptly in journal format. Abstracts of papers are due 15 December 1983; those for posters are due 31 January 1984. *Registration will be limited* and applications filled in order of receipt. Interested persons may obtain registration materials and instructions for submitting abstracts from Dr. Jared Verner, Program Chair, Forestry Sciences Laboratory, 2081 East Sierra Ave., Fresno, California 93710, USA. ●

NATIONAL SYMPOSIUM ON *CALOTES VERSICOLOR*

A Symposium is to be organized on *Calotes versicolor* during late 1984 / early 1985 at Poona/Mysore. It will cover all aspects of this lizard: systematics, ecology, behaviour, anatomy, biology, reproduction, development, endocrinology, immunology, pathology, parasites, etc. It is proposed to publish the proceedings of the Symposium as a monograph containing all available information on *Calotes versicolor*. All scientists working or having worked on *Calotes versicolor* are, therefore, requested to participate in the Symposium. For achieving harmony and coordination a network is being formed of all persons willing to participate in the Symposium. All interested scientists are requested to communicate their participation content to any one of the following.

Professor H. B. Devaraj Sarkar
Department of Zoology
University of Mysore
Manasagangotri, Mysore 570 007 India

Dr. Suresh C. Goel
Department of Zoology
University of Poona
Poona 411 007 India ●

NEW FEDERAL LISTINGS PROPOSED FOR REPTILES AND AMPHIBIANS

On 30 December 1982 the U.S. Fish and Wildlife Service of the Department of the Interior published a review of vertebrate wildlife being considered for listing as endangered or threatened species under the Endangered Species Act (Federal Register, Vol. 47, No. 251). Fifty-two amphibians and 58 reptiles are listed in the proposed rules. Five taxa are listed as extinct, 6 taxa are being considered for listing, and 9 taxa are listed as being more abundant than previously believed and/or not subject to any identifiable threat. Persons working with the proposed taxa should be aware that listing often hampers captive propagation (or other research) programs; they are encouraged to write to the Service and emphasize this aspect of the listing, as well as the importance of habitat protection.

The Fish and Wildlife Service is soliciting comments on the proposed listings from the public. All interested persons in the herpetological community are encouraged to contribute comments and information on the status of the proposed taxa. Comments should be submitted to: Director (OES), U.S. Fish and Wildlife Service, Department of the Interior, Washington, D.C. 20240.

Submitted by **GARY CASPER,** 1857 Third Street, White Bear Lake, Minnesota 55110 U.S.A. ●

OHIO REPTILE SURVEY

An exhaustive survey of reptilian distribution in Ohio has been initiated. I am specifically interested in the following:

A. Distribution data since 1951 of reptiles in Ohio which have not appeared in the literature. Ideally the data should be documented by specimens or clear identifiable photographs, though any information would be valuable.

B. The existence of little-known collections which contain Ohio specimens.

C. Individuals who have collected in Ohio.

If you can be of any assistance please contact:

Douglas Wynn
Westerville North High School
950 Smothers Road
Westerville, Ohio 43081 ●

ECTOPARASITES WANTED

Mites and ticks from reptiles wanted! Preserve in isopropyl alcohol if 70% ethyl alcohol is not available. Assistance also provided to institutions and private collectors wanting assistance with identification of reptilian intestinal parasites; there is no charge for this service.

Send ectoparasites to, or request assistance from:

Sue Barnard
Senior Reptile Keeper
Atlanta Zoological Park
800 Cherokee Avenue, SE
Atlanta, Georgia 30315, USA ●

REPTILE PARASITE SYMPOSIUM

There will be a Symposium on Parasites of Reptiles held during the first week of December, 1983, in conjunction with the annual meeting of the American Society of Parasitologists and the American Society of Tropical Medicine and Hygiene. Titles and speakers are:

Intestinal Protozoa of Reptiles *by* Dr. R. S. Wacha (Drake University)
Hemoprotozoans of Reptiles *by* Dr. S. S. Desser (University of Toronto)
Helminth Parasites of Reptiles *by* Dr. D. R. Brooks (University of British Columbia)
Arachnid Parasites of Reptiles *by* Dr. Harry Hoogstraal (Cairo, Egypt)
Pentastomids of Reptiles *by* Dr. J. T. Self (University of Oklahoma)
Veterinary Aspects of Reptile Parasitism *by* Dr. B. Raphael (Dallas Zoo)

All herpetologists are invited to attend this symposium being held at the Convention Center in San Antonio, Texas. Further information may be obtained from:

Dr. Robert E. Kuntz
14794 Cadillac
San Antonio, Texas 78248, U.S.A.
512-492-1735 ●

B.H.S. PUBLISHES SEA TURTLE CONSERVATION BOOK

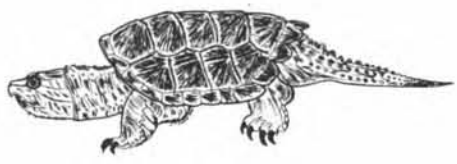
The British Herpetological Society has recently published a critical review of the current problems and controversies of sea turtle conservation. *Conserving Sea Turtles,* by Nicholas Mrosovsky, is of interest to general readers as well as the specialist biologist. The book is concerned with the methods being used to achieve that end; it argues that much is wrong.

The price of this book is:

U.K. £5.00 + 75p postage (surface)
or £2.80 (airmail)
U.S.A. $10.00 + $1.00 postage (surface)
or $5.00 (airmail)

International money orders and checks should be made payable to the British Herpetological Society and sent to:

Dr. S. Townson
British Herpetological Society
c/o Zoological Society of London
Regent's Park, London, NW1 4RY
ENGLAND ●



FACSIMILE OF *BRITISH JOURNAL OF HERPETOLOGY* VOLUME ONE 1948-55

The *British Journal of Herpetology* is published by the British Herpetological Society. The first eight numbers of Volume One, 1948-53, were edited by Prof. Angus Bellairs. Just thirty years since being the editor and on the occasion of his retirement, the Society wishes to honour Prof. Bellairs's contribution to herpetology and announces that *hard-bound* facsimile copies of Volume One of the *British Journal of Herpetology* will be made available at the end of 1983. At twelve numbers per volume (two yearly), Volume One consists of 228 pages. The facsimile will be approximately A5 in size. (Back numbers of the journal are at present sold at £3.00 ($5.50) each).

Copies will be available at a special pre-publication price of £7.50 ($11.50) to non-members of the British Herpetological Society and £5.00 ($8.00) to members. After publication by 31st December 1983, the price will be £12.50 ($19.00) to non-members and £10.00 ($15.50) to members. Prices do not include £0.50 ($1.00) surface postage and packing. Should pre-publication requests be insufficient to cover production costs and the project fails, subscribers will be returned their contributions. But every effort will be made to avoid this.

The British Herpetological Society (founded 1947) is probably the first nationally formed society for the study of amphibians and reptiles in Europe, as well as in the Commonwealth. The *British Journal of Herpetology*, presently edited by Dr. R.A. Avery, is now in its sixth volume. The first volume, besides recording aspects of the early development of the society and herpetology in Britain, includes some classical papers and others of historical interest. The first distribution maps of the herpetofauna of Britain and Ireland compiled by vice-counties by Col. R.H.R. Taylor (1948) make up the first number. Subsequent numbers include a paper on hybridization between the 'green frogs' *Rana esculenta* and *R. ridibunda* by L.C. Mandeville and Helen Spurway, phenological reports on frog *(Rana temporaria)* and toad *(Bufo bufo)* breeding in Britain and a note on the distribution of herpetofauna in the Channel Islands by Dr. J.F.D. Frazer (BHS President 1955-81), a review of snake limbs by Prof. A. d'A. Bellairs, a paper on the influence of the climate of Britain and Ireland on the habits and distribution of the herpetofauna and various notes by the Society's founding President, Dr. Malcolm Smith, and a pioneer paper on toad *(Bufo bufo)* migration by H.J. Moore at Clayesmore School, Dorset.
The last four numbers were edited by Dr R. Maxwell Savage.

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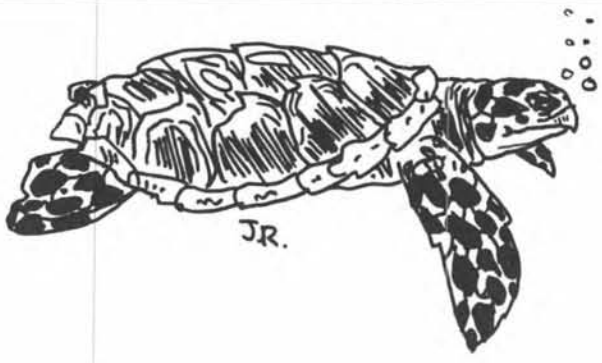
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HERPlab: A HERPETOLOGY LEARNING CENTER

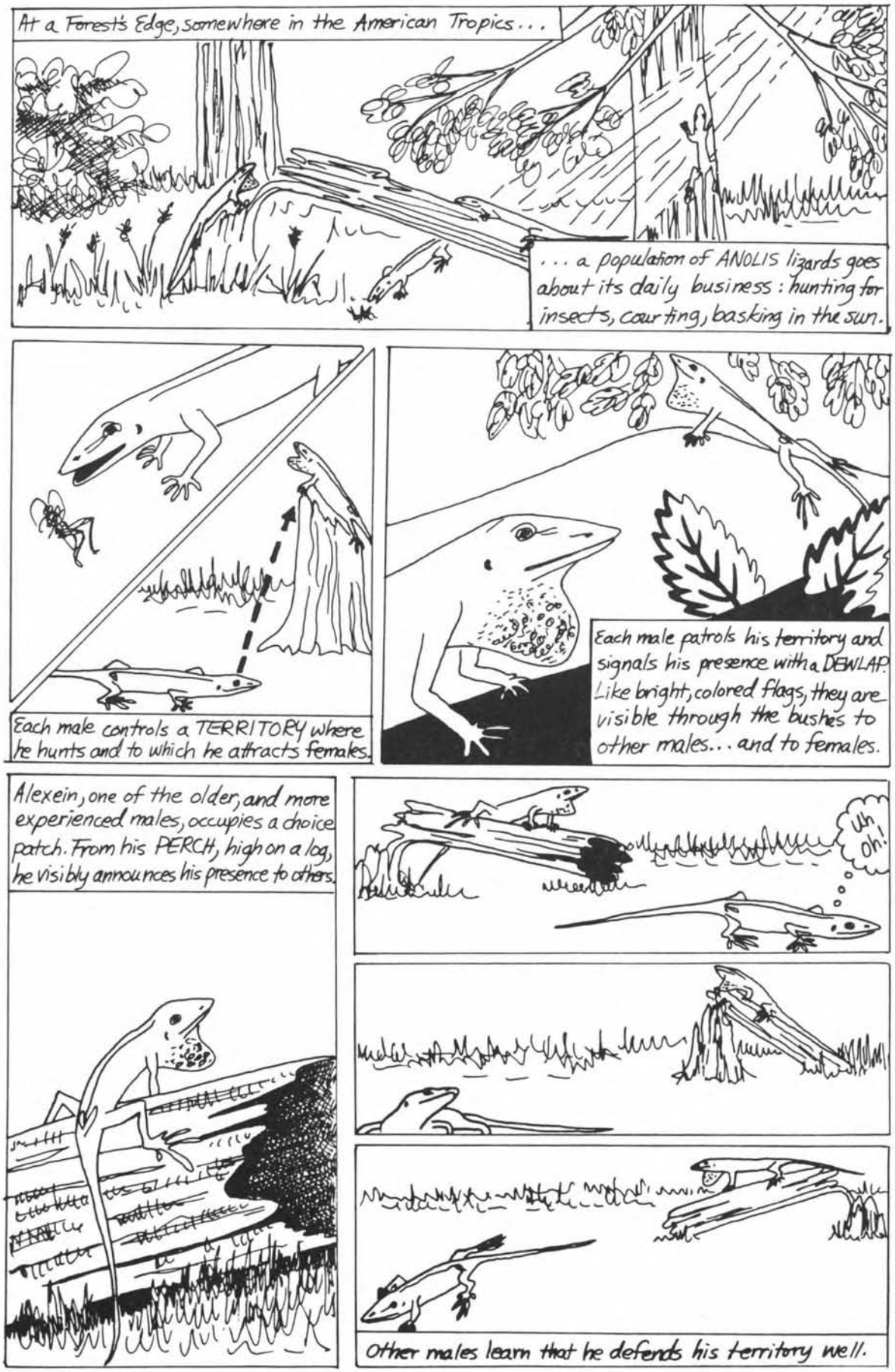
In the center of the newly renovated Reptile House at the National Zoological Park is a new family classroom where zoogoers can learn about herpetology. This classroom, called HERPlab, was developed by the Zoo's Office of Education and Department of Herpetology through a grant from the National Science Foundation. The purpose of the HERPlab project was to develop a core of interactive educational materials that would enable families to learn more about zoology when they visit a zoo. Although the materials focus on herps, the concepts around which they are designed are general ones—e.g. anatomy, behavior, communication, feeding—and apply to other taxons as well.

To help ensure that the materials had general applicability and might be of use to places besides the National Zoo, two other zoos joined the project as field test sites: the John Ball Zoo in Grand Rapids, Michigan, and the Philadelphia (PA) Zoo. Both received copies of the HERPlab educational materials and set up areas to try them out with their zoogoers.

The HERPlab materials are aimed at the variety of ages you might expect in a family group. Thus zoogoers of various learning levels will find something of interest. Activities range from simple sorting games and puzzles to more complicated conceptual activities dealing with topics such as anatomy and social behavior. A small library with children's books as well as advanced reference texts supplements the HERPlab materials.

The lab is about the size of a small classroom and holds 20 to 25 people comfortably. To avoid crowding, a free ticket system regulates visitors on busy days. The lab is a pleasant environment, furnished with tables and chairs. Along the walls are a few exhibits, but the majority of the materials are contained in activity boxes located behind a check-out counter—as in a library. When visitors enter the lab, they receive a list of these activities and may select what interests them to use during their visits. They can take an activity box to a table and are free to explore its contents. The lab is staffed by one or two volunteers from the Friends of the National Zoo (FONZ). They work as facilitators to help visitors use the materials and find answers to their questions.

There are currently 14 activity boxes, with a few additional ones being developed. Most are based around objects like bones or eggs, or are games. Four, however, focus on a live animal: SNAKE, FROG, LIZARD, TURTLE. SNAKE, for example, lets visitors look closely at and learn about a live corn snake. The animal is housed in a clear plastic box which is secured on a special plastic stand with a mirror on the bottom. This arrangement allows viewing from all sides without moving the box and possibly stressing the animal. The corn snake *(Elaphe guttata)* is a tractable species as are all those used for the live animal activity boxes. Individuals are rotated so that no one animal is used consecutively.


At a Forest's Edge, somewhere in the American Tropics...
... a population of ANOLIS lizards goes about its daily business: hunting for insects, courting, basking in the sun.
Each male controls a TERRITORY where he hunts and to which he attracts females.
Each male patrols his territory and signals his presence with a DEWLAP. Like bright, colored flags, they are visible through the bushes to other males... and to females.
Alexein, one of the older, and more experienced males, occupies a choice patch. From his PERCH, high on a log, he visibly announces his presence to others.
Uh oh!
Other males learn that he defends his territory well.


Reptile Keepers

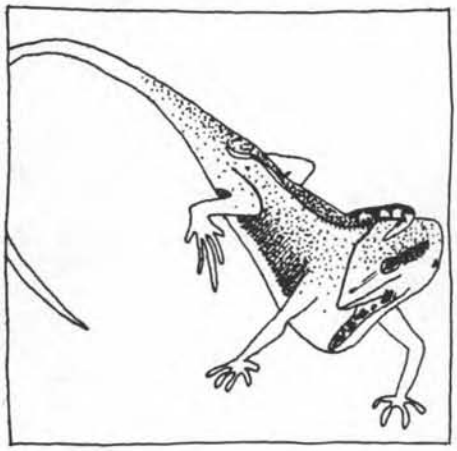


Time out. Stop and size up the situation.



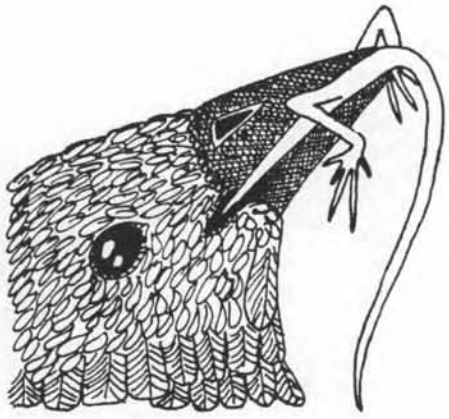
Stand Still

Put your best side forward. Flatten yourself sideways and appear taller.



Gain 1

A big bird picks you off.



Game over. You lose.

Play the game again. If you draw this card again, ignore it and keep playing.

Accompanying the boxed animal is a packet of observation cards that encourage visitors to look closely at and think about the animal. Questions like "Why do you think the snake keeps sticking out its tongue?" focus attention on the sensory capabilities of the animal and lead to further questions and answers. Short answers in fairly simple language are provided for parents to read to children. Information in smaller print provides more details for those with more interest.

There are similar activity boxes for three additional species: African bullfrog *(Pyxicephalus adspersa)*, Eastern box turtle *(Terrapene carolina)*, and leopard gecko *(Eublepharis macularis)*. All species are rotated on a daily basis, similar to the method used with the corn snake.

The activity box TERRITORY is a board game with the board painted to resemble the woodland home of an anolis lizard. Each player takes the role of a lizard: one is the resident defending his territory, the other is the intruder. The game is constructed to teach certain things about territoriality and behavior. Displays are described clearly with drawings and in functional contexts. Players take turns drawing cards that describe these behaviors and determine their moves on the board. For example, "You flag your dewlap, but the resident ignores it. Better luck next time. LOSE 2." "Give it your all. Do a full display—head bobs, flags, and push-ups, all at once! GAIN 4." By the end of a game, both players have sampled the repertoire of *Anolis* aggressive behavior. Included in the game is a comic book called "Leaping Lizards" that describes a typical aggressive encounter.

Activity boxes include a range of materials and topics. TURTLE BONES is an anatomy puzzle built around a skeleton. COMMUNICATIONS includes the sounds of frogs and lizards. EGGS offers shells, larvae, and a guided quiz to explore the topic of reproduction. Additional boxes include VENOMOUS SNAKES, REPTILE OR AMPHIBIAN?, ENDANGERED HERPS, REPTILE KEEPERS (husbandry), SKULLDUGGERY (teeth and eating), and HERP SORTING CARDS.

In addition to the activity boxes, there are some interactive exhibits and film loops. The purpose of these 8 mm films is to show some common behaviors which a visitor frequently misses in the Reptile House. Four loops were produced for this project: Eating, Snake Feeding, Locomotion, and Lizard Aggressive Behavior. A written guide accompanying each loop discusses important points to observe.

One of the interactive exhibits is called LIZARD WORLD. It is a display which includes three tanks of pairs of *Anolis carolinensis*. Visitors can participate in an on-going experiment about *Anolis* color change. Equipped with an observation sheet, they are encouraged to try out the scientific method, observe, and record carefully. The data collected by the visitors are recorded, tallied, and graphically represented next to the tanks.

Another display, REPTILE KEEPERS, contains information on husbandry and keepers' tools such as snake hooks, triple beam balance, and boots. Visitors can try on the boots and use or examine the other objects. Nearby, two glass doors permit viewing behind the scenes so visitors can actually watch keepers at work.

HERPlab has been open since October 1, 1982. Formal evaluations were conducted there and at the field sites for the first two months. As a result a few changes are being made in the materials. In general, however, the overall response of the visitors at all three sites was overwhelmingly positive, and our concern at the present time is finding ways of sharing the results of this project with other interested zoos and nature centers. We encourage any of you who are interested in finding out more about this project to visit the lab or contact us at the National Zoo.

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Natural Nest Sites and Brooding Behavior of *Eumeces fasciatus*

Nesting sites of *Eumeces fasciatus* have been frequently observed (e.g., Cagle, 1940; Fitch, 1954; McCauley, 1939). We report further observations stressing arboreal nesting, the distribution of nest sites, and brooding behavior in natural and artificial sites.

On 22 June 1982, a decaying stump of a hardwood tree and a log leaning on the stump were examined on a small island (ca. 500 x 50 m) in a cypress swamp at the mouth of Steel Creek on the Savannah River Plant, Barnwell Co., South Carolina. Respective diameters of stump and log were approximately 1 m and 0.8 m. Some of the woody surfaces were bare, and most of the remaining bark was loose and easily removed. Sections of the wood had been reduced to sawdust by beetle larvae. Removal of bark and outer layers of loose wood exposed five adult female *E. fasciatus* and four clutches of eggs. The clutches contained 5, 6, 8 and 10 eggs. One of the clutches

was found on the elevated log about 1.5 m above the ground. The remaining clutches were found in distinctly separated locations on the stump, but all were approximately 1 m above ground. All four clutches were deposited on sawdust.

A more thorough search of the rotting logs and stumps on the entire island was conducted on 2 July 1982. Two isolated clutches were discovered. A female was brooding one clutch of nine eggs on sawdust in a rotting log approximately 2.3 m long and 15 cm in diameter. This log lacked bark and was hard on the outside, but soft on the inside. The other clutch was located approximately 10 m above ground in the decaying stump of a hardwood tree, which had a diameter of 0.6 m at the base. Four eggs, one hatchling, and a female were located in soft wood.

Although *Eumeces fasciatus* is often considered less arboreal than the larger *E. laticeps* (e.g., Smith, 1946; Mount, 1975), it readily climbs trees while foraging and avoiding predators (Fitch, 1954; Fitch and von Achen, 1977). In Swamps in central Alabama, Georgia and on the Savannah River Plant, we have frequently observed *E. fasciatus* on living and dead trees at heights greater than three meters. However, nest sites have not been previously reported at this height. We suggest that a quantitative assessment of perch heights and nest heights in woodland habitats is necessary to evaluate the vertical niche characteristics of *E. fasciatus* and the other southeastern members of the *fasciatus* group.

The occurrence of four clutches in close proximity combined with our inability to locate more than two isolated clutches in the surrounding area strongly suggests a clumped distribution of clutches. Since there was a notable lack of other large stumps at a suitable stage of decomposition in the area searched, the observed grouping of clutches presumably represents a response to scarcity of nesting resources, an explanation suggested by Fitch (1954). Fitch also suggested that gregarious and communal nesting might provide increased protection of each clutch from small predators while the female leaves the nest to forage. If gregarious nesting occurs primarily because it is selectively advantageous due to reduction of egg predation, it should be the norm even when nesting sites are abundant. However, no data are available to indicate the relative importance of resource limitation and protection of eggs to the establishment of nests in close proximity or to reveal possible density-dependent effects on nest predation.

Peeling bark and wood by hand and potato rake obscured the three-dimensional relationships between females and eggs in all but one of the elevated nests, but it was apparent in that instance that spatial relationships between female and eggs are more complex in natural nesting sites than descriptions in the literature indicate. The relatively undisturbed brooding site consisted of a small open cavity with a wide mouth and front chamber behind which the opening became shallower, narrowing into shallow passages, one running to the right and slightly up for several cm, and another running several cm above and behind the main chamber. When the cavity was exposed, the female was coiled in the front chamber, which had a shallow sawdust substratum and contained no eggs. Six eggs were found on or in nearly dry sawdust in deeper portions of the brooding chamber. In the recess extending to the right, four eggs, including one which had shriveled, were located at the level of the female and slightly above her. Two eggs were found in the other recess, approximately 8 cm above the female and slightly behind the main cavity. The closest members of the two groups of eggs were separated by a distance approximately equal to the female's snout-vent length (66 mm).

Skinks brooding eggs on two-dimensional cage bottoms usually gather the entire clutch into one or two tightly clumped groups about which or between which the female lies in one of three characteristic postures. Noble and Mason (1933) reported that although no fixed position is assumed, the most frequent arrangements of the female's body are a semicircle surrounding the eggs, an s-curve in which eggs are located in both concave portions, and a straight line among or over the eggs. However, these arrangements may be impossible in the confined three-dimensional chambers of some natural brooding sites. Spatial constraints may prevent females from gathering all the eggs into closely juxtaposed groups. Because pockets of sawdust are found in channels between relatively solid wood, single eggs or small groups may be placed in separated locations. Furthermore, brooding sites in vertical structures such as tree stumps usually have irregular, sloping surfaces on which the eggs are deposited. As a result of these spatial features of brooding sites in logs and stumps, eggs may be simultaneously above and below the female and separated from the female and other eggs.

Our observations suggest further studies of three natural historical aspects of *E. fasciatus*. First, regular use of trees for foraging and escape in at least three southeastern states and arboreal nesting suggest that more of the woodland habitat is available to *E. fasciatus* than has been suspected, especially in swamps. Second, in natural nest cavities spatial constraints may necessitate more complex brooding behavior than has been observed in laboratory settings. For example, it may be impossible for some females to gather their clutches into one or two compact clusters and maintain nearly continuous contact with them. Egg rolling, egg movement, and brooding postures in three-dimensional simulated natural nest cavities may all differ from the published accounts based on observations on flat cage bottoms (Nobel and Mason, 1933; Evans, 1959). Since *E. fasciatus* nests frequently in spaces containing large amounts of sawdust, females presumably must modify natural nest sites to a greater extent than revealed by the formation of small clearings in sphagnum moss or wood debris (Evans, 1959; Noble and Mason, 1933). *Eumeces fasciatus, E. laticeps,* and *E. inexpectatus* in our laboratory (Cooper and Vitt, unpublished observations) burrow in sand readily by using the snout as a wedge and dig holes with the forelegs in a manner similar to that described for *Anolis carolinensis* (Tokarz and Jones, 1979). Such behaviors are probably employed in nest construction.

Finally, the aggregated distribution of detected nest sites suggests that optimal nest sites may be scarce. Future studies should compare the distribution of suitable nest sites to that actually observed to determine the degree of aggregation. Comparison of nest predation rates on isolated and aggregated nests would reveal whether there is a selective advantage of communal nesting due to more effective guarding of the nests by several females, as suggested by Fitch (1954).

ACKNOWLEDGMENTS

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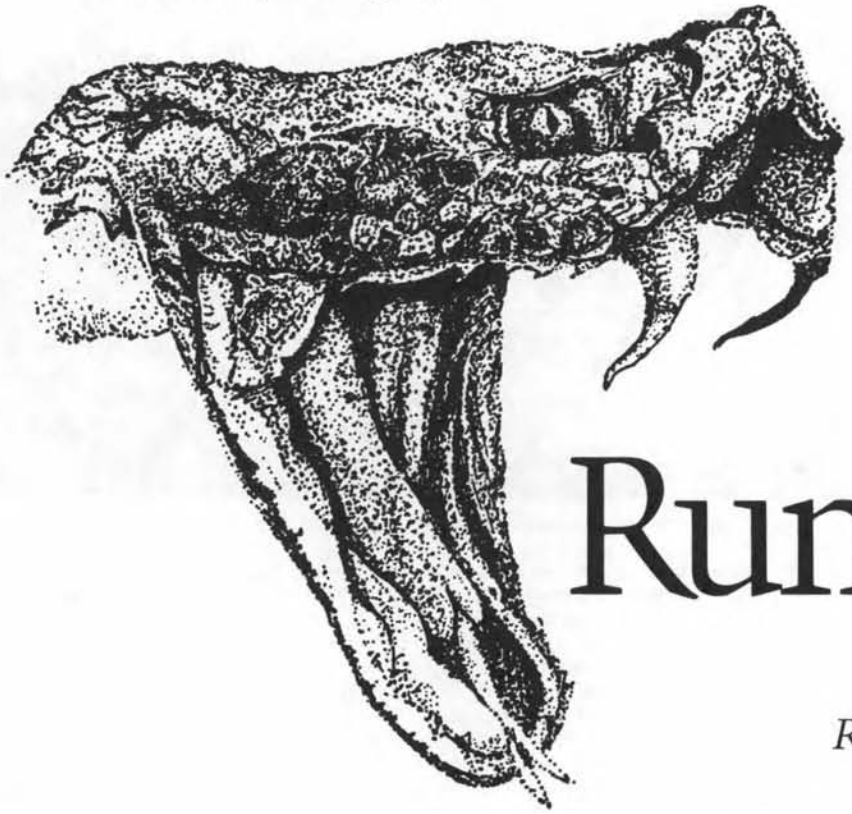
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NATURAL HISTORY NOTES ON THE FIJIAN GROUND FROG (RANIDAE: *PLATYMANTIS VITIANUS*)



Fig. 1. Adult female *Platymantis vitianus* (USNM/FS 30762). Dorsolateral aspect.

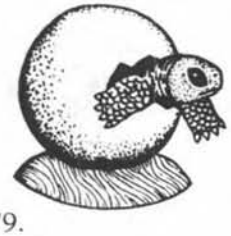
Fiji has two endemic species of frogs: *Platymantis vitianus*, the ground frog, and *P. vitiensis*, the tree frog. The tree frog is relatively common on the islands of Ovalau, Taveuni, Vanua Levu, and Viti Levu (Pernetta and Watling, 1979) and is an inhabitant of leaf axils of pandanus in low-lying marshy areas or along mountain streams (Gorham, 1968; Pernetta and Goldman, 1976). In contrast, the ground frog is rarer on these same islands and usually stated to be an inhabitant of rocky forest streams and rivulets (Gorham, 1968; Pernetta and Goldman, 1976). During a brief stay on Ovalau in May 1982, I had the opportunity to observe and capture several *P. vitianus* in circumstances "unusual" for this species and, herein, summarize my observations.

Of the five ground frogs seen, none were in close proximity to a stream with running or standing water. All were on hill sides or ridge tops, at approximately 200 m or more above sea level, and 100 m or more from the nearest permanent stream. An adult female and juvenile male (USNM/FS 30762-63, respectively) were captured on the northeast facing ridge (*ca.* 200 m elevation) immediately behind Levuka in the remnant of a rainforest with a thinly closed canopy and heavy ground litter (4-5 cm deep). The frogs were captured within 4 m of one another in the litter associated with a giant Fijian heliconia. The female was discovered beneath a fallen and rotten heliconia stalk and dead fern root mass in the midst of a low terrestrial fern clump; the male was in basal litter of a heliconia clump. Although it was not evident at first, both sites lay in a temporary stream channel — slope 45-60° — which probably bore water only briefly during the heaviest rains; the nearest permanent stream was downslope at least 300 m away. The frogs when first observed were beneath the litter near the soil (soil temperature 24.5° C; moist but not wet, *i.e.*, could not be rolled into a ball; air temperature 27° C). The female's escape behavior was to move forward and bury deeper in the litter, a scurrying movement with no attempt to jump. The juvenile male made short jumps/dives into the litter, although there was no attempt to move from the base of the heliconia clump. Two immature females (USNM/FS 30778-79) and an escapee were discovered in litter associated with yaqona (Piper methystictum) plantations (*ca.* 250-300 m elevation) along the Draiba-Lovoni trail on the southeastern slope of a mountain. One female was hidden beneath a small log in the middle of a yaqona patch, lightly shaded by widely spaced legume trees with a thin ground cover of fallen legume leaves; she was partially buried in rotten wood and soil (soil and air temperature of 25° C; soil moist but not wet). The other female and an escapee were beneath a heap of cut cassava branches lying in thick (10-20 cm high) grass at the edge of a yaqona patch. This was a damper site with more vegetative litter and both frogs made quick short jumps moving downward and forward through the litter. The quick movements and depth of the litter in the brush heap made capture difficult. A *Bufo marinus* shared this hiding place and showed a similar escape behavior. The nearest permanent stream was 100-150 m downslope from both sites, and only the second site may have lain in a runoff channel, although a strong erosion pathway was not evident. The second site was likely shaded for at least part of the day by a small tree.

Upon capture, all four frogs were dark shades of brown. The two Levuka specimens lightened somewhat to a olive brown dorsal ground color with dark brown spots and



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Fig. 2. Closeup of head of an adult female *Platymantis vitianus* (USNM/FS 30762). Anterolateral aspect.

beige axillary spots (Figs. 1 & 2). One of the Draiba females shared this coloration, the other lightened to a golden beige ground color. All possessed light axillary spots. The physical dimensions are summarized in Table 1. Only the Levuka female is sexually mature, but not gravid. Her ovaries contain at least two sizes of follicles (vitellogenic ones *ca.* 0.9-1.2 mm in diameter and previtellogenic ones 0.2-0.4 mm). The Draiba females are immature with numerous small (0.1 mm) previtellogenic follicles giving the ovary a granular appearance. The male is likely immature; its testes are ellipsoidal, 6.5 mm in length, apparently lobulated with each lobe externally outlined by melanocytes. Both Fijian *Platymantis* are believed to be voiceless (P. Ryan, *pers. comm.*), and this male lacks vocal sac openings, although absence in this case can also be attributed to immaturity.

The Fijian ground frogs appear to be opportunistic carnivores. All four frogs had stomachs full of arthropods, although only in one specimen did the volume of prey fully distend the stomach wall. The prey of two individuals included millipedes; two had eaten ants, two had eaten beetles, and two had eaten orthopterans. The large female also had eaten two large pieces of plant matter, presumably swallowed accidentally. There was no gross difference in prey size among the frogs in spite of their disparate sizes.

SUMMARY

Platymantis vitianus is not restricted to heavily canopied forest streams, but occurs in disturbed habitats with incomplete canopies and distantly removed from permanent streams. In such circumstances, the frogs live beneath vegetative litter and, if uncovered, attempt to escape by burrowing deeper in the litter. *P. vitianus* occurs microsympatrically with the introduced *Bufo marinus*.

ACKNOWLEDGMENTS

Field work in Fiji was made possible by The Max and Victoria Dreyfus Foundation and the Smithsonian Scholarly Studies Program. The School of Natural Resources, The University of the South Pacific, provided laboratory facilities. W. R. Heyer reviewed an early draft of this manuscript. I wish to thank all of the above for their generous assistance.

Table 1. Body dimensions of recently captured *Platymantis vitianus* from the Levuka area of Ovalua. All weights are in grams and measurements in millimeters.

Catalog Number	Sex	Body Weight	SV Length	Tibia	Foot	Head Length	Head Width	Ear-Naris	Internarial
30762	F	72.0	91.6	43.6	64.7	41.6	37.3	11.0	7.4
30763	M	4.0	37.0	16.6	26.1	15.9	13.1	4.4	3.1
30778	F	8.6	50.1	25.7	40.1	22.0	19.0	6.0	4.2
30779	F	10.1	50.9	25.8	38.4	23.0	19.3	6.0	4.4

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TRAUMA-INDUCED DEVELOPMENTAL VERTEBRAL DISPLACEMENT (RHOECOSIS) IN A GARTER SNAKE

ABSTRACT A case is reported for the Great Plains Garter snake, *Thamnophis radix haydeni*, of acute kypholordosis and scoliosis resulting from partial displacement of the vertebral column opposite the 54th ventral, causing injury to the spinal cord and ensuing traumatic partial amyoplasia. It is the most acute case of its kind ever recorded in snakes, the only one not of congenital origin, and only the second one not promptly lethal. The literature on the subject is reviewed for vertebrates in general, and the term rhoecosis is proposed to embrace all kinds of vertebral displacement.

Key words: rhoecosis, kyphosis, lordosis, scoliosis, snakes.

Vertebrates of several classes have been reported to show anomalous distortions of the vertebral column. In general they take three different forms. Displacement in a sagittal plane, especially dorsad and hence usually thoracic, is regarded as kyphosis (humpback); if it is ventrad, hence usually in the lumbar or cervical regions, it is designated as lordosis (sway back). Displacement in a frontal plane, to either side, is scoliosis (lateral curvature). All conditions may occur to different extents within the same animal. We here report a nearly mature snake exhibiting spontaneous occurrence of all three conditions.

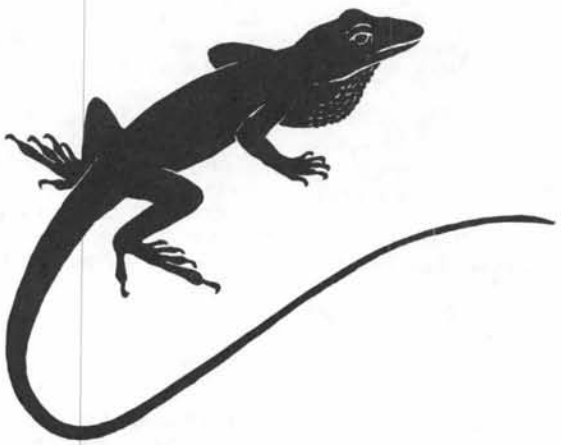
No generic term exists to embrace all kinds of distortion of the vertebral column. We propose the term "rhoecosis" (from the Greek "rhoikos," meaning crooked) to serve in that context.

In mammals many cases of all three kinds of rhoecosis listed above have been documented, with disease, trauma, degenerative or genetic conditions listed as primary causes although many cases are regarded as idiopathic. A BIOSIS search through Biological Abstracts from 1969 through 1981 reveals 611 references to mammalian rhoecoses, covering experimental as well as spontaneous occurrences. Much of the former concerns hormonally-controlled behavioral lordosis in rodents (e.g. DeBold and Whalen, 1975), but considerable experimental work has been done on other aspects of anomalous vertebral columns in various mammals (e.g. Canadell et al., 1978; Spencer and Zorab, 1976). Numerous descriptions exist of spontaneous occurrences in horses (e.g. Jeffcott, 1980) and other domesticated animals, and in humans (e.g. Swank et al., 1981; Winter et al., 1979).

The same search, over the same time-span, revealed far fewer works on rhoecosis in other classes of vertebrates, with 24 on birds (e.g. McCarrey et al., 1981; Rigdon, 1971;

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Riggins et al., 1977; Wise, 1977); 33 on fishes, (e.g. Austin and Hickey, 1973; Couch et al., 1977; Dorfman, 1972; Kroger and Guthrie, 1971; Moore and Burton, 1975); two on amphibians (Browder, 1972; Hadeen, 1976; both concern anurans); and four on reptiles.

The literature on reptiles is limited to turtles, lizards and snakes. Plymale et al. (1978) summarize the rather extensive literature on turtles, to which we add White and Murphy (1972). Grogan (1976) notes two records in the literature on lizards *(Agama* and *Lacerta),* and adds one record of his own *(Agama).* Although Grogan (op. cit.) states that "scoliosis is evidently a well known phenomenon in snakes," we find but one explicit record (Progscha and Lehmann, 1970), for *Sanzinia madagascariensis,* in which four of twelve young born in captivity exhibited scoliosis and kyphoscoliosis. Only one of those four survived more than a brief period after birth, and that one exhibited relatively mild vertebral deformities.

Hence a rhoecotic subadult Western Plains garter snake, *Thamnophis radix haydeni* (Kennicott), taken in early May, 1981, in Boulder, Colorado, is of special interest.

This specimen, alive at present writing, is a male measuring 338 mm s-v (June 22, 1981), tail 109 mm, possessing the characteristics typical of the subspecies: lateral light stripe on the 3rd and 4th scale rows, a relatively short tail, a yellow-orange vertebral stripe, a double row of alternating black spots between vertebral and lateral stripes, and a single row ventral to latter; vertical bars on lips; scales in 21 rows at neck and at midbody, ventrals 163, caudals 82, anal entire.

The anterior third of the body of this animal appears normal externally, whereas throughout the full length of the rest of the body and the tail the vertebral column is strongly sinuous, mostly in the sagittal plane. The ventral scales are spaced as is normal on the anterior third of the body, but elsewhere on the venter they are telescoped to no more than about two-thirds their normal length. The caudal scales are similarly reduced in length.

Sensory and motor functions persist throughout the body and tail, indicating that the innervation of the posterior myotomes is not interrupted completely although perhaps impaired. Also the snake demonstrates almost normal motions although the rear venter and tail are held partially rotated laterally at times and often seem to be dragged rather than participating in movement. In general the snake appears to be in good health and feeds (on earthworms) avidly.

Lateral and dorsal-ventral radiographs of this animal were taken to determine the extent of the vertebral malformations. As can be seen in Figure 1 (dorsal-ventral radiograph) the vertebral column is normal in the anterior third of the body, but at the level of the 54th ventral is sharply displaced to the right (scoliosis). Posterior to this point, as seen in Figure 2 (lateral radiograph), the entire rest of the body and tail display dramatic dorsoventral sagittal (kypholordotic) deviations.

The cause of the kypholordosis in this specimen is almost certainly due to some postembryonic trauma, at the level of the 54th ventral. The resultant vertebral displacement

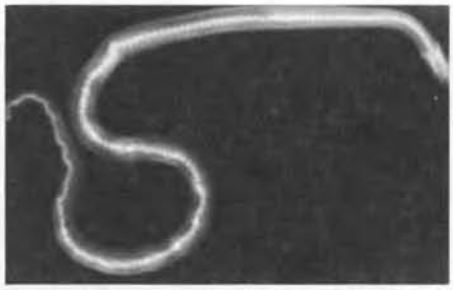


Figure 1. Dorsoventral radiograph of a rhoecotic specimen of a garter snake, *Thamnophis radix haydeni.* Total length 447 mm.

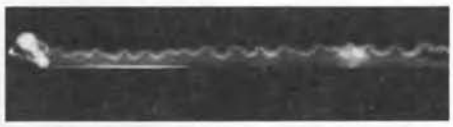


Figure 2. Lateral radiograph of the snake shown in Fig. 1. The anterior end (right) is shown only immediately in front of the site of presumed original trauma. The tail is turned toward the viewer, hence several parts appear superimposed.

presumably severely injured the spinal cord but did not sever it. The motor neurons of the ventral funiculi were probably damaged, so that the myotomes posterior to the site of injury could not develop normally, although growth was not inhibited completely. It appears that the vertebral column and other trunk organs and structures, however, continued to grow at the same rate as before, and hence became progressively more convoluted or telescoped as their size increased while the body wall remained the same or grew more slowly. In this case, then, kypholordosis and scoliosis are apparently a product of traumatic partial amyoplasia following trauma of the spinal cord.

There is only very slight evidence externally of the trauma suffered by the vertebral column; one scale in the 7th scale row opposite the 54th ventral is abnormally short, broad, smooth (lacking a keel) and fused with the diagonally adjacent posterior scale in the 6th row. The diagonally adjacent anterior scales in the 6th and 8th rows are also abnormal in having a short keel, absent on the posterior third of each scale. This small scar suggests a puncture. The site of vertebral displacement is readily evident as a bulge on the right side of the body. Elsewhere the columnar distortions are clearly apparent as middorsal bulges separated by depressions of varying length. Fourteen medial bulges are evident externally on the trunk, perhaps as many as thirteen on the tail; the latter number is uncertain because of the small sizes involved, particularly toward the tip of the tail. The terminal 20 mm of the tail has lateral as well as dorsoventral columnar displacement.

The radiographs reveal good to normal bone density with no sign of degenerative bone disease or resorption as the origin of the kypholordosis; thus trauma can almost certainly be implied as the cause of this malformation. The presence of the scar at the initial site of the disorder would appear to confirm this.

The peculiar appearance of the vertebral column throughout much, but not all, of the kypholordotic region, as though exhibiting dorsal spina bifida, is apparently an illusion resulting from a slight sinistral torsion of the body as a whole or of the vertebral column alone. Thus the vertebral column is viewed dorsolaterally in those parts rather than directly dorsoventrally, as in the anterior third of the body.The scattered hiati in the vertebral column are situated at the apices of kyphotic flexions. The only obvious anomalous vertebral osteosis lies on each side of the trauma at the 54th ventral, where two vertebrae appear to be partially fused.

Whether the condition has stabilized or will become progressively more acute as the animal grows further is unknown, but depends upon the nature of the dysfunction of the motor nerves and whether the disturbance of the myotomal growth rates was incidental or is on-going. The condition cannot be expected to diminish with time or to improve as the animal grows, except perhaps in proportion if growth rates are maintained in synchrony. The developmental damage has been done and is irreversible.

At present, the animal is being kept alive to monitor the progress of the condition. In due time the spinal cord will be sectioned to determine the histological extent of the trauma at the level of the 54th ventral, and gross dissection will be undertaken to ascertain the effect of such extensive kyphosis on the abdominal viscera and upon the myology of the body wall. In the meantime, it is evident that the kyphotic condition of this snake is a product of uncoordinated rates of growth of myotomes and the skeletal system.

In summary, this case is noteworthy especially for its susceptibility to causative diagnosis and the longevity of the subject, as well as for the extreme development of rhoecosis and the rarity of records of such anomalies among serpents. It is the only case in snakes not of congenital origin, and it is an excellent demonstration of the separate endogenous controls of growth rates of the axial skeleton and its somatic musculature.

ACKNOWLEDGMENTS

We are much indebted to Jerry Niemeyer, who found the snake and gave it to us; to Dr. Robert C. Eaton, for counsel; to Gwen Hantsbarger for radiographic assistance; and to David Fagerstrom for the BIOSIS search. The latter is available on request from the senior author.

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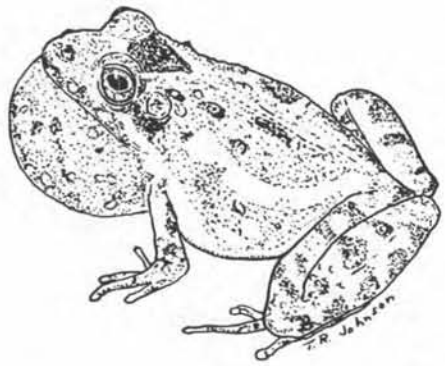
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CAUDATA

PLETHODON CINEREUS (Redback Salamander). **COLORATION.** An erythristic *Plethodon cinereus* was found 23 August 1977 near Raccoon Creek, Springfield Twp., Erie Co., PA. The collection site is located on the proposed U.S. Steel Lakefront Plant Site, Conneaut, Ohio.

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The salamander appears to be quite similar in appearance to Reid's (1908. Am. Nat. 42:460-464) Fig. 7 of an erythristic form. The primary differences between our specimen and Reid's are that approximately 80% of the lateral and ventral surface of the tail of our specimen is black compared to only the distal half of the tail in Reid's, and our specimen has less black pigment along the lateral edges of the dorsal stripe and head. In life those regions of the body lacking melanin were a light orange color.

A second salamander captured 18 May 1977 near Raccoon Creek shows a weakly developed erythristic arrangement. In this animal there is appreciable melanin reduction on the ventro-lateral surfaces, the dorsum over the front limbs and the front limbs. In life these regions were a yellowish orange in color. There was also less melanin present on the ventral surface than expected in the normal striped form.

Erythristic forms were not found after extensive collecting along Turkey Creek, 3 km west of Raccoon Creek or near the mouth of Elk Creek, 16 km east of Raccoon Creek.

Tilley, et al. (1982. Herpetologica 38:409-417) recently summarized the distribution of the erythristic form of *Plethodon cinereus* in northeastern U.S. and Ohio. While this is apparently the first report of the erythristic phase in Pennsylvania, the collection site is only 96 km southwest of the nearest New York record (Reid and Wright, 1909. Proc. Amer. Phil. Soc. 48:370-459) and 40 km east of collection sites reported by Pfingsten (1969. J. Herpetol. 3:104-105).

The specimens were collected during the course of field work while employed by Aquatic Ecology Associates, Pittsburgh, PA. The U.S. Steel Corporation kindly granted permission for additional field work on their property. The specimens were deposited in Carnegie Museum (CM-91432, 91433).

Submitted by **CHARLES F. MUELLER** and **MIKE HIMCHAK,** Department of Biology, Slippery Rock State College, Slippery Rock, Pennsylvania 16057 USA. ●

SAURIA

CNEMIDOPHORUS GULARIS (Texas Spotted Whiptail). **HIBERNATION.** Other than reports by Trauth (1977. Herp. Review 8:33), Sellers, et al. (1980. J. Herpetol. 14:185-187), and Etheridge, et al. (1983. Copeia 1983:206-214) on the collection of large numbers of hibernating *C. sexlineatus* and by Bostic (1966. Southwest. Nat. 11:275-289) on the excavation of 25 *C. hyperythrus*, published information on hibernation in species of *Cnemidophorus* is largely anecdotal. The following describes a successful attempt to excavate hibernating *C. gularis*.

In January, 1983, Drs. J. W. Wright and J. P. Karges (Los Angeles County Museum of Natural History) expressed to me the need for hibernating *C. gularis* for research purposes. Karges suggested I search in the Lake Benbrook area south of Fort Worth, Tarrant Co., Texas. On 3 February 1983, I drove to an arbitrary site in the Rocky Creek Park area near the lake. From my past experiences in collecting *C. sexlineatus* from hibernation, I chose a moderately-sloping, SW facing embankment along a highway. Excavation began in friable soil mixed with medium to large rocks. A "swath method" was used to remove soil and rocks to a depth of ca. 30 cm in linear strips to the face of the bank. After about 15 minutes, an adult male *C. gularis* (SVL = 83 mm) was spotted in a cavity near a lodged rock. I continued excavating for ca. 1½ hrs., and my efforts yielded 7 additional lizards (SVLs = 98 mm, female; 50, 49, 46, 43, 38, and 38 mm juveniles). The juveniles were found at the ends of well-constructed burrows. Two snakes (*Sonora episcopa* and *Virginia striatula*) were also collected beneath large rocks.

I suggest that this collection technique could yield adequate samples of any species of *Cnemidophorus* from hibernation, especially when existing populations occur along highways bordered by elevated sloping embankments.

Lizards are deposited in the LACM collection, and the snakes will be deposited in the Milwaukee Public Museum.

Submitted by **STANLEY E. TRAUTH,** Department of Biology, Southern Methodist University, Dallas, Texas 75275 USA. ●

CROTAPHYTUS COLLARIS COLLARIS (Eastern Collared Lizard). **HIBERNACULA.** Legler and Fitch (1957. Copeia 1957:304-307) were the first to report observations on hibernation and nests of collared lizards. Trauth (pers. comm., 1983) found a male *C. c. collaris* (80 mm SVL) hibernation under shelf rock on 16 March 1975 in Caddo Co., Oklahoma, 3.2 km N of Anadarko off Hwy 281. The following confirms this pattern of hibernation of collared lizards.

The study site was an abandoned rock quarry located in Denton Co., Texas, 18.8 km W of Denton along U.S. 380. Four inactive adult *C. c. collaris* (two males, $\bar{x}$ SVL= 95.1 mm; two females, $\bar{x}$ SVL= 81.2 mm) were uncovered singly within hibernacula burrows on 1 March 1983 (1630 hrs; air temp = 29.4° C) beneath limestone rocks with average dimensions of 60 X 38 X 4.2 cm. All burrows were open-ended and situated nearer the largest portion of the rock chamber roof. Hibernacula dimensions averaged 12.5 X 4.8 X 5.8 cm and conformed to the body size of each lizard. Similar observations have been reported for *Cnemidophorus sexlineatus* (see Etheridge, et al., 1983. Copeia 1983:206-214) where burrow diameter correlated positively with lizard body size, suggesting that these lizards dig their own burrows and rarely utilize abandoned mammalian (i.e., rodent) shelters. The lizards were found facing head downward in hibernacula with hindquarters and tail partially exposed in a fashion similar to that reported by Legler and Fitch (1957).

Cloacal temperatures ranged from 17.2 to 18.4° C ($\bar{x}$ = 17.9 ± 0.3 SEM), while soil burrow temperatures ranged from 15.8 to 16.8° C ($\bar{x}$ = 16.2 ± 0.2 SEM). Lizards entered hibernation in mid-October 1982 and the earliest activity record was on 10 April 1983 at an air temperature of 30.6° C.

Voucher specimens have been deposited in

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the North Texas State University Herpetological Collection (NTSUHC #R677-680).

I thank Dr. Stanley E. Trauth of Southern Methodist University for providing the additional information.

Submitted by **CHRIS T. McALLISTER,** Renal Metabolic Lab (151-G), VA Medical Center, Dallas, Texas 75216 USA. ●

HEMIDACTYLUS GARNOTI (Indo-Pacific Gecko). **PREDATION.** *Hemidactylus garnoti* is a recent addition to the herpetofauna of southern Florida. It was reported to occur prior to 1964 (King and Krakauer, 1966. Quart. Jour. Florida Acad. Sci. 29(2):144-154). Since that time, little has been published on its interactions with other members of the south Florida faunal community. The following accounts report two cases of predation on this species.

On the morning of 2 August 1982, in a residential area of SW Miami (Dade County, Florida), a juvenile *H. garnoti* was found dead in the web of *Achaearanea tepidariorum,* the common house spider (identified by G. B. Edwards, Florida State Collection of Arthropods). When first observed, the lizard had a bloody spot near its eye, and the spider was feeding on the tail region of the lizard. Later that afternoon the tail region of the gecko appeared dehydrated, and the spider was feeding on the abdominal region of the lizard. The predation of lizards by this species of spider is an unusual occurence (G. B. Edwards, pers. comm.).

On the eve of 25 July 1982, in a residential area of Homestead (Dade County, Florida an indo-pacific gecko was observed being held by an *Osteopilus septentrionalis,* the cuban tree frog. *O. septentrionalis* is an introduced species first reported in mainland Florida in 1952 (Schwartz, 1952. Copeia 1952:117-118). The discovery of this event by the author apparently startled the frog and caused it to release the gecko, which ran off. *O. septentrionalis* has been previously reported to feed on arthropods and anurans (Carr, 1940. Univ. Florida Biol. Sci. Ser. 3(1):1-118), but not on lizards. Photographs of the predator-prey interaction of *A. tepidariorum* and *H. garnoti* were deposited with the Florida State Collection of Arthropods, Gainesville, Florida.

Submitted by **TODD M. STEINER,** 8275 SW 144 Street, Miami, Florida 33158 USA. ●

LAEMANCTUS LONGIPES (Casque-headed Lizard). **REPRODUCTION.** There are few accounts in the literature that refer to the eggs and hatchlings of the tropical American lizard *Laemanctus longipes* (Fitch, 1970. Univ. of Kansas Mus. Nat. Hist. Publ. (52):1-247).

A sexual pair of lizards, from an unknown locality, was obtained by the Fort Worth Zoological Park (FWZP) in October, 1980. The lizards were initially housed together in a planted exhibit measuring approximately 1 x 1.7 x 2 m. The female laid two eggs on 18 March 1981, which were incubated in a vermiculite medium (Tryon, 1975. Bull. New York Herp Soc. 11:33-37) at temperatures ranging from 26.6° C-32.2° C. The eggs hatched on 7 May 1981. The young weighed 2.3-2.4 g and measured 45-47 mm SVL, and 190-192 mm TL.

A second pair of *Laemanctus longipes,* without locality data, was obtained by FWZP on 12 March 1981. These lizards were also housed in the previously mentioned exhibit from which the first pair had been removed. The female deposited four eggs in sphagnum moss under a shallow water dish on 5 August 1982. Weights and measurements were not taken on the eggs until 30 August 1982 at which time they weighed 4.0-4.5 g ($\bar{x}$ = 4.1) and measured 16.2-17.0 mm ($\bar{x}$ = 16.4) in width and 25.3-26.4 mm ($\bar{x}$ = 25.8) in length. The eggs were incubated in a similar fashion and hatched on 29 and 30 September 1982. All of the hatchlings weighed 2.4 g and measured 43-46 ($\bar{x}$ = 45.2) mm SVL and 181-188 ($\bar{x}$ = 182.7) mm TL. On 30 September 1982, the adult female weighed 31.8 g and measured 124 mm SVL and 509 mm TL and the adult male weighed 31.0 g and measured 106 mm SVL and 498 TL.

Coloration of all hatchlings resembled that of the parents.

Submitted by **DAVID A. BLODY,** Department of Herpetology, Fort Worth Zoological Park, 2727 Zoological Park Drive, Fort Worth, Texas 76110 USA. ●

SERPENTES

CALLOSELASMA RHODOSTOMA (Malayan pit viper). **FOOD.** The natural diet of *Calloselasma rhodostoma* has been listed as rats, frogs and lizards (Lim, 1956. Malayan Nature Journal 10:139-144). Recent observations at the Fort Worth Zoological Park (FWZP) show that captive hatchlings will accept a wider ranging diet, which includes toads, fish, and snakes of their own species.

A clutch of nine eggs hatched at FWZP on 21 May 1981. Six of the young were retained and housed individually in gallon jars. On 30 July 1981 recently metamorphosed toads *(Bufo woodhousei)* were accepted by all of the snakes and on 16 December 1981, four of the six young consumed golden shiners *(Notemigonus crysoleucas).*

An instance of cannibalism in a pair of young snakes was noted at FWZP on 7 September 1981. The snakes hatched from a clutch of 25 eggs on 5 July 1981 and were initially housed separately in gallon jars. A number of small frogs *(Acris crepitans)* had been accepted by both snakes before they were housed together which was approximately one week prior to cannibalism.

Submitted by **DAVID A. BLODY,** Department of Herpetology, Fort Worth Zoological Park, 2727 Zoological Park Drive, Fort Worth, Texas 76110 USA. ●

CROTALUS VIRIDIS VIRIDIS (Prairie Rattlesnake). **COLORATION.** On 3 August 1980, an albino rattlesnake was collected by Mrs. Lloyd Lewis on a wheat farm near Follett, Lipscomb Co., Texas. The specimen is a juvenile male (293 mm SVL), possessing one rattle and a button. The skin is basically leucistic with a faint, light tan dorsal stripe. The specimen was identified as *Crotalus viridis viridis,* based on scutellation, by T. L. James and F. C. Killebrew.

This individual was received alive on 10 August 1980 and observed in the laboratory until its death on 30 September 1980. The specimen was lethargic and rejected all food that it was offered. The specimen was preserved and deposited in the West Texas State University Museum of Natural History (WTSU 7578).

L. M. Klauber (1956, Rattlesnakes; Their habits, life histories, and influence on mankind. Berkeley, Univ. California Press, Vol. 1, pp. 231-234) noted that the approximate rate of albinism in natural populations is only 0.1% to .01% and that albinos have a low survival rate past the juvenile stage due to the effects of competition and predation. Klauber (op. cit.) also noted the locations of several reported cases of albinism in the prairie rattlesnake. Other reported specimens of albinistic prairie rattlesnakes are summarized by Stanley Dyrkacz (1981, SSAR Herpetological Circular No. 11, pp. 1-31). No other albinistic specimens have been noted in the collecting locality of our specimen. The closest recorded specimen was reported from a locality approximately 450 km NE of our site at Scott County Park in Kansas (R. J. Boles, 1971, Alabaster, Kansas School Natur. 17(3):3-15).

Submitted by **F. C. KILLEBREW** and **T. L. JAMES,** Department of Biology, West Texas State University, Canyon, Texas 79016 USA. ●

LAMPROPELTIS CALLIGASTER CALLIGASTER (Prairie Kingsnake). **PREDATION.** Prairie kingsnakes prey upon a wide variety of food items (Klimstra, 1959. Herpetologica 15:1-5) with reptiles (mostly snakes) constituting only a small portion (6.8% by volume) of its diet. Lizards, such as *Sceloporus undulatus* (Klimstra, op. cit.) and *Cnemidophorus sexlineatus* (Burt, 1935. Amer. Midl. Nat. 16:311-366; Webb, 1970. Reptiles of Oklahoma), are also consumed. The following is an account of a predator-prey encounter between *L. c. calligaster* and *C. s. viridis.*

On 14 June 1978 in Huges Co., Oklahoma (ca. 3 km E Calvin), I observed an adult male *C. s. viridis* (SVL = 67 mm) moving cautiously along the base of a sandy, red-clay roadcut. Since numerous activity burrows of the lizard species were present, I decided to wait and see if the lizard would enter one, and then dig it out. As I moved closer, I saw a juvenile female *L. c. calligaster* (SVL = 350 mm) ca. 1.5 m away from the lizard. She was slowly weaving around clumps of soil, occasionally poking her head into an entrance of an activity burrow. Soon, she sighted the lizard and, immediately, chased it into a burrow. I removed the snake (over half of its body was inside the burrow) and then dug out the lizard.

Both specimens (SET 2842 and 2825) will be deposited in the Milwaukee Public Museum.

Submitted by **STANLEY E. TRAUTH,** Department of Biology, Southern Methodist University, Dallas, Texas 75275 USA. ●

NERODIA ERYTHROGASTER FLAVIGASTER Yellowbelly Water Snake). **COLORATION.** A young female amelanistic specimen of *Nerodia erythrogaster flavigaster* was collected in Harris County, Texas, in the Pasadena city limits near the east border of South Houston. The snake, collected by Sue Ezell, was found crawling among weeds in a drainage ditch on 25 September 1982. Its ground color is a light flesh tone bordered by cream-colored bands that surround the dark tan blotches on its back. The sides are marked with chocolate-brown spots which are also encircled with cream-colored rings. The eyes are bright red and the head is pinkish-orange. The last few inches of the tail are bright orange (Fig. 1).

At the time of its capture the snake measured 440 mm total length. Since that time it has fed on a diet of small goldfish. Upon its death the snake will be deposited in the vertebrate collection of the Carnegie Museum of Natural History.

Submitted by **PAUL S. FREED,** Department of Herpetology, Houston Zoological Gardens, P.O. Box 1562, Houston Texas 77001 USA. ●



Figure 1. A young amelanistic *Nerodia erythrogaster flavigaster* collected in Harris County, Texas, in September 1982. Photo by Mara Freed.

THAMNOPHIS PROXIMUS PROXIMUS (Western Ribbon Snake). **FOOD.** Western Ribbon Snake *(Thamnophis proximus proximus)* has been reported to take a broad range of prey items. Fouquette (1954. Texas J. Sci. 6:172-188) provided a summary of food habits from Texas specimens and Rossman (1963. Bull. Florida State Mus. 7:99-178) surveyed the literature on the *sauritus* group of the genus. Clark (1974. Herpetologica 30:372-379) reported on the food habits of a Texas population.

All of these accounts reported a wide range of prey items consumed by this species. Amphibians, both metamorphosed and larval, especially anurans, are the major component of the diet of this species. Toads of several species have occasionally been reported in the diet of *T. p. proximus.*

At ca. 2400 hrs, 10 July 1982, while "road-cruising" for amphibians along County Rd. H, west of Englewood, southeastern Boone County, Missouri, after a moderately heavy rain, I observed a ribbon snake thrashing on the road surface. I stopped, assuming the snake to be injured, but on approach I discovered a large (ca. 70 cm TL), uninjured *T. p. proximus.* The thrashing was an apparent attempt to dislodge a badly smashed and partially dried toad (either *Bufo americanus* or *B. woodhousei*), ca. 6.0 cm SVL, from the pavement to which it was adhered. The snake had the distal portion of the left hind limb of the toad in its mouth and was violently thrashing its body from side to side in a whiplike motion. The snake continued this behavior as I approached to within 0.5 meters. I observed long enough to identify the snake and attempted to identify the toad, then backed away to avoid disturbing the snake. I left and returned approximately 30 min later. The snake and the toad were gone, suggesting that the snake had succeeded in its scavenging.

The night was typical of rainy July nights in central Missouri, with nothing unusual that might explain the behavior of the snake. The week preceding the event had been rainy, as had much of the summer (NWS, Columbia Regional Airport) and amphibians were active and abundant in the area at the time, thus eliminating prey scarcity as a factor.

The scavenging of road-killed animals has not been previously reported for this species and is unusual because of the ready availability of alternate prey items, both alive and more freshly dead, the condition of the toad, and amount of effort needed to dislodge it from the pavement.

Submitted by **WILLIAM J. RESETARITS, JR.,** The Nature Conservancy, Missouri Natural Heritage Inventory, P.O. Box 176, Jefferson City, Missouri 65102 USA. ●

TESTUDINES

CLEMMYS GUTTATA (Spotted Turtle). **X** ***CLEMMYS MUHLENBERGII*** (Bog Turtle). **NATURAL HYBRID.** No hybridization has been previously reported in the North American turtles of the genus *Clemmys.*

In April 1979, a resident of Baltimore County, Maryland found a female bog turtle, *Clemmys muhlenbergii,* in a shallow brook on his property where both bog turtles and spotted turtles, *Clemmys guttata,* occur. The female was kept until June when she laid two eggs and was then released at the capture site. The eggs were incubated, but only one developed and hatched. The hatchling was kept until the summer of 1982 when it was given to one of my former students. Unfortunately it developed a severe mycotic infection, and was in poor condition when brought to me in November, 1982. Despite treatment it died in January 1983, and has been preserved in the George Mason University herpetological collection (GMU 1452).

The juvenile female (carapace 76.0 mm, plastron 69.2 mm) is clearly a hybrid between *C. guttata* and *C. muhlenbergii.* It most closely resembles *C. guttata* in coloration and patterns, but *C. muhlenbergii* in shell morphology. The carapace is blue-black with scattered small yellow spots as in *C. guttata.* However, it contains a dorsal, medial keel from the posterior third of the first vertebral scute to the anterior third of the fifth vertebral; such a keel occurs on *C. muhlenbergii,* but never on *C. guttata.* The carapace is also more domed, has a slightly serrated posterior rim, and shows prevalent growth annuli on each carapacial scute, all characters associated with *C. muhlenbergii,* but not *C. guttata.* The coloration and pattern of the plastron are as in *C. guttata,* as is also a very shallow posterior notch. The head is dorsally blue-black with a few yellow spots, typical of *C. guttata,* but the tympanic area contains a large, broad, rounded, orange blotch, as in *C. muhlenbergii;* this spot in *C. guttata* is elongated, narrow and yellow. The jaws, chin and iris show the typical sexual dichromatism of female *C. guttata,* and the limbs are also colored and patterned as in *C. guttata.*



Submitted by **CARL H. ERNST,** Department of Biology, George Mason University, Fairfax, Virginia 22030 USA. ●

GOPHERUS POLYPHEMUS (Gopher Tortoise). **SCUTELLATION.** At 1015 hours on 1 June 1981 an adult *G. polyphemus* (carapace length 250 mm, mass 4.7 kg) was observed in the process of egg deposition. The nest site selected by this female was a construction area that had been built up with fill dirt. This individual was a member of a free ranging population of *G. polyphemus* at Santa Fe Community College Teaching Zoo (4.5 ha), Gainesville, Florida.

On 4 September 1981 following a 95 day incubation period, 6 hatchlings emerged from the nest. All hatchlings exhibited aberrant scutellation of the carapace (Fig. 1, page 76). Measurements (McCrae, et al. 1981. Herpetologica 37(1):46-52) of the 6 hatchlings were as follows: mass 32.0-36.8 g, mean 33.9 g; carapace length 47-49 mm, mean 48.5 mm; total length 52-54 mm, mean 53 mm; carapace width 42-44 mm, mean 43.3 mm; maximum thickness 27-29 mm, mean 28.0 mm; plastron length 49-52 mm, mean 49.6 mm; anal notch 7-9 mm, mean 7.5 mm; anal width 9-11 mm, mean 9.5 mm. Further excavation of the nest site revealed 2 fertile but undeveloped eggs (41 x 46 mm, mass 41.5 g; 41 x 44 mm, mass 41.1 g) at the bottom of the nest.

In 1982 the same female was monitored nesting at a site where clay and fill dirt had been deposited. After 120 days the nest site was excavated. One live tortoise (UF 53441) was removed from the egg which exhibited aberrant vertebral scutellation. Examination

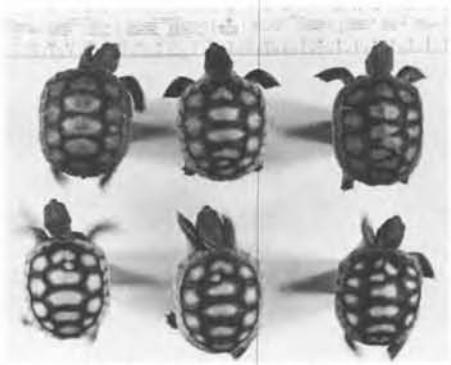


Figure 1. *Gopherus polyphemus* clutch exhibiting epidermal scute anomalies of the carapace. Photo by Andrew Manis.

of the remaining clutch was inconclusive due to previous nest destruction by ants and Diptera larvae.

Scute abnormalities can occur with some frequency in wild populations (Douglass, 1977. Florida Sci. 40(3):256-258). If the abnormalities noted above were the result of embryonic stress, insufficient water in the egg environment may have been a contributing factor (Lynn and Ullrich, 1950. Experimental production of shell abnormalities in turtles. Copeia 1950:253-262). This circumstance is more likely to occur when females choose to nest in areas altered by man.

Upon death the specimens noted above will be deposited in the vertebrate collection of the Florida State Museum.

Submitted by **JAMES B. BARKER** and **FREDERICK B. ANTONIO,** Santa Fe Community College Teaching Zoo, 3000 N. W. 83rd Street, Gainesville, Florida 32601 USA. ●

MALACLEMYS TERRAPIN TERRAPIN (Diamondback Terrapin). **NESTING.** This note reveals nesting of a Diamondback Terrapin population in the Hackensack River salt marshes, meadows of Lyndhurst, New Jersey. According to the literature (Pope, 1971, Turtles of the United States and Canada, Alfred A. Knopf, Inc., pp. 156-157; Conant, 175, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., pp. 52-53), *M. terrapin* prefers quiet unpolluted estuaries. Considering that this area has been heavily industrialized and is under active commercial development, these observations are of interest.

Active nests were observed from 1980 to 1982. Eggs were collected and incubated at ambient room temperature to determine emergence time and to verify species. Hatchlings were released at original nest sites. In mid-July, 1980, four *M. terrapin* nests were discovered approximately 12 ft. from the water in the Lyndhurst meadows area (Lyndhurst site). The nests contained 8, 9, 12 and 17 eggs respectively. These nests were on the top of an exposed clay mound located at the end of a brackish channel. *Phragmites* spp. was the dominant vegetation. Emergence was on the 18th, 22nd and 31st of August and 12th of September.

In August 1981, at North Arlington, New Jersey (two miles west of the Lyndhurst site), in the same salt marsh system, a trampled *M. terrapin* nest was discovered. It was located on a well-used foot path in sandy clay soil approximately 30 ft. from water's edge on level open ground. The nest site soil and the unhatched eggs were severely compressed by people walking the path. The dead, unhatched turtles appeared to be fully developed. The Lyndhurst site also had two *M. terrapin* nests in mid-June, 1981, located on the same clay mound. The nests contained 8 and 12 eggs, with emergence on the 11th and 17th of August 1981.

A third site was found in August 1982 on the bank of the Hackensack River, near East Rutherford, New Jersey (three miles northeast of the Lyndhurst site). A single nest was on the slope of an open sandy mound (approximately 70 ft. from the water), surrounded by *Phragmites* spp. The nest contained 17 eggs; emergence was on the 20th of August. In 1982, two nests were also found at the Lyndhurst site. These two nests contained 14 and 16 eggs which hatched on the 9th of August and 1st of September 1982.

In summary, ten *M. terrapin* nests were located at three different sites in New Jersey's Hackensack Meadowlands from 1980 through 1982. Nests were in tidal river or salt marsh habitat, with *Phragmites* spp. being the predominant vegetation. The finding of *M. terrapin* nesting activity in the New Jersey Meadowlands suggest that, during this period, water quality and habitat were adequate to support a population of these turtles.

Submitted by **ROBERT PITLER,** 113 William Street, Belleville, New Jersey 07109 USA. ●

STERNOTHERUS ODORATUS (Stinkpot). **ALGAL RELATIONSHIPS.** On 9 April 1983 a male *Sternotherus odoratus* was collected from President's Pond, Jackson County, Illinois, and brought into the lab. It was found moving along the bottom of the pond in 30 cm of clear water and was well camouflaged by a dense covering of algae on its carapace. Its carapace measured 10.5 cm and the algae was 17 cm deep. The algae was predominantly *Basicladium chelonum* that is normally epizoophytic on turtles and the plastron was covered with the branching protozoan commensal *Opercularia* to a depth of 3 mm.

The next day the stinkpot was observed eating the algae off of its carapace. By the following day it had eaten all the algae within reach of its mouth leaving a cropped area on either side of its carapace.

The algal-turtle relationship has generally been accepted to be one of mutualism. Epizoic algae profit by gaining mobility and protection from the turtle as well as being freed from most competition for substrate with other algae. The turtle in turn is camouflaged from predators and prey by the epizoophytic algae which may even attract potential prey. Algal growth has been shown to harm or even cause the death of turtles. The ingestion of the algae by the turtle puts a new twist into their symbiotic relationship. A relationship where the turtle occasionally eats the algae and the algae occasionally harms the turtle can not be considered completely mutualistic.

Submitted by **STEVE M. REILLY,** Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901 USA. ●

Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Houston Zoological Gardens, Houston, Texas 77001.

EFFECTS OF ROTATION ON THE VIABILITY OF TURTLE EGGS

There are abundant warnings in the literature on the dangers of disturbing the orientation of turtle eggs. Ewert (1979), Pritchard (1979), Tracey et al. (1978) and Tryon (1978) have all cautioned that an increased mortality rate will result if turtle eggs are disturbed. However, all of these observations were of a subjective nature without quantitative data to substantiate them. Bustard (1972) and Limpus et al. (1979) both concluded that there's an increased mortality in sea turtle eggs that are moved during certain periods of incubation. Limpus' work required the construction of man-made nests which introduced an uncontrolled variable into the experiment. Since Burger (1976) has shown that subtle variations in nest location can radically alter egg mortality Limpus' data must be interpreted carefully. Drajeske (1974) and Marcellini (1982) both have reported controlled experiments involving small numbers of turtle eggs that result in no increase in mortality from egg manipulation. In this paper large numbers of eggs of *Malaclemys terrapin*, *Chelydra serpentina* and *Chrysemys picta picta* were rotated at various intervals under controlled conditions to determine if such motion did increase egg mortality.

Table 1. Hatching rates of rotated and control eggs of *Malaclemys T. terrapin.*

week turned	# eggs	# hatch	# no develop	# dead embryo	% hatch
1	14	9	4	1	64
2	14	11	3	0	79
3	14	14	0	0	100
4	14	13	1	0	93
5	14	12	2	0	86
6	14	14	0	0	100
7	14	12	2	0	86
Total	98	85	12	1	87
Control	14	10	4	0	71

Table 2. Hatching rates of rotated and control eggs of *Chrysemys P. picta.*

week turned	# eggs	# hatch	# no develop	# dead embryo	% hatch
1	10	10	0	0	100%
2	10	10	0	0	100%
3	10	9	1	0	90%
4	10	9	0	1	90%
5	10	10	0	0	100%
6	10	10	0	0	100%
7	10	8	1	1	80%
Total	70	66	2	2	94%
Control	12	11	1	0	92%

Table 3. Hatching rates of rotated and control eggs of *Chelydra S. serpentina.*

week turned	# eggs	# hatch	# no develop	# dead embryo	% hatch
1	10	5	4	1	50%
2	10	9	0	1	90%
3	10	8	1	1	80%
4	10	10	0	0	100%
5	10	7	3	0	70%
6	10	10	0	0	100%
7	10	10	0	0	100%
Total	70	59	8	3	84%
Control	20	18	1	1	90%

Table 4. Hatching rates of rotated and control eggs of *Chelydra S. serpentina.*

day turned	# eggs	# hatch	# no develop	% hatch
1	10	10	0	100
3	17	17	0	100
6	17	16	1	94
9	7	7	0	100
Total	51	50	1	98
Control	20	20	0	100

Materials and Methods

All eggs used in this study were collected from fresh nests and marked to maintain orientation. Thirteen *Chrysemys*, 13 *Malaclemys* and 4 *Chelydra* nests were used in the study. All eggs were randomly assigned to the control or one of the rotated groups. All rotated eggs were turned 180° once during development (from top to bottom).

All eggs were incubated in a mixture of 600 g vermiculite and 670 cc water in plastic, transparent sweater boxes. Eggs were half buried in the mixture. The temperature of the nest boxes varied with the room. Highest temperature recorded was 38° C and the lowest was 20° C. Water was added to the vermiculite as it was needed to maintain egg volume. Average time to hatching was 58 days.

In the first year of the study the eggs of all three species were turned after one, two, three, four, five, six, or seven weeks of incubation. No egg was turned more than once. Eggs in the control group were not disturbed. A total of 284 eggs was used the first year.

In the second year eggs of *Chelydra serpentina* were rotated on day one, three, six or nine. These eggs were also rotated only once. Control eggs were undisturbed. Seventy-one eggs were used. The purpose of the second year's study was to evaluate the possible increased mortality of *Chelydra* eggs rotated in the first week of incubation. All hatchlings were kept at least two weeks after hatching. No mortality was observed.

Results

As tables one, two and three show there was very little difference between the success rate of rotated and control eggs. The only possible exception was the 50% mortality of *Chelydra serpentina* eggs turned after one week's incubation (Table 3). Table 4 illustrates the results of an experiment designed to further assess the effect of rotation during this first week of incubation for *Chelydra serpentina*. Results clearly show that there was no increase in mortality with rotation of these eggs.

This study shows that eggs rotated under the stated conditions hatch with about the same success as undisturbed eggs, for the three species evaluated.

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REPRODUCTION IN TWO SPECIES OF CAPTIVE BROWN SNAKES, GENUS *Pseudonaja*

The genus *Pseudonaja*, comprised of six currently-recognized species, is found throughout mainland Australia with one species, *P. textilis*, also occurring in eastern Papua (Cogger, 1979). All are venomous and four are considered dangerous (*P. affinis, P. guttata, P. nuchalis* and *P. textilis*) (Sutherland, 1981).

Within Australia, brown snakes are maintained in greater number and diversity by private collectors than by zoological institutions. However, relatively little information concerning their reproduction in captivity has been published.

The Royal Melbourne Zoo has included the Eastern brown snake (*P. textilis*) in its reptile collection for many years but has maintained Western brown snakes (*P. nuchalis*) since 1973. Since detailed records of the collection have been kept, *P. nuchalis* has been bred twice and *P. textilis* on three occasions.

Materials and Methods

Due to their small size and initially nervous temperament, the two original *P. nuchalis* were housed separately in off-limit tanks. These cages were quite spartan, with gravel on the floor, a 'hide-box' for cover and a small water bowl. Temperatures varied from 25-32° C. Both snakes fed well on dead mice, often seized the first mouse vigorously and sometimes used their bodies to hold the mouse against the side of the tank. Gillam (1979) noted similar methods of prey restraint for a number of *Pseudonaja* species including *P. nuchalis*.

In early March 1980, both snakes were transferred to a 1 m x 1 m x 1 m exhibit containing a thick layer of gravel on the floor as well as a small pond and a section of tree stump. The snakes often attempted to burrow beneath the stump, necessitating daily attention to the display. Gillam (1979) noted that in the Northern Territory, this species often uses lizard and mammal burrows as shelter.

The adult *P. textilis* were displayed in the same exhibit following removal of the *P. nuchalis*.

Newly-laid eggs were weighed on a triple-beam balance, measured with calipers and placed in vermiculite-filled containers (Table 1). The young snakes were also weighed on a triple-beam balance and were measured using the squeeze-box technique (Quinn and Jones, 1974) within two days of hatching.

P. nuchalis

The Western brown snake is found Australia-wide except for a narrow strip extending the length of the eastern coast and reaching into South Australia. Highly variable in colour and pattern, it is basically light brown to russet or black above with irregular, darker bands or small marks, particularly about the head and nape. The belly varies from cream to orange or gray with darker blotches (Cogger, 1979).

The original (Melbourne Zoo) male was received from the Renmark area in South

Australia on 9 April 1973, as a 4-5 month old juvenile of 350 mm total length. At this time of writing, the snake measures 1.66 m snout-vent and 1.79 m total length.

The original female arrived on 4 February 1974 from southern Western Australia. This was a larger snake, probably 12-15 months of age. The two snakes were similar in coloration but possessed different neck markings.

Breeding

The adult snakes were first placed together in an off-limit tank in early December 1976. They were left together until the following April but no courtship or mating behaviour was observed, although the male exhibited nervous behaviour in the presence of the female. They were placed together again for five days in mid-September, but again there was no sexual activity. However, when the male was retrurned to the female on 3 October, immediately after she had sloughed, mating was observed. This was repeated on the following day and the male was removed on 7 October. The female laid nine eggs from 17 November-9 December. These were all fertile as tiny embryos were clearly visible, but unfortunately they were premature, with the final layer of egg shell apparently absent. The eggs were not incubated.

A similar sequence of events occurred during 1978 and 1979. The snakes were placed together in early October immediately following the female sloughing, mating occurred the next day, and the male was removed after 3-6 days. Oviposition occurred in early December. The female also laid a clutch of eight fertile eggs in late February 1978. Both snakes appeared to become agitated for short periods when together. This appeared to be initiated by the female when the male's body came into contact with hers. She whipped her tail violently from side to side and moved rapidly around the tank, which caused the male to react in a similar manner. After 5-10 minutes they resumed normal activity. This was initially thought to be a male/female interaction but in recent months similar behaviour has been observed between two young males. In 1978, 17 eggs were laid, of which two were infertile and were not incubated. Another egg was removed during incubation when it became mouldy. By day 53 the eggs had increased in size by an average of 3 mm (width).

Hatching occurred over five days commencing 2 February with the resultant incubation period being 59-64 days at an incubation temperature of 28° C. A total of 15 snakes emerged including two from one egg. These appeared normal apart from lacking eyes. Seven other snakes lacked one eye.

The 1979 clutch consisted of 12 eggs of which only one was fertile. This egg hatched after an incubation period of 52 days at 30° C.

The first slough occurred after 10 days and some individuals became extremely aggressive, striking without hesitation when disturbed. Initially the young snakes had pale brown/orange bodies, black heads and two narrow black bands on the nape. After one month the black markings had changed to a dark brownish-orange and by the end of the first year, the head had assumed the same tan color as the body. By this time the nape bands had also diminished to a single diagonal bar of 4-6 black scales as well as 2-4 separate black scales. Ventral coloration had changed from a pale cream with orange flecks at hatching to pale yellow with gray/brown flecks. The young of both clutches showed similar alterations in color and markings. The slightly 'speckled' appearance of the adults began to show after about eight months of age.

The young snakes were fed only on pink mice. Some accepted these quite readily but the majority had to be tricked into taking mice after the latter had been rubbed with the body of a frozen skink. After some months the snakes began to accept untreated mice and grew steadily (Table 2). The two remaining snakes were sexed by probing on 14 May 1982 with the following results:

Male 2 (3 years, 3 months) - probe depth of 48 mm; 14 sub-caudals.
Male 3 (2 years, 4 months) - probe depth of 48 mm; 15 sub-caudals.

P. textilis

The Eastern brown snake is found in a wide range of habitats throughout eastern Australia. Adults are usually a uniform brown although a wide range of different shades occurs. The belly is cream to orange with scattered orange or grayish flecks (Cogger, 1979).

Table 1. Egg data at oviposition for *P. nuchalis* and *P. textilis* at the Royal Melbourne Zoo.

Species	Clutch	Clutch size (Nos. fertile)	Mean egg length(mm)	Mean egg width(mm)	Mean egg weight(g)
P. nuchalis	17 Nov-9 Dec 1977	9(9)	Eggs	premature	
" "	5 December 1978	17(14)	41	24	13.1
" "	4 December 1979	11(1)	38	26	16.3
P. textilis	21 December 1971	28(9)	Not	recorded	
" "	12 October 1972	14(8)	26	9	Not recorded
" "	23 November 1977	10(8)	Not	recorded	
" "	13 Nov-17 Dec 1978	9(6)	Eggs	dehydrated	
" "	29 October 1979	8(3)	50	21	14.4

Table 2. Growth of *P. nuchalis* and *P. textilis* at the Royal Melbourne Zoo from hatching to 12 months of age.

Species	Oviposition date	No. of young hatched	Young at hatching: Mean total length(mm)	Young at hatching: Mean weight(g)	Total length in mm at: 1mth	3mth	6mth	12mth	Weight in g at: 1mth	3mth	6mth	12mth
P. nuchalis	5 Dec. 1978	15	330	8.1	346	415	460	602	10.6	13.7	17.5	31.2
" "	4 Dec. 1979	1	321	6.3	329	340	390	530	7.1	6.6	10.4	31.5
P. textilis	5 Dec. 1972	8	280	7.3	Data not recorded or snakes no longer in collection							
" "	23 Nov. 1977	8	280	7.9								
" "	29 Oct. 1979	2	295	7.1								

Table 3. Summary of reproductive data for *P. nuchalis* and *P. textilis* at the Royal Melbourne Zoo.

	P. nuchalis	*P. textilis*
Time of mating	3-10 October	28 September-12 October (1972 & 1977 only)
Time of oviposition	17 November-9 December	29 October-5 December, 21 December from 1971 wild mating.
Gestation period	45-67 days	52-56 days (1972 & 1977 only)
Incubation length	52 days (at 30° C) 59-64 days (at 28° C)	40-42 days (at 30-31° C) 49-52 days (at 28° C)
Clutch size	9-17 (mean 12.3, n = 3)	8-28 (mean 14, n = 5)

Breeding

The first recorded reproductive event for this species was the laying of 28 eggs by a newly arrived female on 21 December 1971. Although nine were fertile, none hatched.

Copulation involving a second female was observed on 12 October 1972. This snake had been in the collection for at least three years. The male was donated in 1971. After constructing a shallow depression the female laid 14 eggs on 5 December. Six of these were infertile but the remaining eight produced young snakes which hatched after 49-52 days incubation at 28° C.

A pair of *P. textilis* hatched in 1973 were placed on display on 27 September 1977 in the exhibit described for *P. nuchalis*. Mating was noted on the two following days and 10 eggs were laid 56 days later on 23 November. The two snakes remained together until the female's death on 29 January 1980 at an age of seven years. Attempted or successful copulation was observed on 19-20 February, 30 March, 2-10 May, 9 August, 26-28 September, 10-12 and 23-28 October and 3 November in 1978; and 24 April, 2 August and 3 September in 1979. Mating was also seen following oviposition on 3 November 1979. On this occasion the male had been removed from the female two days prior to laying, and reintroduced on 1 November.

On 23 November 1978, five fertile eggs were found at the rear of the exhibit. These were severely dehydrated and were thought to have been laid at least ten days earlier. A further four eggs were laid on 17 December and although one was fertile, it failed to hatch. In 1979 the female started to fill out in early October and refused to feed. Nest material was provided on 27 October and eight eggs were deposited on 29 October. These were rather elongated and blood vessels were visible in three eggs.

As with the *P. nuchalis*, the eggs were laid 12-13 days after the female sloughed. In 1977, eight young hatched after an incubation period of 40-42 days at 30° C. The remaining two eggs were infertile. Of the eight eggs laid in 1979, only three were fertile. Two hatched after an incubation period of 41-43 days at 31° C but one young snake had a severely kinked spine and died 19 days after hatching. The remaining egg contained an almost full-term dead embryo which did not appear to be malformed.

The first slough occurred after 8-9 days. The young of neither clutch were as aggressive as the young *P. nuchalis* and all possessed only a single, black band on the nape as well as a black head. They were all a brownish-orange dorsally and a pale orange with brown spots on the ventrals. Although their markings faded with age, none remained in the collection long enough for us to witness the complete disappearance of the black head and nape markings. Great difficulty was experienced in persuading the young snakes to accept small mice despite using the methods described earlier for the young *P. nuchalis*. Long-term growth data were not obtained.

Discussion

A summary of reproductive data for the two species is shown in Table 3. As there are few published reproductive data for these species, under either wild or captive condition, it may be of value to make observations based on the data presented here, despite the relatively small sample size.

The species are similar in the timing of mating and oviposition; gestation period and mean clutch size. Worrell (1970) stated that in *P. textilis* mating takes place during October and November with egg-laying following in December and January. Shine (1977 a & b) found that females of both species in the New England region of New South Wales 'ovulated late spring (November) . . . . . and oviposited shortly thereafter.' The specimens in this study followed a similar pattern and the continued interest shown by the male *P. textilis* in the female may have simply been a result of captive conditions. The continued presence of the male *P. textilis* might also have led to a stressful situation for the female as neither 1978 or 1979 were successful years.

If the first, possibly premature, clutch deposited by the female *P. nuchalis* is discarded, the number of eggs per clutch decreased for both species as the females increased in age and size. This is not a normal occurrence (Fitch, 1970) and may again be related to captive conditions, although we have found the reverse to occur in another oviparous Australian elapid, *Oxyuranus scutellatus*, housed in similar conditions (Banks, in press). There are insufficient data to establish whether smaller clutches consisted of larger eggs.

In general, clutch sizes in this study are similar to those previously recorded for both *P. nuchalis* (Gillam, 1979; Gow, 1976) and *P. textilis* (Gow, 1976; Wells 1980; Worrell, 1970). The incubation length was shorter for *P. textilis* than for *P. nuchalis* at the same incubation temperatures. The only other record of captive incubation is 74 days at 24-30° C for a clutch of 11 *P. textilis* eggs (Wells, 1980). *P. nuchalis* is generally found in areas of consistently higher temperatures than *P. textilis* and it is possible that individuals of the latter species from Victoria and southern New South Wales, where seasonal temperatures are unpredictable, have adapted to take advantage of shorter periods of temperatures which are suitable for successful egg incubation.

Newly-laid eggs and newly-hatched young of *P. textilis* were smaller and weighed less than those of *P. nuchalis*, except that the mean hatchling weight was slightly greater for *P. textilis*. Wells (1980) found that seven hatchling *P. textilis* measured 235-300 mm total length (mean 275 mm) and weighed 4.71-7.20 g (mean 6.10 g); slightly less than for the individuals in this study.

In the five instances where hatching occurred, twice for *P. nuchalis* and on three occasions for *P. textilis* (see Table 2), two of the groups of hatchlings contained malformed individuals. For *P. nuchalis*, of the 15 snakes emerging from 14 fertile eggs incubated at 28° C, eight were malformed. In contrast, one normal snake emerged from the single, fertile egg incubated at 30° C. For *P. textilis*, eight normal snakes hatched from eggs incubated at both 28° C and 30° C; whereas only one normal snake hatched from three fertile eggs incubated at 31° C. One hatchling was severely malformed and the remaining individual died in the egg.

Poor hatching rates and hatchling deformities in reptiles resulting from excessively high incubation temperatures have been reported by a number of workers (Dunn, 1981; Ross, 1980; Zweifel, 1980). Incubation temperatures which are too low have also been reported to cause hatchling deformities in *Crocodylus porosus* (R. W. Dunn, pers. comm.). It is possible that incorrect incubation temperatures led to the malformations noted here. If that is the case, it appears that 28° C is too low for eggs of *P. nuchalis* and 31° C is too high for *P. textilis* eggs. Further study is required to determine exact ranges for successful incubation of eggs from these species.

ACKNOWLEDGMENTS

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TECHNIQUES

A NITROCELLULOSE EMBEDDING TECHNIQUE FOR VERTEBRATE MORPHOLOGISTS

INTRODUCTION

Herpetologists preparing material for light microscopy may have difficulty finding histological techniques that provide faithful representation of the many tissue types they wish to examine. I describe a low-viscosity nitrocellulose (LVN) embedding procedure useful to morphologists who encounter such problems. LVN has been primarily used in this lab in the preparation of heads and soft tissue of members of the order Gymnophiona for comparative morphological studies. Caecilian heads are very bony and can be difficult to section. A variety of decalcification, dehydration and embedding schedules and techniques were tried and the following protocol was selected as providing the best mixed tissue integrity for these and other specimens.

In addition to ease of preparation LVN has several advantages over other embedding media. No heat or pressure is used during infiltration as is used with paraffin. The minimal tissue perturbation curtails shrinkage and results in sections with tissue relationships more accurately maintained. In addition LVN provides greater support so that larger tissue blocks can be satisfactorily sectioned. Differential staining is brighter and more distinct than with the epoxy plastics and with less wrinkling of sections. The tissue blocks are relatively soft, facilitating cutting and the maintenance of knife sharpness. Seven microns is about the minimum at which sections can be cut, but much thicker sections can be cut quite easily. This is particularly useful in tracing structures through sequential sections and aids in making three-dimensional reconstructions.

PROCEDURE

The following protocol is an outline for complete tissue preparation from decalcification through staining and mounting.

LVN PREPARATION

The LVN is available from Hercules Inc., Wilmington, Delaware (RS 1/2 grade). Three solutions are made: thin, medium and thick.

Thin LVN

Absolute ethanol	112.0 ml
Anhydrous ether	168.0 ml
LVN	30.0 g

Medium LVN

Absolute ethanol	112.0 ml
Anhydrous ether	168.0 ml
LVN	60.0 g

Thick LVN

Absolute ethanol	112.0 ml
Anhydrous ether	168.0 ml
LVN	100.0 g

The LVN is shipped and should be stored in 40% alcohol. Dry it thoroughly in a large pan lightly covered with cheesecloth before weighing it out. This should be done under a hood and away from any open flame as nitrocellulose is extremely flammable. The LVN will take on a powdery appearance as it dries and should be ready for use in 1 or 2 days. Periodic stirring will speed the process. Mix the LVN and the alcohol in clean, dry, brown jars (light causes the LVN to deteriorate). Shake well to thoroughly dampen the LVN and let sit for 24 hours. Next add the anhydrous ether shaking vigorously to break up lumps. Seal the tops of the jars with waterproof tape to prevent evaporation. Rotate them top to bottom and side to side several times daily until all the LVN has gone into solution (1-2 weeks for the thick LVN). If the solutions dry out and become too thick additional anhydrous ether:absolute alcohol (A&E) in a 1:1 ratio can be added. All water must be excluded.

DECALCIFICATION AND DEHYDRATION

In decalcification the most consistently good results were obtained using Humason's (1979) Formic Acid A solution. It is not too harsh and tests for completeness of decalcification are reasonably accurate.

Formic Acid A

Formic Acid	5-25.0 ml
Formalin (concentrated)	5.0 ml
Distilled water to make	100.0 ml

Place tissue in the solution for 1-7 days depending on the size of the tissue and the amount of bony material present. To test for completion of decalcification, take 5 ml of the formic acid tissue solution and add to it 1 ml of 5% sodium oxalate. Decalcification is complete if no white precipitate forms within 5 minutes. The tissue should be put in fresh Formic Acid A after each test.

To dehydrate run the tissue through alcohols of increasing strength, timing dependent on the size and permeability of the tissue.

70%	1-6 hr
80%	1-6 hr
95%	1-6 hr
100%	1-6 hr (two changes)
A&E	1-6 hr (two changes)

INFILTRATION AND EMBEDDING

To infiltrate leave the decalcified, dehydrated tissue in a vial of thin LVN (approximately 20x volume) for several days to several weeks depending on size and type of tissue. For reference, a 15x20 mm salamander head will require 5-7 days to infiltrate. Gentle heat from a warming tray at 40° C will speed infiltration with no detrimental effects. Unsuccessful attempts were made to speed this process at higher temperatures with vacuum pressure.

Transfer the tissue to a vial of medium LVN leaving it in solution for a comparable amount of time as in the first solution. The used solutions can be saved in marked bottles and used for subsequent infiltrations.

Leave the tissue in a vial of thick LVN for the same time period as used in the two preceding steps. The tissue can be left up to a month or more at each step. This is advisable if it is very dense and sections less than 10 μ are desired.

To embed use a stender or other straight-sided glass or plastic container. Pour in fresh thick LVN and insert the tissue specimen. The tissue will sink to the bottom so allow 20-30 mm of LVN above it. This is the side that will be attached to the embedding block. The bottom will become the cutting surface so orient the tissue accordingly.

Pour a small amount of the A&E solution over the surface to cause the bubbles to rise and dissipate. Leave the dishes in a standard desiccator vented to the air for one to several weeks. Do not poke around in the LVN as it is drying. This can have a salting out effect creating a granular block that is impossible to cut. As a skin begins to form on the surface of the block, run a knife around its edge to allow air into the interior. When the block is firm enough to move, take it out of the container and place it on a flat surface in the desiccator turning it daily to ensure even drying. To cut 20 μ sections the block should be dried to the consistency of firm rubber. To cut 10 μ sections you should barely be able to dent the block with a fingernail. If the blocks dry out excessively pour 10 ml of A&E in the bottom of the desiccator. Slow even drying will produce blocks of uniform consistency and ease cutting.

MOUNTING AND CUTTING

To mount, trim the hardened tissue block with a razor blade leaving approximately 5 mm around the sides of the tissue and 15 mm on the side that will attach to the tissue block. Staple a double thickness of paper around a hard fiber embedding block forming a mold extending 30 mm above the block. Score the bottom and sides of the tissue block with a sharp pair of forceps and immerse in A&E for 20 seconds. Pour fresh thick LVN into the paper mold. Push in the tissue block, making sure that it is completely covered and at the correct orientation. Place the block in a half-filled jar of chloroform. The block will be hard enough to cut in three days but it can be stored for several months in the chloroform.

If the tissue is brittle run the mounted block through a series of chloroform : cedarwood oil solutions to give it tensile strength and ease cutting. Leave the block in 1 part cedarwood oil (immersion grade) to 3 parts chloroform for 24 hrs; then into a 1:1 solution for 24 hrs (Lillie and Fullmer, 1976) and finally into 100% cedarwood oil for 2 days. Blocks can be stored indefinitely in cedarwood oil. Blocks can also be stored indefinitely in 70% alcohol after the initial chloroform step, although this softens them somewhat.

Trim the block with a razor blade to several mm around the tissue and orient it on a sliding microtome. Leave enough LVN below the tissue to insure that it stays solidly affixed to the embedding block. It is easier to cut a head anterior to posterior. With soft tissue the direction is not important. The cutting stroke should be of an even moderate speed. A sharp clean knife is essential. Stropping is the best way to maintain a good edge. Keep the block wet with 70% alcohol by setting up a bottle of alcohol with a continuously dripping tube above the microtome. The knife should also be kept wet with alcohol. A thin film of honing oil applied to the knife surface before cutting will prevent rust formation. With a pair

of fine forceps pull the sections from the knife onto pieces of onionskin paper cut just larger than the section size. Place them in a small dish of 70% alcohol. When cutting is finished wrap the sections in cheesecloth, secure with a rubber band and store in 70% alcohol. We did not have success cutting cedarwood soaked blocks dry but used 70% alcohol on these as well.

STAINING

The LVN sections accept a variety of stains with excellent results. Adaptations for two staining sequences are included here. Hematoxylin and eosin is a good general stain. Picro-ponceau is a connective tissue stain that distinguishes muscle, bone and cartilage well. LVN dissolves in 100% alcohol so propanol must be substituted for the last dehydration step.

The sections can be mounted on slides for staining but it is more efficient to stain them in bulk and mount them afterwards using the illustrated staining trays (fig. 1). In transferring the sections keep them moist with 70% alcohol for they dry out very rapidly. Stack the trays in a dish with enough 70% alcohol to cover each sequential layering.

Hematoxylin and Eosin

1.	Distilled water	3 min
2.	Hematoxylin (Ehrlich's)	20 min
3.	Tap water	2 rinses
4.	Acid alcohol	quick dip
5.	Tap water	2 rinses
6.	Tap water with 6 drops $Li(CO_3)$	3 min
7.	Tap water	2 rinses
8.	Eosin	2-4 min
9.	70% ETOH	1 min
10.	95% ETOH	2 min
11.	Propanol	3 min
12.	Terpineol or Xylene	5 min or until ready to mount

Formulae for the hematoxylin and eosin can be found in Humason (1979). Acid alcohol contains 900 ml 70% ETOH and 10 ml HCL. $Li(CO_3)$ is a saturated aqueous solution.

Picro-ponceau

1.	Distilled water	3 min
2.	Hematoxylin (Weigert's)	15 min
3.	Running water	10 min
4.	Picro-ponceau	2-1/2 min
5.	Distilled water	2 rinses
6.	70% ETOH	1 min
7.	95% ETOH	2 min
8.	Propanol	3 min
9.	Terpineol or Xylene	5 min or until ready to mount

All formulae are in Humason (1979).

The stained sections are mounted in permount on glass slides, weighted and left to dry on warming trays. A few drops of a 10% methyl benzoate in xylene solution applied to the sections before coverslipping will flatten out wrinkled or bulky sections.

STAINING TRAYS

Trays for bulk staining of loose sections can be constructed from inexpensive, readily available material. The two trays illustrated can accommodate sections from 5 mm to 25x30 mm in size. Figure 1b was cut from a 'mini-cocktail' ice-cube tray available at hardware stores. Holes were drilled in the bottoms of each of the 15 mm straight-sided cubes to facilitate draining. In figure 1c six plastic bottoms from 'Tissue-Tek II Process/Embedding Cassettes' were melted together at the interfaces with a soldering iron to form a rigid tray. The trays are stacked and inserted in the tray holder (fig. 1a) constructed from two pieces of PVC plastic cut to fit the 9x12 cm metal staining dishes used in this lab. Wingnuts allow the whole ensemble, held together with four stainless steel screws, to be screwed down with sufficient force to keep sections from escaping.

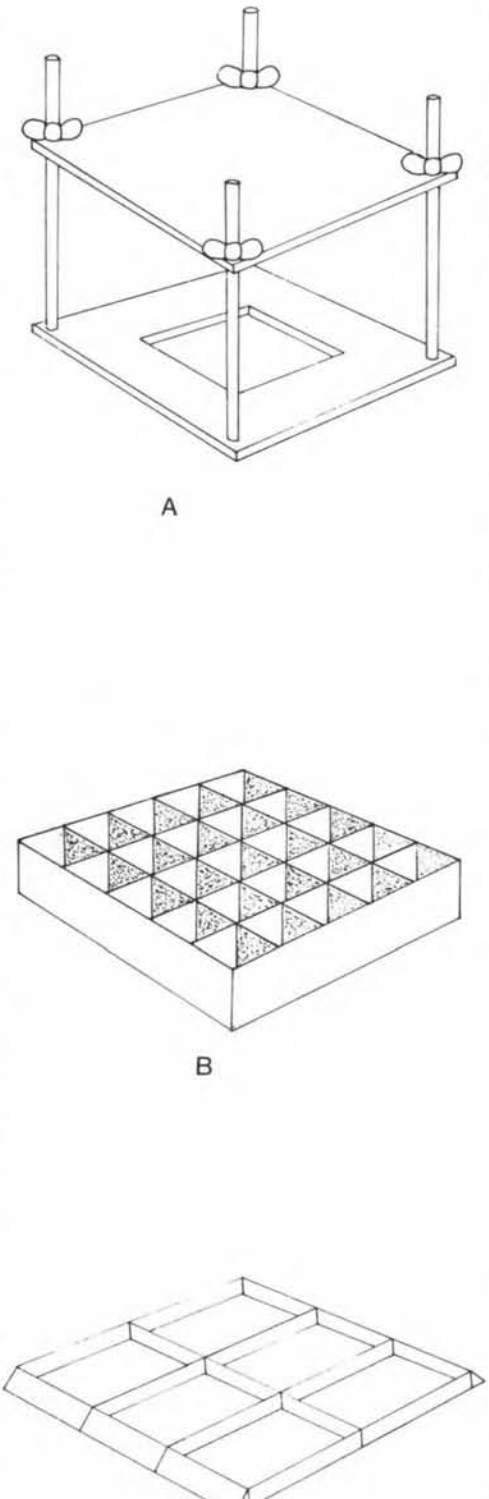


Figure 1. Construction of staining trays. A. Staining tray holder. B. Staining tray for smaller sections. C. Staining tray constructed for larger sections. (See text for further description.)

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FREEZE-BRANDING: A LONG TERM MARKING TECHNIQUE ON LONG-TOED SALAMANDERS

We evaluated freeze-branding as a marking technique for salamanders. Freeze-branding has been successfully used on mammals, fish (Everest and Edmundson, 1967; Fujihara and Nakatani, 1967; Raleigh *et al.*, 1973), snakes (Lewke and Stroud, 1974), banana slugs, *Ariolimax columbianus* (Richter, 1973), and tailed frogs, *Ascaphus truei* (Daugherty, 1976). Recommended application times vary from 1.5 seconds with fish (Raleigh *et al.*, 1973) to 30 seconds with snakes (Lewke and Stroud, 1974). Freeze-branding selectively destroys chromatophores and alters pigmentation without disrupting other components of the integument (Lewke and Stroud, 1974). This technique produces a variety of marks quickly and economically, remains durable, and does not alter behavior; but there is a delay in the mark becoming visible (Lewke and Stroud, 1974). Our objective was to compare the clarity of brands among three application times on long-toed salamanders *(Ambystoma macrodactylum).*

METHODS

In April 1978, 30 long-toed salamanders were collected and held in the laboratory. Each was toe clipped for identification (Twitty, 1966) and branded on the dorsal surface. We used letter brands 5 mm in height made with copper rods and silver tips (Raleigh *et al.*, 1973). Each brand was cooled 5 minutes in a thermos filled with liquid nitrogen and reimmersed for at least 30 seconds prior to reuse. We branded 10 salamanders for 0.75 seconds, 10 for 2 seconds, and 10 for 4 seconds. The condition of each salamander and brand legibility were recorded daily for 3 days after branding and at intervals of 1, 3, and 6 months. The clarity of each brand was recorded as: easily identified, barely identified, and unidentifiable.

RESULTS AND DISCUSSION

The skin turned white for 2-3 seconds after contact with the brand before returning to natural color. An hour later, the brand appeared as a darkening of the skin. Clarity increased with time, and the brands became legible as dark imprints after 1 to 3 days. Two animals branded for 4 seconds temporarily lost mobility in the limbs, but no adverse effects were observed after 24 hours, and no salamanders developed infections. Mortality occurred when the storage facility (refrigerator) malfunctioned and four of the salamanders froze. We did not attribute any mortality to the branding.

The 0.75-second application produced the cleanest, most readable marks (Table 1). Maximum clarity of brands was obtained after 3 months, although the same trends were evident at the 1 and 6 month recordings. Brand quality deteriorated as application time increased. Longer branding times probably froze adjacent tissues and blurred the mark.

Table 1. Clarity of brands (%) at different application times on long-toed salamanders after 3 months.

Application	Brand clarity[1]			n
time (seconds)	+	0	-	
0.75	50	50	0	8
2.0	30	30	40	10
4.0	12.5	37.5	50	8

[1] Clarity categories are: (+) easily identified, (0) barely identified, (-) unidentifiable.

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A BACK MARKER FOR INDIVIDUAL IDENTIFICATION OF SMALL LIZARDS

Behavior studies often require identification of specific individuals. We were interested in identifying individual *Emoia physicae* (Duméril and Bibron), 1839, a small New Guinea skink, from a distance but found general methods used for marking other lizards (Ferner, 1979) unsatisfactory for this species. We report here on a technique that allowed us to identify individuals from a distance of at least 6 m.

Adult males of *E. physicae* that we marked ranged from 153 to 210 mm, and adult females, from 140 to 189 mm in total length; snout-vent lengths were 66 to 75 mm and 63 to 73 mm, respectively. This species has small (± 1.0 x 1.5 mm, exposed surface) cycloid-like scales that make retention of some kinds of marks difficult.

We marked lizards with a pressure sensitive rip-stop nylon tape that is manufactured for mending such things as nylon tents and jackets and is distributed by Coghlan's Ltd., Winnipeg, Canada. Tape was applied to the back after washing the skin with 95% alcohol. We detected no adverse effects of this tape on individuals.

The size of our markers was about 5 x 10 mm, rounded at the corners to help prevent peeling. We coded the tapes with 2 colors of artists' acrylic paint and this lasted very well if allowed to dry thoroughly, about 30 minutes, before the lizard was released into a pen.

Over a 3-month period, we held 66 lizards marked with nylon tape in outside arenas (5 x 5 m) at the Wau Ecology Institute in Papua New Guinea. Four separate behavioral trials were run, lasting 11, 14, 13, and 12 days, respectively. Different individuals were used in each trial, with 50% of the lizards in the pens for each trial period and the other 50% for 1/2 of each trial period. One lizard lost its mark, 2 died with marks intact, and 1 disappeared. Fifteen lizards shed their skins during the trials and 11 markers attached to shed skin were recovered from the pens; 4 were not found. All lizards had been toe-clipped and were recaptured and re-marked within one day if they shed their skin during a trial. None lost a second mark.

Marked lizards were observed from a 2-1/2 m tower from about 1 m outside the edge of an arena. Non-moving individuals were readily identified with the naked eye anywhere in the pens. Moving individuals were easily identified with binoculars.

This technique allowed us to identify individuals from a distance for at least 2 weeks, or until shedding of the skin. We do not know how often *E. physicae* molts, but we suspect that it is fairly frequent because about 25% of our animals shed their skins during the 11 - 14 day trials. We suspect that the life span of the marks we used is considerably longer than the 2 week minimum that our data indicate, for all were in good condition at the termination of each trial.

Other marks that we had attempted to use on this species included artists' acrylic paint, either alone or mixed with 5-minute epoxy glue, both applied directly on the skin, and plasticized or adhesive tape pressed onto the neck or back (after washing the skin with alcohol). Paint or the paint/glue mixture normally peeled off within 2 - 3 days and the two kinds of tape within 5 - 10 days. We also attempted to mark lizards by placing small harnesses made of thread, each carrying an adhesive tape back-tab, just behind the front legs or just in front of the hind legs of individuals. *E. physicae* has small limber legs and was able to slip out of the harness unless we made them so tight that they restricted growth. None of these techniques was considered successful.

This study was done at Wau Ecology Institute, Wau, Papua New Guinea. Funding was provided by the Natural Sciences and Engineering Research Council of Canada. Personnel of Wau Ecology Institute provided logistic support for constructing arenas and our observation tower. R. A. Lewis, Department of Zoology, University of Alberta, provided critical comments on an early draft of the manuscript. We are grateful for all support received.

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GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Joseph T. Collins, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

CAUDATA

AMBYSTOMA TIGRINUM TIGRINUM (Eastern Tiger Salamander). USA: DELAWARE: New Castle Co: On Route 463, about 60 meters W junction with Route 36 (and 3.7 km SSW of Townsend), 1 August 1973, Rudolf G. Arndt, verified by Rudolf G. Arndt. Carnegie Museum of Natural History (CM 92895, 92896). Two highly active recently transformed specimens (10.5 cm and 10.7 cm total length) taken on a blacktop road between 2200 and 2300 hours during a moderate rain after a two- to three-week period of drought; air temperature approximately 28° C. The capture area is mature deciduous forest with several wooded ponds. First record for the county. Extends the range some 27 km NW of the nearest known Delaware locality (near Dover, Kent County, R. Conant, pers. comm., 1983). The capture area is to date (1983) apparently undisturbed, which strongly suggests that this population of the eastern tiger salamander is extant.

Submitted by **RUDOLF G. ARNDT,** Faculty of Natural Sciences and Mathematics, Stockton State College, Pomona, New Jersey 08240. ●

PLETHODON LARSELLI (Larch Mountain Salamander). USA: WASHINGTON: Klickitat Co: 7.8 km W of Lyle. 18 February 1983. (A00294). Skamania Co: 9.5 km W of Archer Mt. 16 February 1983. (A00276-278); 9.8 km NE of Stabler. 8 March 1983. (A00350); 8.3 km n of Willard. 2 May 1983. (A00276-278). R. E. Herrington. Verified by J. H. Larsen, Jr. All specimens deposited in the collection of the Department of Zoology, Washington State University. First record for Klickitat County. Skamania County specimens indicate an inland penetration of 18 km from the Columbia River. New localities increase the potential range of *P. larselli* in Washington from approximately 80 km^2 (Nussbaum, Brodie and Storm, 1983, Amphibians and Reptiles of the Pacific Northwest) to 1100 km^2. Twelve additional populations have been identified within the area of the new localities. Study supported by the Washington Department of Game.

Submitted by **ROBERT E. HERRINGTON** and **JOHN H. LARSEN, JR.,** Department of Zoology, Washington State University, Pullman, Washington 99164. ●

SIREN INTERMEDIA NETTINGI (Western Lesser Siren). USA: ARKANSAS: Yell Co: 0.5 km SW Petit Jean Wildlife Management Area headquarters, in Pond Creek. 11 March 1983. Collected by John Gallagher. Verified by G. D. Turnipseed. Arkansas Tech University Herpetological Collection (GDT 321), two specimens. The specimens were found in the debris from a dynamited beaver dam. The nearest previously reported specimens are from the Arkansas Tech University campus, Russellville, Arkansas, approximately 31 km to the NW (Turnipseed, G. D. 1980. Geographic distribution: *Siren intermedia nettingi*. SSAR Herp. Review 11(1):32).

Submitted by **MATTHEW GALLAGHER,** 901 East "E", Russellville, Arkansas 72801, or c/o Biology Department, Utah State University, Logan, Utah 84322. ●

ANURA

RANA CLAMITANS MELANOTA (Green Frog). USA: ARKANSAS: Washington Co: 24.1 km W of Fayetteville in entrance zone of Savoy Cave near Illinois River-Clear Creek confluence. 14 November 1982. S. E. Trauth and C. T. McAllister. Verified by R. S. Caldwell. Arkansas State Univ., Herpetological Museum (ASUHM #4044). A new county record (Dowling, H. G. 1957. Occ. Pap. U. Ark. Mus. 3:1-51) and the second reported individual from an Arkansas cave (see McDaniel, V. R. and J. E. Gardner. 1977. Proc. Ark. Acad. Sci. 31:68-71). Black (1973. Proc. Okla. Acad. Sci. 53:33-37) reported juvenile green frogs from the twilight zone of an Oklahoma cave. Our specimen, a male (head length = 22.0 mm, tibia length = 34.6 mm) was a cave accidental utilizing the site for shelter (outside air temp.= 5.0° C; cave water temp.= 11.5° C). Ecological associates included *R. catesbeiana, Eurycea longicauda melanopleura, E. lucifuga, E. multiplicata griseogaster* and *Plethodon glutinosus.*

Submitted by **STANLEY E. TRAUTH,** Department of Biology, Southern Methodist University, Dallas, Texas 75275, and **CHRIS T. McALLISTER,** Renal Metabolic Lab (151-G), VA Medical Center, Dallas, Texas 75216. ●

TESTUDINES

CHRYSEMYS SCRIPTA ELEGANS (Red-eared Turtle). USA: TEXAS: Rockwall County: Rowlett. Collected on SR 66 next to Lake Ray Hubbard. 31 October 1982, Steven Myers. Verified by P. A. Meylan. Florida State Museum, University of Florida (UF 53447). This specimen represents a new county record (Raun and Gehlbach, 1972, Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **STEVEN MYERS,** Department of Biological Sciences, University of Central Florida, Orlando, Florida 32816. ●

SAURIA

ANNIELLA NIGRA ARGENTEA (Silvery Legless Lizard). MEXICO: BAJA CALIFORNIA: Trib. Rio San Carlos, 20 km SE of the turnoff to Ojos Negros, along Mexican Highway 3 (=BCN16). 29 April 1979. This site is about 60 km ESE Ensenada. Collected and identified by the author. National Museum of Natural History (USNM 225333-334). There are few inland records of *Anniella* in Baja California, and prior accounts do not seem to define accurately the range of the species in Baja California. Van Denburgh (1922. The Reptiles of North America. Calif. Acad. Sciences), Klauber (1932. Copeia:4-6), and Shaw (1949. Herpetologica 5:27-28) report specimens from San Jose (Meling Ranch) at about latitude 31° N. L. E. Hunt (pers. comm.) provided records from near La Rumorosa (San Diego Natural History Museum 57373 and California Academy of Sciences 123702-705), which is near the U.S.-Mexico border at about lat. 32° 30'N. The Ojos Negros locality along Highway 3 is at about 31° 52'N, and fills in a gap of about 175 km between the other two inland records. Van Denburgh and Klauber both reported *Anniella* from San Salado Canyon, which is probably also known as Arroyo Salado, about 19 km S of San Vicente along Highway 1 (Wheelock, W. and H. E. Gulick. 1975. Baja California Guidebook. A. H. Clark Co.). This is a Pacific coastal site and is not to be confused with Laguna Salada near Mexicali. Bezy et al. (1977 Syst. Zool. 26:57-71) indicate that the range of *Anniella* is only in northwestern Baja California. Stebbins (1966. Field Guide to Western Reptiles

and Amphibians. Houghton Mifflin Co.) shows the range of *Anniella* extending to the Gulf of California in northern Baja California. R. C. Stebbins (pers. comm.) based this record on Gorman (1957. Copeia:148-150), who shows a locality near San Felipe on the Gulf of California. J. Gorman (pers. comm.) kindly reported to me that the locality probably mistaken by him to be near San Felipe was recorded as a specimen from "SDNHM 16284 BC Sta Maria n 4 mi. (Arroyo Paballon)." Santa Maria (along Arroyo or Rio Pabellon) is near San Quintin on the Pacific coast of the Baja California peninsula. Seemingly, Gorman earlier confused this locality with Junta Santa Maria, which is about 18 km S of San Felipe and at the same latitude as Santa Maria (Rio Pabellon) on the west coast. Also, the specimen number is probably SDNHM 41862 (L. E. Hunt, pers. comm.). To my knowledge, there are no records of *Anniella* east of the Sierra de Juarez and Sierra San Pedro Martir of Baja California. This clarification is shown in the range map of Hunt (1983. Copeia:79-89).

Submitted by **R. BRUCE BURY,** Denver Wildlife Research Center, 1300 Blue Spruce Dr., Fort Collins, Colorado 80524. ●

EUMECES ANTHRACINUS PLUVIALIS (Southern Coal Skink). USA: KENTUCKY: Calloway Co: 0.9 km north of Rte 121 on Rte 280. 22 June 1983. J. Moriarty, M. Evans, T. Sheehan, and W. Burger. Verified by J. R. MacGregor. Kentucky Nature Preserves Commission (KNPC H1076). This is the first record of this subspecies for the state. This extends the range east of the Mississippi River north by 175 km. (Mount, 1975. Reptiles and Amphibians of Alabama. Auburn).

Submitted by **JOHN MORIARTY,** Kentucky Nature Conservancy, Box 4207, Lexington, Kentucky 40544 and **MARC EVANS,** Kentucky Nature Preserves Commission, 407 Broadway, Frankfort, Kentucky. 40601. ●

EUMECES EGREGIUS ONOCREPIS (Peninsula Mole Skink). USA: FLORIDA: Indian River County: 4 miles south of Vero Beach, near jct. of Old Dixie Hwy. and Kelly Rd. 19 November 1977, Steven Myers. Verified by P. A. Meylan. Florida State Museum, University of Florida (UF 45794). Collected under boards in Rosemary Scrub. First published record of *Egregius* from Indian River County. Fills gap in distributional hiatus between Brevard and St. Lucie Counties (Mount, 1965, Variation and Systematics of the Scincoid lizard, *Eumeces egregius* (Baird), Bull. Fla. Sta. Mus. 9(5):184-213.

Submitted by **STEVEN MYERS,** Department of Biological Sciences, University of Central Florida, Orlando, Florida 32816. ●

HEMIDACTYLUS GARNOTI (Indo-Pacific Gecko). USA: FLORIDA: Orange Co: ca. 5.0 km NE Union Park (T22S, R31E, Sec. 9). 27, 29 March 1983. R. E. Smith, M. R. Bolt, J. M. Bloodwell. Verified by Peter Meylan. Florida State Museum (UF/FSM 53909-53910). Snout-vent length 52.0 mm and 53.1 mm, respectively. Geckos were initially observed on walls of newly constructed and landscaped apartment building in summer and fall 1982. *Hemidactylus turcicus* is absent from this locality. New county record. Northernmost record for this species. First recorded non-coastal sighting since introduction into Florida prior to 1964 (King and Krakauer, 1966, Quart. J. Fla. Acad. Sci. 29(2):144-154). Although Myers published first Brevard Co. record (Myers, S. 1979. SSAR Herp. Review 10(3):102-103), Cooper and Thompson's collections from Merritt Island (UF/FSM 44142, 44148; unpubl.) represent northernmost east coast locality. Union Park record lies ca. 61.1 km W-NW of Merritt Island locality and ca. 249.5 km N-NE of northernmost west coast record from Sanibel Island (McCoy, C. 1972. SSAR Herp. Review 4(1):23).

Submitted by **RICHARD E. SMITH,** Department of Biological Sciences, University of Central Florida, P.O. Box 25000, Orlando, Florida 32816. ●

LEIOLOPISMA LATERALE (Ground Skink). USA: TEXAS: Rockwall County: Rockwall, Lake Ray Hubbard. 9 October 1982, Steven Myers. Verified by P. A. Meylan. Florida State Museum, University of Florida (UF 53454). Collected under a trash pile on the shore of the Lake. First published record of *Leiolopisma* from Rockwall County (Raun and Gehlbach, 1972, Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No. 2). This together with the Rains County record helps to fill the last few distributional gaps in East Texas (Raun and Gehlbach, 1972).

Submitted by **STEVEN MYERS,** Department of Biological Sciences, University of Central Florida, Orlando, Florida 32816. ●

LEIOLOPISMA LATERALE (Ground Skink). USA: TEXAS: Rains County: East Towakoni, Lake Towakoni. 6 November 1982, Steven Myers and Rick Nappi. Verified by P. A. Meylan. Florida State Museum, University of Florida (UF 53452-53453). These specimens were found under a trash pile near the shore of the lake. This represents the first published record of *Leiolopisma* from Rains County (Raun and Gehlbach, 1972, Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **STEVEN MYERS,** Department of Biological Sciences, University of Central Florida, Orlando, Florida 32816. ●

SERPENTES

AGKISTRODON PISCIVORUS LEUCOSTOMA (Western Cottonmouth). USA: INDIANA: Dubois Co: Buffalo Bottoms, 2 km northeast of Jasper. Collected 4 May 1983 by John Krempp and Phil Schuetter. Verified by S. A. Minton and A. B. Wilson who observed two additional cottonmouths at this locality on 8 May 1983. Voucher specimen in Minton Collection (No. 1876). First record of the species for Indiana. Extends the known range 73 km E of previous record for Mount Carmel, Illinois (Cope, 1877. Am. Phil. Soc. Proc. 17 (100):63-68) and 101 km NE of previous record for Union County, Kentucky (Lodato and Burnley, 1975, Kentucky Herpetologist 5:4).

Submitted by **ANTHONY B. WILSON,** Indiana Department of Natural Resources (Enforcement Division), Indianapolis, Indiana 46204 and **SHERMAN A. MINTON,** Indiana University School of Medicine, Indianapolis, Indiana 46223. ●

CONTIA TENUIS (Sharptail Snake). USA: WASHINGTON: Skamania Co: 6.7 km NE of Carson. 2 May 1983. R. E. Herrington. Verified by J. H. Larsen, Jr. Department of Zoology, Washington State University. (A00551). Specimen is an adult female collected at 500 m elevation from an exposed talus slope. Locality is 4 km W of the Cascade Crest and extends the range 35 km W of the only other record for southern Washington (Stebbins, 1966, Field Guide to Western Reptiles and Amphibians). Study supported by the Washington Department of Game.

Submitted by **ROBERT E. HERRINGTON** and **JOHN H. LARSEN, JR.,** Department of Zoology, Washington State University, Pullman, Washington 99164. ●

DRYMARCHON CORAIS COUPERI (Eastern Indigo Snake). USA: FLORIDA: Indian River County: Wabasso Beach, DOR at the intersection of Jungle Trail and SR ALA. 8 December 1982, Steven Myers and Gary Tinsley. Verified by P. A. Meylan. Florida State Museum, University of Florida (UF 53465). This male specimen represents the first catalogued voucher specimen from Indian River County. An uncatalogued specimen collected by Herbert W. Kale II 31 October 1966 on the property of the Florida Medical Entomology Laboratory, South of Vero Beach is at that institution. Although the Eastern Indigo Snake is included in the Florida List of Rare and Endangered Species, it appears to be abundant in Indian River County particularly in citrus groves and coastal hammocks. I have also observed *Drymarchon* abundantly in these situations in St. Lucie County. It has been recorded from the surrounding counties of Brevard, Osceola, and Okeechobee (Ashton and Ashton, 1981, Handbook of Reptiles and Amphibians of Florida, Part I, The Snakes, Windward Publishing, Inc.).

Submitted by **STEVEN MYERS,** Department of Biological Sciences, University of Central Florida, Orlando, Florida 32816. ●

NERODIA HARTERI HARTERI (Brazos Water Snake). USA: TEXAS: Haskell Co: just below Lake Stamford Dam, 19 km ESE of Haskell. 3 August 1965, 4 April 1967, and 8 August 1968. Donald D. Smith. Verified by Donald D. Smith. Bobby Witcher Memorial Collection, Avila

College, Kansas City, Missouri (BWMC 2028-2029), and University of Kansas, Museum of Natural History, Lawrence, Kansas (KU 193260-193266). These specimens represent a county record, and extend the range of this snake approximately 18 km to the west of the Throckmorton County record of Tinkle and Knopf (1964, Herpetologica, 20(1):42-47).

Submitted by **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th Street and Rainbow Boulevard, Kansas City, Kansas 66103. ●

THAMNOPHIS RADIX HAYDENI (Western Plains Garter Snake). USA: MISSOURI: Carroll Co: 10.4 km south of Carrollton on US Highway 24. 1 May 1983. D. D. Smith and R. Powell. Verified by R. Powell and D. D. Smith. Avila College, Bobby Witcher Memorial Collection (BWMC 1987). The adult male is the first record from Carroll County, approximately 60 km SSE and 50 km SSW of the nearest reported localities in Livingston and Chariton Counties respectively, and extends the known distribution in central Missouri to the Missouri River flood plain (Anderson, 1965. The Reptiles of Missouri. Univ. Mo. Press, Columbia. p. 162). The capture site was due south of the proposed zone of intergradation between *T. r. radix* and *T. r. haydeni*, but this specimen is attributable to the latter with 21 cervical dorsal scale rows and 162 ventrals. We suggest that the southern limit of distribution of this snake in Missouri parallels the Missouri River, with dispersal being facilitated by occasional flooding in a manner proposed for Great Plains anurans by Metter et al. (1970. Copeia 1970(4): 780-781).

Submitted by **ROBERT POWELL,** Department of Natural Sciences, Avila College, 11901 Wornall Road, Kansas City, Missouri 64145, and **DONALD D. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th Street and Rainbow Boulevard, Kansas City, Kansas 66103. ●

NEW DISTRIBUTIONAL RECORDS OF TEXAS AMPHIBIANS AND REPTILES

The records reported herein add to the distributional data for some species of amphibians and reptiles in Texas. These records supplement those of Raun and Gehlbach (1972), Lewis (1974), Hambrick (1975, 1976), Merkord (1975), Cys (1976), Mather and Dixon (1976), and Karges (1978, 1979, 1981). Unless discussed as a range extension or range-margin extension, specimens represent new county records. Voucher specimens from counties hitherto represented by literature records only, are indicated by asterisk following the county name. All specimens are deposited in the Stephen F. Austin State University Collections. All identifications and verifications were made by the authors. Nomenclature follows Collins, et al. (1978).

CAUDATA

Ambystoma maculatum (Spotted Salamander): CASS Co. * SFA-5028. 8 km S Atlanta. 13 April 1973. R. Jackson. SAN AUGUSTINE Co. SFA-4853. 8.4 km NNW Broaddus. 4 March 1981. V. Rakowitz. This record is a range-margin extension westward from adjacent Sabine Co.

Ambystoma opacum (Marbled Salamander): NEWTON Co. SFA-160. 16.1 km E Burkeville. 30 November 1957. E. Toole. RUSK Co. * SFA-2087. Cannon's Ranch. 13 October 1962. C. Burrows.

Ambystoma talpoideum (Mole Salamander): RED RIVER Co. SFA-4718. 24.1 km N Clarksville. 26 April 1975. F. Rainwater. This specimen represents a range extension 223 km northward from previously recorded Texas populations. This is a partial link between the east Texas and southeastern Oklahoma populations. SAN AUGUSTINE Co. SFA-4854, 4855, 4856, 4857, 4858. 8.4 km NNW Broaddus. 13 April 1980. V. Rakowitz. These specimens bridge the gap between Jasper Co. to the south and Nacogdoches Co. to the north.

Ambystoma texanum (Smallmouth Salamander): ANGELINA Co. SFA-4209. Lufkin. 19 March 1969. G. Jacobs. KAUFMAN Co. SFA-3669. 8 km N Kaufman. 1 March 1969. K. Skidmore. SFA-3688, 3689. 9.6 km N Kaufman. 4 April 1969. K. Skidmore. SFA-3712. 8 km E Seagoville on FM rd. 5. 22 March 1969. K. Weatherford. NACOGDOCHES Co. * SFA-30, 146, 257, 280, 310, 1094, 1691, 3006, 4650, 4773. The ten specimens listed above are from various locations within the county and were collected from 1957 through 1978. NEWTON Co. SFA-183. 16.1 km E Burkville. 8 December 1957. E. Toole. SABINE Co. SFA-3969. 24.1 km N Hemphill. 8 March 1969. B. McDowell.

Ambystoma tigrinum mavortium (Barred Tiger Salamander): ARMSTRONG Co. * SFA-3194. 11.3 km W of Claude on FM rd. 1151. 22 August 1965. C. Mather. *Ambystoma tigrinum* (Eastern Tiger Salamander): NACOGDOCHES Co. * SFA-3773. 3.2 km N Nacogdoches. 27 January 1969. J. Leach.

Amphiuma tridactylum (Three-toed Amphiuma): ANGELINA Co. SFA-2417. 1.6 km S of Angelina River bridge on TX. 21. 15 May 1966. A. Foley. This record is a range-margin extension northwestward from Tyler Co. CHEROKEE Co. SFA-2561. 11.3 km S of Alto on TX. 21. 4 July 1966. W. Holder. This specimen is a range-margin extension southward from Smith Co. NACOGDOCHES Co. * SFA-2585 through 2595. On S.F.A. campus in Nacogdoches. 23 February 1966. J. Lock. SFA-3008. Banita Creek in Nacogdoches. 18 March 1967. J. Shaw. NEWTON Co. SFA-1884. 1.6 km S Old Columbia. 27 April 1961. J. Hurst.

Desmognathus auriculatus (Southern Dusky Salamander): ANDERSON Co. SFA-2363. 14.5 km E Palestine. 8 October 1964. S. Hillis. CHEROKEE Co. SFA-223. 2.4 km N Galatin. 18 January 1958. J. Collins. The specimens from Cherokee and Anderson Counties represent successive range-margin extensions to the west of Nacogdoches Co.; a westward range extension of 50 km.

Necturus beyeri (Gulf Coast Waterdog): CHEROKEE Co. SFA-2562. 10.5 km E of Jacksonville. 18 June 1966. K. Griffin. This specimen represents a range-margin extension to the west from adjacent Nacogdoches and Rusk Counties.

Notophthalmus viridescens louisianensis (Central Newt): NACOGDOCHES Co. SFA-383, 746, 909, 1295, 1831, 2128, 3002, 3849, 4057, 4750. The ten specimens listed above are from various locations within the county and were collected from 1957 through 1978. RUSK Co. SFA-3332. Intersection of U.S. 84 and FM rd. 839. 17 November 1967. C. Mather.

Siren intermedia nettingi (Western Lesser Siren): NACOGDOCHES Co. * SFA-2418. Nacogdoches. 10 March 1966. P. Thornburgh. SFA-2419. Nacogdoches. 24 June 1966. M. Land. SFA-2596, 2597, 2598. S.F.A. Campus, Nacogdoches. 23 February 1966. J. Lock. SFA-3367. 16.1 km SW Nacogdoches. 4 April 1968. C. Meitzen. SFA-3439. 4.8 km W Nacogdoches on TX. 7. 25 March 1969. J. Malloy. SFA-4367. Nacogdoches. 24 February 1971. R. Dorman. SFA-4368. Nacogdoches. 26 February 1971, D. Herbert. PANOLA Co. SFA-2677. 3.2 km SW Carthage. 16 October 1964. W. Gullette.

SALIENTIA

Acris crepitans blanchardi (Blanchard's Cricket Frog): FORT BEND Co. * SFA-2816. 6.4 km S Rosenberg. 28 March 1967. C. Meitzen. NUECES Co. SFA-1416. 16.1 km S Port Aransas. 23 July 1960. R. Packard. ROCKWALL Co. SFA-3700. S shore Lake Ray Hubbard. 1 March 1969. K. Weatherford. VAN ZANDT Co. SFA-2961. 11.2 km N Canton. 12 March 1967. M. Robinson.

Acris crepitans crepitans (Northern Cricket Frog): GREGG Co. SFA-1647. 11.3 km E Kilgore. 22 October 1960. J. Kincaid.

Bufo speciosus (Texas Toad): FAYETTE Co. SFA-3911. Schulenburg. 12 April 1969. T. Frizzell. GARZA Co. * SFA-4602. 11.3 km NE Post. 17 June 1973. S. Restivo.

Bufo valliceps valliceps (Gulf Coast Toad): BREWSTER Co. SFA-4445. On TX. 118, N of Study Butte. 24 July 1971. F. Rainwater. This record is a range-margin extension westward from adjacent Terrell Co. COMANCHE Co. SFA-3591. 6.4 km E DeLeon. 18 April 1969. B. Garrett. This specimen represents a range extension westward of 47 km from the nearest county record, Bosque Co. NACOGDOCHES Co. * SFA-752. Nacogdoches. 27 September 1959. R. Packard. SFA-1177. 0.4 km E Nacogdoches. 18 July 1960. J. Bowers. SFA-3709. Nacogdoches. 10 February 1969. K. Weatherford. SABINE Co. SFA-3975. 24.1 km N Hemphill. 29 March 1969. B. McDowell. This record fills the distribution gap between Shelby Co. to the north and Jasper Co. to the south.

Bufo woodhousei fowleri (Fowler's Toad). GALVESTON Co. SFA-2865. West Lagoon, Galveston. 19 April 1967. R. Dutcher. SFA-3009. Lagoon area, Galveston. 15 April 1967. J. Shaw. SAN AUGUSTINE Co. SFA-1183. 4.8 km NW San Augustine. 8 June 1960. D. Alford. SFA-1190. 4.8 km NW San Augustine. 15 June 1960. D. Alford. SFA-4859. 1.6 km NNE Broaddus. 8 March 1981. V. Rakowitz. VAN ZANDT Co. * SFA-2963. 11.3 km N Canton. 18 March 1967. M. Robinson.

Bufo woodhousei woodhousei (Woodhouse's Toad): WARD Co. SFA-4390. 8 km

NE Monahans. 3 April 1971. S. Restivo and J. Schultz. WINKLER Co. SFA-4392. 14.5 km NE Kermit. 23 June 1966. C. Kauffman. SFA-4393. 8 km NE Kermit. 2 April 1971. S. Restivo and J. Schultz. SFA-4580. 16.1 km NE Kermit. 20 May 1972. S. Restivo. The Ward and Winkler county specimens confirm their presence in an area previously mapped by Conant (1975) as a disjunct population.

Gastrophryne carolinensis (Eastern Narrowmouth Toad): ANGELINA Co. SFA-3715. 12.9 km NW Lufkin. 19 March 1969. K. Weatherford. SFA-4062. Clawson. 19 March 1969. J. Vincent. SAN AUGUSTINE Co. SFA-4860. 8.4 km NNW Broaddus. 20 April 1981. V. Rakowitz.

Gastrophryne olivacea (Great Plains Narrowmouth Toad): LAMPASSAS Co. SFA-4375. 6.4 km N Bend. 10 April 1970. D. Wood.

Hyla cinerea (Green Treefrog): ANGELINA Co. * SFA-3466. Hank's Creek marina, Sam Rayburn reservoir, 3 May 1969. B. Bates. PANOLA Co. SFA-1336. 6.4 km W, 3.2 km S Carthage. 29 June 1960. P. Osborne. SFA-2670. Carthage. 26 October 1964. W. Gullette. SAN AUGUSTINE Co. SFA-4884. 5.6 km N Broaddus on Forest Service Rd 300-1. 3 May 1982. R. Fleet.

Hyla crucifer crucifer (Northern Spring Peeper): JEFFERSON Co. SFA-3049. 4.8 km W Beaumont. 27 March 1967. B. Bilbo. SAN AUGUSTINE Co. SFA-3981. San Augustine. 18 April 1969. B. McDowell.

Hyla squirella (Squirrel Treefrog) NACOGDOCHES Co. SFA-3738. 24.1 km NE Nacogdoches. 1 March 1969. R. Harrell. This specimen represents a range extension 88 km northward from the nearest county record, Tyler County.

Pseudacris streckeri streckeri (Strecker's Chorus Frog): LEON Co. * SFA-4070. Buffalo. 26 April 1969. J. Vincent. NACOGDOCHES Co. * SFA-31. 9.6 km SW Nacogdoches. 18 October 1957. B. Hyndman. PANOLA Co. SFA-2655. Junction of FM rds. 10, 999 and 1970 at Gary. 26 November 1964. L. McWilliams. SFA-2656. 19.3 km SW Carthage. 24 November 1964. W. Gullette. These two specimens represent a range-margin extension eastward from adjacent Rusk Co. ROBERTSON Co. SFA-587. 6.4 km E Benchly. 7 December 1951. P. Parmalee. SHELBY Co. SFA-3716. 16.1 km NE Hurstown, Sabine National Forest. 26 April 1969. K. Weatherford. This record is a range-margin extension eastward from adjacent Nacogdoches County. UPSHUR Co. SFA-4781. 11.3 km W Gilmer. 18 March 1978. B. Reed.

Pseudacris triseriata feriarum (Upland Chorus Frog): POLK Co. * SFA-2654. 1.6 km S Corrigan. 10 October 1964. R. Chisolm. SABINE Co. SFA-3985, 3986. 24.1 km N Hemphill. 26 April 1969. B. McDowell.

Rana areolata areolata (Southern Crawfish Frog): NAVARRO Co. SFA-4544. 16.1 km E Corsicana on U.S. 287. 28 March 1972. G. Connor. This specimen is a range-margin extension west from Anderson County.

Rana blairi (Plains Leopard Frog): DONLEY Co. * SFA-3191. Salt Fork of the Red R., N of Ashtola. 25 August 1965. C. Mather. POTTER Co. * SFA-3170. Canadian R., 24.1 km N Amarillo on U.S. 287. 17 July 1965. C. Mather.

Rana catesbeiana (Bullfrog): ANGELINA Co. SFA-322. 6.4 km W Lufkin. 15 April 1958. J. Collins. SFA-2850. Lufkin. 29 April 1967. R. Diamond. SFA-4231. 4232. Lufkin. 12 April 1969. G. Jacobs. FORT BEND Co. SFA-2813, Brazos River bottom. 26 March 1967. C. Meitzen. GREGG Co. * SFA-1646. 11.3 km E Kilgore. 22 October 1960. J. Kinkaid. NACOGDOCHES Co. * SFA-1485, 1486, 1910, 1914, 1923, 1956, 1961, 2514, 2515, 2665, 2678, 4060. These twelve specimens are from various locations within the county and were collected from 1960 through 1969. PANOLA Co. SFA-2416. 16.1 km E Carthage. 20 June 1966. H. LaGrone. SFA-2663. 8 km S Carthage on U.S. 59. 8 January 1965. R. Anderson. SFA-4126. 6.4 km N Tenaha. 3 April 1969. R. Fetterolf.

Rana clamitans clamitans (Bronze Frog): ANGELINA Co. * SFA-2511. 3.2 km W Lufkin State School. 3 July 1966. A. Foley. SFA-2862. Lufkin. 4 May 1967. R. Dutcher. SFA-3457. Hank's Creek marina, Sam Rayburn Reservoir. 3 May 1969. B. Bates.

Rana sphenocephala (Southern Leopard Frog): ANGELINA Co. SFA-3464, 3465. Hank's Creek marina, Sam Rayburn Reservoir. 3 May 1969. B. Bates. SFA-4201, 4202. Lufkin. 17 March 1969. G. Jacobs. SFA-4203. Lufkin. 18 March 1969. G. Jacobs. SFA-4204, 4205. Lufkin. 19 March 1969. G. Jacobs. PANOLA Co. SFA-2498. 8 km W Carthage on TX. 315. 18 June 1966. W. Gullette. SFA-2686. 4.8 km S Carthage on Hill's Lake Rd. 22 December 1964. R. Anderson. SFA-2687. 4 km SW Carthage on Dixie Lake Rd. 18 October 1964. W. Gullette. SMITH Co. SFA-2689. Tyler. 25 October 1964. R. Moss.

Scaphiopus bombifrons (Plains Spadefoot): WILLACY Co. SFA-4377. 9.6 km W Raymondville on TX. 186. 4 April 1971. J. Jacob. WINKLER Co. SFA-5002. 1.6 km N junction TX. 115 and FM rd. 1218. 3 June 1972. J. Schultz. This specimen provides a link in the distribution gap between the Trans-Pecos and Texas Panhandle populations.

Scaphiopus couchi (Couch's Spadefoot): MIDLAND Co. * SFA-3588. Midland. 4 April 1969. B. Garrett.

Scaphiopus hammondi (Western Spadefoot): LUBBOCK Co. * SFA-4605. through 4611. 8 km SE Lubbock. 17 June 1973. S. Restivo.

Scaphiopus holbrooki hurteri (Hurter's Spadefoot): CHEROKEE Co. SFA-3699. 1.6 km N Jacksonville. 5 April 1969. K. Skidmore. SFA-3786, 3787, 3788, 3789. Jacksonville. 7 April 1969. J. Leach. GREGG Co. SFA-1651. Kilgore. 26 November 1960. J. Kincaid. HOUSTON Co. SFA-293. 4.8 km E Ratcliff. 7 March 1958. J. Collins. PANOLA Co. SFA-747. 3.2 km E Gary. 21 November 1959. R. Packard. SFA-2658. Junction of FM rds. 10, 999 and 1970 at Gary. 26 November 1964. L. McWilliams. POLK Co. SFA-2936. 1.6 km S Neches River. 7 April 1967. J. Birch. SAN AUGUSTINE Co. SFA-4861. 7.6 km NNW Broaddus. 20 April 1981. V. Rakowitz.

TESTUDINES

Chelydra serpentina serpentina (Common Snapping Turtle): HENDERSON Co. * SFA-4045. Malakoff. 12 April 1969. M. Lewis. NACOGDOCHES Co. SFA-1185, 1477, 1478, 2618, 2958, 3594, 3618, 4135, 4589. These nine specimens were collected from various localities within the county from 1960 through 1972. RUSK Co. SFA-2904. 3.2 km E Overton. 3 April 1967. J. Bynum. SHELBY Co. SFA-1308. 3.2 km S Center. 14 June 1960. J. Martin. SMITH Co. * SFA-2736. Tyler. 29 March 1967. M. Vredenburg.

Chrysemys concinna texana (Texas River Cooter): PALO PINTO Co. SFA-4799. Brazos River 8 km downstream from TX. 16 bridge. 9 April 1977. T. Truax. SAN SABA Co. SFA-4786. 16.1 km ESE San Saba. 23 April 1978. R. Marr.

Chrysemys scripta elegans (Red-eared Slider): ANGELINA Co. SFA-4210. Lufkin. 20 March 1969. G. Jacobs. SFA-4226. Lufkin. 31 March 1969. G. Jacobs. JASPER Co. SFA-4694. Jasper State Fish Hatchery. 18 April 1975. M. Hamilton. SHELBY Co. SFA-4131. 0.4 km S Paxton. 22 March 1969. R. Fetterolf.

Deirochelys reticularia miaria (Western Chicken Turtle): CHEROKEE Co. SFA-4645. New Summerfield. 21 April 1974. A Whitehurst. JASPER Co. SFA-2859. 1.6 km N Jasper. 1 April 1967. R. Dutcher. MARION Co. SFA-2612. Scottsville. 18 June 1966. L. Waite. NACOGDOCHES Co. SFA-4649. 14.5 km S Nacogdoches. 8 March 1974. R. Nicely. PANOLA Co. SFA-2611. Murval Creek. 12.9 km S Carthage. 18 June 1966. H. LaGrone.

Graptemys versa (Texas Map Turtle): SAN SABA Co. * SFA-4721, 4723, 4737, 4761, 4790. All five specimens collected on herpetology field trip from Rough Creek 16.1 km ESE San Saba. 22-23 April 1978.

Kinosternon subrubrum hippocrepis (Mississippi Mud Turtle): ANGELINA Co. * SFA-1284. NE city limits Lufkin. 3 July 1960. E. Dabbs. SFA-2927. U.S. 59 at Redland. 20 April 1967. J. Birch. JASPER Co. SFA-4696. Jasper State Fish Hatchery. 18 April 1975. W. Strelke. MARION Co. SFA-2435. Keener Ranch, Scottsville. 18 June 1966. L. Waite. NACOGDOCHES Co. * SFA-1197, 2433, 2866, 3013, 3108, 3416, 3583, 4697, 4783. These nine specimens are from various locations within the county and were collected from 1960 through 1978. TRINITY Co. SFA-2857. 9.6 km SW Groveton on TX. 94. 19 April 1967. R. Dutcher.

Macroclemys temmincki (Alligator Snapping Turtle): POLK Co. SFA-4600, (skull only). 1.6 km SE Goodrich, McCardle's Lake. 14 February 1973. C. Fisher.

Sternotherus carinatus (Razorback Musk Turtle): ANGELINA Co. * SFA-2860. Angelina River. 7 May 1967. R. Dutcher. CHEROKEE Co. SFA-1292. 9.6 km W Wells. 12 June 1960. J. Gaston. SFA-2436. 11.3 km S Alto on TX. 21. 4 July 1966. W. Holder. NEWTON Co. SFA-1563. Big Cow Creek. June 1960. J. Hurst.

Sternotherus odoratus (Stinkpot): ANDERSON Co. SFA-2316. 24.1 km E Palestine, Neches River. 18 October 1963. G. Lloyd. ANGELINA Co. * SFA-2438. 19.3 km S Nacogdoches at Angelina River. 2 July 1966. R. Garcia. SFA-2620. TX. 21 at Angelina River. 2 June 1966. M. Upshaw. MONTGOMERY Co. SFA-3764. 16.1 km SE Cleveland. 6 April 1969. J. Leach. NACOGDOCHES Co. SFA-2439. 4.8 km E Trawick. 6 June 1966. D. Shopay. SFA-4698. 4.8 km SE Nacogdoches. 16 April 1975. V. Suchy. SFA-4794. SFA Campus, Nacogdoches. 1 April 1978. G. Mowad.

Terrepene carolina triunguis (Three-toed Box Turtle): GREGG Co. SFA-1648. 11.3 km

E Kilgore. 22 October 1960. J. Kincaid. MARION Co. SFA-2627. Scottsville. 19 June 1966. L. Waite. PANOLA Co. * SFA-2624. 3.2 km SW Carthage on TX. 315. 22 June 1966. W. Gullette. SFA-2629. 16.1 km E Carthage. 20 June 1966. H. LaGrove. SAN AUGUSTINE Co. SFA-4862. 6.7 km NNW Broaddus. 24 April 1981. V. Rakowitz. SFA-4863. 9.7 km NNE Broaddus. 22 April 1981. V. Rakowitz. SMITH Co. SFA-2771. Tyler. 31 March 1967. W. Wilborn. VAN ZANDT Co. SFA-2970. 11.3 km N Canton. 22 April 1967. M. Robinson.

Terrepene ornata ornata (Ornate Box Turtle): FAYETTE Co. * SFA-3909. 4.8 km W Schulenburg. 12 April 1969. T. Frizzell. JEFFERSON Co. SFA-4404. 8 km E Fannet. 6 April 1969. M. Lewis. RED RIVER Co. SFA-3069. 8 km E Boxelder. 30 April 1967. C. Mather.

Trionyx muticus muticus (Midland Smooth Softshell): HUTCHINSON Co. SFA-3217. Lake Merideth. 5 August 1965. C. Mather. This record is a range-margin extension northwest from Gray Co. SHELBY Co. SFA-2836. 4.8 km E Tenaha. 22 April 1967. C. Nutt.

Trionyx spiniferus pallidus (Pallid Spiny Softshell): RUSK Co. SFA-1839. 22.5 km S Henderson, Lake Striker. June 1961. R. Adams.

SAURIA

Anolis carolinensis carolinensis (Green Anole): FREESTONE Co. SFA-2006, 2007. 9.6 km E Fairfield. 26 October 1962. R. Kiragon.

Cnemidophorus gularis (Texas Spotted Whiptail): RANDALL Co. * SFA-4357. 0.8 km E Palo Duro Canyon State Park. 7 April 1971. D. Wood.

Cnemidophorus sexlineatus sexlineatus (Six-lined Racerunner): ANGELINA Co. SFA-2427. 19.3 km S Nacogdoches at Angelina River and TX. 21. 2 June 1966. M. Upshaw. SFA-2428. Lufkin. 9 July 1966. A. Foley. NACOGDOCHES Co. * SFA-792, 793, 920, 1257, 1362, 1370, 1596, 1660, 1726, 2117, 2215, 3158, 3739, 3851, 3913. These fifteen specimens are from various localities within the county and were collected from 1959 through 1969. RUSK Co. * SFA-2051. 8 km E Henderson. 13 October 1962. V. Lewis. SFA-2908. 4.8 km W Henderson. 10 April 1967. J. Bynum. SABINE Co. SFA-3980. 24.1 km N Hemphill. 12 April 1969. B. McDowell. SAN AUGUSTINE Co. SFA-4872. 8.4 km NNW Broaddus. 8 April 1981. V. Rakowitz. *Cnemidophorus sexlineatus viridis* (Prairie-lined Racerunner): HEMPHILL Co. * SFA-1530. 4.8 km W Lake Marvin. 2 July 1960. G. Myers et. al. WEBB Co. * SFA-3779. Laredo. 6 April 1969. J. Leach.

Crotaphytus collaris collaris (Eastern Collared Lizard): CLAY Co. * SFA-3607. 4.8 km S Ryan, OK. 12 April 1969. B. Garrett.

Eumeces anthracinus pluvialis (Southern Coal Skink): MARION Co. SFA-5029. 3.2 km S Karnack. 15 April 1973. R. Jackson. SAN AUGUSTINE Co. SFA-4864, 4865. 7.6 km NNW Broaddus. 12 February 1981. V. Rakowitz. SHELBY Co. * SFA-1154. 6.4 km S Timpson. 23 April 1960. C. Cordes, R. Burkett.

Eumeces fasciatus (Five-lined Skink): SAN AUGUSTINE Co. SFA-4866. 1.6 km NNE Broaddus. 26 February 1981. A. Alexander. SFA-4867. 1.6 km NNE Broaddus. 14 April 1981. V. Rakowitz.

Eumeces laticeps (Broadhead Skink): SABINE Co. SFA-3978. 4.8 km S Hemphill. 12 April 1969. B. McDowell. SAN AUGUSTINE Co. SFA-4868. 1.6 km NNE Broaddus. 6 May 1981. V. Rakowitz.

Gerrhonotus liocephalus infernalis. (Texas Alligator Lizard): LLANO Co. SFA-4267. 9.6 km W Llano. 10 August 1969. J. Filecia.

Ophisaurus attenuatus attenuatus (Western Slender Glass Lizard): NACOGDOCHES Co. * SFA-364. Nacogdoches. 24 May 1958. J. Collins. SFA-3234. 6.4 km S Nacogdoches. 12 April 1967. C. Mather.

Phrynosoma cornutum (Texas Horned Lizard): LIMESTONE Co. SFA-2691. 3.2 km SE Tehuacana Post Office. 18 June 1966. A. Foley. NACOGDOCHES Co. * SFA-341, 790, 1179, 1181, 2261, 2262, 2401, 2476, 2695, 2701, 3055, 3254. These twelve specimens are from various localities within the county and were collected from 1958 through 1967. PANOLA Co. * SFA-1180. Carthage. 5 June 1960. W. Osborne. SABINE Co. SFA-1367, 1368. 4.8 km N Geneva. 14 June 1960. B. Simmons. These specimens represent the easternmost county record in Texas. This is a range extension eastward of 42 km from Nacogdoches Co. UPTON Co. SFA-4565. 19.3 km SE Crane. 28 March 1964. F. Brannowsky. VAN ZANDT Co. SFA-2957. 11.3 km N Canton. 25 February 1967. M. Robinson.

Sceloporus olivaceus (Texas Spiny Lizard): VICTORIA Co. * SFA-4073. Victoria. 4 April 1969. J. Vincent.

Sceloporus undulatus consobrinus (Southern Prairie Lizard): MIDLAND Co. SFA-3993, 3994, 3995. 48.3 km S Midland. 15 March 1969. T. Wenk. *Sceloporus undulatus garmani* (Northern Prairie Lizard): CHEROKEE Co. * SFA-1614, 2131, 2132, 2711. These four specimens were collected from separate localities within the county between 1960 and 1966. LAMAR Co. * SFA-870. 0.4 km N Paris. 27 October 1959. B. Coe SFA-871. 1.6 km N Paris. 28 October 1959. B. Coe. MORRIS Co. SFA-2195. 1.6 km E Dangerfield. 19 October 1962. S. Palmer. NAVARRO Co. SFA-2022. 1.6 km W Corsicana. 29 September 1962. R. Kiragon.

Scincella lateralis (Ground Skink): SAN AUGUSTINE Co. SFA-4869. 1.6 km NNE Broaddus. 16 April 1981. R. Fleet. SFA-4870. 3.3 km NE Broaddus. 16 April 1981. V. Rakowitz. SFA-4871. 7.6 km NNW Broaddus. 16 April 1981. J. deBin.

Urosaurus ornatus ornatus (Eastern Tree Lizard): COMAL Co. * SFA-4247. 32.2 km W San Marcos on FM rd. 12. 3 May 1969. G. Jacobs.

Uta stansburiana stejnegeri (Desert Sideblotched Lizard): MIDLAND Co. SFA-3651. 3.2 km S Midland. 6 April 1969. B. Garrett. SFA-4134. Midland. 6 March 1969. R. Fetterolf. The Midland County specimens represent a range-margin extension eastward from adjacent Ector County. UPTON Co. SFA-4260. 19.3 km E Crane. 28 March 1964. F. Bannowsky, E. Greding. This specimen represents a range-margin extension eastward from adjacent Crane County.

SERPENTES

Agkistrodon contortrix contortrix (Southern Copperhead): ANGELINA Co. SFA-340. 0.4 km N Pollock. 1 May 1958. J. Collins. NEWTON Co. * SFA-1881. 3.2 km N Farr's Chapel, near Big Cow Creek. 16 April 1961. J. Hurst. SFA-1970. 8 km N Burkeville. 8 September 1961. J. Hurst. COMAL Co. * SFA-4244. 27.4 km W San Marcos on FM rd. 12. 3 May 1969. G. Jacobs. This specimen was taken within the range of *A.c. laticinctus* as mapped by Conant (1975).

Agkistrodon piscivorus leucostoma (Western Cottonmouth): ANGELINA Co. SFA-2306, 2307. 3.2 km S Boykin Springs, Angelina National Forest. 18 June 1964. R. Murray. SFA-2429. 9.7 km W Lufkin on TX. 103. 1 June 1966. A. Foley. MARION Co. * SFA-2722. Keener Ranch, Scottsville. 5 July 1966. M. Land. PANOLA Co. SFA-1335. 6.4 km W, 3.2 km S Carthage. 29 June 1960. W. Osborne. SABINE Co. SFA-1355. Sabine River bottom near Hemphill. 1 June 1960. J. Phillips. UPSHUR Co. SFA-4779. 11.3 km W Gilmer. 18 March 1978. B. Reed.

Arizona elegans arenicola (Texas Glossy Snake): STARR Co. SFA-4406. 16.2 km N Rio Grande City on FM rd. 755. 23 May 1971. J. Jacob. *Arizona elegans elegans* (Kansas Glossy Snake): DONLEY Co. SFA-3192. 8 km W Hedley on U.S. 287. 3 September 1965. C. Mather.

Coluber constrictor anthicus (Buttermilk Racer): ANGELINA Co. * SFA-2322. 24.1 km S Nacogdoches. October 1964. R. Ireland. BRAZORIA Co. SFA-1586. Old Angleton Rd. between Angleton and Clute. 25 November 1960. C. Cordes. CHEROKEE Co. * SFA-1301. 8 km W Wells. 13 June 1960. J. Gaston. NEWTON Co. * SFA-1885. 1.6 km NW Newton. 14 May 1961. J. Hurst.

Coluber constrictor flaviventris (Eastern Yellowbelly Racer): GRAY Co. SFA-3165. Lake McClellan. 24 June 1965. C. Mather. LAMAR Co. SFA-874. 1.6 km N Paris. 28 October 1959. B. Coe.

Crotalus atrox (Western Diamondback Rattlesnake): KENT Co. * SFA-302. 32.2 km S Snyder. 5 April 1958. J. Collins.

Diadophis punctatus arnyi (Prairie Ringneck Snake): SAN SABA Co. SFA-4736. 16.1 km SE San Saba, Rough Creek. 21 April 1978. C. Hodgson.

Drymarchon corais erebennus (Texas Indigo Snake): DUVAL Co. * SFA-4329. 12.9 km NE Freer on U.S. 59. 20 June 1970. W. Dickens.

Elaphe guttata emoryi (Great Plains Rat Snake): BELL Co. SFA-4352. 9.7 km S U.S. 190 on FM rd. 1670. 8 May 1970. D. Wood.

Elaphe obsoleta lindheimeri (Texas Rat Snake): ANGELINA Co. * SFA-1281, 2442, 3283. These three records are from different localities within the county and were collected in 1960, 1966, and 1967, respectively. JASPER Co. * SFA-2893. Jasper. 2 April 1967. J. Talbett. LIBERTY Co. * SFA-2444. 8 km W Hardin. 1 June 1966. H. Baker. NACOGDOCHES Co. * SFA-717, 1103, 2310, 2323, 2440, 2752, 3028, 3107, 3286, 3601, 3895. These eleven records represent collections from various localities within the county from 1957 through 1969. SAN AUGUSTINE Co. * SFA-4873. 7.6 km NNW Broaddus. 12 April 1981. J. deBin.

Farancia abacura reinwardti (Western Mud Snake): NACOGDOCHES Co. * SFA-1216, 1233, 2033, 2309, 4673. These six specimens

are from different locations within the county and were collected from 1960 through 1974.

Heterodon platyrhinos (Eastern Hognose Snake): ANDERSON Co. SFA-2150. 4.2 km from Neches River in Neches Oil Field. 20 October 1962. R. Lanier. ANGELINA Co. * SFA-1278. 4.8 km NW Lufkin on old Moffitt Rd. 20 June 1960. E. Dabbs. CHEROKEE Co. * SFA-2125. Price's Switch on Neches River. 28 September 1962. R. Lanier. GREGG Co. SFA-3836. 3.2 km S Lakeport on TX. 322. 15 April 1969. D. Wilkinson. JASPER Co. * SFA-3045. 16.1 km N Vidor. 29 March 1967. B. Bilbo. NAVARRO Co. * SFA-2168. Kerens. 3 November 1962. D. Baker. SHELBY Co. * SFA-907, 1302, 1344, 1703, 1706. The five specimens came from different locations in the county and were collected in 1959 and 1960. WOOD Co. * SFA-1222. 1.6 km SE Mineola, Smith Creek. 11 June 1960. J. Bruner.

Lampropeltis calligaster calligaster (Prairie Kingsnake): NAVARRO Co. SFA-1635. Corsicana. 22 November 1960. K. Kimes. SFA-2944. 19.3 km W Corsicana on TX. 31. 2 April 1967. J. DeFranco. RUSK Co. SFA-2921. 9.6 km SW Henderson. 18 April 1967. J. Bynum. SAN AUGUSTINE Co. SFA-4874. 8.4 km NNW Broaddus. 19 February 1979. V. Rakowitz. SHELBY Co. SFA-1707. 4.8 km SW Timpson. 1 November 1960. J. Scott.

Lampropeltis getulus holbrooki (Speckled Kingsnake): BRAZORIA Co. SFA-1573. Mouth of Brazos River, near Freeport. 18 April 1960. C. Cordes. SFA-2604. 4.8 km N Freeport bridge on TX. 288. 15 May 1966. A. Foley. CHEROKEE Co. SFA-1944. 3.2 km W Rusk on U.S. 84. 21 June 1962. C. McClatchey. SFA-2605. 9.6 km N Jacksonville. 28 August 1965. K. Griffin. NACOGDOCHES Co. SFA-3632, 3633. Nacogdoches. 1 April 1969. T. Tuck. SFA-3697. 4.8 km N Nacogdoches. 19 April 1969. K. Skidmore. RED RIVER Co. * SFA-3060. 8 km S Boxelder. 30 April 1967. C. Mather. SABINE Co. SFA-3964. 24.1 km N Hemphill. 8 March 1969. B. McDowell. SAN AUGUSTINE Co. SFA-4875. 8.4 km NNW Broaddus. 28 April 1981. V. Rakowitz.

Lampropeltis triangulum amaura (Louisiana Milk Snake): NEWTON Co. * SFA-1503. 6.4 km N Bon Wier. 8 October 1960. J. Hurst. POLK Co. SFA-4339. Shore of Lake Livingston. 14 June 1970. J. Vincent and T. Brannon.

Masticophis flagellum flagellum (Eastern Coachwhip): NACOGDOCHES Co. * SFA-815, 882, 896, 2948, 3025, 3111. The six specimens are from several locations within the county and were collected from 1959 through 1967. RUSK Co. SFA-2161. 8 km E Henderson. 13 October 1962. R. Kiragon. SFA-2466. 6.4 km W Tatum. 15 June 1966. L. Jameson. SAN AUGUSTINE Co. SFA-4876. 8.4 km NNW Broaddus. 8 May 1981. V. Rakowitz. *Masticophis flagellum testaceus* (Western Coachwhip): MIDLAND Co. SFA-3600. 12.9 km S Midland. 7 April 1969. B. Garrett.

Micrurus fulvius tenere (Texas Coral Snake): LAMAR Co. SFA-873. 1.6 km N Paris. 28 October 1959. B. Coe. This record is a range extension of 83 km northwest from the nearest county record in Morris County. SAN AUGUSTINE Co. SFA-4877. 3.3 km NE Broaddus. 12 April 1981. V. Rakowitz.

Nerodia cyclopion cyclopion (Green Water Snake): FORT BEND Co. SFA-2822. Jew's Prairie. 28 March 1967. C. Meitzen.

Nerodia erythrogaster flavigaster (Yellowbelly Water Snake): ANGELINA Co. * SFA-2810. Sam Rayburn Lake. 14 April 1967. S. Fleener. CHEROKEE Co. * SFA-601, 1289, 2103, 2154, 2456. The five specimens were collected from several localities within the county from 1938 through 1966. NACOGDOCHES Co. * SFA-318, 602, 1188, 1201, 1381, 2753, 3019, 3579, 3869, 4230. The ten specimens were collected from various locations in the county from 1938 through 1969. NEWTON Co. * SFA-714. 16.1 km E Burkeville. 12 April 1957. E. Toole. PANOLA Co. SFA-1332, 1333, 1334. 6.4 km W, 3.2 km S Carthage. 29 June 1960. W. Osborne. ROCKWALL Co. SFA-3723. S shore Lake Ray Hubbard. 1 March 1969. K. Weatherford. VAN ZANDT Co. SFA-2966. 1.3 km N Canton. 8 April 1967. M. Robinson. *Nerodia erythrogaster transversa* (Blotched Water Snake): POTTER Co. * SFA-3167. Canadian River, 24.1 km N Amarillo, U.S. 287. 17 July 1965. C. Mather.

Nerodia fasciata confluens (Broad-banded Water Snake): ANGELINA Co. SFA-1271. 0.8 km NE Lufkin. 9 June 1960. E. Dabbs. CHEROKEE Co. SFA-1300. 8 km W Wells. 13 June 1960. J. Gaston. SFA-1941. 11.3 km NW Rusk. 18 June 1962. C. McClatchey. WALLER Co. SFA-2609. Lake Winona. 2 July 1966. L. Waite. WILLIAMSON Co. SFA-3085. San Gabriel River, Georgetown. 22 April 1967. M. Watkins. This specimen represents a range-margin extension north from adjacent Travis County.

Nerodia rhombifera rhombifera (Diamondback Water Snake): CHEROKEE Co. * SFA-2145. Lake Jacksonville. 5 October 1962. R. Lanier. FREESTONE Co. SFA-2036. Hill Ranch, Fairfield. 20 October 1962. R. Kiragon. NACOGDOCHES Co. * SFA-1862, 1991, 2025, 2311, 2454, 2754, 2874, 3239, 3361, 3724. These ten specimens were collected from various locations within the county from 1961 through 1969. SAN AUGUSTINE Co. * SFA-4878. 3.3 km NE Broaddus. 12 April 1981. V. Rakowitz. VAN ZANDT Co. SFA-2967. 11.3 km N Canton. 8 April 1967. M. Robinson.

Opheodrys aestivus (Rough Green Snake): ANDERSON Co. SFA-2151. 3.9 km from Neches River in Neches oil field. 6 October 1962. R. Lanier. ANGELINA Co. SFA-1275. 1.6 km NW Lufkin. 18 June 1960. E. Dabbs, SFA-2606. Lufkin. 15 June 1960. A. Foley. GREGG Co. SFA-2202. Rabbit Creek. 8 October 1962. C. Burrow. KAUFMAN Co. SFA-3690. 9.7 km N Kaufman. 4 April 1969. K. Skidmore. NACOGDOCHES Co. SFA-1814. 12.9 km E Nacogdoches. 6 July 1961. E. Caldwell. SFA-4760. Nacogdoches. 28 March 1978. M. Stafford. PANOLA Co. SFA-1329. 6.4 km W, 3.2 km S Carthage. 29 June 1960. W. Osborne. SFA-2372. 16.1 km SE Carthage. 22 October 1964. W. Gullette. SFA-2463. 19.3 km E Carthage. 20 June 1966. H. LaGrone. POLK Co. * SFA-2336. 3.2 km E Corrigan. 29 October 1964. R. Chisolm.

Pituophis melanoleucas ruthveni (Louisiana Pine Snake): WOOD Co. * SFA-5038. 30.6 km NW Gilmer. 26 May 1973. D. McKee. This specimen confirms an isolated literature record for the county and is 330 km north of the northernmost Texas population records. *Pituophis melanoleucus sayi* (Bullsnake): GRAY Co. * SFA-3193. Lake McClellan. 17 August 1965. C. Mather. GRAYSON Co. SFA-4669. 10.5 km W intersection of FM rd. 1417 and U.S. 82. 25 March 1975. R. Hendricks. This specimen is a link between the isolated Fannin County record and the more westerly records.

Regina grahami (Graham's Crayfish Snake): CHAMBERS Co. SFA-4613. 11.3 km S Winnie on TX. 124. 5 April 1974. R. Beavers. NACOGDOCHES Co. SFA-3915. 19.3 km S Nacogdoches near Angelina River. 28 April 1969. T. Frizzell. This specimen is from the East Texas area hitherto devoid of county records for this species.

Regina rigida sinicola (Gulf Crayfish Snake): CHEROKEE Co. SFA-1942. 11.3 km NW Rusk. 18 June 1962. C. McClatchey. NACOGDOCHES Co. SFA-2143. 8 km E Nacogdoches. 13 October 1962. R. Lanier. SFA-3908. Nacogdoches. 11 April 1969. T. Frizzell. The Cherokee and Nacogdoches County records fill the hiatus between Rusk and Smith Counties to the north and Angelina County to the south.

Rhinocheilus lecontei tessellatus (Texas Longnose Snake): POTTER Co. SFA-3159. N city limits of Amarillo. 18 August 1965. C. Mather. This record bridges the gap between Randall County to the south and Hutchinson County to the northeast.

Sistrurus catenatus tergeminus (Western Massasauga): ARCHER Co. SFA-4881. 4.8 km N Lake Kickapoo. 14 June 1968. E. Roth. SFA-4882. Lake Kickapoo. 30 June 1968. W. Seifert. SFA-4883. 8 km E Lake Kickapoo. 22 April 1970. W. Seifert.

Sistrurus miliarius streckeri (Western Pigmy Rattlesnake): NACOGDOCHES Co. SFA-4586. 16.1 km S Nacogdoches. 21 August 1972. R. Jackson. SFA-4587. 8 km NE Nacogdoches. 24 February 1973. M. Garrett. SABINE Co. SFA-3979. 4.8 km S Hemphill. 12 April 1969. B. McDowell. SAN AUGUSTINE Co. SFA-4879. 4.1 km NE Broaddus. 4 May 1981. M. Whiting.

Sonora episcopa taylori (South Texas Ground Snake): ZAPATA Co. * SFA-4088. Falcon State Park. 5 April 1969. J. Vincent.

Storeria occipitomaculata occipitomaculata (Northern Redbelly Snake): CASS Co. SFA-5024. 11.3 km N Atlanta. 14 April 1973. R. Hendricks.

Storeria dekayi texana (Texas Brown Snake): SMITH Co. SFA-2326. Tyler. 15 October 1964. R. Moss.

Tantilla gracilis (Flathead Snake): HENDERSON Co. SFA-1058. 8 km SW Malakoff. 7 April 1958. W. Robertson.

Tantilla nigriceps fumiceps (Texas Blackhead Snake): HOCKLEY Co. SFA-4599. 2.4 km N Levelland. 20 July 1972. J. Schultz. This record is a range-margin extension westward from adjacent Lubbock County.

Thamnophis proximus proximus (Western Ribbon Snake): ANGELINA Co. SFA-1274. 0.8 km NE Lufkin. 17 June 1960. E. Dabbs. SAN AUGUSTINE Co. SFA-4880. 8.4 km NNW Broaddus. 12 April 1981. V. Rakowitz. WOOD Co. SFA-2465. 24.1 km E Quitman on TX. 154. 25 June 1966. D. Seago.

Thamnophis sirtalis annectans (Texas Garter Snake): SAN PATRICIO Co. SFA-3695. 11.3 km N Sinton. 19 April 1969. K. Skidmore.

Tropidoclonion lineatum annectens (Central Lined Snake): CHEROKEE Co. SFA-1834. 4.8 km N Rusk on U.S. 69. 1 July 1961. V. Barton. SMITH Co. SFA-2733. 4.0 km E Tyler

on U.S. 59. 27 March 1967. M. Vredenburg. The Cherokee and Smith County records constitute successive range-magin extensions southward from Gregg County. This results in a range extension southward of 65 km.

Virginia striatula (Rough Earth Snake): HOUSTON Co. SFA-3156. Crockett. 12 February 1967. C. Mather. SFA-3218. 6.4 km W Crockett on FM rd. 2026. 25 March 1967. C. Mather. NACOGDOCHES Co. * SFA-71, 298, 653, 2873, 2901, 3086, 3548, 3604, 3727, 3923. These ten specimens were collected from several localities within the county from 1957 through 1969.

Virginia valeriae elegans (Western Earth Snake): GREGG Co. SFA-266. 16.1 km SE Longview. 19 January 1958. G. Raney. This record is a range-margin extension northeast from adjacent Rusk County.

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BOOK REVIEWS

Threatened Amphibians and Reptiles in Europe, by Rene E. Honegger. Academische Verlagsgesellschaft (Postfach 11 07, D-6200 Wiesbaden, West Germany) 1981, 158 pp, cloth bound, boxed, DM 68, ISBN 3-400-00437-5.

This small book is a supplementary volume of the "Handbuch der Reptilien und Amphibian Europas" and was edited by the European Committee for the Conservation of Nature and the Natural Resources-Council of Europe. This well-bound, attractively printed book is marred by numerous typographical errors.

Dr. Rene E. Honegger of the Zurich Zoo has been active in the conservation of European amphibians and reptiles for more than a decade. Working with numerous colleagues he has now produced an "official" guide to the threatened species of the European herpetofauna. Each of 14 taxa of amphibians and 39 of reptiles considered to be threatened are documented in detail, including status (extinct, endangered, vulverable, rare, or undetermined), distribution, populations in Europe, habitat, reasons for decline, conservation measures taken, conservation measures proposed, and remarks.

These accounts are documented thoroughly. For example, the olm *(Proteus anguinus)* is noted as having been introduced from Yugoslavia to the Parolini Grotto in Italy about 1850; among the reasons for the decline of the species is the habit of farmers collecting them for pig food. Likewise, the decline of island populations of lacertid lizards is documented — *Podarcis filfolensis* because island shelled by British Navy for target practice, *Podarcis lilfordi rodriguezi* because habitat destroyed in the rebuilding of a port, *Podarcis lilfordi lilfordi* and *Podarcis sicula coerulea* because of over-collecting.

The first third of the book is devoted to the reasons for decline and protective measures. Honegger concludes that the main reason for the drastic decline of the European herpetofauna is habitat destruction. He provides extensive documentation of habitat destruction and diminution of populations, especially the draining and filling of wetland habitats and the detrimental effects on populations of amphibians. Second in importance is chemical effects (pesticides, acidification, and pollution), followed by collecting and trade, and lastly, effects of introduced species.

American herpetologists will recognize equivalent problems of habitat destruction and chemical effects in North America. However, Americans will be appalled at the numbers of amphibians and reptiles collected for the pet trade and culinary purposes in Europe. For example, on the basis of weight of exports, Honegger estimates that more than 2 million frogs were exported from Greece in 1975 alone; these were for human consumption. Data for specimens collected in Italy in 1968-1970 for commercial, scientific, and culinary purposes amounted to more than 235,000 reptiles, 96,000 salamanders, and more than 47 million frogs, most of the latter for food. The pet trade of amphibians and reptiles flourishes in Europe more than anywhere else in the world. Some of the persons that purchase and maintain amphibians and reptiles make careful observations that result in worthwhile contributions to the scientific literature as published in numerous aquarium and terrarium journals, but the vast majority of animals must be wasted. I suspect that a very small percentage of the total number of specimens collected are destined for scientific endeavors; yet because of the necessity of protective regulations, scientists who have legitimate research needs are restricted by regulations aimed at commercial interests.

In the chapter on protection, the major issues are discussed and the existing and proposed legislation in Europe and in each country is summarized. Protection varies from all species of amphibians and reptiles being nominally protected by law in Denmark, France, Gibraltar, Lichtenstein, Luxembourg, and the Netherlands, to no protection in Greece, Norway, and Turkey. Honegger emphasizes eight aspects of conservation of the herpetofauna; 1) Conservation of habitats (main aspect); 2) Management and creation of habitats; 3) Legal conservation of taxa; 4) Restriction against the use of pesticides and measures against pollution; 5) Education of the decision makers and general public; 6) Coordination of conservation efforts among conservationists, ecologists, legal authorities, and the general public; 7) Measures to eliminate traffic mortalities; and 8) Intensification of basic and practical research.

Europeans are well ahead of other parts of the world in conservation efforts. This is evident from the existence of the book under review. Why doesn't a comparable volume exist for North America? Persons interested in the survival of amphibians and reptiles in their native habitats will find this book useful and enlightening while being discouraging at the same time. Persons involved in gathering data for conservation measures and proposing legislation will find the documentation and extensive bibliography pertaining to European species as a useful guide. And may everyone who eats frog legs from Greece and Italy suffer acute indigestion.

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Tortues Marines de Guyane, by Jacques Fretey. 1981. 136 p., 114 photos (18 color), soft cover (8-3/4 x 9-1/4 in.). Publisher and source: Editions du Léopard d'Or, 11 rue du 4-Septembre, 75002 Paris, France (cite ISBN 2.86377.008-X). Price: 140 French francs including surface post (airmail 25 francs extra).

French Guiana, situated between Surinam and Brazil on the northeastern coast of South America, has some of the prime nesting beaches for sea turtles. Beginning in 1978 the World Wildlife Fund initiated a project to study and protect sea turtles along the French Guiana coast, under the supervision of Jacques Fretey, zoologist with the Museum National d'Histoire Naturelle in Paris since 1973. This handsome book, which includes a large number of beautiful photographs mostly by the author, is an important contribution to our knowledge of the five species found there: *Chelonia mydas, Lepidochelys olivacea, Caretta caretta, Eretmochelys imbricata,* and *Dermochelys coriacea.*

Following a brief historical summary and an illustrated key to species, there are short sections on osteology and anatomy and mating behavior. There are extensive discussions (with detailed maps and photos) of nesting areas in French Guiana, movement patterns of females on the beaches, egg-laying behavior, mortality of adults, incubation of eggs, emergence, predation on hatchlings (including fish, dogs, coatimundi, crabs and, especially, birds), the influence of tourists, and a short discussion of Fretey's tagging program. Finally, there is a summary of some of the measures taken to protect the sea turtles and their nesting beaches in French Guiana (including photos of conservation posters displayed there) and a final chapter on representations of sea turtles in the pottery and carvings of the local Kaliña Indians.

This is an excellent first attempt to popularize these remarkable animals in French Guiana and to develop a greater appreciation by the general public of the importance of the nesting areas there. Let us hope that the book will have the desired effect, to reverse the sad decline of sea turtle populations, especially for the leatherback for which the French Guiana beaches represent one of the best nesting areas in the world.

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Herpetology of Africa: A Checklist and Bibliography of the Orders Amphisbaenia, Sauria, and Serpentes, by Kenneth R. G. Welch. 1982. 314 pages. $19.50. Robert E. Krieger Publishing Company, Inc., PO Box 9542, Melbourne, Florida 32901, USA.

It is remarkably easy to find fault with checklists, in part because they frequently carry opinions other than our own, but more fundamentally because the difficulty in preparing any worthwhile checklist precludes perfection. This particular checklist is not perfect, but it is worthwhile and should be a welcome addition to the bookshelf of any herpetologist who wants easy access to the literature of the reptiles of Africa, Madagascar, and adjacent islands.

The title printed on the front cover of the book, *Herpetology of Africa,* is misleading because this volume does not treat amphibians and treats adequately only the squamates; the turtles and crocodilians are given short shrift. Within the squamates Welch provides current generic, species, and subspecies names, each with the author and year proposed. Type species are provided with the genera and distributions are given for species and subspecies. The stated distributions tend to be too general. For those species and subspecies that were described under a different generic name the original name is given at the margin to the right of the current name. These marginal notations might be confusing because this convention is explained nowhere in the text. Each genus, species, and subspecies record includes citations to pertinent literature. To my knowledge, all literature cited, both original descriptions and other reference literature, appears in the bibliography, although such bibliographic anomalies such as Tornier, 1900a, but no 1900b makes one wonder. Diacritical marks are not used in this volume, a minor problem, but a little annoying when Günther is spelled Gunther rather than the correctly transliterated Guenther. I know of only one species missed by Welch, *Python saxuloides* Miller and Smith, 1979 (Bull. Maryland Herp. Soc. 15:71), an oversight forgivable given the recency and obscurity of the description.

The crocodilians and turtles are treated somewhat inadequately, especially considering their small numbers. Only a list of current taxonomy, names and authors is provided in an appendix, with no distributions. All reference to pertinent literature is presented at the beginning of each order. In another appendix familial references are provided; these references would have been better placed in the body of the checklist. Another appendix references regional works and may be useful to those interested in faunal surveys.

Welch has treated nearly 1700 species and provided 1600 references in this volume. This represents a great deal of work on the part of Welch and a great deal of work saved for those interested in African herpetology. In spite of a few relatively minor problems, $19.50 is a small price to pay for ready access to the literature on African reptiles.

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Philippine Lizards of the Family Gekkonidae, by Walter C. Brown and Angel C. Alcala. Dumaguete City; Silliman University (Natural Science Monograph Series No. 1). 1978. 146 pages.

Philippine Lizards of the Family Scincidae, by Walter C. Brown and Angel C. Alcala. Dumaguete City; Silliman University (Natural Science Monograph Series No. 2). 1980.

The team of Brown and Alcala has a remarkable record of steady production of useful contributions to our knowledge of the Philippine herpetofauna. These two volumes cover the two principal families of lizards in the Philippine Islands — 32 species of gekkonids and 64 of skinks. The other families, Agamidae, Varanidae and Dibamidae combined, are represented in the Philippines by only 15-25 species.

Both volumes continue the tradition of care and attention to detail that characterizes the work of these authors. Each volume begins with a key to genera followed by a section on each genus and ending with a discussion of zoogeographic phenomena. Each generic segment consists of a key to the species and for every species a complete synonymy, lists of material examined, complete description, range, and ecological notes. The tables of scale counts and measurements are scattered through the volumes. Both line drawings and half-tone illustrations are included.

A few technical details mar these otherwise excellent monographs. In general, the halftones are not clear and, therefore, not very useful. The line drawings of the gekkonid volume are fine but some of those of the scincid one are too small to be helpful. There is also a disturbing number of typographical errors, only a portion of which is noted in errata sheets. The most troublesome ones involve incorrect notation of figure numbers in several keys. Fortunately, all these mistakes are easily caught and rectified by anyone with a serious interest in the subject matter.

The diversity and endemism of these two families in the Philippines are impressive and do not appear to be based on excessive splitting. Each family is represented by 10 genera. Seventy-two percent of the gekkonid species and 81% of the skinks are endemic. Brown and Alcala speculate that their list of species of gekkonids is probably close to the actual number occurring in the Philippines except possibly for forms restricted to very small islands. That seems to be a reasonable estimate. The list of skinks is certainly incomplete. That Palawan is known to be poorly explored makes it likely that the 10 species now recorded from there represent less than half of the actual number.

One bit of interesting information is buried in the volume on geckos. *Hemidactylus frenatus,* one of the most cosmopolitan of house geckos, is rarely encountered in forests (even secondary ones) in Southeast Asia and Borneo. Yet Brown and Alcala observe that it is abundant in ". . . all natural tree-vegetation types up to about 400 meters." *Gekko monarchus,* known only from houses and other man-made environments in the Malay Peninsula and Borneo, is according to Brown and Alcala apparently more abundant in forests in the Philippines than in man's neighborhood. What enables these inquilines of man to exploit the forest environment in the Philippines?

Brown and Alcala emphasize that we lack information on the basic biology of most of the species covered. Fortunately, these volumes provide a springboard for local biologists who wish to study the natural history of Philippine geckos and skinks. They also pro-

vide a wealth of information for taxonomists working on these two families.

These books may be purchased from the Department of Herpetology, California Academy, San Francisco, California 94118 or from the Division of Research and Development, Silliman University, Dumaguete City 6501, Negros Oriental, Philippines. The price of the gekkonid volume is $6.00 and of the scincid volume $8.00.

ROBERT F. INGER
Field Museum of Natural History ●

Handbuch der Palaeoherpetologie. Part 2. Gymnophiona, Caudata by R. Estes. 1981. Gustav Fischer. 131p illust. DM 138.

All known specimens of fossil Caudata and Gymnophiona are included in this number of the Handbuch. Each specimen is illustrated and accurately described. Estes summarizes the geological and geographic distribution of the fossils but has to admit that the available material does not yet provide an answer to the origin of salamanders nor for the caecilians either as only one fossil is currently recognized as belonging to that group. This volume is only one part of a projected 19-part series. ●

Snakes of Virginia, by Linzey, D. W. and M. J. Clifford. 1981. Univ. Press of VA., Charlottsville. xiv + 159p. illust. $15.95.

The Snakes of Virginia provides for each species a description of adult and young, the habitat, geographic range, notes on habits and reproduction, on longevity, food, enemies, and location of museum specimens. A map shows the state distribution by counties. There are keys for the identification of species, handsome color plates, and an extensive bibliography. This will be a most useful handbook for Virginia snake enthusiasts. ●

The Journal of Oman Studies. Special Report no. 2. The Scientific Results of the Oman Flora and Fauna Survey 1977 (Dhofar). 1980. 399p. illust. obtainable from the Ministry of National Heritage and Culture, PO Box 668, Muscat, Sultanate of Oman. 20 pounds.

The Journal is a beautifully printed book that contains a variety of articles on the flora and fauna of Oman. It is lavishly illustrated with numerous figures and plates, among which are color plates of butterflies, acridodean grasshoppers, birds, etc. Of interest to herpetologists are: "The reptiles and amphibians of Dhofar, Southern Arabia" by E. N. Arnold, "Chromosome morphology of some reptiles from Oman and adjacent territories" by W. R. Branch, as well as in-depth descriptions of the ecology and general environment of Dhofar. A fold-out map identifies the localities mentioned in the 22 articles. The Sultan of Oman is to be congratulated for making this splendid contribution about his country available to all of us.

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Missouri's Venomous Snakes (1981). Missouri Department of Conservation, Natural History Section, P.O. Box 180, Jefferson City, Missouri 65102, $35.00.

This is an audiovisual program consisting of 78 transparencies and a cassette tape lasting 14.4 minutes. The program was written by Tom R. Johnson, who was also responsible for most of the photography and all of the line drawings. Others credited with photos are Carl Gerhardt, Mark Sullivan, Gordon Maupin, John Wylie, and Joel Vance. Tom Troughton was responsible for sound. The narration is by Jim Keefe. The pictures are of the high quality we have come to expect of Johnson after *The Amphibians of Missouri* (Johnson, 1977) and a previous audiovisual program, *Voices of Missouri's Toads and Frogs* (Johnson, 1979; see Villa and Powell, 1980, for review). The narration is clear and well modulated. In all, the package is professional and certainly worth its price. Both Johnson and the Missouri Department of Conservation should be commended.

The program begins with several introductory comments on venomous snakes, common attitudes toward them, and the harmless, even beneficial, nature of snakes in general. This is followed by a short and interesting discourse on the distinction between the terms venomous and poisonous. The next section introduces Missouri's venomous species, explains how to distinguish them from harmless species, discusses the nature and composition of venoms, emphasizes the often beneficial predatory role these snakes play, and lists animals that may in turn prey upon the snakes. Each species is then covered in a more detailed sequence. Brief comments deal with the size and distinguishing characteristics of the species, its habitat and range within the state, and the potential severity of its bite. In addition, some accounts include notations of food preferences and habits. Several also illustrate and discuss the differences of non-venomous species with which the snake in question is often confused. A short section dealing with the prevention of snakebite is followed by an even briefer section on first aid treatments. A summary emphasizes that enjoyment of the out-of-doors need not suffer due to the presence of potentially dangerous snakes, and may actually be enhanced by it. Credits and a final, humorous slide conclude the program.

Comparisons may be odious, but are often necessary; comparing the *Venomous Snakes* program with its predecessor, *Voices of Missouri's Toads and Frogs*, is inevitable. There are 15 more slides in *Snakes* than in *Voices*; and there is a general technical superiority in the slides themselves. For example, slides with inserts (a habitat photo with an insert of the snake in question) and composite slides, made of up to six photographs, are included. There are also photos of food items (a lizard, a fish) and some that, though not directly relevant to the "core" of the program, enhance its aesthetic value (a fisherman posed against a sunset, a hiker, and a child holding a snake).

Some of the extra slides, however, are a bit too much. The Information Section of the Department, which put the package together, could have easily trimmed some without affecting the program. There are, for example, seven slides of titles and acknowledgements at the beginning and end of the program; these could have been reduced to two or three and still provide the same information. There are three pictures of a technician in nearly identical poses to illustrate lab work on venoms. There are some snakes pictured by two or three slides, some apparently of the same individual (the Osage copperhead, western pygmy rattlesnake, and timber rattlesnake), while another subspecies, mentioned and mapped, is not pictured (the southern copperhead). There are also slides of a mouse, a bee, a mushroom, the covers of two pamphlets, and even a set of car keys (have them handy to take a snakebite victim to the hospital!) which add little but dollars to the cost of the program ($10 more than *Voices*).

There is artwork, some in color, to illustrate a few points. We have seen Johnson's drawings, frequently appearing in *Herpetological Review* as well as in his own publications, and find those in *Snakes* a disappointment. Poor quality reproductions may contribute to this.

One topic is disconcertingly misplaced. The rattlesnake's rattle is not described until after three subspecies of *Sistrurus* have already been noted to possess a rattle. On the other hand, there is a good recording of a timber rattler's buzz, probably the only one most Missourians will ever hear.

We feel the inclusion of the distributional record of the cottonmouth in northern Missouri (Livingston County) is questionable. While the record is noted as being old, it most likely is no longer valid. Its presence merely increases the possibility of mistakenly identifying water snakes as being venomous in an area where this is, at best, unlikely.

The packaging of the products is also somewhat different. *Voices* comes with a cassette tape of adequate length, identically recorded on both sides, making rewinding unnecessary. The Information Section recorded *Snakes* on only one side, where it occupies less than half the tape available. The rest is blank.

Our major criticism, however, is the obvious ambivalence regarding the audience to whom the program is directed. If directed to an elementary or secondary school-age audience, the material dealing with the snakes themselves, snakebite prevention, and attitude are excellent. Those dealing with snakes as predators and with animals that prey on snakes are good, but should be expanded, as should the notations of relationships between these snakes and their environments. The portion of the program covering venoms and their compositions is extraneous and disconcertingly out of place; it is potentially confusing and even the photos detract from the continuity of the presentation. Similarly, the section mentioning first aid contributes little and

would best be omitted altogether. On the other hand, if the program is directed to a more advanced audience, undergraduates or even professional herpetologists, the introductory and summary comments are overly simplistic and often superfluous. The species accounts cry out for a more formal approach, at least the inclusion of generic and trivial names and a brief mention of systematic relationships. An expansion of those notations dealing with ecological topics would be necessary. More detailed explanations and relevant illustrations should be incorporated into the section on venoms, or it should be omitted. Johnson informed us that legal implications prohibited in-depth coverage of first aid treatment. Omission would have been preferable to citing a single source, the American Red Cross, whose suggested treatment has undergone frequent and significant revisions in recent years. The inclusion of a section dealing with clinical treatment by medical professionals, though similarly prohibited, would also be valid and would further expand the potential audience to include physicians and hospital emergency room personnel, whose knowledge of this topic is unfortunately often lacking. With proper treatment being a matter of much controversy, discussion of alternatives and their advantages and disadvantages would add significantly to the program.

In spite of our complaints, the program is serviceable and meets a need in expanding the public's understanding of venomous snakes. Also, its relatively low cost enhances its chances of being incorporated into the educational curricula of elementary and secondary schools, scouting and community service programs, and even colleges like ours, which lack extensive specimen collections, tape and slide libraries, as well as the funds to develop them. So, while encouraging Johnson and the Missouri Department of Conservation to develop alternate versions of the program oriented to different audiences, we nevertheless applaud their efforts in producing *Missouri's Venomous Snakes* and encourage other states to follow suit in using this means of educating the public.

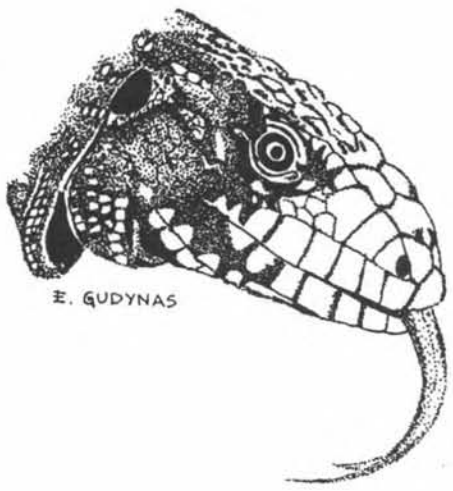
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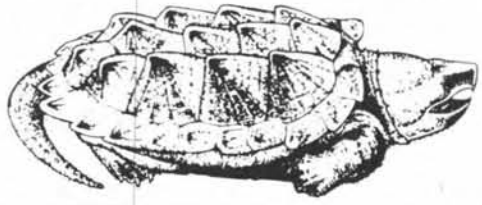
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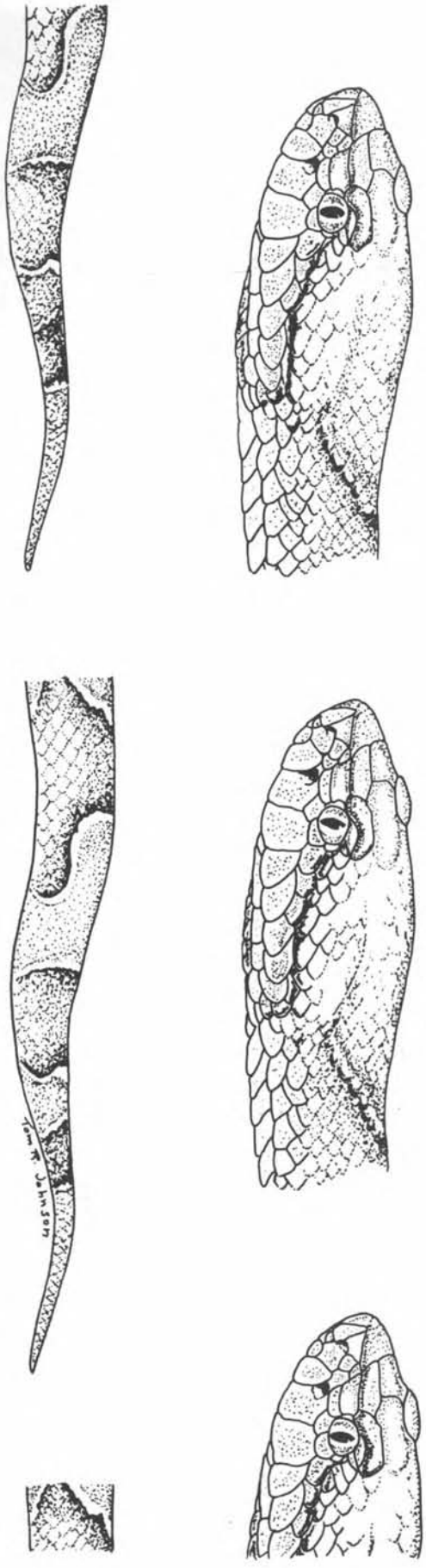
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The St. Louis Herpetological Society is a group of amateur and professional herpetologists dedicated to promoting the appreciation and conservation of our diverse herpetofauna, especially that of Missouri. The society is a non-profit organization and was founded in 1974.

The organization meets in the Community Room of the Greensfelder Recreation Complex at Queeny Park, 550 Weidman Road, Manchester, Missouri. Meetings begin at 7:00 PM and are held on the second Sunday of each month; there are no meetings during the months of June, July and August. Meetings include a guest speaker or presentation, an organized business meeting and good fellowship among members and guests.

Membership in the SLHS is for the calendar year, *i.e.*, from January 1 to December 31 of each year. Members who agree to join the society any time during the year will receive all back issues of publications for that year and then continue receiving them as they are published. Dues for each calendar year are payable as early in January as possible. Membership categories are: Individual — $7.00; Family — $10.00; Overseas — $15.00.

The society's basic means of public education is by publication of our newsletter, containing information, news items, and other matters regarding herps. We depend largely upon our membership for these contributions to the newsletter. The SLHS Newsletter is published approximately 10 times per year, and is usually 5 pages or more in length.

The SLHS also maintains a speakers bureau, which gives slide presentations and lectures on Missouri's herpetofauna to interested groups. Public education, along with donations to conservation groups and to the St. Louis Zoo Parents Association, contributes to conservation and protection of our reptiles and amphibians. A poster, "Please ... Don't Kill That Snake" is also offered for $1.00 (Postpaid).

Should you have any further questions, please do not hesitate to write us at: P.O. Box 9216, St. Louis, Missouri 63117. ●

ANNOUNCEMENT

SEARCH FOR GILAS

Several banded gila monsters *(Heloderma suspectum cinctum)* have been illegally collected from a study area in Washington County, Utah. The gilas are important to the Master of Science project of Daniel D. Beck, Utah State University, Logan, Utah. Some of the specimens involved are *marked and numbered by toe-clipping.*

If you have acquired any *toe-clipped* gilas in the past several months or have any information possibly concerning these gilas, please contact:

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THE HISTORY OF THE CONCEPT OF VIVIPARITY IN THE ALLIGATOR LIZARD GENUS *Barisia*

Ever since Stebbins' review of gerrhonotine lizards appeared (1958), all members of the genus *Barisia* have generally been thought to be viviparous. (The term "ovoviviparous" has often been applied, indicating egg-retention to birth without formation of a placenta, but Guillette [1981, 1982] has shown that a placenta is present in all viviparous lizards so far as known, and that it is unlikely on physiological grounds that embryos can reach full term in any squamatan without presence of a placenta. Hence live-bearing squamatans are all thought to be in reality euviviparous, having a placenta. Indeed it appears that all viviparity is euviviparity; we thus utilize the former, non-commital term.) Prior to that time it was considered likely that some species or subspecies are oviparous (*e.g.* Tihen, 1949:252), but evidence obtained subsequently has borne out the validity of Stebbins' generalization.

However, the evidence of viviparity in the genus began to accumulate long before Stuart (1948) recorded it in *moreleti*, the earliest date noted by Fitch (1970:111-112) for any member of the genus. The latter author credited Stebbins (1958:18) for the first record of viviparity in *imbricata*, but Bocourt (1879:366) noted its occurrence even earlier.

Gadow (1905:217) made a sweeping statement that all species of *Gerrhonotus sensu lato* (including *Elgaria, Barisia* and *Abronia*) in Mexico are viviparous, but on what grounds is not apparent. Certainly no species of *Elgaria* or *Gerrhonotus sensu stricto* in Mexico is viviparous, hence his generalization cannot be accepted as valid for any species for which viviparity is not otherwise confirmed.

Actually the earliest explicit report of viviparity for any species of *Barisia* is contained in Wiegmann's (1828:382) account describing the first species known of the genus. His statement follows (translated from the German): "In a pregnant female of the same species [*rudicollis*] I found five rather well developed young and two yolk masses in the uteri; it accordingly brings living young into the world, which state perhaps occurs in the other species [of *Gerrhonotus sensu lato* as then known]."

Wagler in 1833 (text for pl. 34, fig. 2) stated that *Gerrhonotus* gives birth to living young, in the account for *lichenigerus* (the only species dealt with in that work), a synonym of *imbricata*. However, no documentation was given for his generalization, which we presume was drawn from Wiegmann's conjecture extrapolating from his discovery of nearly full-term young in a specimen of *rudicollis*.

Wiegmann (1834:34) provided a more detailed account of those young. His comments (translated from Latin) follow, in part: "Opening the venter of one female, I observed the oviducts filled with five young animals and, in addition, two yolk-masses; it is certain that

[this species] is live-bearing, and to me it does not seem unreasonable to speculate the same for the other species [of the genus *Gerrhonotus* as then understood]." The description notes that the fetuses are extremely similar to the adults, with a few differences that are now well known to be characteristic of immature animals, and that their coloration is just the same as in the adults.

Duméril and Bibron (1838:396) also assumed, from Wiegmann, that all species of the genus *(sensu lato)* are viviparous, and they restated (in French) Wiegmann's 1834 description of the uterine young of *rudicollis*.

Almost equally as interesting a comment in Wiegmann (1834) as the description of the young is the only indication in the literature of the habitat of *rudicollis:* "Deppe found this species in oak forests hidden among rocks much like skinks" (translated from Latin, *loc. cit.*). This observation suggests that Tihen's conjecture (1949:240) that the species is arboreal, based upon pattern and long limbs, may not be justified. However, the species would have to compete with *imbricata* if it is terrestrial, with *Abronia deppei* (Sanchez-Herrera and Lopez-Forment, 1981) if it is arboreal, for both occur in the same general area (western part of the state of Mexico) and are very likely sympatric. Competition in both habitats may well have led *rudicollis* to marginal existence; its rarity in collections may well reflect a rarity in nature and not the vagaries of collecting effort and skill. Nevertheless, *Abronia deppei* is equally rare in collections in that area, known only by the material reported *(op. cit.)* from the Sierra de Temascaltepec one km SSW Valle de Bravo, Mexico (state), although ample material is known from central Guerrero in the Omiltemi area, where much more collecting has been done. Sympatry does not necessarily lead to competitive exclusion, however, as indicated by the report of Bogert and Porter (1967:19) of three species of gerrhonotine lizards sympatric at Tejocotes, Oaxaca - one arboreal *(Abronia mixteca)*, the other two terrestrial *(Barisia gadovi levigata, Gerrhonotus l. liocephalus)*.

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FURTHER NOTES ON PARASITES OF ZAMBIAN REPTILES

Of late, there has been increased interest among biologists and especially zoo keepers in parasites of African reptiles because of their patho-physiological importance in free ranging and captive animals and their effect on host behavior.

Except for studies by Mettrick (1950), Colbo (1973) and Simbotwe (1979), literature on African reptile parasites is scanty.

During the monthly examination of reproductive tracts and gut contents of reptiles from Dambwa Forest Reserve and Lochinvar National Park, endoparasites were collected. General accounts of collecting localities were given by Douthwaite and Van Lavieren (1977), Sheppe and Osborne (1971), and Simbotwe (1979). Simbotwe (1979) emphasized methods of parasite preparation, parasite life histories and host-parasite associations. This paper



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Table 1. A list of host animals and their parasites.

Host	Parasite	Type of parasite	Location	Locality
Python sebae (Gmelin)	*Abbreviata* spp.	nematoda	stomach	Dambwa Forest
	Bothridium pithomis Blainville, 1824	cestoda	stomach	Dambwa Forest
	Polydelphis anoura Dujardin, 1845	nematoda	stomach	Dambwa Forest
Mabuya striata (Peters)	*Spirura* spp.	nematoda	stomach	Lochinvar National Park
Agama hispida (Linnaeus)	*Pharyngodon* spp.	nematoda	stomach	Lochinvar National Park
Varanus exanthematicus (Bosc)	*Duthiersia fibriata* Monticelli and Crety, 1891	cestoda	stomach	Dambwa Forest
	Proteocephalus spp.	nematoda	stomach	Dambwa Forest
	Abbreviata baylisi Chabaud, 1956	nematoda	stomach	Dambwa Forest
	Hexametra spp.	nematoda	stomach	Dambwa Forest
Mabuya varia (Peters)	*Abbreviata* spp.	nematoda	stomach	Lochinvar National Park
	Thelandros spp.	nematoda	stomach	Lochinvar National Park
Lygodactylus chobiensis FitzSimmons	*Pharyngodon* spp.	nematoda	stomach	Lochinvar National Park

presents a list of ten metazoan parasites and their host animals with comments on pathonogenic ascarids and cestodes of snakes, eight of which were new records for Zambia (Table 1). The recovery of *Spirura* spp. from *Mabuya striata* which apparently is not a normal parasite of reptiles (Gibbons pers. comm.) is interesting. It is possibly from the animal eaten by the host. A large number of ascarids, *Polydelphis anoura*, were recovered from a 3.5 m African rock python, *Python sebae*. These ascarids, including the cestode *Bothridium pithonis*, were found in the stomach walls of the host apparently causing severe ulceration and tumours. The infected host exhibited aggressive behavior which is atypical of captive pythons. I attributed this behavior to the possible discomfort experienced by the host as a result of stomach ulcers and tumours.

Parasites were deposited in the Commonwealth Institute of Helminthology and the Livingstone Museum under catalogue numbers NMZL 1 to 27.

ACKNOWLEDGMENTS

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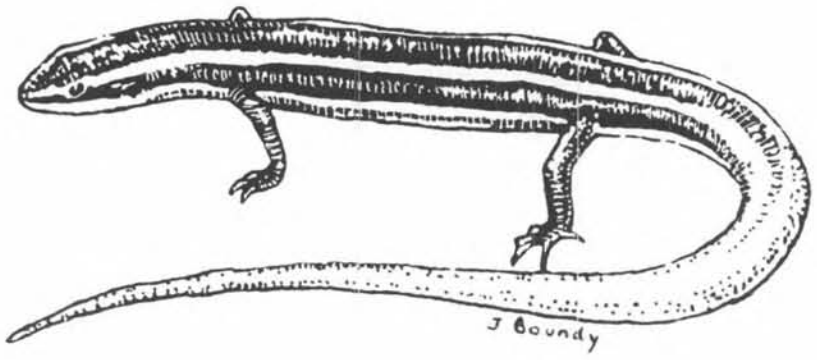
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A NEW SIZE RECORD FOR THE SALTWATER CROCODILE *(Crocodylus porosus)*

On 11 October 1979 a very large male saltwater crocodile *(C. porosus)* drowned in a fishing net at Obo, approximately 320 km above the mouth of the Fly River in the Western Province of Papua New Guinea (07°37'S, 141°18'E). The carcass had already been slaughtered and the meat divided amongst the local Zimikani villagers, but the complete head, commercial skin (cut from the posterior edge of the mandibular symphasis to the 24th row of caudal scutes, and minus the four dorsal scute rows), and the distal tail (caudal scute rows 24-38) were still at the site 14 hr after the animal drowned.



Figure 1. The commercial skin of a 620 cm saltwater crocodile *Crocodylus porosus* killed on 11 October 1979 near Obo, 320 km up the Fly River in Papua New Guinea. (Photo by Romulus Whitaker.)

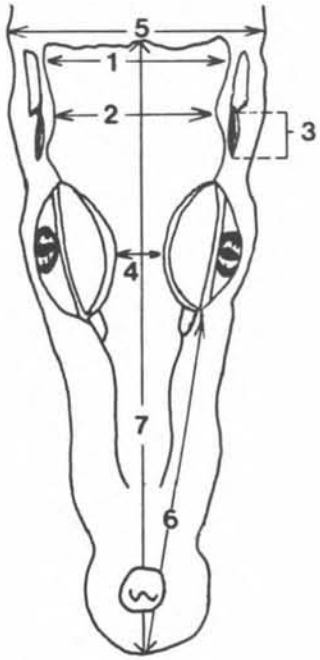


Figure 2. *C. novaeguineae* head showing measurements. 1) Width of cranial platform (HPP). 2) Cranial platform mid-point width (HMP). 3) Ear slit length (EL). 4) Interocular width (HIO). 5) Maximum head width (HMW). 6) Snout-eye length (HSE). 7) Total head length (HTL).

By laying out but not stretching the unsalted skin (Figure 1), placing the head and tail tip in position, and measuring between pegs placed at each end, the total length recorded was 620.2 ± 1 cm (Table 1). Fifteen other measurements were also recorded (Figure 2; Table 1). The skull, teeth and skin are currently at the Wildlife Office, Konedobu, Papua New Guinea.

Although quantitative data are unavailable, crocodile skins generally shrink to some degree after removal from the animal. And since the Obo *C. porosus* skin had dehydrated in the sun at 32-38° C for 14 hr before it was measured, the skin morphometrics reported in Table 1 probably underestimate its live dimensions.

The crocodile appeared in excellent health, and other than one old scar (anterior to the right femur), the skin was unblemished. Teeth were in good condition and had replacement tooth buds in various stages of development. The villagers stated that a complete rusa deer *(Cervus timorensis)* had been removed from the stomach.

George Craig (personal communication 1980), who hunted the Obo area in the 1960's, often saw and unsuccessfully tried to catch a large crocodile there, which the local people believe to be the same animal.

Predicting TL from SVL using formulae in Webb and Messel (1978) indicated 621.9 ± 2.3 cm, a value in close agreement with our TL estimates. Predicted live body weight (BWT) = 1019 ± 104 kg. Predicting TL from a combination of morphometric data (their formula 137) indicated a low value (513 cm), which is consistent with the wide variation of head proportions in large *C. porosus*.

The data in Table 1 agree with Webb and Messel (1978), in that Bellairs' (1969) ratio of head length to total length of 1:7.5, and Wermuth's (1964) ratio of 1:7.48 do not apply to large *C. porosus*. They also support the conclusion of Webb and Messel (1978), Schmidt (1944) and Greer (1974), that the skulls described by Boulenger (1889) and Barbour (1924) are not from crocodiles of 8.8 m and 10.1 m respectively. The HTL ratios of 1:8.57 and 1:9.23 for the Obo and Mary River *C. porosus* (Webb and Messel 1978) respectively suggest that crocodiles approaching the maximum TL for the species have HTLs proportionately shorter than those of the rest of the population. Predicting TL from HTL using formulae derived from *C. porosus* up to 4.3 m gave an estimate of 5.2 m, a substantial underestimate. It is interesting to note that Webb and Messel's equation for predicting TL from SVL for male *C. porosus* (up to 207 cm SVL) gives a realistic prediction of the Obo crocodile TL.

The Obo crocodile is believed to be the largest saltwater crocodile yet measured for which recorded morphometric data together with skull and skin are available. The next largest is the 615 cm specimen from Mary River, Australia, discussed by Webb and Messel (1978), for which only the skull is preserved. The good condition of the Obo crocodile suggests that TL's in excess of 620 cm may be possible for *C. porosus*.

I am indebted to O. Saiga of Kavianangа Village for holding the remains of this crocodile until my arrival, to E. Balson, A. Graham, P. Hall, G. Webb and R. Whitaker for critically reading this manuscript, and to J. Lang for his advice on crocodilian morphology.

Table 1. Morphometric data for the large *C. porosus* drowned near Obo on the Fly River, Papua New Guinea. Measurements follow the method of Webb and Messel (1978) and are in centimeters and kilograms.

Measurements	Fresh	Dried
Head platform width (HPP)	22.3	22.0
Head platform mid-point width (HMP)	20.5	20.4
Ear slit length (EL)	12.9	—
Interocular width (HIO)	8.5	8.1
Head maximum width (HMW)	45.1	45.0
Snout-eye length (HSE)	50.6	50.5
Head total length (HTL)	72.0	70.0
Weight of head with teeth	49.2	26.0
Snout-vent length (SVL)	304.0	
Total length (TL)	620.2	
Neck girth (NG)	150.6	
Commercial belly-width (girth at the third most anterior row of dorsal scutes minus the width of the 4 dorsal scute rows)	151.2	
Vent length	8.5	
Width of the largest nuchal scute	4.8	
Largest tooth		
length	13.9	
diameter	3.1	
weight	0.09	

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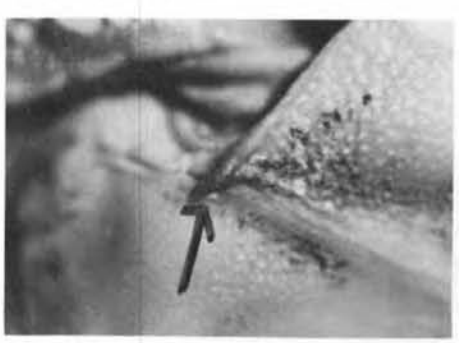
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OBSERVATIONS ON THE LAMINAL SPURS OF *Gopherus polyphemus*

Allen and Neill (1957) made mention of the juvenile gopher tortoise having laminal spurs growing on the posterolateral margin of each humeral lamina.

In March 1979 a juvenile gopher tortoise was collected south of Savannah, Georgia. I decided to keep this tortoise in a twenty gallon aquarium to observe it. I placed several inches of clean white sand, number 1 grit, as a medium on the bottom. Also included was a shallow water dish 5/8 inches deep and 4 inches in diameter. A hide box open on one end and numerous pieces of log and cork bark, and other materials were scattered throughout the cage.

The juvenile tortoise was estimated to be six months old. The umbilical area was covered with a wrinkled plate and was very soft and pliable. The hind legs were very thin and delicate in structure, almost too delicate to support the weight of the turtle. The tortoise dug constantly in the sand, perhaps trying to construct a tunnel. It climbed over all the obstacles in the tank and was extremely active most of the day. it was often observed soaking in its water dish. Larger obstacles in the tank were insurmountable in a single try and it would pause to rest several times during the attempt. It would use its forelegs to pull itself up an incline and then place its plastron flat against the substrate anchoring one of its sharp spurs. It thus appeared to hold on so that it would not slide backwards and lose ground.



Baby gopher tortoises dig their own burrows shortly after hatching, usually beneath a clump of wiregrass. It is probable that the juvenile tortoises also use existing tunnels created by mice and other rodents. The burrows that they dig are thirty to thirty-six inches deep.

From my personal observations of a number of specimens, I believe that these spurs are beneficial to the juveniles climbing out of steep burrows. They anchor the spurs in the clay and sand to keep the tortoise from sliding backward as it climbs up the steep ramp of the burrow.

I have obtained other juveniles since the first one was caught and have had the opportunity at the Savannah Science Museum in Savannah, Georgia to check nearly fifty live specimens of assorted sizes for spurs. Tortoises four-to-five inches in length usually had a blunt worn spur, and the adults had no indication that a spur had ever existed. As the tortoises get older and larger the spurs appear to wear down, probably by the abrasiveness of the sand in their natural habitat. An occasional midsize specimen would have a sharp well pronounced spur (Table 1).

A hatchling indigo snake *(Drymarchon couperi)* was kept in the same tank with several juvenile gopher tortoises. On several occasions when dead mice were placed in the tank for the indigo snake to eat, the tortoises were observed pulling on the fur and trying to bite into the mouse. When pink mice were fed to the snake, the tortoises were observed carrying the mice about the cage in their mouths.

Other observations on juvenile gopher tortoises have been reported by Allen and Neal (1957a) and Arata (1958).

ACKNOWLEDGMENTS

I would like to thank Gerald K. Williamson, Director of the Savannah Science Museum and Charles W. Seyle Jr., Research Associate at the Savannah Science Museum for their assistance in the field and allowing me to examine their specimens and to use their notes.

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Table 1. Mean data of 57 tortoises examined

N.	LC (mm)		PL (mm)		WC (mm)		TH (mm)		spur	Age (months)	
	min	max	min	max	min	max	min	max	Class	min	max
16	53.4	117.7	51.4	112.8	47.6	92.3	26.2	47.2	W	11	84
5	89.	143.8	86.	143.3	71.	112.5	39.	60.2	X	48	108
7	90.	186.3	91.	184.	77.	144.	39.	77.5	Y	40	204
29	165.6	295.	161.	293.	126.	207.	72.2	110.6	Z	132	264

KEY: N- Number animals examined; LC- Carapace length; PL- Plastron Length; WC- Width of Carapace; TH- Total height. W- Prominent sharp spurs; X- Prominent Dull Spurs; Y- Dull Spurs- not prominent; Z- No spurs present.

MEETINGS

The editor would like to encourage the submission of any and all information concerning *special* meetings related to herpetology, for publication in **HR.** Publication of the existence of a meeting, along with a contact person's name and address, is a service to the herpetological community even if a tentative program has not yet been established. Please note that the deadline dates for the March, June, September and December issues of **HR** are the first days of the previous months. Communications from non-U.S. correspondents should take into account the expected postal delays. Announcements from regional herpetological societies should be directed to Janice Perry, the SSAR Regional Society Liaison; all others should be sent to the editor. ●

AMPHIBIAN AND REPTILE HUSBANDRY AND PROPAGATION CONFERENCE

The Northern California Herpetological Society is sponsoring a conference on 15 October 1983 dealing with the propagation and husbandry of amphibians and reptiles. The conference will be held at the University of California, Davis. The keynote speakers will be Dr. Fredric Frye and Dr. Murray Fowler, with other invited speakers consisting of a cross section of academic, institutional, and private herpetologists. The proceedings will be published. Further information can be obtained by writing: the Northern California Herpetological Society, 706 Arnold Street, Davis, California 95616. ●

ANNUAL MEETING OF THE AMERICAN ASSOCIATION OF ZOO VETERINARIANS

The annual meeting of the American Association of Zoo Veterinarians will be held from 23-27 October 1983 at the Holiday Inn International, Tampa, Florida. For further information contact: Dr. M.S. Silberman, Executive Secretary, American Association of Zoo Veterinarians, PO Drawer TT, Emory University, Atlanta, GA 30322. ●

EASTERN SEABOARD HERPETOLOGICAL LEAGUE MEETING

The Eleventh Spring Meeting of the Eastern Seaboard Herpetological League (ESHL) will be held on Saturday, 15 October 1983, at the Philadelphia Zoo. The meeting will consist of a series of presentations on many aspects of herpetology. Dr. Peter C.H. Pritchard will be the keynote speaker. Any individual interested in herpetology is invited to attend this one-day meeting. There is no admission or registration fee. For further information contact Malvin Skaroff, 1555 Pratt Street, Philadelphia, PA 19124. ●

SEVENTH REPTILE SYMPOSIUM ON CAPTIVE PROPAGATION AND HUSBANDRY

The Seventh Reptile Symposium on Captive Propagation and Husbandry will be held on 3-6 August 1983 in Dallas, Texas, hosted by the Dallas Zoo. The meeting will take place at the Quality Inn one mile northwest of downtown Dallas. In addition to contributed papers, there will be special events and tours of the herpetological collections at the Dallas Zoo and the Fort Worth Zoo. For program information contact Dr. Peter J. Tolson, Curator of Reptiles, Toledo Zoological Society, 2700 Broadway, Toledo, OH 43609, (419)-385-5721. For preregistration information contact Richard A. Hahn, Zoological Consortium, Inc., 13019 Catoctin Furnace Road, Thurmont, MD 21788, (301)-271-7488. ●

THIS BROKEN ARCHIPELAGO

Lazell, J. *THIS BROKEN ARCHIPELAGO. Cape Cod & the Islands, Reptiles and Amphibians.* NY 1976, photos, maps, 260p, hardcover. In-print at $12.50. Our price-$4.98 + $1 postage. Catalogues issued. B. Zaremba, 3 Livermore Pl, Cambridge, Ma. 02141

REPRODUCTION IN A FAN THROATED LIZARD *Sitana ponticeriana*

This note provides the first information on the eggs and hatchlings of the fan throated lizard, an agamid ground-dwelling lizard *Sitana ponticeriana* Cuvier. Observations were made on ten different occasions on the grounds of Kapilathirtham field area, Tirupati (13°8'N and 79°4'E) in Andhra Pradesh. Morphometrics of the eggs were taken at 1, 10, 20 and 30 days and hatchlings were measured.

In this species, eggs are laid only during the rainy season (July to October). The specimen under observation laid 8 eggs in a hole measuring 60.5 mm vertically and 64.2 mm diagonally with a diameter of 22.5 mm (Fig. 1). She laid all the eggs (8) in 5 min and 45 secs, the interval between the eggs being 40-45 secs. The time taken for digging the hole was 48 min and closing the same after laying the eggs was 34 min 45 secs.



Figure 1. Longitudinal section of the hole in which the eggs were laid by *Sitana ponticeriana*.

The eggs are small and ellipsoidal with a soft shell. The clutch size varied from 8 to 13. However it is interesting to record that one animal of *Sitana ponticeriana* laid 36 eggs in three different clutches (11, 12 and 13) in a period of 41 days. Mortality was 89% (calculated on the basis of 112 eggs laid in 10 clutches by 8 different animals).

The mean sizes of the eggs on the 1st and 30th days were 5.94 X 8.75 and 9.3 X 12.1 (mm) respectively. The weight of the eggs laid on the 1st day increased from 0.1 to 0.25 gm up to the 30th day (Table 1). Most of the increases in the egg sizes occurred during the first half of the incubation period of 40-45 days. One egg was broken on day 20 and two were eaten by ants by day 30.

Table 1. Mean dimensions (length X width) in mm of the eggs of *Sitana ponticeriana* during incubation.

1st day	10th day	20th day	30th day
8.75 X 5.94	10.38 X 7.7	11.0 X 8.3	12.1 X 9.3

Table 2. Weights and sizes of fan-throated lizards, *Sitana ponticeriana* immediately after hatching (1st day).

N	Sex	Weight (g)	Total length (mm)	Snout-vent length (mm)	Tail length (mm)
1.	Female	0.177	49.10	16.55	32.55
2.	Female	0.166	49.00	16.50	32.50
3.	Male	0.175	47.50	17.25	30.25
4.	Male	0.170	48.50	17.00	31.50
5.	Male	0.178	49.00	17.50	31.50
	MEAN:	0.173	48.62	16.96	31.66

The mean weight of the young ones irrespective of sex immediately after hatching was 0.173 gm and snout-vent and total lengths were 16.96 mm and 48.72 mm respectively (Table 2).

Thanks are due to Dr. B. S. Rajabai, Department of Zoology, Sri Venkateswara University, Tirupathi, A.P., India for guidance; to the Secretary, University Grants Commission, New Delhi, for financial support and to Dr. Kraig Adler, Section of Neurobiology and Behavior, Cornell University, Ithaca, New York for reading the manuscript and offering helpful suggestions.

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TECHNIQUES

VENOMOUS SNAKE IMMOBILIZATION: A NEW TECHNIQUE

Immobilizing venomous snakes for purposes of determining sex or administering drugs often presents a difficult problem and a variety of solutions have been suggested. Anesthesia (Brazenor and Kaye, 1953; Karlstrom and Cook, 1955; Betz, 1962; Hackenbrock and Finster, 1963 and Wang, Kubie and Halpern, 1977) and various mechanical restraints have been used for this purpose. Murphy (1971) suggested the use of clear plastic tubes for both manipulative and surgical procedures. Similar methods are described by Johansen (1959) and Sutherland and Hampton (1961) who employed the use of flexible polyvinyl tubes. McDonald (1964) taped snakes directly to wooden dowels slightly larger than the diameter of the snake. Luck and Keeler (1929) used a wooden trough in a similar fashion while Ward and Howell (1978) used a board with padded velcro straps to pull the snake taut against the surface.

Each of these methods is certainly an effective method of snake immobilization, but when put into practice involves a great deal of manipulation and hands-on contact which, when the snake is venomous, subjects the handler to considerable risk. Here we suggest a novel method which involves much less manipulation and yet has proven effective in both determining sex (by probing; see Laszlo, 1973) and drug administration.

A plastic bucket with a lid was notched on the upper lip to a depth of 4 centimeters so as to accommodate medium-sized snakes (Fig. 1A). A snake is then placed, using a snake-handling hook, over the lip of the pail so its midbody lies in the notch and its head is within the bucket (Fig. 1B). Immediately subsequent to this placement, the lid (to which a handle has been attached) is placed onto the bucket (Fig. 1C, D). Simultaneously, the tail region of the animal is grasped by hand to prevent its withdrawal into the bucket (Fig. 1E). This allows the handler access to about the posterior one-half of the animal and sexing or drug injections can be easily accomplished (Fig. 1F).

The lock rings on the bucket covers were not removed, but during the immobilization process the cover was not pressed shut to the point where the tabs were engaged. In actuality this takes a great deal of pressure. We do not recommend that these tabs be used to lock the cover due to the difficulty in opening the lid from a locked position. We do recommend, however, if further security is desired, that a length of cord be tied to the pail handle base on one side, passed through the lid handle and secured to the opposite handle base, especially for manipulations of longer duration.

We feel this method of restraining snakes is as simple as it is effective. Different sized buckets with notches cut accordingly have been used to accommodate snakes of different sizes. We have encountered minimal resistance by the snake to grasping the tail, and because of this feel that the use of this method subjects the snake to minimal traumatization. Additionally, this method is not only relatively safe from the handler's standpoint, but can be used rapidly, and large numbers of animals can be temporarily restrained and released in a very short time period. We feel this method of venomous snake immobilization to be the most satisfactory for the purposes described above.

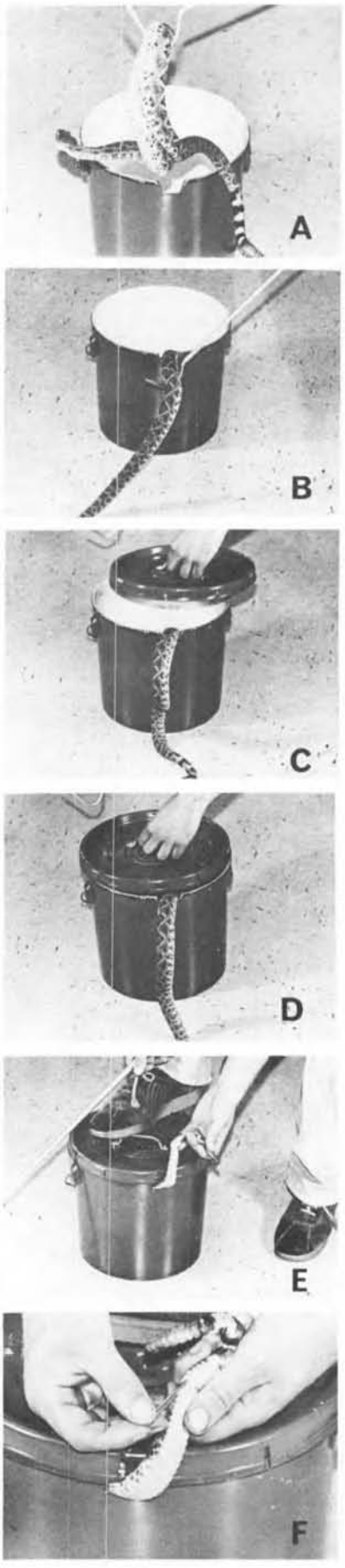


Figure 1. Immobilization device: A, B. Placement of snake in device; C, D. Covering device; E. Tail procurement; F. Sexing procedure performed on snake while in device.

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A RAPID PLOTTING AND ANALYSIS PROGRAM FOR NUMERICAL DATA

Hubbs and Hubbs (1953) proposed an improved graphical analysis technique for the comparison of numerical data in series of samples. This technique employs the range, mean, standard deviation, and two standard errors to each side of the mean of each sample for comparison. The Hubbs and Hubbs graphs have proven to be a useful tool for making visual assessments of statistical differences between several samples. This technique has gained popularity in recent years as a tool for comparing data from studies of critical thermal maxima (Hutchison, 1961; Spotila, 1972; Hassan and Spotila, 1975), temperature selection (Feder and Pough, 1975), metabolic rates (Holzman and McManus, 1973), and thermal tolerance (Heath, 1963; Pough and Wilson, 1970).

Andreasen (1976) described a computer program to draw Hubbs and Hubbs graphs using an automatic plotting device (the CalComp plotter). The program user must supply the range, mean, standard deviation, and standard error for each group. Although the program provides the user with a high quality product, much time must be spent computing the sample statistics for input.

This paper describes a FORTRAN program that provides a line printer plot of Hubbs and Hubbs graphs using raw data furnished by the user. The program also supplies the user with several sample statistics and analyses. The plot is only intended to allow rapid visual assessment of differences between group means. The determination of significant differences between means requires more rigorous multiple comparison procedures.

This program was written to plot and analyze a maximum of 50 data points for up to 50 separate treatment groups. These limits were chosen because they are large enough to handle most collected data and small enough to remain within the bounds set for rapid execution at most central computer facilities. An increase in storage requirements, to accommodate larger data sets, can be easily accomplished.

The program was written in standard FORTRAN language for the WATFIV compiler. Statistical procedures follow the methods outlined by Steel and Torrie (1960) and Sokal and Rohlf (1969). Each section of the program was written as a separate subroutine and tested individually. The entire program was then tested against programs in the statistical library of University Computing Services at The University of Oklahoma. All tests were conducted on an IBM 370 Model 158.

The plotting portion of the program was designed to accept character strings to define labels on the ordinate and abscissa. One of five optional ranges is selected for scaling the ordinate. Scaling on the ordinate varies from 0.05 unit/division to 1.0 unit/division depending on the range selected. The abscissa has a fixed scale and labels are printed for each group. The program was designed to accept numerical values between -999.999 and +999.999.

Diagnostic messages were built into the program to assist the user in the event that data are omitted or the data deck is improperly stacked. The WATFIV compiler also provides extensive diagnostics for the user.

Figure 1 is a typical printer plot of critical thermal maxima (CTM) measured under six different treatments in the mudpuppy, *Necturus maculosus*. A range of ten units, beginning at 28° C, was supplied by the user to scale and label the ordinate. The data are from Erskine and Hutchison (1981).

The exact positioning of range, mean, and two standard errors to each side of the mean are subject to some round-off error. Round-off error is reduced if the range over which the data are plotted is decreased. The effect of reducing the range is to increase the resolution of the plot.

The output of the program also includes a table of input data as a permanent record, sample statistics for each group, a single classification analysis of variance between groups (Model I or Model II ANOVA), a test for homogeneity of variance, and the maximum variance ratio.

The strength of the program is that it offers a convenient and inexpensive printer plot of Hubbs and Hubbs graphs for quick reference. The program is sufficiently flexible to allow analysis of data from a wide range of studies, and since all of the analyses are performed on a single data set the data need not be resubmitted for each statistical test. Complete analysis saves time and circumvents the difficulty of incompatible data formats between common library packages. Finally, the knowledgeable user can improve upon the efficiency of the program by reducing the storage requirements when small data sets are analyzed.

A program listing, source deck, test data with output, instructions for stacking the data decks, and a detailed explanation for reducing storage requirements are available from the author.

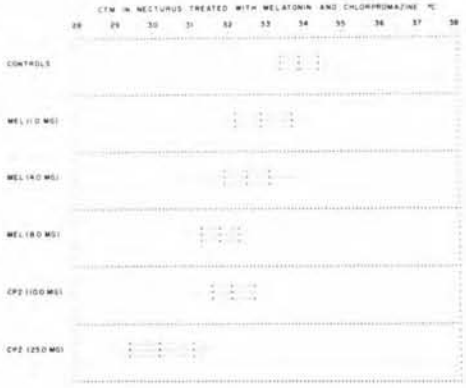


Figure 1. A typical printer plot of the Hubbs and Hubbs graph of critical thermal maxima (CTM) measured for six different treatments in *Necturus maculosus*. Two standard errors to each side of the mean are represented by the rectangular box. The mean for each group is defined by (X) and the range is the dashed (---) line through the center of each open box. Figure labelling was redrawn because printer alphanumerics would be illegible after reduction.

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AN ALTERNATIVE METHOD TO SAND-PACKED INCUBATION OF SEA TURTLE EGGS

Current practice for the artificial incubation of sea turtle eggs, widely used in conservation practices, employs sand-packed styrofoam boxes which can be transported to hatcheries or locations other than the turtles' nesting beach. Temperature and oxygen levels in sand-packed styrofoam boxes have been previously summarized with an expected temperature rise during incubation of up to 5° C, depending upon hatchability of the clutch (Wood and Wood, 1979). Oxygen levels in both artificially and naturally incubated nests generally decrease from 21% to 16-12% (Ackerman, 1975). The effect of artificial incubation of eggs, particularly the temperature effects on sex ratio, has been reviewed (Mrosovsky and Yntema, 1980).

At a sea turtle farm in the Cayman Islands, over 40,000 eggs from a captive breeding population of *Chelonia mydas* are artificially incubated annually. Hatchery conditions and incubation techniques have been previously described (Wood and Wood, 1979). Briefly, all eggs are collected as laid, transferred to a hatchery maintained at 27.5° C, and incubated in sand-packed styrofoam boxes. The quantity of eggs handled and the desire to maintain a high degree of cleanliness have indicated the need for an alternative to sand for packing the eggs.

During the 1979 season, nine clutches were divided and incubated in sand or foam. For foam-packed eggs, a layer of polyethylene foam 3.8 cm thick was placed inside the styrofoam box (36 x 21 x 23 cm, perforated with an icepick approximately every four cm^2), the eggs were layered directly on the foam (28-32 eggs, maximum three layers), another layer of foam was placed snugly over the eggs, and then the perforated lid of the styrofoam box was put on. Each box contained 56-97 eggs. Percentages of undeveloped eggs, developing eggs not hatching, and hatched eggs for sand-packed boxes were 20.2, 31.3, and 48.4%, respectively. Percentages for foam-packed boxes were 15.2, 27.2, and 57.7%, respectively. Following this trial, the remaining 4,400 eggs collected in 1979 were incubated in foam-packed boxes with a resulting hatch of 29.8% compared to 26.2% for the other 42,000 eggs packed in sand during the season. Temperature levels in the foam-packed boxes were similar to those in sand-packed boxes. Oxygen levels tended to decrease less in foam-packed boxes than in the sand-packed boxes. In sand-packed boxes, oxygen levels decrease from 21% to as low as 14%; in foam-packed boxes, the minimum level recorded was 17%. Oxygen levels in the nests begin to decrease and temperature levels begin to increase on approximately day 30 of incubation. Both oxygen and temperature levels are dependent upon the number of developing eggs in the nests. The sex ratio of 800 hatchlings which died during a period of 12 months after hatching was 1.0:1.3 (females:males).

Foam-packed boxes are currently used for the incubation of all eggs collected at Cayman Turtle Farm's breeding facilities. The ease with which foam can be handled as compared to sand simplifies the large scale handling of sea turtle eggs with no apparent adverse effects when incubated at an ambient temperature of 27.5° C.

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IDENTIFICATION OF SEX OF SMALL SNAKES IN THE FIELD

Identification of sex of living newborn or newly hatched snakes often presents a problem in the field. Probing for the inverted hemipenes of the male (Fitch, 1960; Platt, 1969) is difficult, or dangerous to the snake, and although sex can in theory be determined from the shape of the tail base (Martof, 1954), as in adults, most herpetologists would probably not be able to sex neonates using this criterion alone. In many species, the tail length to total length (body plus tail) ratio is sexually dimorphic (Martof, 1954; Fitch, 1960; Jackson and Franz, 1981), but overlap between the sexes often negates the usefulness of this as an index (Martof, 1954). Martof (1954) indicates that male and female newborn *Thamnophis* can be distinguished by the yellow coloration of the ventral surface of the base of the tail in females, due to the large cloacal glands being visible through the skin. Martof's identifications using this method were verified by a few dissections but he also mentioned that some could not be sexed externally and had to be dissected. Dissection is a sure method for sexing small snakes (Gregory, 1977; Semlitsch *et al.*, 1981), but is obviously not very useful in mark-recapture population studies. My objectives here are to describe and assess a simple method for sexing very small snakes in the field. This technique is not original, but I have not seen previous mention of it in the literature. A likely similar technique ("post-cloacal hemipenial distention") was mentioned by Freedman and Catling (1978), but they did not give details or data assessing its effectiveness.

The method described here relies on the anatomy associated with the hemipenes of male snakes. The two hemipenes are inverted into the base of the tail when not in use, allowing sexing by probing in larger snakes. In small snakes (*e.g.* neonate *Thamnophis*), the hemipenes can be made to evert in response to firm pressure by the thumb at the ventral surface of the base of the tail just posterior to the position of the inverted hemipenes. This does not seem to harm the snakes in any way. With increasingly larger *Thamnophis* specimens (>300 mm snout-vent length, SVL) known to be males, the method works increasingly less often, but even when it does, considerable pressure may be required to make the hemipenes pop out. However, when the hemipenes pop out in small snakes, they do so quickly and easily, suggesting that presence or absence of this response might be a useful means of sexual identification in the field.

I used this technique to sex 71 newborn young of 9 female garter snakes (8 *Thamnophis ordinoides* and 1 *T. sirtalis*). The SVL of the young snakes ranged from 115-155 mm and 170-180 mm for *T. ordinoides* and *T. sirtalis* respectively. The apparent sex ratio of these snakes was 35 ♂♂:36 ♀♀. The young were then killed by freezing and preserved for later examination. Those identified as males were taken to be positively identified, but those labelled as females could have been either females or males whose hemipenes failed to evert. To identify small snakes to sex by dissection I looked for the presence or absence of the two large hemipenial retractor muscles which run lengthwise on the ventral surface of the tail of the male (Bellairs, 1969). Females lack these muscles; the cloacal glands are the only large structures visible upon dissecting the base of the female's tail. Two snakes identified as females were lost, leaving a total sample of 34 "females." Of these 34, 3 (all *T. ordinoides*) were misclassified males, so that after adding these to the 35 known males, only 3/38 = .079 of all males were misclassified. For the total sample of 69 snakes, only 3/69 = .043 were misclassified. Considering the ease with which the method is used, and the lack of equipment needed, this seems a suitable method to use for live sexing of neonates, or other small snakes, in the field.

It should be noted, however, that this technique may not be equally suitable for all kinds of snakes. In male rattlesnakes *(Crotalus viridis)*, the hemipenes usually evert in both neonates and large adults when the tail is pulled slightly such as when measuring SVL. I dissected 11 neonate *C. viridis* independently sexed by another researcher using the hemipenis-popping method and confirmed the identification for each (6 females, 5 males). On the other hand, when I attempted to sex 8 newly hatched fox snakes *(Elaphe vulpina)* using this method, I found that great pressure was required to make the hemipenes pop out and obtained two different sex ratios on consecutive attempts (1 male the first time and 2 the next). I did not confirm the sex ratio by dissection because the snakes were needed alive for other purposes but I would accept such sex ratio data for this species (and possibly other constrictors) with more caution than data for the other species mentioned. Perhaps preliminary testing is

desirable before the technique is applied to a particular species.

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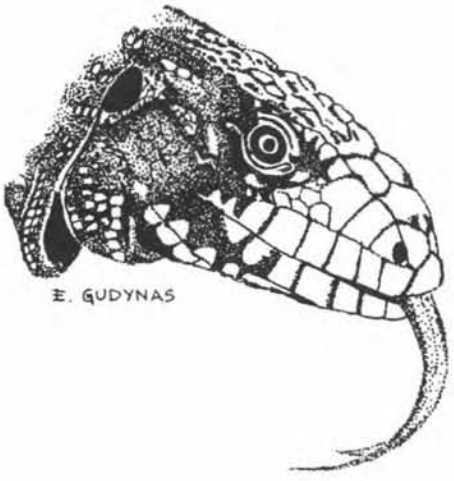
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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Houston Zoological Gardens, Houston, Texas 77001.

TWO GENERATIONS OF CAPTIVE-HATCHED LEOPARD TORTOISES, *Geochelone pardalis babcocki*

On March 1981 a hatching leopard tortoise, *Geochelone pardalis babcocki*, was discovered at approximately 1545 in an incubator which had last been checked on 18 March 1981. This was the first hatchling from a clutch of eggs laid on 17 October 1980.

The female parent had been maintained with a sibling male. Both parents were captive-hatched between 1 June and 21 July 1973. These two tortoises were not in contact with other tortoises between 18 May 1978 and 17 October 1981. Prior to 18 May 1978 they were maintained with immature siblings. On 18 October 1981 an unrelated captive-hatched male was added to the pair. The hatchling of 20 March 1981 and the eight subsequent hatchlings of 1981 and 1982 were the result of breeding of these two captive-hatched parents.

Bowler (1975) described a Galapagos tortoise *(Geochelone elephantopus)* which hatched at the Philadelphia Zoo. Its mother was hatched in captivity, but its father was wild caught. Kirsche (1979) mentioned captive-hatched *Testudo h. hermanni* laying their first clutches between 11 and 14 years of age, but did not mention hatchlings from these clutches. This paper represents the first published record of second generation captive-hatched tortoises whose parents were both captive-hatched.

Materials and Methods

The F1 tortoises were housed in two different facilities. The outdoor pen was 5.5 X 3 m with walls of wire and wood 1 meter high. A wooden shelter was provided. Vegetation growing in the pen included grasses, dandelions, clover and unidentified weeds. A stainless steel water container 60 X 45 X 6.4 cm deep was provided. The water was changed at least daily as the tortoises tended to walk through it, soak in it, and drink from it. The outdoor pen was utilized from June to September, and occasionally in April, May and October. The tortoises were kept outside continually as long as the daytime temperatures remained above 21° C and nighttime temperatures remained above 10° C. By gradually increasing the amount of time the tortoises were left outdoors in the evening they were acclimated to the cooler night temperatures in June. After 1-2 weeks they were left outdoors overnight. If rain persisted for two or more days the tortoises were usually brought in overnight.

From 18 May 1978 to 17 October 1981 the indoor facility consisted of a pen 1.5 X 9 X 0.5 m high with a substrate of wood shavings. The pen contained a box of soil for oviposition. The female nested in this container on 3 December 1980.

The pen had a 250 watt infra-red heat lamp at one end and a four foot (40 watt) Vita-lite® fluorescent tube (Durotest Co.) in a fixture along one side. Both the heat lamp and the Vita-lite® were suspended approximately 46 cm over the wood shavings. The lights were on a 12 h day/night cycle, from 1000 until 2200, regulated by a timer. The pen also received additional early morning light.

Daytime temperatures ranged from 21° C to a maximum of 40° C under the heatlamp. At night the temperature dropped to a minimum of 15° C. The tortoises thermoregulated by moving to different locations in the pen and usually basked under the heatlamp immediately after it came on and after feeding.

On 17 October 1981 a new indoor pen was utilized. It was constructed of plywood 1.2 X 2.4 X 1.2 m high. Wood shavings were used as the substrate and a 250 watt heatlamp was used. The single fluorescent fixture was replaced with a four foot fixture containing two Vita-lite® bulbs. Temperature ranges remained the same as in the pen used previously.

Diet consisted strictly of plant material provided at least 3-4 times per week. No animal protein was fed to either wild-caught parents or their offspring. Their staple diet consisted of lettuce (iceberg, romaine, bib), cucumbers, bananas, tomatoes, green beans, and apples. This was supplemented with a mixture of two parts bonemeal and one part vitamin/mineral powder (Vionate® for Pets Vitamin/Mineral Supplement, E. R. Squibb & Sons, Inc. or Pervinal Nutritional Supplement®, St. Aubrey, Division of 8 in 1 Pet Products, Inc.). The staple diet was varied with dandelions, carrots, watermelons, spinach, squash, berries and other fruits and vegetables as available. All food was washed thoroughly. When the tortoises were outdoors they were fed daily, in addition to grazing on vegetation in the pen. Clean water was always available.

Eggs were placed in a dry air incubator (Brower Manufacturing Company, Quincy, Illinois; catalogue number 846) soon after laying. The clutch laid 31 August 1980 was

placed in the incubator two days after laying. All eggs were marked with the date and a number with a black felt marker in 1980 and with a pencil in subsequent years. Eggs were incubated at a constant temperature of 30° C except for two days when the temperature fell to 25.5° C. Humidity was maintained by filling a 22 cm diameter glass pie plate, containing a sponge, with water. Eggs were sprayed at least twice a week with water from a spray bottle kept inside the incubator.

Table 1. Eggs Laid by F1 Leopard Tortoise *(Geochelone pardalis babcocki)*

Date Laid	# Eggs	# Hatchlings	Date Hatched	Incubation Period	Remarks
28 Dec 1979	3 or 4	None			Found as fragments
31 Dec 1979	1	None			Found as fragments
5 Jan 1980	1	None			Found as fragments
9 Jan 1980	1	None			Found as fragments
31 Aug 1980	5	None			1 egg cracked when laid
17 Oct 1980	7	2	20 Mar 1981	154 days	
			7 May 1981	202 days	
3 Dec 1980	6	1	5 May 1981	153 days	1 egg cracked while incubating
29 Aug 1981	9	3	18 Jan 1982	142 days	Hatchling kyphotic/ scoliotic
			26 Jan 1982	150 days	
			4 Mar 1982	187 days	Died while hatching
12 Oct 1981	6	3	24 Feb 1982	135 days	
			24 Feb 1982	135 days	
			9 Mar 1982	148 days	
24 Aug 1982	6				Eggs incubating
28 Sept 1982	9				Eggs incubating

Observations and Discussion

The parents of the second generation tortoises hatched between 1 June and 21 July 1973 from a clutch of eggs laid 30 December 1972 by a wild-caught female from Kenya. The eggs were the result of a series of matings involving a group of one male and three female wild-caught tortoises maintained together since spring 1971. The male was from Botswana and had been in captivity in California approximately 10 years when he was obtained in 1971. He produced no offspring in California. The females were obtained from a reptile dealer in 1971.

The F1 male first exhibited sexual behavior on 30 July 1977 consisting of mounting a juvenile tortoise, while thrusting and emitting guttural, scraping noises. He was approximately four years old. On 2 July 1979 this male was observed mounting the sibling female in the outside pen. It was not possible to observe if penetration occurred. Numerous mountings and copulation attempts were observed from 1979 to 1982 with the peak sexual activity occurring in the months of June and July when the specimens were outside. Mountings were stimulated by spraying the specimens with a fine mist from a garden hose while they were in the outside pen.

The female produced three or four broken eggs in the indoor pen on 28 December 1979. At this time she was approximately 6.5 years old and weighed 3.63 kg. She laid single eggs on 31 December 1979, 5 January, and 9 January 1980. The eggs were broken as they were extruded from the female's cloaca. Possibly the eggs were too thin-shelled or the carapace-plastron opening was too narrow to allow the eggs to pass. Between 28 December 1979 and 28 September 1982 the female produced 11 clutches of eggs totaling 54 or 55 eggs (Table 1). All of the eggs were laid in the outside pen with the exception of those produced in December 1979 and January and December 1980.

Incubation periods ranged from 135 to 202 days with an average of 156 days. Rowe and Janulaw (1971) gave average incubation periods of 116-145 days for clutches of leopard tortoise eggs. The average incubation period of the clutches mentioned by Rowe and Janulaw (1971) was 132 days. Klemens (1974 and unpublished data) gave incubation periods of 120-185 days for eggs from one female and 137-202 days for eggs from the mother of the F1 female. Flint (1977) gave incubation periods of 152, 158, and 182 days for eggs from the same clutch. Hine (1978) gave incubation periods of 111-177 days for a single clutch. Cairncross (1946), Bowker (1926), and Archer (1948) reported on eggs laid in the ground and left *in situ* to hatch. Cairncross (1946) mentioned an egg laid on 20 March 1940 which was exhumed on 29 December 1940 after an incubation period of 275 days. A living embryo was found inside the egg. Bowker (1926) discussed a clutch which took 14 months to hatch. Archer (1948) stated that eggs laid in early spring may hatch in eight months. Archer (1948) also stated that eggs laid late in autumn may take up to 18 months to hatch if the summer after oviposition is short and cool.

Eggs incubated in incubators appear to have shorter incubation periods than eggs left in the nest to hatch.

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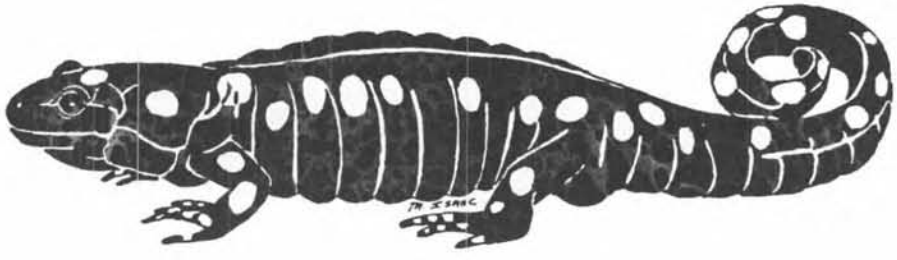
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NOTES ON THE REPRODUCTIVE BIOLOGY OF THE EYELASH VIPER *Bothrops schlegeli*, IN CAPTIVITY

The Eyelash Viper *Bothrops schlegeli* is a species of arboreal pit viper, widely distributed from Southern Mexico to Ecuador and Venezuela (Peters and Orejas-Miranda, 1970). Although common in many parts of its range, information concerning reproduction is scarce in the literature. Antonio (1980) reported on a litter which resulted from a captive-breeding of wild caught snakes.

This paper presents data on five litters (50 neonates) born to three captive-born females. Included are behavioral observations on gestating females, age of attainment of sexual maturity, fecundity with relation to female total length, and coloration of neonates.

Materials and Methods

Male A, from an unknown locality, was received as an adult on 4 August 1978. Male B, and females A and B, captive born on 9 August 1978, to parents from Sula, Honduras (Antonio, 1980) were received as juveniles in February 1979. The snakes were maintained in various sized aquaria in the author's personal collection. On 26 February 1981, the snakes were transferred to the Fort Worth Zoological Park. Female C, captive born on 25 July 1978, to wild-bred parents from San Jose Province, Costa Rica (Finstrom, pers. comm.) was received on 15 December 1981 at the Fort Worth Zoological Park.

The snakes were housed on exhibit in a 91.4 cm fiberglass enclosure (Hulsey, 1973), and on reserve in screen-topped glass aquaria. Props in the exhibit included gravel substrate, rocks, plastic plants, dried leaves branches and water bowl. The aquaria on reserve were provided with newspaper substrate, plastic plants, branches and water bowl. The snakes were offered freshly killed laboratory mice of various sizes, every 1-2 weeks. Ambient temperature was maintained between 24.4 and 29.4° C. Lighting was provided by skylights and a 20 watt Vita-lite® tube (Durotest Corp.). A 50 watt infrared spotlight (Sylvania Corp.) was placed above one corner of the exhibit to provide additional heat during daylight hours for gestation. The snakes were misted 1-3 times per week and often drank water from their body coils.

Males A and B were first introduced into the exhibit housing females A and B in April 1981. Female C was first introduced 20 December 1981. The males were switched between exhibit and reserve cages at intervals of three days to three weeks, while females remained on exhibit.

Neonates were weighed within one week, *postpartum*, on an Ohaus, triple-beam balance. Adult females and neonates were measured within one week, *postpartum*, using the squeeze box technique (Quinn and Jones, 1974). The young were housed in plastic containers of various sizes, with props similar to those of the reserve aquaria. The juveniles were offered defrosted frogs or frog parts *(Acris crepitans)* after their first shed (1-10 days, *postpartum*). Stubborn individuals were coaxed with live frogs *(Acris)* and lizards *(Tropidurus)*. The snakes that fed (46) were switched to pre-weanling mice or parts of mice within 1-12 weeks.

Table 1. Birth dates, age of females at parturition, time intervals between litters, total length (mm) and weights (g) of neonate *Bothrops schlegeli*.

	Female A Litter #1	Female A Litter #2	Female B Litter #1	Female B Litter #2	Female C Litter #1
Date	7 Nov 1981	17 July 1982	26 Dec 1981	5 Aug 1982	20 June 1982
Age	3 yrs 90 days	4 yrs 33 days	3 yrs 139 days	4 yrs 59 days	3 yrs 329 days
Interval		8 mos 10 days		7 mos 10 days	
Total length (mm) neonates ($\bar{x}$)	165-190 ($\bar{x}$=181)	147-207 ($\bar{x}$=188)	170-186 ($\bar{x}$=177)	190-211 ($\bar{x}$=198)	182-190 ($\bar{x}$=186)
Weight (g) neonates ($\bar{x}$)	2.1-3.1 ($\bar{x}$=2.8)	1.3-3.5 ($\bar{x}$=3.0)	2.4-3.2 ($\bar{x}$=2.7)	2.8-3.2 ($\bar{x}$=3.0)	2.3-3.1 ($\bar{x}$=2.6)

Results

All observations took place during daylight hours. Although copulation was not observed, females appeared gravid 4-5 months *prepartum*. During this time they positioned themselves on branches within 9-27 cm from the spotlight, while males generally positioned themselves at random throughout the exhibit. Temperature 9 cm below the spotlight was 29.4° C. while the opposite side of the cage was 24.4° C. Cessation of feeding began 4-5 months *prepartum* for the females, with the exception of two individuals that fed once during that period, while males fed consistently. Females began feeding again within one week after birth took place. Birth dates, age of females at parturition, time intervals between litters, total lengths (mm) and weights (g) of neonates, are given in Table 1. Total length of *postpartum* females and number of neonates are given in Table 2.

Table 2. Females' total length *(postpartum)* and number of neonates in *Bothrops schlegeli*.

	Female C Litter #1	Female A Litter #1	Female B Litter #1	Female B Litter #2	Female A Litter #2
Female length (mm) *postpartum*	630	686	691	700	725
Number neonates	6	8	9	10	17

Coloration of neonates was equally divided (25:25) between two basic color phases: a dark phase ranged from deep green to gray-green background, and a light phase ranged from dull yellow to tan background. The adult males had background color which ranged from deep olive green to deep green while the females ranged from light salmon to bright yellow. Neonate color was drab with poorly defined pattern in comparison to the adults. The tips of the neonates' tails were white. As they grew, their colors and pattern became more vivid and distinct, and the tail tip coloration faded.

Observations and Discussion

The above observations of *B. schlegeli* in captivity indicate that 1) females can reach sexual maturity at less than three years (Table 1), 2) females can produce more than one litter *per annum* (Table 1), 3) gestating females generally fast and position themselves close to a heat source when given the opportunity (similar behavior has been seen in other live-bearing snakes of the families Crotalidae and Boidae [pers. obs.]), and 4) there is a direct correlation between litter size and total length of the female (Table 2).

The observation that females can produce more than one litter *per annum* differs significantly from wild populations of viviparous snakes studied by Fitch (1970) who suggests that there are relatively few live-bearers that have the capacity to ovulate again soon after the birth of a litter and that the interval between successive ovulatory periods is most typically a year or more.

The direct correlation between litter size and total length of the female (Table 2) is supported by Fitch (1970) who found similar results in almost every squamate species that has been thoroughly investigated.

It is also interesting to note that the above litters were born in every season of the year, but only between 20 June and 26 December. Additional data are necessary before the exact nature of the reproductive cycle in *B. schlegeli* can be determined.

ACKNOWLEDGMENTS

I express gratitude to the following people: Matt Finstrom for supplying data, Gary Carl and James B. Murphy for reviewing the manuscript, and Steva K. Blevins for typing. I am especially grateful to the staff of the Department of Herpetology, Fort Worth Zoological Park for assistance and to my wife Joanna for encouragement and helpful comments. Specimens will be placed at the University of Texas at Arlington Collection of Vertebrates upon their deaths.

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LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Longevity, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1982. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

Please submit Life History Notes in the standard format directly to the ***SECTION EDITOR*** to avoid delays in publication: Bern W. Tryon, Houston Zoological Gardens, P.O. Box 1562, Houston, Texas 77001.

ANURA

BUFO AMERICANUS (American Toad). **ESTUARINE HABITAT.** On 19 April 1982, we found a breeding congregation of at least 50 *Bufo americanus* in a tidal marsh, the Iona Island Marsh on the Hudson River in the Town of Stony Point, Rockland County, New York. The toads were concentrated in the shallower portions of the tidal creeks on both sides of the fill causeway crossing the marsh, in a sheltered area some distance from the open estuary. We watched the toads from 1230-1330 h, around low tide, when they were in little pools and sheets of water *ca* 3-20 cm deep. Many toads were calling. About half of the toads seen were in amplexus. One amplexed pair was on a bare mudflat with the female sunk about halfway into soft mud. There were many strings of toad eggs in the pools; a few strings were stranded by the low tide on bare mud and two strings hung over snags 30 cm above water. Large numbers of killifish (*Fundulus heteroclitus* and *F. diaphanus*) in the pools seemed to ignore the toad eggs. Mean tide range at this locality is *ca* 0.9 m, and the water varies from fresh to slightly brackish seasonally.

On 23 April EK visited the marsh at about high tide (0940 h) and again at low tide (1530-1730 h). No toads were seen or heard. The eggs were still in the tidal creeks. *Fundulus heteroclitus* picked gently at egg masses but seemed to be ingesting algae or detritus rather than eggs. A water sample collected at low tide had a salinity of 300 mg/1 or less than 1% seawater strength. Another sample from the breeding site collected 26 May 1982 had salinity 585 mg/1. (Samples were analyzed by Hach C1 method by Michael Rosenthal, Bard College Chemistry Department.)

Eggs collected 23 April began hatching in captivity the same day. Small live tadpoles offered to *F. heteroclitus* in an aquarium were repeatedly mouthed and spat out — 1 tadpole might have been swallowed. All of the tadpoles died 13 May, apparently from overheating, at a head-body length of about 4 mm and a normal appearance.

Neill (1958, Bulletin of Marine Science of the Gulf and Caribbean 8(1):1-97) summarized reports of several *Bufo* species in tidal and/or brackish water habitats, but did not mention *B. americanus*. Although Iona Island Marsh is tidal all year, the water is normally fresh or nearly so in spring when the tadpoles would be developing. Few amphibians (both species and numbers) have been found in the tidal Hudson River. Limiting factors could include salinity, tidal fluctuation, generalized PCB pollution, or presence of many potential predators. Single calling male *B. americanus* have been heard in strictly freshwater tidal wetlands farther up the Hudson, but choruses, amplexed pairs, or eggs have not been found.

Submitted by **ERIK KIVIAT** and **JIM STAPLETON,** Hudsonia, Bard College, Annandale, New York 12504. ●

SAURIA

ANOLIS CAROLINENSIS (Green Anole). **PREDATION.** On 27 and 28 March 1966 at Griffis Camp, 18 km E. of Fargo, Clinch County, Georgia, a large migratory flock of robins, *Turdus migratorius*, was very much in evidence. On several occasions robins were observed to kill and eat individuals of *Anolis carolinensis*. The lizards were grasped in the beak of the robin, killed or stunned by several sharp biting motions, and swallowed whole in a manner similar to killing and swallowing an earthworm.

Although the staple foods of robins consist of vegetable matter and insects such as beetles and caterpillars (Bent, 1949. U.S. Nat. Mus. Bull., No. 196, 454 pp), they may opportunistically feed upon small vertebrates as trout fry (Michael, 1934. Condor 36:33-34). At such times large, normally transient, migratory or wintering flocks (of robins and presumably other birds) could severely impact local populations of small lizards or other small herpetofauna.

Appreciation is extended to Robert Powell for critically reviewing this note.

Submitted by **DONALD D. SMITH,** Dept. of Pathology and Oncology, University of Kansas Medical Center, 39th and Rainbow, Kansas City, Kansas 66103. ●

CROTAPHYTUS COLLARIS (Collared Lizard). **REPRODUCTION.** Fitch (1970. Univ. Ks. Mus. Nat. Hist., Misc. Publ. No. 52, 247 pp) reported clutch sizes for *Crotaphytus collaris* ranging from 1-12 eggs, based on over 50 records. Here two additional clutches of seven and 13 eggs respectively are reported. A specimen collected 25 June 1962 in Independence, Jackson County, Missouri, and measuring 98 mm (snout-vent length) delivered seven eggs on 9 and 10 July 1962. These eggs averaged 19 X 11 mm (17-20 X 10-12 mm).

The other specimen, captured 17 km E. of Olnay, Archer County, Texas, on 10 May 1975, delivered 13 eggs on 29 May 1975. These eggs also averaged 19 X 11 mm. The snout-vent length of this female was never measured, but she weighed 47.5 g on 24 May and 28.2 g on 29 May after delivery — a loss of 19.3 g or about 1.5 g per egg. These eggs were placed individually on dampened paper towels in plastic sandwich bags, and incubated at temperatures fluctuating between 24 and 30° C. On 4 August 1975, three of the eggs (23%) hatched 86 days after deposition. Fitch (1956. Univ. Ks. Publ., Mus. Nat. Hist. 8(3):213-274) reported possible incubation periods of from 51 to 82 days depending on temperatures. Measurements of hatchlings were taken on 6 August 1975 (Table 1).

Table 1. Length, weight, and sex of 3 hatchling *Crotaphytus collaris*

S-V Length mm	Tail Length mm	Weight g	Sex
32	46	1.7	F
31	44	1.1	F
33	52	1.5	F

Appreciation is extended to Robert Powell for critically reviewing this note.

Submitted by **DONALD D. SMITH,** Dept. of Pathology and Oncology, University of Kansas Medical Center, 39th and Rainbow, Kansas City, Kansas 66103. ●

SERPENTES

CORALLUS ENYDRIS ENYDRIS (Garden Tree boa). **FOOD.** Groves (1980, Brit. J. Herp. 6:89-91) reviewed instances of ovophagy in a number of varieties of mainly terrestrial boids. This report describes post-parturient behavior in an arboreal species, *Corallus enydris enydris*, which ingested her own freshly deposited egg masses. Thirteen masses and three stillborn young were deposited between 0300-0600 h, 16 May 1979. The snake was

observed at 0600 h with one egg mass in her mouth. After swallowing, she investigated the perimeter of the aquarium. Tongue-flick rate was approximately 1/sec until she contacted a second egg mass. She then bit, constricted, and swallowed the mass. The female repeated this procedure with six additional eggs during an 80 min period. The remaining six eggs and stillborn young were then removed from the enclosure. The six masses were examined and determined to be infertile. Constricting behavior suggests that the normal feeding sequence (grasping, killing and swallowing) was followed even though such behavior was presumably unnecessary.

Food had been offered throughout the gestation period. One meal of two mice, each weighing 25 g, was accepted on 17 March 1979, 90 days after the last observed copulation. The meal previous to the first observed copulation was on 8 December 1978. The cessation of normal feeding behavior in gravid snakes for the gestation period has been observed by the author on several occasions. This is by no means the rule, as I have observed *Bitis arietans* to feed throughout the gestation period. Pressures of infertile eggs and/or the developing embryos on the viscera may halt feeding behavior.

I thank Bern W. Tryon for editorial comment.

Submitted by **TRACY J. MILLER,** Buffalo Zoological Gardens, Delaware Park, Buffalo, New York 14214. ●

ELAPHE SUBOCULARIS (Trans-Pecos Rat Snake). **COLORATION.** An *Elaphe subocularis* collected by the authors 1.6 km WNW of Castolon, Big Bend National Park, Brewster County, Texas, on 14 July 1966 exhibits an aberrant color pattern. The specimen differs from normally patterned *E. subocularis* in lacking the dark H-shaped markings and black, anterior, dorso-lateral lines characteristic of the species (Figure 1). The resulting pattern consists of 22 somewhat diamond-shaped blotches on the body and seven on the tail. They are lighter in color than normal and difficult to distinguish on the preserved specimen.

The female measures 1020 mm (total length), 142 mm (tail length) and has 275 ventrals, 72 subcaudals, 10 supralabials, 14 infralabials, 1 preocular, 2 postoculars, and 7-6 lorilabials. The anal plate is divided. Diagnostic characters are within the ranges given by Worthington (1981. Cat. Amer. Amphib. Rept: 268.1-268.2). Dorsal ground color was a dull yellow in life, and within the color range given by Wright and Wright (1957. Handbook of Snakes, Vol. 1. Comstock: p 256).



Figure 1. Aberrant dorsal pattern of an *Elaphe subocularis* from Brewster County, Texas.

This specimen is similar to a female, also captured in Brewster County and depicted by W. E. Lamoreaux (1980. Herp. Review 11(4): 117). The patterns of both of these specimens apparently resemble the posterior portion of a male (Chicago Natural History Museum # 38943) without locality data described by Dowling (1957. Univ. Mich. Mus. Zoo., Occ. Papers, No. 583:1-22). The two Brewster County specimens verify the presence of *E. subocularis* with depauperate dorsal patterns from within currently defined range.

The specimen has been deposited in the Bobby Witcher Memorial Collection (BWMC 01019) housed at Avila College, 11901 Wornall, Kansas City, Missouri 64145. Appreciation is extended to Robert Powell for critically reviewing this note.

Submitted by **DONALD B. SMITH,** Department of Pathology and Oncology, University of Kansas Medical Center, 39th and Rainbow, Kansas City, Kansas 66103 and **HARRY L. GREGORY,** Hutchinson-Reno County Zoological Society, Inc., P.O. Box 444, Hutchinson, Kansas 67501. ●

STORERIA DEKAYI WRIGHTORUM (Midland Brown Snake). **COLORATION.** On 15 April 1982, an albino *Storeria dekayi wrightorum* was found underneath a rock by a junior high school student while working in a flower garden in a residential section of West Grove, Jefferson County, Alabama. The specimen, a subadult female, had a total length of 232 mm and an S-V length of 187 mm.

When alive, the snake had pink-red eyes. Its ground color was creamy white, with a slightly brighter dorsal stripe. The body pattern was greatly reduced and lighter in coloration than normally-pigmented specimens of *S. dekayi wrightorum*. The dorsal stripe was flanked by a row of light brown spots on each side, but the spots were not fused to form crossbars, as is evident in 90% of *S. dekayi wrightorum* from Alabama (Mount, 1975, The Reptiles and Amphibians of Alabama, Auburn Univ. Agricultural Experiment Station, Auburn). Only a few faint rusty flecks were present along the sides, and some small dark spots were found along the edges of the anterior ventral scales. The normally dark-pigmented regions of the head (parietal scales, temporal bar, and spot on labials below the eye) were a light pink-brown.

According to the reviews of Hensley (1959, Publ. Mus., Mich. State Univ. 1(4):133-159) and Dyrkacz (1981, SSAR Herp. Circ. 11), three other albinos of this species have been reported previously in the literature. Hensley (1959) noted an albinistic individual from Pennsylvania, but did not describe it. Smith (1961, The Amphibians and Reptiles of Illinois, Ill. Nat. Hist. Surv. Bull. 28, Urbana) reported a cream-colored subadult from Illinois with pink dorsal spots, and Thrall (1971, Trans. Ill. Acad. Sci. 64(4):400) described another from the same state as being pink with pinkish-brown dorsal spots.



Figure 1. Dorsal view of albino *Storeria dekayi wrightorum* from Jefferson County, Alabama.

The animal described here was maintained in captivity for a short time, but refused to eat and was preserved. The specimen has been deposited in the University of Alabama in Birmingham Vertebrate Museum (VM-UAB 0383).

Submitted by **KEN R. MARION,** Biology Department, University of Alabama in Birmingham, Birmingham, Alabama 35294 and **GRADY CHANDLER,** P.O. Box 692, Bessemer, Alabama 35021. ●

TESTUDINES

CHELYDRA SERPENTINA (Common snapping turtle). **MORPHOLOGY.** In August, 1982, while completing a three year study on the effects of rotation on egg viability in turtles, an unusual specimen was noted. A two-headed *Chelydra serpentina* was found by Thomas McFarland among the day's hatchlings from a group of 240 eggs under observation. This turtle had successfully hatched from the egg without help and appeared alert. A snapping turtle of similar description evidently lived in the 1930s. It grew to a weight of 7½ lbs. by the age of five-and-one-half years. After the death of its owner, Mrs. Grace Wiley, the turtle was lost to follow-up (Campbell, H. 1967. Once upon a time. Int. Turtle and Tortoise Soc. J. 1(4):24-29). A photo of this turtle (named "nip and tuck") is quite similar to the speciman presently described. There are two heads, equally active and alert, and a somewhat diminutive shell structure. Other observations regarding the present specimen (Fig. 1) are a kinked tail and a projection of tissue between the heads that yields speculation of additional nervous tissue. In addition the plastral opening for the yolk sac has failed to close at all since hatching. The behavior of this specimen is similar to a two-headed *Graptemys pseudogeographica* kept at the Staten Island Zoo in 1966 (Clement, H. 1967. Are two heads better than one? Int. Turtle and

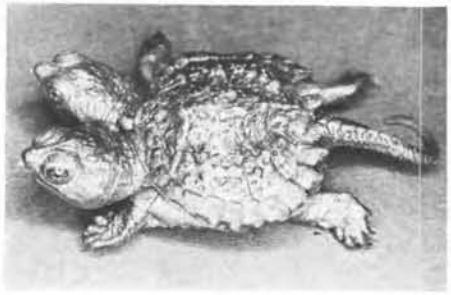


Figure 1. Dorsal view of 2 headed *Chelydra serpentina* hatched under controlled conditions.

Tortoise Soc. J. 1(2):4-5). As in that specimen the heads are truly independent of each other. They demonstrate no cooperation or unity of intent. They will fight over food and try to guide the body in opposite directions simultaneously if divergent food items are present. This behavior has not extinguished with time; that is, the heads will simply not learn to cooperate. However, each head appears to be quite capable of learning on its own. Both heads have well developed snapping reflexes and have adjusted to hand feeding. Such conflict of motion also precludes normal righting behavior. Each head attempts to right the turtle in an opposite direction when the animal is placed on its carapace. Hence, it is unable to right itself, even over prolonged periods.

As well developed and independent as cranial nerve function appears to be in the heads, a similar lack of cooperation might be expected in the limbs. Indeed, it seems each foreleg is controlled by the ipsilateral head during times of conflict (*i.e.* divergent food sources). Yet, when the two heads agree on a course of action, the animal moves in a frog-like manner with all the limbs jerking in unison.

These behavioral alterations translate into unusual difficulties in caring for the animal. To avoid drowning the water must be kept only as deep as the carapace is high. Since the turtle is incapable of coordinated motion over complex terrain it must be kept in a gently sloping, small, flat-bottomed container so it can move under a sunning lamp when desired. Since the heads do not have the use of forelegs to tear food, each head must be fed separately with pieces of food small enough to be eaten whole. It appears that feeding 2-3 times a day achieves the best results. Growth after five months has been about 70% normal for a hatchling *C. serpentina*.

Submitted by **MARK L. FELDMAN,** 705 S. Potomic Street, Waynesboro, Pennsylvania 17268. ●



NEWSNOTES

ANNOUNCEMENT TO THE MEMBERSHIP OF THE SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

The Association of Systematics Collections (ASC) is currently compiling an annotated checklist of the amphibians of the world, the second in a series of annotated checklists started by *Mammal Species of the World* (published in 1982). The amphibian checklist is scheduled to be published in early 1984 as a joint venture of ASC and Allen Press, Inc. Information to be carried in the checklist for each species includes: current scientific name (based on most recent literature), original name, author, date, and literature citation of description, museum registration number of primary type(s), type locality, and distribution. Comments citing pertinent reviews, revisions, and alternative systematic opinions will be presented with appropriate bibliographic citation. In addition, regulatory status under the Convention on International Trade in Endangered Species (CITES) and the United States Endangered Species Act (US-ESA) will be included in the published volume.

The checklist is not intended to be an 'official' list of names, nor is it an attempt to 'standardize' amphibian systematics; instead the checklist is designed to be a reference volume for practicing systematists, a source of 'current' taxonomy for non-systematists, and a source of regulatory information for those who import and export amphibians. An important difference between the ASC checklists and previous ones is that the ASC checklists represent the efforts of a community, and are not intended to promote the proprietary views of any one segment of the systematic community over another. We think that by detailing systematic controversies and making the lacunae in our knowledge apparent, the ASC checklists will promote systematic research where it is most needed. In addition, unlike other checklists, the ASC checklists can be computer sorted to accommodate requests through ASC and will be updated at predictable intervals to ensure that they do not fall too far behind current nomenclature.

Sections of the amphibian checklist are currently being completed, corrected, and augmented by individually recruited contributors. The accuracy and content of this draft checklist will be ensured by a process of open review, in which reviewers can add comments (from published sources) and correct errors. Like the contributors, the reviewers will be attributed by name with the section(s) of the checklist on which they have worked.

In order to guarantee the accuracy and completeness of the published checklist and assure that it best serves the needs of herpetologists, ASC wishes to enlist the cooperation of the members of the Society for the Study of Amphibians and Reptiles. If you are willing to review taxonomic and/or geographic sections of the checklist, please write to Darrel Frost (Editor/Compiler), Association of Systematics Collections, Museum of Natural History, The University of Kansas, Lawrence, Kansas 66045, USA, and inform him on which taxonomic sections and/or geographic regions you would like to work. ●

ERRATA

Alvin L. Braswell was erroneously included as an author on the article "Lampreys in the diet of the hellbender *Cryptobranchus alleganiensis* (Daudin), and the Neuse River waterdog *Necturus lewisi* (Brimley)" in HR 14(1), 1983 - removal requested by Alvin L. Braswell. ●

LOCALITY RECORDS OF MINNESOTA HERPS WANTED

Minnesota locality records of all species of amphibians and reptiles in the state are sought to update distribution maps as part of a nongame project sponsored by the Minnesota Department of Natural Resources. Records from regional or private collections, likely to be otherwise overlooked, are of particular interest. For more information and a checklist of the species occurring in Minnesota, please contact Jeffrey Lang, Department of Biology, University of North Dakota, Grand Forks, N.D. 58202. (701) 777-4564, 772-0227. ●

REPORT ON A SYMPOSIUM ON INTRODUCED SPECIES, LONDON, ENGLAND, AUTUMN 1982

A Symposium on Introduced Species was held jointly by the British Herpetological Society (BHS), Fauna & Flora Preservation Society (FFPS) and Mammal Society on Saturday, 27th November 1982, in the meeting Rooms of the Zoological Society of London, Regent's Park, London NW1.

The Morning and Afternoon Sessions were chaired respectively by Dr. J.F.D. Frazer, formerly of the Nature Conservancy Council (lately President of the BHS, Treasurer of the Mammal Society) and Mr. I. J. Linn, Department of Zoology, University of Exeter (Chairman of the independent Working Group on Introductions of the UK Committee for International Nature Conservation). The eight papers included four each on herpetofauna and mammals. After an introductory paper by Sir Christopher Lever, the herpetological papers included:

Dr. T.J.C. Beebee (Department of Biology, University of Sussex): Green frogs and other illegal immigrants

Mr. R.E. Honegger (Curator of Herpetology, Zürich Zoo, Switzerland): Intoduced amphibians and reptiles and their influence on native biota, with reference to *Bufo marinus* (read by M.R.K. Lambert)

Mr. Q. Bloxam (Jersey Wildlife Preservation Trust): The potential of re-introducing *Leiolopisma telfairii* in the Mascarenes, Indian Ocean

Mr. K.F. Corbett (BHS Conservation Committee and Chairman, Societas Europaea Herpetologica Conservation Committee): Conservation of declining UK herpetofauna - successful re-introduction techniques.

The Symposium followed an earlier one, jointly held by the BHS and Mammal Society, in 1963. The papers presented are to be published in summarized form by *Oryx*, the journal of FFPS, in 1983.

M.R.K. LAMBERT
British Herpetological Society, London

EVOLUTION IN THE GALAPAGOS ISLANDS - REPORT ON A SYMPOSIUM, LONDON, 1982

A one-day Symposium 'Evolution in the Galapagos Islands' was held by the Linnean Society of London, in association with the Charles Darwin Foundation, on Tuesday 9th December 1982. The symposium took place in the Lecture Theatre of the Linnean Society (where meetings of the British Herpetological Society are held), Burlington House, Piccadilly, London W1, England. The meeting was chaired in the morning by Professor R.J. Berry (University College, London), 1982 President of the Linnean Society and Editor, the *Biological Journal of the Linnean Society*, and in the afternoon by Dr. P. Kramer (Essen, F.R. Germany), President of the Charles Darwin Foundation (CDF) and Dr. O. Hamann (Denmark), European Secretary of the CDF.

The talks ranged from a general consideration of 'islands and evolution' (Professor A.J. Cain, University of Liverpool), through the geological formation (Dr. B.R. Rosen, British Museum Natural History), genetical processes, specific vertebrate groups, effects of the introduction of an ant on other invertebrates (Dr. Y. Lubin from U.S.A., CDF) and colonization by flora (Professor D. Porter, University of Virginia, U.S.A.), to the impact of man on fragile ecosystems (Dr. P. Kramer). Four of the twelve papers were on or involved an herpetological interest (giant tortoises):

Dr. F. Sulloway (Harvard University, Cambridge, Massachusetts, U.S.A.): 'Darwin and the Galapagos'
Dr. J. Patton (University of California, Berkeley, U.S.A.): 'Genetical processes in the Galapagos'
Dr. T. Fritts (U.S. Fish & Wildlife Service): 'Tortoises'
Dr. H. Snell (University of Colorado, Boulder, U.S.A.): 'Iguanas'

The Symposium constituted part of the Linnean Society's Centenary Commemoration of Charles Darwin's death in 1882 (19th April, in Kent, buried seven days later in Westminster Abbey). The papers will be published in full, together with others that the symposium time did not allow, in 1983 (August) in part 1 of the second volume *(20)* of the *Biological Journal of the Linnean Society*. A hard cover edition will also be prepared for wide circulation.

It may also interest members to know that nine essays on Charles Darwin: the man, his theory and his life, were published in February 1982 in *Biological Journal of the Linnean Society* 17(1). This journal, already emphasising the processes of organic evolution in the broadest sense, is to concentrate on this sphere from 1983.

M.R.K. LAMBERT
British Herpetological Society
London

BOOK REVIEWS

Frösche und Kröten, by Rainer Schulte, 1980. Verlag Eugen Ulmer, Stuttgart. 240 pp. 38 color photographs. 62 black and white photographs and line drawings. Price: 38 DM.

Europeans, particularly the Germans and the Dutch, have long been known for their interest in keeping reptiles and amphibians in terraria, and much of the recent European literature on the breeding behavior of these animals has appeared in several high quality aquarium and terrarium magazines published in Germany and the Netherlands. These papers often contain useful information and generally are illustrated with excellent color photographs which cannot be included in most scientific journals. Rainer Schulte's book on frogs and toads is a product of this tradition.

Most American books aimed at terrarium enthusiasts and amateur herpetologists are overpriced and poorly produced, filled with inaccurate information, and illustrated with poor quality, frequently mislabelled photographs. Schulte's book, on the other hand, is a high quality hard-bound production filled with useful information and many beautiful color and black-and-white photographs. It is expensive by American standards (around $20) and presently available only in a German language edition. Nevertheless, for those who read German, it should be a worthwhile investment.

The first 98 pages are devoted to a general introduction to anuran classification and biology, including sections on breeding biology, vocalizations, and poisonous skin secretions, and a very detailed discussion of maintaining frogs and toads in captivity. Here Schulte describes types of aquaria and terraria suitable for different species, and he discusses in detail such topics as temperature and moisture conditions, light regimes, and feeding requirements. Also included are methods for rearing tadpoles through metamorphosis, methods of eliciting breeding behavior in captivity, equipment and techniques for collecting insects to feed captive animals, diagnosis and treatment of amphibian diseases, methods for recording vocalizations, and a variety of other practical information. These features of the book should be useful for graduate students and researchers interested in maintaining anurans in the laboratory.

The remainder of the book is devoted to accounts of individual species which the author has personally maintained in captivity, and in many cases, observed in the field. Although the book is subtitled "Tropical and Native Frogs in the Terrarium," the emphasis is very much on tropical forms; European species are discussed in only four pages at the end. In each species account, the author describes morphology and color pattern, geographical distribution, general ecology and natural history, breeding biology, and behavior in the field and in captivity. Coverage is somewhat spotty and mainly reflects the author's own interests. His specialty is the family Dendrobatidae; many species in this family are described in detail and illustrated with spectacular color photographs. On the other hand, only three species of *Hyla* are given separate treatment. Overall, the species described tend to be colorful, poisonous species most frequently imported by European pet dealers.

Several features of the book may be annoying to professional herpetologists. Species accounts are arranged alphabetically by genus, rather than taxonomically. Hence descriptions of the dendrobatid genera *Colostethus, Dendrobates,* and *Phyllobates* are in different parts of the book, rather than together for easy comparison. Literature citations are somewhat sloppy and heavily weighted toward articles in German aquarium magazines, with only occasional reference to recent field studies. Several authors cited in the text do not appear in the bibliography. Perhaps the most serious deficiency is that many statements appear without a clear indication of the source of information. Many statements apparently are derived from the author's own observations, but the lack of explicit attribution makes it hard for readers to evaluate the reliability of the information.

Despite these reservations, I think the book contains much useful information not readily available elsewhere, and the color photographs alone will make it a worthwhile purchase for anyone interested in the diversity of tropical frogs.

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Natural History of Amphibians and Reptiles of Wisconsin, by Richard Carl Vogt. 1981. Milwaukee Public Museum. 205 pp. ISBN 0-89326-060-6. $25.95.

In recent years a number of regional and state herpetological handbooks have become available, most of good quality. Ideally, a geographically localized volume on reptiles and amphibians should be of value to the general public, as well as to the professional herpetologist. Dick Vogt has now completed such a volume for Wisconsin, and it is certainly an impressive and successful contribution.

In Natural History of Amphibians and Reptiles of Wisconsin, Vogt begins with a history of herpetology in Wisconsin, and a description of the state's physiography and vegetation. Wisconsin is in an interesting geographical position from a herpetological standpoint, with the Mississippi Valley allowing herp species a corridor from the south, while prairie species enter from the west, boreal species from the north, and eastern species from the lower Great Lakes. In this account, the author has sifted out many old, questionable records with clearly explained justifications.

Of great value here are the identification keys to adult and larval amphibians and to reptiles. While useful identification keys must often resort to somewhat technical terminology, Vogt has included explanatory diagrams where necessary. Terms not illustrated can usually be found in the glossary.

The heart of any regional guide is the species accounts. In this book, the life history of each species is described fully, with sections on description, range, habitat, and habits (includes reproduction). All species are illustrated with color photographs, usually a large portrait and several smaller plates showing details of identification, eggs, young, *etc.* Unfortunately, some of the photos—particularly the smaller ones—appear either too dark or too light (under- or over-exposed).

The range of each species is illustrated, by site and museum specimen records, on a county map of Wisconsin. A small inset map of North America shows the general range for the species, based on the maps in Roger Conant's Field Guide to Amphibians and Reptiles of Eastern and Central North America (Houghton-Mifflin, 1975). A minor criticism here is that these small maps were reproduced so faintly as to be practically invisible for some species.

The author's writing style is readable and clear. Dick's occasional personal anecdotes and "collecting stories" liven up the text and add interest. As previously mentioned, a glossary is included, as well as a literature cited and reference section. A general index, and useful indices to herptile predators and foods, round out the book.

It is obvious that a great amount of time and effort went into this project, and the result is a scholarly, yet colorful and readable, contribution to American herpetology. This book may well have set a new standard for state and regional herpetological handbooks.

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Veterinary Biology and Medicine of Captive Amphibians and Reptiles, by Leonard C. Marcus, D.V.M., M.D. 1981. Lea & Febiger, Philadelphia.

Herpetological medicine is a specialty that is in its infancy. The slow growth in the popularity of herpetological medicine is due to a number of factors. Few amphibians or reptiles are of great economic importance, and the use of these classes in laboratory situations remains limited when compared to other laboratory species. In zoos, herpetological collections are variable in both size and diversity and even as pets they are kept on an infrequent but increasing basis. The literature itself is limited and often found in less familiar publications. The limited practice possibilities and literature have restricted the veterinarian from becoming involved in this area. The classes Reptilia and Amphibia are large and diverse and their biology, husbandry and medicine are equally diverse. The slow progress.of this specialty has generated a science filled with extrapolations and case reports with few innovative clinical advances or well documented syndromes.

Doctor Marcus' book is the first publication in over a decade to attempt a comprehensive update of this field. The book is divided into three major sections. Each section is intended to build upon the earlier section and move logically from the normal animal through the clinical evaluation, diagnosis and treatment of the specimen.

The first section, "The Normal Amphibian and Reptile," focuses on the anatomy and physiology of these two classes. The information for the most part is general and allows the reader to gain an introductory exposure to the normal animal. Some caution must be exercised in this section to recall the danger of generalizing for classes as divergent as these.

In the second section, "Principles of Husbandry and Veterinary Care of the Herpetofauna," the author covers a broad spectrum of topics from environmental needs to anaesthesia. The breadth of knowledge in these areas is considerable but unfortunately it is treated in very general terms making this the weakest portion of the book. The information that is provided should be considered introductory and not as the state of the art. The clinician should recall the growing importance of the captive environment and its overall effect on the health of the animal.

The greatest portion of the book focuses on the "Specific Diseases of the Herpetofauna." This section is by far the book's strong point. It is well written with an extensive bibliography covering the infectious and parasitic diseases. Doctor Marcus' familiarity and concern with the zoonoses is particularly helpful when considering herpetological diseases from a public health standpoint. Disease transmission from species to species and to man is considered for many of the reported conditions. The reader becomes immediately aware that a major difficulty in dealing with the diseases of the herpetofauna is an overall lack of depth in many major areas. Quite often the total number of captive specimens is few, the frequency of the clinical syndrome is low, and many diagnoses are made at post mortem.

In a field of growing interest with a scant literature, Doctor Marcus' book is well worth the price for the student, veterinarian, researcher and professional herpetologist. The work reflects the slow progress of herpetological medicine both in institutions and in private practice and should lend itself to stimulating interest in the area and serve as a basic reference for future comprehensive works.

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Leopard Frog Populations and Mortality in Wisconsin, 1974-76, by Ruth L. Hine, B. L. Les, and B. F. Hellmich. 1981. Technical Bulletin 122. Dept. of Nat. Resources, Madison, Wisconsin.

For more than 10 years herpetologists have been concerned that the natural populations of North American frogs such as *Rana pipiens* have been declining. Without accurate baseline data much of the supposed decline has failed to be accurately documented. Nevertheless biologists and professional frog collectors with extensive field experience have raised a warning and implicated chemical contaminations of the frog's aquatic habitat as the cause of the decline.

This timely article represents the first attempt to obtain precise information about the status of natural populations of *Rana pipiens.* The project started in 1974 and concluded in 1978. It involved a statewide survey and an intensive study of the east central counties of Wisconsin along Lake Michigan. Data were obtained on number and quality of ponds, population estimates, breeding ponds, egg mass counts, egg development, mortality and survival, breeding activity, post breeding movements, growth, and mortality during hibernation. Other amphibians associated with *Rana pipiens* were also studied.

The results of the study are alarming: low population numbers, many ponds devoid of any frogs, low survival of the eggs, and high mortality during hibernation. In some areas the mortality at the end of three years was 100%.

The authors were unable to firmly establish the cause of this abnormally high mortality. They did obtain evidence that ruled out disease as a common cause. Degenerative liver changes indicated toxic substance as the causative agent. The authors suggest that Atrazine, a herbicide, may be one of the chemicals.

The implications of this study are alarming. Given all the unfortunate prior examples of the effect of chemical contamination on wildlife, it is sad and disheartening to realize that the Wisconsin situation is probably not an isolated tragedy, but one that is occurring over much of the world. It is clearly time that herpetological societies assume responsibility for publicizing this unnecessary destruction. Herpetologists as students of amphibians should also be the protectors. More studies are necessary and the need to accurately determine the causative agents should have high priority.

The authors are to be thanked and congratulated for this timely and very necessary study.

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Expedition to Greece 1980, by D. Stubbs, A. Hailey, W. Tyler and E. Pulford. University of London Natural History Society. 1981. Mimeo 136 pp. (Available from Univ. London Union, Malet Street, W.C.I. $9.00 incl. post. or £3.50 + postage).

This report is based on field surveys of tortoises in Greece, principally at Alyki (coastal Macedonia) during July and August 1980. Contents include detailed information on one population of *Testudo hermannii*: morphometry, population sex and age structure, longevity, mortality, density, habitat preference, activity patterns, feeding, breeding and aggression, defence, mobility, effects of fire, and a chilling account of a conservation crisis. The authors also discuss the local distribution and niche separation of *T. hermanii* and *T. graeca*, and provide observations on other reptiles and amphibians at Alyki. Appendices contain lists of species of mammals and birds seen on the expedition.

Descriptions of the itinerary, accounts of financial woes, *etc.*, are irritating and indicate that this report must receive rigorous editing before it can be considered a scientific treatise. Many minor typographical errors and inconsistencies (*e.g.*, 10 Km and 10 km on p. 11) are distracting.

Age estimates based on growth rings are approximate (± 2 years) and some relationships are crude (*e.g.*, females aged as 10 years old varied in length from 95 to 155 mm). Morphometric analyses are presented only in graphic form and statistical comparisons are postponed for a later paper. Weights for juveniles seem to have been recorded inaccurately (*e.g.*, one individual weighed only 5 g, less than that of a tortoise hatchling).

Conclusions of annual mortality rates of 8 to 9% and longevity estimates of about 50 years are difficult to accept because one-third of the tortoises older than 10 years could not be accurately aged. Further, the authors calculated adult male population density (18 per ha) but then added an estimate of females (one-third the proportion of males) and juvenile density (based on few recaptures), obtaining an overall density of 53 to 67 tortoises per ha. This estimate would be a record density for any species of tortoise. We should be cautious in accepting this value until substantiated by further field work, particularly where more reliable measures can be obtained on the number of juveniles in tortoise populations.

So what is worthwhile in this paper? It does contain an appreciable amount of data on 632 *T. hermanii* captured on one 75-ha plot, *e.g.*, sex ratio, a bimodal diurnal activity pattern, weight/length relationships, and size frequency histograms. Graphs and illustrations are plentiful. Considerable information on the ecology of the species is presented, and the data will prove useful for comparisons with other species. The authors unjustifiably dismiss comparisons with North American *Gopherus*, particularly *G. berlandieri* which is ecologically equivalent to Alyki *T. hermanii*.

In the last section, these workers reveal the grim reality of tortoise ecology at this site: deliberately set scrub fires followed by destruction by a bulldozer and a rotavator essentially obliterated the Alyki tortoise population and its habitat. The area was levelled in hopes of building holiday homes.

The expedition members located an excellent study area and collected valuable ecological data on a dense population of Mediterranean tortoises. Although expensive for mimeo release and a preliminary report, serious students of tortoises will want a copy of this important study of *Testudo hermanii*.

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Systematic Herpetology: A Synopsis of Families and Higher Categories, by H. G. Dowling and Wm. E. Duellman. 1978 (1974-1978). HISS Publ., New York. 118 accounts. $26.50.

This is a loose-leaf volume with the groups subdivided into their various components, with the basic account being the family. If one selected a typical account each is subdivided into family (or subfamily thereof) with author and date, followed by sections on identification, description, content (usually listing genera plus number of species in each), distribution, fossil record, relationships, life histories, remarks and references. Most accounts are concisely written and informative. There is an index of genera and higher categories.

The copyright date is 1978; also on the front is the date 1974-1978 (on the next page is the notation "with minor revisions 1975-1978"). Each individual account is dated, most are either 1973 or 1974. A number of major papers, even prior to 1975 have not been included. These omissions were not due to lack of space, as in many cases an account ends leaving one-half or more of a blank page. Examples of several important snake papers omitted are the Hoffstetter and Rage (1972) paper on Erycinae, McDowell's (1974) Scolecophidia article and (1975) Anilioidea and Pythoninae article. Very few recent papers (after 1974) are cited. The number of species within each genus is given, however in many cases it is an estimate and in some it apparently involves an error. For example, *Lampropeltis* is listed as having 16 species, the genus *Coluber* as having one, and *Zamenis* 21 (if this is a change in handling of the complex genus "*Coluber*," the authors do not so indicate).

The reference section at the end of each account could be improved. For example the "general references" on reptiles (p. 51.4) has room for more references on the page. Included are two references by Bellairs (1960 & 1970) of which the latter is simply an expansion of the former. Klauber's rattlesnake monograph is included, but the 1956 edition is cited rather than the newer edition. In the lizard family Scincidae there are no references to any of Walter C. Brown's publications. Likewise, I find no references to Broadley's work either in the lizard or snake accounts. Both authors (as well as others) should have some references cited, especially since Dowling (1975) is repeated in at least 11 reference accounts, Romer (1956) in 34, and others numerous times.

A considerable number of drawings are included throughout the book. Most are well done, however, I find myself wishing the authors had used labels or the legend to better show the significance of the drawing. In some cases this was done, but too frequently, for example in figure 31.1, the skull of the leptodactylid frog *Caudiverbera caudiverbera*, all that is indicated is that it is a lateral view of the above frog. Probably to the "frog anatomist" this figure plus the other frog diagrams so labeled are adequate. However, to those of us less informed it would be nice to have at least one frog skull fully labeled. The same comment could be made for some of the other illustrations, especially if the book is to be used in teaching situations.

The book is extremely useful both as a reference and as a teaching aid. It was something that the herpetological community needed, and I for one appreciate its availability. It includes such a diversity of material it is easy for a reviewer to find something to criticize.

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GEOGRAPHIC DISTRIBUTION

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles**, Collins, Huheey, Knight and Smith, 1978), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Joseph T. Collins, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

ANURA

ACRIS CREPITANS BLANCHARDI (Blanchard's Cricket Frog). USA: ARKANSAS: Stone Co: 18 km S of Junction with Ark. Rt. 14 on Ark. Rt. 5. 5-7 June 1970. F. Killebrew, H. Blair, D. Stout, J. Sikes, D. Bailey, and A. Clark. Verified by F. C. Killebrew. West Texas State University Museum of Natural History (WTSU 592, 596, 599, 601, 604, 605, 609, 611, 619, 628). New county record. Fills in gap between previous county records (Dowling, 1957, Occas. Papers University Ark. Mus. No. 3, 51 p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016. ●

HYLA CINEREA (Green Treefrog). USA: ARKANSAS: Pike Co: Caddo River at Glenwood. 18 July 1973. J. Widmer, D. Goff, K. Conway, and J. Needham. Verified by F. C. Killebrew. West Texas State University Museum of Natural History (WTSU 1743-1746, 1758, 1759, 1766, 1767). New county record. Extends range 75 km N and 160 km W of nearest recorded localities in Hempstead and Jefferson Counties, respectively (Dowling, 1957, Occas. Papers University Ark. Mus. No. 3, 51 p.).

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PSEUDACRIS TRISERIATA (Striped Chorus Frog). USA: ARKANSAS: Baxter Co: Ark. Rt. 5 at Moccasin Creek. 5 June 1970. F. Killebrew and J. Sikes. Verified by F. C. Killebrew. West Texas State University Museum of Natural History (WTSU 581, 582). New county record fills in gap in north central Arkansas between localities in Lawrence and Madison Counties. (Dowling, 1957, Occas. Papers University Ark. Mus. No. 3, 51 p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016. ●

NEW DISTRIBUTIONAL RECORDS FOR SELECTED AMPHIBIANS AND REPTILES OF TEXAS

In the past decade, considerable data have been published on the geographic distribution of Texas amphibians and reptiles (see Raun and Gehlbach, 1972; Hambrick, 1975, 1976; Karges, 1978, 1979, 1981; Vance, 1980a, 1980b; and others). Here, we report new distributional information for 20 species of amphibians and reptiles from nine Texas counties. Specimens are exclusively new county records for the given counties and are deposited in the North Texas State University Herpetological Collection (NTSUHC). Specimens are assigned individual catalog numbers, nomenclature follows Collins, *et al.* (1978) and identification was verified by the authors. We thank Drs. L. C. Fitzpatrick and E. G. Zimmerman for allowing us access to the collection.

CAUDATA

Ambystoma tigrinum tigrinum (Eastern Tiger Salamander): RED RIVER Co. 3.2 km NW Manchester at Big Pine Creek. 3 May 1979. E. G. Zimmerman *et al.* NTSUHC A-44 through A-51.

Notophthalmus viridescens louisiensis (Central Newt): RED RIVER Co. 3.2 km NW Manchester at Big Pine Creek. J. R. Glidewell *et al.* 4 May 1979. NTSUHC A-14.

SALIENTIA

Scaphiopus holbrooki hurteri (Hurter's Spadefoot): RED RIVER Co. 3.2 km NW Manchester at Big Pine Creek. E. G. Zimmerman *et al.* 3 May 1979. A-7 through A-12.

Hyla squirella (Squirrel Treefrog): SABINE Co. 16.0 km SE Hemphill on TX 87 in Sabine National Forest. C. W. Kilpatrick. 26 June 1972. NTSUHC A-40, 41.

Rana catesbeiana (Bullfrog): WICHITA Co. 1.6 km NE Electra on US 287. B. J. Hart. 16 October 1971. NTSUHC A-39.

Gastrophryne olivacea (Great Plains Narrowmouth Toad): SABINE Co. 16.0 km SE Hemphill on TX 87 in Sabine National Forest. C. W. Kilpatrick. 26 June 1972. NTSUHC A-42.

TESTUDINES

Chelydra serpentina serpentina (Common Snapping Turtle): COLLIN Co. 1.6 km WSW Blue Ridge at Pilot Grove Creek on FM 545. B. Venables *et al.* 31 July 1976. NTSUHC R-964. 6.8 km E Frisco at West Rowlett Creek on FM 720. J. R. Glidewell *et al.* 20 September 1976. NTSUHC R-998. FANNIN Co. 2.4 km SW Leonard on TX 78. J. R. Glidewell *et al.* 19 July 1976. NTSUHC R-997. RED RIVER Co. 3.2 km NW Manchester at Big Pine Creek. J. R. Glidewell *et al.* 8 September 1979. NTSUHC R-1087.

Sternotherus odoratus (Stinkpot): CAMP Co. 11.2 km SW Pittsburg at Ferndale Lake. P. J. Prete. 5 April 1979. NTSUHC R-1038, 1039. RED RIVER Co. 3.2 km NW Manchester at Big Pine Creek. J. R. Glidewell. 29 August 1979. NTSUHC R-1075 through R-1080.

Chrysemys concinna texana (Texas River Cooter): CAMP Co. 11.2 km SW Pittsburg at Ferndale Lake. P. J. Prete. 5 April 1979. NTSUHC R-1041, 1042. DENTON Co. 6.4 km S Denton on US 377 at Brush Creek. D. Orf. 15 June 1976. NTSUHC R-1000.

Chrysemys scripta elegans (Red-eared slider): CAMP Co. 11.2 km SW Pittsburg at Ferndale Lake. P. J. Prete. 5 April 1979. NTSUHC R-1040. COLLIN Co. 5.6 km N Blue Ridge on TX 78. J. R. Glidewell. 19 July 1976. NTSUHC R-984. 8.0 km ENE Blue Ridge on FM 981. J. Hughes *et al.* 13 July 1976. NTSUHC R-1015. 6.4 km N Farmersville on TX 78 at Indian Creek, J. R. Glidewell *et al.* 10 August 1976. NTSUHC R-1019 through R-1021. COOKE Co. 19.2 km NW Gainesville on FM 1201 at H. H. Moss Lake. J. R. Glidewell *et al.* Various dates from 8 April 1977 through 21 May 1980. NTSUHC R-710 through R-962. These 252 *C. s. elegans* represent voucher specimens for Glidewell's Ph.D. Dissertation (In preparation). Also, they partially fill the hiatus in a four county area of extreme northcentral Texas.

Graptemys kohni (Mississippi Map Turtle): CAMP Co. 11.2 km SW Pittsburg at Ferndale Lake. P. J. Prete *et al.* 4 June 1979. NTSUHC R-1095. The complete distribution of *G. kohni* in Texas is taxonomically confusing (see Raun and Gehlbach, 1972).

Terrapene carolina triunguis (Three-toed Box Turtle): RED RIVER Co. 3.2 km NW Manchester at Big Pine Creek. J. R. Glidewell and J. Hughes. 4 May 1979. NTSUHC R-1052, 1110. 8.0 km NE Clarksville on FM 1159. R. Meckel. 5 July 1980. NTSUHC R-1090.

Trionyx spiniferus pallidus (Pallid Spiny Softshell): COOKE Co. 19.2 km NW Gainesville on FM 1201 at H. H. Moss Lake. J. R. Glidewell. 8 July 1976. NTSUHC R-1096, 1097.

SERPENTES

Coluber constrictor flaviventris (Eastern Yellowbelly Racer): COLLIN Co. 4.8 km NNE Westminster on TX 121 near county line. J. R. Glidewell and J. Hughes. 15 July 1976. NTSUHC R-985.

Elaphe guttata emoryi (Great Plains Rat Snake): DENTON Co. 0.5 km W Sanger at junction FM 455 & I-35. P. Grant. 15 May 1978. NTSUHC R-1064.

Elaphe obsoleta lindheimeri (Texas Rat Snake): CASS Co. 4.8 km E Atlanta on FM 249. L. Burrows. 23 August 1970. NTSUHC R-706.

Lampropeltis getulus holbrooki (Speckled Kingsnake): CASS Co. 9.6 km N Queen City on US 59. L. Burrows. 24 August 1970. NTSUHC R-707. 4.8 km E Atlanta on FM 249. L. Burrows. 17 August 1970. NTSUHC R-708. COOKE Co. 12.8 km NW Gainesville on FM 1201. J. R. Glidewell. 17 June 1977. NTSUHC R-1023.

Masticophis flagellum flagellum (Eastern Coachwhip): COLLIN Co. 8.0 km WSW Princeton on US 380. G. S. Hacker. 8 May 1977. NTSUHC R-966, 977.

Opheodrys aestivus (Rough Green Snake): COLLIN Co. 3.2 km NE Westminster on FM 455. J. R. Glidewell and J. Hughes. 15 July 1976. NTSUHC R-994.

Storeria dekayi texana (Texas Brown Snake): RED RIVER Co. 3.2 km NW Manchester at Big Pine Creek. J. R. Glidewell. 7 September 1979. NTSUHC R-1088.

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OPHISAURUS VENTRALIS (Linnaeus): AN ADDITION TO THE LIZARD FAUNA OF VIRGINIA

Prior to McConkey's (1954) revision of North American *Ophisaurus*, checklists and other publications (Dunn, 1918; Brumfield, 1937; Carroll, 1950; Werler and McCallion, 1951) listed *O. ventralis* as a member of Virginia's fauna. McConkey's (1954) notation that only *O. attenuatus longicaudus* occurred in Virginia led to some confusion and speculation on its occurrence. The species was included in some subsequent checklists (Schmidt, 1953; Burger, 1958; Delzell, 1979) and omitted in others (Anon., 1976; Mitchell, 1977). This problem is clarified with the collection by us of an adult male *O. ventralis* (USNM 221849) 13.3 km S Sandbridge (USGS marker in Sand Bridge) in False Cape State Park, Virginia Beach, Virginia, on 16 May 1981. It was collected DOR on a sandy road adjacent to Spratt's Cove, a marsh-lined cove leading to Back Bay. The specimen agrees in every respect with other specimens of *O. ventalis* as described by McConkey (1954), Conant (1975), and Martof, *et al.* (1980). This record confirms the presence of *O. ventralis* in Virginia and extends the known range 67 km NNW of the previous northernmost locality, 1.4 km S Wright Memorial Monument, Bodie Island, Dare County, North Carolina (W. M. Palmer, pers. comm.; Brothers, 1965).

ACKNOWLEDGMENTS

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HERPETOLOGICAL RECORDS FROM NORTHWESTERN ARIZONA

During the year 1981, the Bureau of Land Management, Department of the Interior, Phoenix District, Kingman Resource Area, conducted a herpetological inventory in the area north of Kingman. Listed below are records that have been determined to be range extensions. Voucher specimens are currently on file at the Bureau of Land Management, Kingman Resource Area, 2475 Beverly Avenue, Kingman, Arizona, 86401. Vegetative associations listed are based on Brown and Lowe (1974).

SAURIA

Cnemidophorus velox - Mohave County, Arizona, ca 5,600 ft. Music Mountains, 1.6 km NE Hells Canyon, 69 km NNE Kingman, T28N, R16W, SE, Sec. 36, Great Basin Conifer Woodland, 28 April 1981 (BLM 8100). Additional records by legal: T28N, R15W, SW, Sec. 30, T28N, R16W, NE, Sec. 24; T28N, R15W, NE, Sec. 31; T28N, R15W, SW, Sec. 19, Great Basin Conifer Woodland. Extends range 40 km west of that illustrated by Stebbins (1966).

Cnemidophorus exsanguis - Mohave County, Arizona, ca 4,500 ft. Cerbat Mountains, 5.1 km N Kingman, T24N, R18W, SE, Sec 16, Great Basin Conifer Woodland, 27 May 1981 (BLM 8275). Additional records by legal: T24N, R18W, SE, Sec. 15; T24N, R18W, NW, Sec. 23, Great Basin Conifer Woodland. Extends range 55 km NNW of that reported by Jones *et al.* (1981).

Eumeces gilberti arizonensis - Mohave County, Arizona, ca 4,800 ft. Cerbat Mountains, 20 km NNW Kingman, T24N, R18W, SE, Sec. 15, Great Basin Conifer Woodland, 11 April 1981 (BLM 8014). Additional records by legal: T24N, R18W, NW, Sec. 23, T24N, T18W, NE, Sec. 20, Closed Chaparral and Juniper-Oak extends range 43 km NNW of that reported by Jones *et al.* (1981); -Mohave County, Arizona, ca 5,500 ft., Music Mountains, 67 km NNE Kingman, T28N, R15W, NW, Sec. 31, Great Basin Conifer Woodland, 10 May 1981 (BLM 8197). Extends range 74 km N of that reported by Jones *et al.* (1981); - Mohave County, Arizona, ca 2,900 ft. Black Mountains, 27 km SW Kingman, T19N, R19W, NW, Sec. 4, Mohave Desert Scrub, 15 April 1981 (BLM 8030, 8031, 8032, 8033, 8035, 8036, 8037). Extends range 32 km WSW of that reported by Jones *et al.* (1981).

Phrynosoma douglassi - Mohave County, Arizona, ca 4,500 ft. Cerbat Mountains, 20 km NNW Kingman, T24N, R18W, SE, Sec. 16, Great Basin Conifer Woodland, 15 April 1981 (BLM 8014). Additional records by legal: T24N, R18W, NW, Sec. 23, T24N, T18W, NE, Sec. 23, Interior Chaparral, Extends range 55 km NNW of Hualapai area illustrated by Stebbins (1966); - Mohave County, Arizona, ca 5,500 ft. Music Mountains, 67 km NNW Kingman, T28N, R15W, SW, Sec. 30, Great Basin Conifer Woodland, 10 April 1981 (BLM 8011, 8047). Additional records by legal: T28N, R15W, NW, Sec. 31; T28N, R16W, NE, Sec. 24, Interior Chaparral. Extends range 55 km W of that illustrated by Stebbins (1966).

SERPENTES

Tantilla planiceps atriceps - Mohave County, Arizona, ca 4,200 ft. Cerbat Mountains, 5.1 km N Kingman, T24N, R18W, NE, Sec. 20, Interior Chaparral, 15 April 1981 (BLM 8038). Additional records by legal: T24N, R18W, SE, Sec. 16, T24N, R18W, SE, Sec. 15, Great Basin Conifer Woodland. Extends range 51 km of that reported by Jones *et al.* (1981).

Leptotyphlops humilis - Mohave County, Arizona, ca 3,300 ft. Hells Canyon, 30 km N Kingham, T27N, R16W, SE, Sec. 4, Mohave Desert Scrub, 8 June 1981 (BLM 8329). Extends range 67 km E Colorado River as reported by Hahn (1979).

Thamnophis cyrtopsis - Mohave County, Arizona, ca 7,000 ft. Hualapai Mountains, 18 km SE Kingman, T20N, R15W, SW, Sec. 32, Wild Cow Spring, Interior Chaparral, 14 July 1981 (BLM 8358). Extends range 13 km to the NW as reported by Jones *et al.* (1981).

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DISTRIBUTIONAL RECORDS FOR CENTRAL AND SOUTHERN TEXAS

The following new county records supplement the compendium of Raun and Gehlbach (1972, Dallas Mus. Nat. Hist. Bull. 2). Unless otherwise indicated, specimens were collected by one or both of the authors; all identifications have been verified by Lieb. Collected materials are deposited in the following biological resource collections: Natural History Museum of Los Angeles County (LACM), Texas Cooperative Wildlife Collection (TCWC), California State University at Dominguez-Hills (CSDH), Amphibian and Reptile Osteological Collection, University of Southern California (JMS), and Laboratory for Environmental Biology (UTEP).

ANURA

Acris crepitans (Northern Cricket Frog). GUADALUPE Co. 7.5 km NNE Kingsbury. 18 April 1976. LACM 125398.

Bufo debilis (Green Toad). MCMULLEN Co. 25 km S Tilden, 1-2 km (by RnRd 1962) E StHy 16. 28 August 1969. LACM 128603.

Bufo speciosus (Texas Toad). FRIO Co. 24 km SE Pearsall. AOR RnRd 1582, 25 July 1975. UTEP OC-920.

Bufo woodhousei (Woodhouse's Toad). GUADALUPE Co. 8.0 km (by FmRd 117) NW Dewville. 14 April 1981. UTEP 8660.

Gastrophryne olivacea (Great Plains Narrowmouth Toad). KENDALL Co. 14 km (air) NNE Boerne, Camp Alzafar. 18 April 1976. UCLA field class. LACM 125405.

Hyla chrysoscelis (Cope's Gray Treefrog). WILSON Co. 5 km (air) SW La Vernia. 31 August 1969. Eickleberger, T. LACM 127426.

Pseudacris clarki (Spotted Chorus Frog). KENDALL Co. 14 km (air) NNE Boerne, Camp Alzafar. 18 April 1976. UCLA field class. LACM 125399.

Scaphiopus couchi (Couch's Spadefoot Toad). FRIO Co. 5 km (air) W Bigfoot. 26 August 1981. UTEP 8990.

SAURIA

Anolis carolinensis (Green Anole). KENDALL Co. 14 km (air) NNE Boerne, Camp Alzafar. 1 August 1977. LACM 126270. 21 March 1980. LACM 131233.

Sceloporus poinsetti (Crevice Spiny Lizard). KENDALL Co. 14 km (air) NNE Boerne, Camp Alzafar. 20 August 1978. LACM 128490. 21 June 1980. LACM 131233.

SERPENTES

Coluber constrictor (Racer). WILSON Co. 6.0 km (by FmRd 3335) W Jct with FmRd 1107. 14 April 1981. UTEP 8654.

Elaphe guttata (Corn Snake). BANDERA Co. 13 km (air) W San Geronimo. 29 June 1981. UTEP 8988.

Elaphe obsoleta (Rat Snake). CALDWELL Co. 3 km (air) WNW Prairie Lea. 29 August 1977. LACM 127108.

Ficimia streckeri (Mexican Hooknose Snake). ZAPATA Co. 10 km (air) NNW Lopena, DOR USHy 83. 15 July 1971. C. S. Lieb and R. R. Reyes. TCWC 36396.

Heterodon nasicus (Western Hognose Snake). LA SALLE Co. 13 km (air) WNW Cotulla, AOR RnRd 468. 21 July 1972. TCWC 39283.

Heterodon platyrhinos (Eastern Hognose Snake). BANDERA Co. 8 km (air) W Tarpley, DOR RnRd 470. 18 June 1975. TCWC 48594.

Leptotyphlops dulcis (Texas Blind Snake). FRIO Co. 4.5 km (by RnRd 1582) SE Pearsall. 25 July 1975. JMS 1730.

Nerodia rhombifera (Diamondback Water Snake). MCMULLEN Co. 29 km (air) S Tilden, DOR StHy 16. 28 August 1969. CSDH 77-67.

Pituophis melanoleucus (Gopher Snake). KENDALL Co. 14 km (air) NNE Boerne, Camp Alzafar. 21 March 1980. LACM 131168.

Storeria dekayi (Brown Snake). GILLESPIE Co. 2.5 km (air) N Cain City, 2 August 1977. LACM 126278. WILSON Co. 1.9 km (by FmRd 1107) NW Pandora. 14 April 1981. UTEP 8673.

Thamnophis proximus (Western Ribbon Snake). FRIO Co. 9.8 km (by USHy 57) WSW Hondo Creek Bridge. 26 August 1981. UTEP 8943.

Virginia striatula (Rough Earth Snake). KENDALL Co. 2.4 km (by StHy 46) E. Boerne. 12 March 1972. C. S. Lieb and F. S. Hendricks. TCWS 38825.

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Siren intermedia IN MEXICO

Siren intermedia has been reported from only two localities in Mexico: Matamoros, and 30 miles south of Matamoros, in extreme northeastern Tamaulipas (Goin, 1942, 1957). Discovery of the species at yet another location somewhat further to the south is therefore of interest.

The new locality is 62 miles SSW of the International Bridge, Matamoros, and 9.5 miles north of E. Tejon, on Route 101, Tamaulipas. The site consists of a pond some 1 to 4 feet deep, and thick with aquatic weeds, particularly *Chara*. Dominant vegetation in the immediate vicinity is mesquite, with some *Opuntia* and *Acacia*. Specimens were collected by seine on three occasions: two specimens by J. Mecham and J. Bogart on 22 June 1965, 1 specimen by Mecham, R. Mitchell, and K. Johnson on 23 January 1966, and 2 specimens by Mitchell, F. Abernathy, W. Rhodes, and V. Colvin on 26 August 1966. One specimen has been placed in the collection of the Texas Tech University Museum.

A number of mature *Notophthalmus meridionalis* were collected in the pond on the June and August dates. None were found in January.

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Two new records of the bog turtle, *Clemmys muhlenbergi* Schoepff, in Georgia

Clemmys muhlenbergi is a secretive species with a spotty distribution, ranging from upper New York and eastern New Jersey southward into the southern Appalachians in Georgia.

The bog turtle was first recorded in Georgia by Hale and Harris (1980. Geographical distribution: *Clemmys muhlenbergi*. SSAR Herp. Review 11(1):1.) from Union County. Five specimens were collected during a nine week period from May to July. This site is a woodland bog with a canopy of yellow poplar (*Liriodendron tulipifera*) (P. E. Hale, Univ. Ga., pers. comm.). An adult female bog turtle was found at this site in July 1981 after five unsuccessful visits (Ben Sanders, U.S. Forest Ser., pers. comm.).

Two adult female bog turtles were found at two Georgia localities on 8 August 1980 by Carl E. Putnam, Jr. The first was found basking on a clump of sphagnum moss at 0930 hr in a bog 3.2 km N Dillard, Rabun County. The air temperature was 23° C. The second turtle was found at 1040 hr in a bog next to Rabun Bald Rd., 3.5 km S Scaly (N.C.), Rabun County. The air temperature was 24° C. Neither turtle was measured, although both were adults; age was indiscernable due to smoothly worn shells. The second turtle had algae growing on the carapace.

Both sites are sphagnaceous bogs with sphagnum mosses *(Sphagnum ssp.)* and alders *(Alnus ssp.)* the predominant growth. The pitcher plant *(Sarracenia purpurea)* reaches its southern-most limit in the Scaly bog (Steve Bowling, Ga. Bot. Soc., pers. comm.).

These two records extend the range, in Georgia, at least 60 km NE of the Union County locality. The range is also extended by at least 10 km S from the known localities in bordering Macon County, North Carolina (Nemuras, K. 1974. Wildl. North Carolina, 38(2):13-15).

These animals were deposited in the vertebrate collection of the University of Georgia Museum of Natural History (UGA-MNH 15021 and 15022). This field work was funded with research grants from the Education, Research, and Conservation Committee of the Zoological Society of Atlanta.

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Origin of *Rana catesbeiana* Populations in the Rio Grande Delta of Texas

The bullfrog, *Rana catesbeiana,* occurs over much of the eastern United States (Conant, 1975). Large-scale introductions have increased the geographic range so that the original natural limits are confused. In Texas, *R. catesbeiana* naturally occurred over the eastern one-third of the state. Raun and Gehlbach (1972:10) believed the southwestern edge of native occurrence to be on the Coastal Plain in the vicinity of the lower Nueces River. Recently, Neck (1981) reported on the observations of an early Mexican expedition which described a frog "as large as the head of a man . . . where astounding call resembles the bellowing of a bull" in Webb County, well inland on the upper Coastal Plain in 1828.

Raun and Gehlbach (1972:Map 35) reported no bullfrog populations in the lower Rio Grande Valley of Texas (Rio Grande delta). More recently, Karges (1978) reported bullfrogs collected in 1977 on Texas Route 186 approximately 20.6 km west of Raymondville, Willacy County. A local informant (J. Ideker, pers. comm.) reported that residents believe these frogs originated from a local frog farm. No further information has been available as to the origin of this population.

The probable origin of this population was revealed in *Monty's Monthly,* a development-oriented publication which was issued from 1919 to 1939. A report (Anonymous, 1927), assumed to be written by P. E. "Monty" Montgomery, editor of the periodical stated, that Judge D. F. Strickland of Mission possessed a frog farm located "out northwest of Pharr" (Hidalgo County). The farm consisted of a lake fed by irrigation water lifted from the Rio Grande. The lake was also stocked with "bass and crappie," but was equipped with "a system of strainers to keep out undesirables . . . . such as gars, terrapins, etc." The lake banks were said to "resound with the orchestral strains of bullfrog music which would make a Louisianian or Mississipian homesick from hearing the dulcet tones." The frog farm was only for use by family and friends; apparently no commercial development was planned by Strickland.

The same article alludes to the former existence of another frog farm in the delta area. This venture, by Nat Wetzel at Raymondville, Willacy County (northeast of Pharr), failed because the "frog pond was of such diminutive dimensions that his imported stock of 'greenbacks' abruptly left enmasse one night." The bullfrogs at the Strickland pond, on the other hand, were described as being "perfectly at home" and "increasing in geometrical proportion."

The bullfrog's requirement for permanent water restricts distribution of this species in the Rio Grande delta area. The collection site of Karges (1978) is an area with several drainage ditches, but is within 9 kilometers of Monte Alto Reservoir, the largest reservoir in the delta area. Smaller lakes are located less than 5 kilometers from the site. Evidence at hand now indicates that descendants of these populations still exist in the area. Field investigators in the area should consider the bullfrog as a possible localized species around other similar reservoirs in this region.

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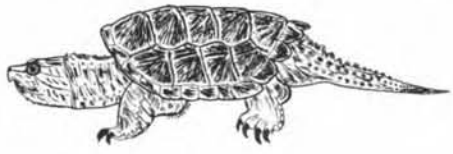
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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (four issues per year), **Herpetological Review** (four issues per year), and occasional **Facsimile Reprints in Herpetology.** Members may purchase other Society publications at reduced rates.

ANNUAL DUES 1983

(Please send only U.S. funds on U.S. banks; make checks payable to SSAR)

Student member	$15.00
Regular member	$18.00
Sustaining member	$30.00
Contributing member	$50.00
Institutional	$30.00

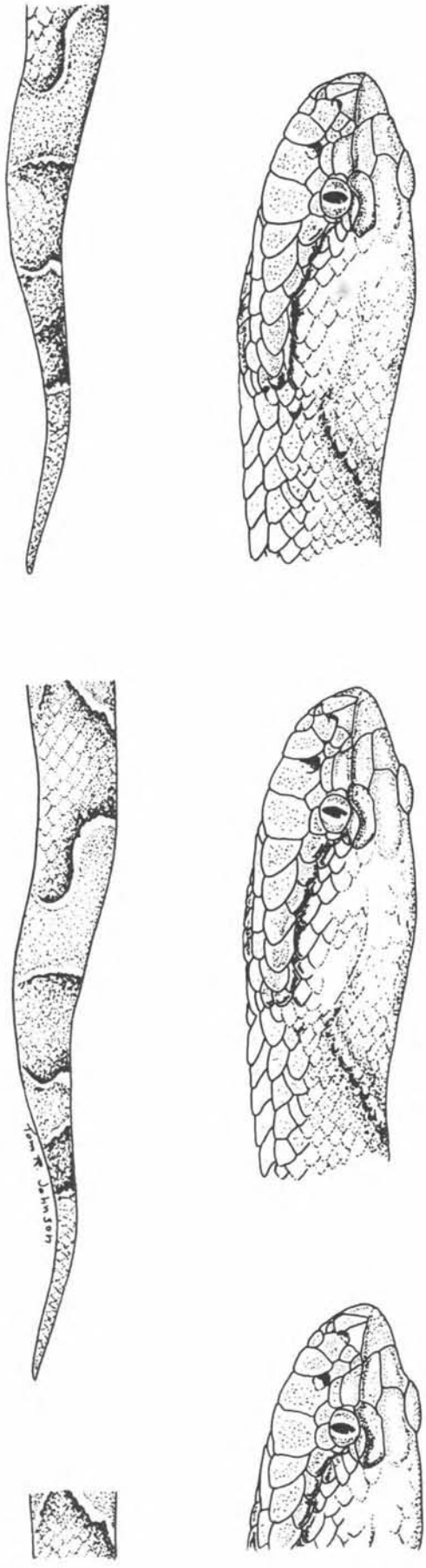
Non-U.S. members and institutions must also include $5.00 additional for postage.

Individuals are encouraged to join at the higher membership categories. Money from such support substantially helps promote the publications and services of the SSAR. For information about SSAR membership, write to:

Henri C. Seibert
SSAR Treasurer
Department of Zoology
Ohio University
Athens, Ohio 45701, U.S.A.

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Herpetological Review

Volume 14 March 1983 Number 1

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JOINT MEETING
The 26th Annual Meeting of
THE SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES
with
The 31st Meeting of
THE HERPETOLOGISTS' LEAGUE
at
THE UNIVERSITY OF UTAH
Salt Lake City, Utah
7-12 August 1983



The University of Utah campus in spring. The Wasatch Mountains are in the background.

SYMPOSIUM

Biogeography of the Herpetofauna of Mexico: Perspectives and Approaches. In honor of Hobart M. and Rosella B. Smith.

DISTINGUISHED HERPETOLOGIST

Roger Conant

PREREGISTRATION AND ABSTRACTS

The final call for papers and preregistration forms will be mailed to all members of both societies in March 1983. Deadline for the receipt of titles and abstracts is 1 May 1983 —this will be rigidly enforced. Foreign scientists who plan to attend and present papers are encouraged to indicate this intention and submit abstracts *far* in advance. Any interested non-member may request the premeeting booklet.

PROGRAM SUMMARY

Sunday, 7 August
- Registration at Austin Hall
- Board & Trustees Meetings
- SSAR Regional Herpetological Societies — Social

Monday, 8 August
- HL Distinguished Herpetologists' Lecture by Roger Conant
- SSAR/HL Liaison Committee
- SSAR Regional Herpetological Societies — Paper Session
- Social and Auction

Tuesday, 9 August
- Group Photo
- Social — Outdoor Barbecue

Wednesday, 10 August
- Business meetings
- Herpetological Resources Committee
- Social — Snowbird Ski Resort

Thursday, 11 August
- Open Discussion of Papers
- SSAR Board Luncheon
- Field Trips
- Open House, Research Facilities

Registration at Union: Daily
Symposium: Tuesday and Wednesday
Paper Sessions: Monday-Thursday
Poster Sessions: Monday-Thursday
Exhibits (art, live, commercial): Monday-Wednesday

MEETING SITE

The University of Utah is in Salt Lake City and is regarded as a major educational, cultural, and medical center in the Intermountain West. The University is a community of 33,000 on an attractive campus of 1500 acres with 149 buildings. The campus sits at 5,000 ft. on a Pleistocene bench (a former shoreline of Lake Bonneville) at the base of the Wasatch Mountains. From campus there is a panoramic view of Salt Lake Valley, the Great Salt Lake and its islands, and the Oquirrh Mountains to the West.

All meeting sessions will be centralized in the air conditioned University of Utah Union Building. Weather in August is usually comprised of hot, dry days and cool nights. A sweater or jacket is wise for any outdoor function after dark.

HERPETOLOGY IN UTAH

The University of Utah, Salt Lake City
- Dennis M. Bramble — Biomechanics of feeding and locomotor systems
- Orlando Cuellar — Parthenogenesis; reproductive cycles
- Harold F. Hirth — Biology of marine turtles
- John M. Legler — Chelonian biology

Veterans Administration Hospital, Salt Lake City
- Jim Glenn — Venomous snakes

Utah State University, Logan
- James A. MacMahon — Life history studies, especially disturbed areas

Brigham Young University, Provo
- Wilmer W. Tanner — Herpetofauna of SW US and Mexico
- Jack W. Sites, Jr. — Evolutionary genetics

Weber State College, Ogden
- G. Craig Gundy — Pineal morphology
- Gloria Z. Wurst — Pineal morphology

ACCOMMODATIONS

Residence Halls. Air conditioned rooms in Austin Hall near Union; $10 single and $17 double (soap, towels, linen, and blankets included). Shared toilet facilities for each block of rooms. Snack kitchen and refrigerator on each floor. An abundance of indoor and outdoor lounging facilities.

Motels/Hotels. Blocks of rooms at reduced rates have been reserved at hotels and motels at varying distances from campus. Write to chairman for information.

Camping. A few recreational vehicle sites with full hookups available on campus; many sites for self contained units. Commercial campgrounds (KOA, *etc.*) within 3 miles; Forest Service Campgrounds within 10-15 miles.

MEALS

A full range of eating facilities is available within the Union, at Ballif Hall, and the University Hospital. All facilities accept cash.

FACILITIES

A complete range of recreational-athletic facilities is available for $3.00. Rental of camping-backpacking gear can be arranged.

ALCOHOL

No problem. The liquor laws in Utah are unusual but not difficult.

ACTIVITIES AND TOURS

A variety of activities and tours will be planned for spouses and families. These will concentrate on the local Mormon scene and the mountain-desert spectrum and its recreational potential. Information will be available for any person or family wishing to do these things independently. Field trips will be announced.

TRANSPORTATION

Make air reservations to Salt Lake City International Airport. There are two adjacent terminals. Information for arriving attendees will be posted prominently. Transportation to Austin Hall is $.50 by city bus, $8.50-$10.00 by taxi. A shuttle will be arranged to maximize transportation opportunities. Attendees arriving by automobile should enter the campus from the East (on Wasatch Drive) and look for the entrance to Austin Hall (opposite hospital and fire station). Campus parking permits are necessary.

MEETING CHAIRMAN

John M. Legler, Department of Biology, University of Utah, Salt Lake City, Utah 84112
Telephone 801-581-6609 ●

JOINT MEETING
The 26th Annual Meeting of
THE SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES
with
The 31st Meeting of
THE HERPETOLOGISTS' LEAGUE
at
THE UNIVERSITY OF UTAH
Salt Lake City, Utah
7-12 August 1983

FIRST CALL FOR PAPERS

Please return completed form and abstract by 1 May 1983 to: John M. Legler, Department of Biology, University of Utah, Salt Lake City, UT 84112.

Please type the following:

Author(s) (last names first); **underline** speaker: _____

_____

Institution(s): _____

_____

Speaker's address: _____

_____ Phone: _____

Speakers will be notified of the time and date of presentation after 1 May 1983.

Check the appropriate item: **[NOTE: ALL PAPERS REQUIRE ABSTRACTS]**

_____Contributed paper

_____Student paper (for HL prize; authored and presented by students *only*)

_____Poster session (HL will present a prize for best poster presentation)

_____Presentation by title only (requires abstract)

All presented papers are allotted 15 minutes (*including* discussion)

A 35 mm carousel slide projector, screen, pointer, PA system, and illuminated lectern will be available to all speakers. You must request *any other equipment* needed in this space: _____

_____.

ABSTRACTS

Directions. Use new ribbon and elite type (*i.e.*, 12 characters per inch). Avoid old mechanical typewriters and microdot printers. Underline scientific names only. Your abstract will appear exactly as you submit it except for possible reduction; please take care. *DO NOT EXCEED THE SPACE IN THE BOX* (approximately 200 words). First line, names of authors. Second line, addresses of authors. Third line, title. Fourth line begin abstract. **SEE SAMPLE.**

SAMPLE ABSTRACT

Legler, J.M., and R.M. Winokur
University of Utah; University of Nevada, Las Vegas
VASCULAR BUCCAL FIMBRIAE IN *CARETTOCHELYS INSCULPTA* (CRYPTODIRA: CARETTOCHELYIDAE).

Recent ecological studies of *Carettochelys insculpta* in Northwestern Australia have revealed several morphological structures that are unknown or poorly known. One of these is . . .

ABSTRACT FORM



WORLD CONGRESS OF HERPETOLOGY

By recent action of the officers and official representatives of the major national and international herpetological societies, an international committee has been established to plan the first World Congress of Herpetology. The congress will be held in 3-5 years at a site yet to be selected. The Planning Committee consists of:

Donald G. Broadley (Zimbabwe)
Harold G. Cogger (Australia)
J. C. Daniel (India)
Ilya S. Darevsky (U.S.S.R.)
Marinus S. Hoogmoed (Netherlands)
Toshijiro Kawamura (Japan)
Michael R. K. Lambert (U.K.)
Hubert Saint Girons (France)
P. E. Vanzolini (Brazil)
David B. Wake (U.S.A.)
Kraig Adler (U.S.A.), *Secretary-General*

The congress will be organized to include a wide range of topics, to appeal to all persons interested in the scientific study of amphibians and reptiles. The committee currently is setting guidelines for operation, including the establishment of a larger and broadly representative International Herpetological Committee to provide a self-perpetuating mechanism for future congresses.

The Planning Committee solicits comments from the herpetological community on all aspects, in particular the choice of a convenient site and content of the congress. Potential hosts for the congress are also invited to communicate. Further announcements will be published in this journal.

Address comments or questions to any member of the Planning Committee or to the Secretary-General: Professor Kraig Adler, Cornell University, Section of Neurobiology and Behavior, Seeley G. Mudd Hall, Ithaca, New York 14853, U.S.A.

SSAR BUSINESS

BALLOTS FOR NON-U.S. MEMBERS: AN APOLOGY

SSAR is an international society and, as such, all members have a right to participate in society affairs, especially in the election of officers. In past years ballots were put inside *Herpetological Review* but since *HR* was sent by surface mail the ballots often were not received by overseas colleagues until after the election deadline. Last August the Board of Directors decided to send ballots separately to non-U.S. members by airmail, even at considerable additional cost, in order to permit them to vote. Unfortunately, due to an error made by the mailing house which handles *HR*, these separately-mailed ballots were sent by surface post. The Society apologizes for this error, which will be corrected for next Fall's election. Through the efforts of GRP and our printer, Steve Meseraull, SSAR will be reimbursed by the mailing house for all printing and postage costs associated with these ballots. ●

CURRENT LITERATURE TO BE A SEPARATE SERIES

The 31 May 1965 issue of *The Ohio Herpetological Society Newsletter* contained two pages of herpetological titles. That unpretentious effort marked the beginning of SSAR's long-standing commitment to providing a titles service to the membership. Over the intervening years, this service grew and experienced the inevitable ups and downs attendant to so arduous an undertaking. The general trend was upward, with the efforts of many volunteers combining to advance it. In June of this year, SSAR members will receive (as part of their member benefits) Number 1 of a new series entitled *Current Herpetological Literature.* The new series, printed by Allen Press, Inc. and coordinated with the *Journal of Herpetology*, will hold titles maintained on magnetic tape and coded with key words so that each number may be indexed, rather than having all titles listed simply alphabetically. The new series will be edited by George R. Pisani, with Joseph Dinardo as Associate Editor. The initial number will also contain a complete history of SSAR's titles service in recognition of all who have contributed to this effort.

The editors will prepare titles contributed by volunteers so that data entry may be via optical character reader, a much more efficient method than we've used before. Said editors urgently need the help of volunteer searchers (in this country and others) to scan journals for herpetological titles. We would like to establish a standing panel of scanners (which would be listed in each number) to assure accuracy and uniformity. The key to providing this service to our membership at no added cost is the same key to every other society function — the dedication of members to service. Volunteers will not be "worked to the bone." So, I ask that those of you with access to extensive libraries and any non-USA periodicals and books contact the editor and, ideally, send me a list of what serials are available to you which may carry herpetological articles. We do not need scanners for any serials published by Allen Press, Inc. since these can be sorted automatically at Allen Press. I also ask that the editors or recipients of certain serials (state journals, university and zoo publications, regional society publications, museum series) participate by volunteering to send us titles of herpetological articles published therein.

The value of this effort hinges on the thoroughness with which we can cover the literature, and that requires considerable help. Preparing and publishing the data will take a large portion of the time Joe and I can devote to this service, so please volunteer.

GEORGE R. PISANI
Division of Biological Sciences
The University of Kansas
Lawrence, KS 66045 ●

PROPOSED AMENDMENTS TO SSAR BYLAWS

Members of the Society for the Study of Amphibians and Reptiles are hereby notified of a proposal approved by the SSAR Board of Directors to amend the following articles of the SSAR Bylaws (1970. *J. Herpetology* 4:95-98) in order to make the Publications Secretary a voting member of the Board:

Article II, Section 3 (p. 96) currently reads:

"The terms of office for the President, President-elect, Immediate Past-President, Secretary and Treasurer shall be for one year; those for the directors shall be for three years (with election to provide for staggered terms so that no more than two Directors shall be elected in any one year)."

If amended, it will read:

"The terms of office for the President, President-elect, Secretary, Treasurer, Publications Secretary and Immediate Past-President shall be for one year; those for Directors shall be for three years (with election to provide for staggered terms so that no more than two Directors shall

be elected in any one year)."

Article II, Section 6d (p. 97) currently reads:
"The Publications Secretary shall assist in the storage, maintenance of inventories and dissemination of the publications of the Society, in particular back issues of the Journal. He shall report annually to the Treasurer."

If amended, it will read:
"The Publications Secretary shall assist in the storage, maintenance of inventories and dissemination of the publications of the Society. He shall serve as an appointive member of the Board of Directors."

Article III, Section 1 (p. 98) currently reads:
"The Board of Directors shall consist of the President, President-elect, Secretary, Treasurer, six Directors and the immediate Past-President."

If amended, it will read:
"The Board of Directors shall consist of the President, President-elect, Secretary, Treasurer, six Directors, Publications Secretary and Immediate Past-President."

These proposed amendments will be on the agenda for discussion at the 1983 general business meeting in Salt Lake City, Utah, during 7-12 August 1983. A ballot will be submitted by mail to the SSAR membership after the annual meeting in Salt Lake City.

Respectfully submitted,
James S. Jacob
SSAR Secretary ●

SSAR ELECTION RESULTS

The results of the 1982 SSAR Election are as follows:

President-Elect: Carl Gans
Secretary: James Jacob
Treasurer: Henri Seibert
Board-Zoo: Hugh Quinn
Board-Regular: Linda Maxson

The Society extends its gratitude to the Nominating Committee (John Wright, Chair) for its hard work and the excellent slate of candidates. ●

Pritchard & Trebbau's TURTLES OF VENEZUELA

Due to unavoidable delays in production, publication of this book will be delayed by several months. Since we do not expect it to be issued until fall 1983, the special prepublication prices announced in the December 1982 issue of *Herpetological Review* will be extended until 1 September 1983. The Society regrets this inconvenience. ●

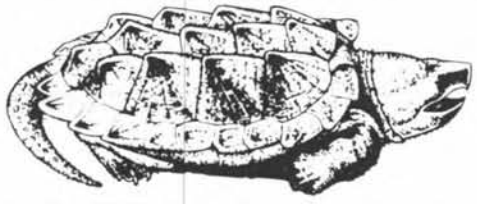
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To Be Published June 1983

Silver Anniversary Year 1958- 1982 Membership Directory Of The Society For The Study Of Amphibians And Reptiles



The first comprehensive listing of the membership of the society now numbering over 2,000 professional and amateur herpetologists. This directory will also include a brief history of the society, the constitution and bylaws, a listing of all previous society officers and annual meeting sites, and a listing of worldwide herpetological societies and organisations and their publications prepared by the 1982 Regional Society Liaison Committee.

TO ORDER:

To SSAR members, *if ordered before 1 August 1983*..... ☐ $2

To non-members; Institutions; all orders after 1 August.... ☐ $4

The directory will be in the same style and size as the *Journal of Herpetology* for easy binding. Commercial use of the list will not be permitted. Prices include packing and shipping. Address orders to Dr. Douglas H. Taylor, Department of Zoology, Miami University, Oxford, Ohio 45056 U.S.A. Receipt sent on request only. Mark here ☐ if you wish to have a complete pricelist of SSAR publications including the *Journal of Herpetology*, *Facsimile Reprints in Herpetology*, *Herpetological Review*, *Herpetological Review*, *Herpetological Circulars*, *Catalogue of American Amphibians and Reptiles*, and the publications of The Ohio Herpetological Society.

SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Contributing Members-1982

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C.J. McCoy
R.H. McWilliams
R. Ruibal
M. Sabeth
C.A. Wilkeson

Contributors to Grants-in-Herpetology

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R.B. Pitkin
R.W. Reese
M.J. Rosenberg
B. Stasczak
M.M. Stewart
R.A. Thomas
W.L. Witt ●

PRIZE FOR BEST STUDENT JOURNAL PAPER

An annual prize of $100 was established in 1973 to be awarded to that student publishing the most significant paper in the *Journal of Herpetology* during the preceding year. This award is to serve a dual purpose: (i) to recognize the important, original contributions made to our knowledge of amphibian and reptile biology by young persons; and (ii) to encourage students to publish in *Journal of Herpetology*. Unlike awards for oral presentations, which require the presence of the person at a particular meeting site in order to compete, this prize is open to all students throughout the world and thus is more fitting for a society having an international focus.

COMMITTEE

1. An *ad hoc* Prize Committee of five persons will be appointed by the Society Chairman early each year.

2. The Committee should be international in composition. Since Committee members will need to have the relevant *Journal* issues at hand, this should be noted in appointing non-American members.

ELIGIBILITY

1. A person must have been a student at an accredited school (elementary, secondary or university level) within one year of submitting the manuscript for publication. Submission dates can be verified by the Editor of the *Journal*.

2. The Committee Chairman should designate all articles to be considered. This list should be all-inclusive, even including those articles where author eligibility is possibly in doubt. After the vote, the highest-ranking, eligible person can be identified.

CRITERIA

1. The prize should be awarded to that person reporting the most significant new contribution to our knowledge of amphibian or reptile biology, interpreted in its broadest sense.

2. If the Committee so chooses, "no winner" may be declared.

AWARD

1. The Committee's decision should be reported to the Society's Chairman and Treasurer by June 1.

2. The Society Chairman will notify the awardee as soon as possible.

3. The award will be presented at that summer's Annual Meeting; it is hoped that the student will be present to accept the award. ●

MEETINGS

CALL FOR PAPERS

All herpetologists are invited to submit for consideration the titles of papers they wish to present at the 7th Reptile Symposium on Captive Propagation and Husbandry to be held at Dallas, Texas. Paper lengths may range from 15 to 40 minutes. A preliminary program will be established by May, 1983, so a 100-150 word abstract of a presentation should be submitted by contributors prior to 1 May 1983. *Titles should be submitted as soon as possible.* Final manuscripts should be submitted prior to 1 June 1983.

Submit all program information to: Dr. Peter J. Tolson, Program Chairman, Toledo Zoological Society, 2700 Broadway, Toledo, OH 43609; 419/385-5721. Symposium Series Director is: Richard A. Hahn, Zoological Consortium, Inc., 13019 Catoctin Furnace Road, Thurmont, MD 21788; 301/662-0328. Symposium Coordinator is: Mike Goode, Columbus Zoo, 9990 Riverside Drive, Powell, OH 43065; 614/889-9472, 889-9475. Host Co-Chairmen are: William E. Lamoreaux and David G. Barker, Department of Herpetology, Dallas Zoo, 621 E. Clarendon Drive, Dallas, TX 75203; 214/946-6898. European Liaison is: Quentin Bloxam, Curator of Reptiles, Jersey Wildlife Preservation Trust, Channel Islands, Great Britain; 0534 61949. ●

CALL FOR PAPERS

The Chihuahuan Desert Research Institute and Sul Ross State University announce the second Chihuahuan Desert Symposium to be held in Alpine, Texas, October 20-21, 1983. Papers should pertain to the objectives of the Symposium:

To update knowledge of the Chihuahuan Desert Region.
To identify potential resources.
To address new concerns for the Region.
To discuss utilization of resources.
To identify changes within the Region.
To address the future outlook of the Region.

Abstracts must be sent to the appropriate Session Chairman by July 15, 1983. Session Chairmen will review all abstracts and assign time slots upon acceptance. Only a limited number of papers will be accepted for each session. All presented papers will be limited to 12 minutes. Papers will be reviewed and published as Occasional Papers by the Chihuahuan Desert Research Institute over a two year period. Editorial guidelines will be provided to authors upon acceptance.

Send abstracts to the appropriate Session Chairman prior to July 15, 1983:

Botanical Biology: A. Michael Powell, Department of Biology, Sul Ross State University, Alpine, TX 79832

Vertebrate Biology: David K. Schmidly, Department of Wildlife Science, Texas A&M University, College Station, TX 77840

Invertebrate Biology: Jim V. Richerson, Department of Biology, Sul Ross State University, Alpine, TX 79832

Plant Resources and Agriculture: Jimmy Tipton, Texas A&M Agricultural Research Center, Texas A&M Circle, El Paso, TX 79927

Archeology and Anthropology: Robert Mallouf, Texas Historical Commission, Box 12276, Austin, TX 78711

Parks and Recreation: Robert Ditton, Recreation and Parks Department, Texas A&M University, College Station, TX 77840

Utilization and Management of Ecological Resources: Roland Wauer, 7500 Axton Street, Springfield, VA 22161

Inquiries for additional topics may be sent to: Dennie Miller, Executive Director, CDRI, Box 1334, Alpine, TX 79830. ●

BRITISH HERPETOLOGICAL SOCIETY MEETINGS 1983

The meetings are held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1 and start at 7:00 P.M., unless indicated otherwise. SSAR members passing through London are most welcome.

February 23rd. Dr. P.A. Arak (Department of Zoology, University of Cambridge): Female choice in natterjack toad *(Bufo calamita)* breeding behaviour.

March 22nd. Annual General Meeting followed by Mr. Lionel Kelleway (Department of Zoology, University of Swansea): Control of reproductive behaviour in the adder, *Vipera berus;* to include a 16 mm research film.

April 14th. Professor H.C. MacGregor, Mrs. M.A. Horner and Mr. S. Sims (Department of Zoology, University of Leicester): European crested newts and their chromosomes: a study in evolution, development and molecular biology. Organised by the Linnean Society of London; all, including BHS members, welcome. Meeting starts at 5:00 P.M. Tea served at 4:30 P.M. in the Library, where BHS Library books are housed. There will be an informal BHS gathering after the meeting at *ca.* 7:00 P.M. in The Chequers, 16 Duke Street, London SW1.

May 5th. Mr. Keith Lawrence, MRCVS: Human causal diseases in captive reptiles.

May 26-27th. Dr. M.W.J. Ferguson (Anatomy Department, Queen's University, Belfast), organiser: A joint two-day symposium with the Zoological Society of London on "Reptile Biology" in honour of Professor Angus Bellairs on the occasion of his retirement, in the Meeting Rooms, Zoological Society of Lon-

don, Regent's Park, NW1. Admission by ticket; full programme and application forms available from the Zoological Society by end of March 1983. Details to be announced in *BHS Bulletin*. A Symposium Volume will be published by Academic Press.

June 15th.* Amphibians and reptiles of the **New World.** A discussion on care and breeding with the Captive Breeding Committee.

July 13th. A visit to the London Zoo. A meeting organised by the Captive Breeding Committee during a Members' Evening of the Zoological Society of London. BHS members and guests should meet at the Fellows' Entrance in the Outer Circle of Regent's Park. If late, please tell the Gateman you are with Mr. S. Townson.

September 21st.* Amphibians and reptiles of the **Old World.** Details as for June 15th.

October 8th. A joint Saturday meeting with ASRA (Association for the Study of Reptilia and Amphibia) at the Cotswold Wildlife Park, Oxon. Details to be announced in *BHS Bulletin*.

November 22nd. Dr. A. Hailey (Zoology Department, University of Nottingham): Ecology of the viperine snake, *Natrix maura*.

*Members should bring live animals, preserved specimens and 35 mm colour slides for display and to illustrate discussions. ●

Symposium on THE STRUCTURE, DEVELOPMENT, AND EVOLUTION OF REPTILES in honour of PROFESSOR A. d'A. BELLAIRS on the occasion of his retirement

This symposium organised by Dr. M.W.J. Ferguson, Department of Anatomy, Queen's University, Belfast, will be held in the Meeting Rooms of the Zoological Society of London, Regent's Park, London, NW1 4RY
on
Thursday, 26th and Friday, 27th May, 1983

This symposium is open to Fellows of the Zoological Society of London, members of The Anatomical Society of Great Britain and Ireland, The British Herpetological Society and to any scientist interested in the subject of the symposium. Tickets (free) will be issued by the Administrative Assistant, Zoological Society of London and a printed programme with booking form for coffee, luncheon, etc. will be available in March 1983. The papers given at the symposium will be published as a Festschrift in honour of Professor A. d'A. Bellairs in the series "Symposia of the Zoological Society of London" by Academic Press (editor M.W.J. Ferguson).

THURSDAY, 26th MAY, 1983

9.00-9.15 M.W.J. FERGUSON — Introduction.

MORPHOLOGY

Chairman: PROFESSOR A.S. BREATHNACH

DEVELOPMENT

Chairman: PROFESSOR L. WOLPERT, FRS

FRIDAY, 27th MAY, 1983

PHYSIOLOGY and ECOLOGY

Chairman: DR. M.R.K. LAMBERT

EVOLUTION

Chairman: PROFESSOR T.S. WESTOLL

Further details and a complete program are available from:

DR. M. R. K. LAMBERT
Centre for Overseas Pest Research
College House, Wrights Lane
London W8 5SJ
Telephone: 01-937-8191 ●

MANAGEMENT OF NONGAME SPECIES AND ECOLOGICAL COMMUNITIES

A workshop on management of nongame wildlife as species and as integral components of ecological communities will be held at the University of Kentucky, Lexington, Kentucky on June 11-12, 1984. The workshop is being sponsored by the Department of Forestry, University of Kentucky, in cooperation with the Kentucky Department of Fish and Wildlife Resources, Kentucky Nature Preserves Commission, TVA Land-Between-the-Lakes, the Daniel Boone National Forest, and the Kentucky Nature Conservancy. Subject areas to be included are: 1) inventory, including listing criteria and computerized retrieval systems; 2) management of nongame species, communities, and people; 3) monitoring methods to determine management effectiveness; and current and future research.

Individuals who wish to present a paper in one of the above areas should submit a 250-word abstract by 15 October 1983 to:

Dr. William C. McComb
Department of Forestry
University of Kentucky
Lexington, Kentucky 40546-0073

Notification of acceptance will be made by 15 January 1984. Instructions to authors regarding format and deadlines for complete manuscripts will be provided at that time. A published proceedings of all accepted papers will follow the workshop. ●

SOCIETIES

SOCIETAS EUROPAEA HERPETOLOGICA

The Societas Europaea Herpetologica (SEH) was founded on September 11, 1979 in Bonn, W. Germany by 24 herpetologists from eight European Countries. The aim of SEH is to further scientific research and nature conservation in the field of herpetology. It tries to realize this by promoting organization of congresses, meetings, symposia and publishing the journal 'Amphibia-Reptilia' (published quarterly, 360 + 24 pages per year). The present membership stands at 353, from 38 countries.

Interested persons should contact:

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MISSISSIPPI HERPETOLOGICAL SOCIETY

One year ago the Mississippi Herpetological Society was founded at a meeting held in Jackson. It was decided at that time to remain purely a local entity for as long as it took to establish ourselves and see if we were going to make it. A year has passed and we feel that it is time to announce our existence to the herpetological community outside Mississippi.

The MHS was founded 26 June 1981. An emblem was chosen which depicts a state map and two herps endemic to Mississippi, the black pine snake and the ringed saw-back turtle. At present our membership stands at approximately 60 and it is hoped that this will increase with out-of-state membership.

Meetings are held every fourth Saturday of each month at 7:30 p.m. in the Clarion Ledger Focus Building, 2915 Terry Road, Jackson, MS. A bi-monthly newsletter is distributed to all members. Various activities such as field trips and holiday festivities are an added bonus to those living within driving distance.

All persons, amateur or professional, sharing an interest in the field of herpetology are invited to visit or join. State membership dues are $10.00 individual and $15.00 family. Out-of-state membership is $7.00. Institutional membership is $20.00.

For more information, contact:

Mississippi Herpetological Society
Post Office Box 8087
Jackson, Mississippi 39204
(609) 373-3135 ●

AMPHIBIAN ECOLOGY GROUP IN BRITAIN

The Amphibian Ecology Group consists of representatives from all the centres in Britain where active research into amphibian ecology is taking place. The group first came together at Leicester in January 1982, and the second meeting took place at the University of Wales Institute of Science and Technology Field Centre, Newbridge-on-Wye in October 1982. The aim of the meetings is to provide a forum for the exchange of ideas on amphibian ecology, in order to define more clearly research objectives and to standardise methods and procedures. It is hoped that meetings will take place in the autumn each year, when accounts of the preceding summer's field work will be presented. The next meeting will be held at Monks Wood Experimental Station, Abbots Ripton, Huntingdonshire, England, in the autumn of 1983. Anybody wishing further details of the group or a report of the October 1982 Amphibian Ecology Seminar should contact Dr. S.P. Gittins, Department of Applied Biology, UWIST, King Edward VII Avenue, Cardiff CF1 3NU, Wales, or through the British Herpetological Society, c/o Zoological Society of London, Regent's Park, London NW1 4RY, England. ●

A DICEPHALIC KING SNAKE *(Lampropeltis getulus yumensis)* FROM ARIZONA

In the autumn of 1977, a dicephalic male kingsnake *(Lampropeltis getulus yumensis)* was collected at South Mountain, Maricopa County, Arizona. The hatchling was later loaned to the Animal Resource Center where one of us (L.N.) has cared for the snake. It is presently on display in the Life Science Center at Arizona State University.

The specimen is referred to Cunningham's (1937) "anterior dichotomy" class due to extent of duplication and separation of the vertebral columns (Fig. 1).

The total length of the snake is 56 cm, the tail length is 10.6 cm, with neck lengths of 8 cm and 9 cm. There are 8 (right head) and 11 (left head) separate ventrals on each neck. These scales appear creased and deformed. Loose folds of skin are present posterior to the hump which represents the vertebral junction (Fig. 2). Also, the ventrals located between the external junction and 3 cm posterior to the vertebral junction are distinctly narrower than mid-body scutes (1.5 vs. 4.0 mm). The two vertebral columns are parallel, with the right one being slightly elevated above the left just before turning left and down to the junction. This results in the humpback appearance (Fig. 2). Cunningham (1937) presents 2 photos (Plate X L, figures 116 and 117) showing a similar hump in *Opheodrys aestivus*.

Shaw and Campbell (1974) described head dominance in both feeding and movement among four dicephalic kingsnakes at the San Diego Zoo. In this specimen, both heads have complete and separate control over movement, and no definite dominance has been demonstrated by either head. This is apparent when one head is eating and the other attempts to move after another food item. When the two heads attempt to go in opposite directions, the neck muscles just quiver as if strained and the back arches. While one head is feeding, the other will try to take the food away which has resulted in numerous scars on both heads. For this reason, both heads are fed simultaneously. To prevent the mice from clogging the alimentary junction, one mouse is presented head first, the other laterally. The snake is fed four mice (5-8 g) every 10 days. Mice are killed just prior to feeding, which discourages constriction.



Figure 1. A two-headed *Lampropeltis getulus* showing vertebral junction.

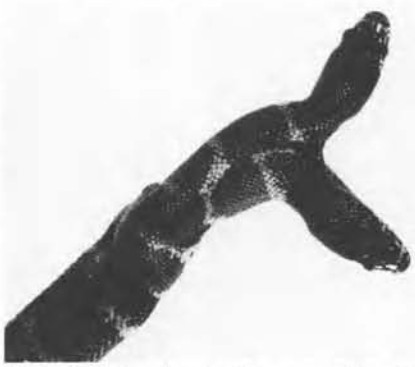


Figure 2. A two-headed *Lampropeltis getulus* from Maricopa Co., Arizona.

Although Shaw and Campbell (1974) reported a *Lampropeltis getulus* that survived for 6 years in captivity, most reported dicephalic snakes die as hatchlings (Lasher 1980, Klauber 1956, Branch 1979). As of July 1981, this snake has survived for at least 3 years and 8 months.

ACKNOWLEDGMENTS

This snake was collected by and generously loaned to Arizona State University by Ann Bassett. The photograph and radiograph were taken and developed by Roy A. Barnes, Anthropology Department, Arizona State University.

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SSAR SILVER ANNIVERSARY COMMEMORATIVE PRINT

As part of the 25th Anniversary Celebration the Society has issued a beautiful *full-color* print of a Gila monster, taken from a watercolor drawing by the noted wildlife artist David M. Dennis. The print measures 11½ by 15¼ inches (29 by 38.5 cm) and is printed on a very heavy acid-free paper stock so that it can be framed or used as a poster.

The edition is strictly limited to 1000 copies, most of which were distributed at the Annual Meeting in Raleigh in August, but some copies remain for sale on a first-come, first-served basis. Prices are $10 each postpaid, or $8 each in quantities of 10 or more. Send orders to Dr. Douglas H. Taylor, SSAR Publications Secretary, Department of Zoology, Miami University, Oxford, Ohio 45056, U.S.A. Checks should be made payable to "SSAR"; payment in U.S. funds, please. ●

LAMPREYS IN THE DIET OF HELLBENDER *Cryptobranchus alleganiensis* (DAUDIN), AND THE NEUSE RIVER WATERDOG *Necturus lewisi* (BRIMLEY)

In 1972 William E. Brode (pers. comm.) stated that lampreys occur in the diet of Tennessee River *Cryptobranchus*, but there is nothing in the literature concerning this phenomenon. Crayfish are the major dietary item of hellbenders throughout their geographic range (Nickerson & Mays, 1973). However, some specimens in Missouri populations of *C. alleganiensis* have contained large numbers of lampreys. One series that contained lampreys was collected in early April 1974 from the Niangua River, Dallas County (Osage River drainage) by James Caliando (Robert Wilkinson, pers. comm.). Nickerson collected another series on 21 April 1977 in the Big Piney River, Texas County (Gasconade River drainage) from which was preserved a sample of regurgitated lamprey.

The Texas County sites are within the range of three lamprey species, but only the Northern brook lamprey, *Ichthyomyzon fossor*, is recorded from either river (Pflieger, 1971). Although the Big Piney River lampreys were partially digested, William L. Pflieger (pers. comm.) identified one as an adult *I. fossor*. April is the breeding season for *I. fossor* at this latitude (Pflieger, 1975), and presumably *Cryptobranchus* are harvesting the lampreys in their breeding pits.

No food studies have been published on the Neuse River waterdog, *Necturus lewisi*, but studies now being made of this species at the North Carolina State Museum of Natural History show that small aquatic invertebrates, some terrestrial invertebrates, and some fish and salamanders are included in the diet. Unlike *N. maculosus*, *N. lewisi* only occasionally feeds on crayfish.

Predatory behavior of the waterdog on fish and other vertebrates in the laboratory is also being studied. Specimens of the Least Brook Lamprey, *Lampetra aepyptera*, were collected in shallow breeding waters of a small tributary of the Neuse River in April 1979 by David S. Lee and David Carroll. Three adults of this small species were introduced into a 165 gallon aquarium containing three adult *N. lewisi* (two females and a male). The lampreys took refuge beneath large pebbles and rocks, and on the same evening they were observed depositing eggs. One of the *N. lewisi* converged on the area. Upon approach of the apparently foraging waterdog the lampreys withdrew under the stones, but the waterdog wedged its head under the stones and sucked a lamprey into its mouth. The *Necturus* then forcefully pulled the lamprey from the stones and consumed it from the head end, swallowing it alive and whole. No lampreys could be located in the tank twenty-four hours after their introduction.

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A MELANISTIC *Elaphe vulpina* FROM OHIO

Certain taxa of snakes, such as *Elaphe o. obsoleta* and *Coluber c. constrictor*, are known to normally undergo a post-embryonic ontogenetic increase in melanism. Other species such as *Sistrurus c. catenatus* and *Crotalus horridus* (Klauber, 1972) have local populations which do the same. Yet other species, such as *Thamnophis sirtalis*, have populations with a high proportion of individuals which have melanism present from birth (Blanchard and Blanchard, 1941). However, for most aberrantly melanistic snakes mentioned to date (for example: *Storeria d. dekayi*, Heckman, 1960; *Nerodia f. fasciata* and *Lampropeltis c. calligaster*, Mount, 1975; *Agkistrodon c. contortrix*, Fitch, 1959; *Crotalus v. viridis* and *C. v. oreganus*, Klauber, 1972; *C. intermedius omiltemanus*, Armstrong and Murphy, 1979; *Micrurus fulvius tenere*, Gloyd, 1938) it has not been determined whether the abnormal amounts of black pigment are present at birth or are post-embryonically ontogenetically acquired. Catling and Freedman (1977) report, however, that aberrant melanism in *Thamnophis butleri* is present from birth. In this paper we report an ontogenetic increase in black pigmentation for an aberrantly melanistic *Elaphe vulpina gloydi*.

On 26 May 1977, the senior author collected a female *E. v. gloydi* at a locality within the Toledo City Limits, Lucas Co., Ohio. Upon its capture the specimen was observed to possess several unusual characteristics. These were the presence of a nodular spinal deformity *ca.* one-third of the way down the dorsum, the unusual shape and appearance of the head, and the uncharacteristically dark coloration of the skin. The specimen at this time was *ca.* 35 cm long (total) and the dorsal coloration was a dusky chestnut, slightly lighter than the rows of dark brown dorsal blotches. This is in contrast to the normal color pattern at this size of dark brown blotches on a straw-colored ground. After examination, the specimen was released where captured.

On 4 June 1978, the specimen was recaptured at the same site. The presence of the same combination of aforementioned aberrant characters in this specimen precluded the possibility of two snakes being involved. It was now *ca.* 80 cm long (total) and was nearly uniformly flat dark brown along the dorsum; the blotches were most evident anteriorly. The ventral pattern consisted of a yellow ground and a concentration of dark brown squares along the sides of the ventrum. This pattern of ventral blotch distribution is also uncharacteristic of the species. The amount of melanin in this specimen was evidently increased between the two capture dates. The scale and blotch counts of the specimen are normal for the subspecies.

A shed epidermis from this snake was saved and shows the same preponderance of dark coloration as does the specimen itself. The presence of the abnormal amount of melanin in the epidermal cells is expected for such cases of morphological melanism as reported herein (Bagnara and Hadley, 1973, p. 31).

This specimen was found in a heavily disturbed industrial area where *E. vulpina* is fairly common. The amount of chemical contamination of the environment probably is moderate to heavy. In this locality other oddly colored *gloydi* have been found which have had unusually pinkish or orange ground colors, though these are not so striking as the melanistic specimen. Also, *Thamnophis butleri* from this locality sometimes exhibit unusually reddish lateral coloration. It should be noted that the authors have never seen unusually colored *E. v. gloydi* or *T. butleri* from any of numerous other localities within northwestern Ohio. It is possible that these color aberrations are due to chemical contamination of the environment, although it remains unproven.

Besides indicating that melanin content in aberrantly melanistic snakes may be post-embryonically ontogenetically increased, this specimen also appears to represent the first reported aberrantly melanistic specimen of the genus *Elaphe*.

We wish to thank H.B. Bechtel for reviewing the manuscript, and M. Nasatir and the Department of Biology, University of Toledo, for the use of their photographic facilities.

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AQUATIC BEHAVIOR OF COLLARED LIZARDS, *Crotaphytus c. collaris*, FROM ARKANSAS

Burt and Hoyle (1934) provided a detailed account of aquatic behavior by a collared lizard which dove into the water, remained submerged and retreated under a rock. In addition, Werth (1973) reported aquatic behavior by a collared lizard from Kansas and suggested that this phenomenon (aquatic utilization) might be a common occurrence in lizards. Ventures into water by lizards of xeric habitats apparently are uncommon; however, Dillon and Baldauf (1945) and Stille (1947) reported this unusual behavior in *Cnemidophorus sexlineatus*. Here, I report on aquatic behavior by collared lizards from Arkansas and suggest possible explanations for this unusual event.

The study site was an abandoned rock quarry located in northcentral Arkansas (Izard County), 0.8 km east of Myron (T18N, R7W, Sec. 26). The area was characterized by outcroppings of cherty limestone upon which collared lizards bask. The center of the site was a rock quarry pit containing a moderately-deep pool of water (mean depth ($\bar{D}$) = 1.8 m). Surrounding the perimeter of the pond were escarpments situated directly above open water.

As anticipated, while attempting to capture lizards to obtain cloacal temperatures, individuals escaped by retreating under rocks or habitually running to a nearby suitable outcropping. Escaping lizards seldom ran over three meters. Alternately, some individuals remained atop large rocks and seemed to "ignore" the presence of intrusion. On six occasions (4, 11, 31 July; 6, 12, 22 August 1979) between 1300 and 1430 hrs, adult male collared lizards ran to the periphery of the quarry pond, hesitated briefly, and jumped into the water. These lizards had adequate room to run elsewhere but instead took refuge in the pond. Upon entering the water, lizards either: (1) briefly remained motionless while filling their lungs with air and then slowly floated back to shore or (2) quickly returned to shore by actively swimming without pausing to allow for lung expansion. It took approximately one to two minutes for lizards to reach the shoreline and, at times, their heads were briefly submerged.

It is difficult to determine whether the lizards "chose" to escape in the quarry pond rather than in their terrestrial surroundings. This type of concealment would lower their body temperature, may have caused a temporary thermal shock, and in turn, restricted mobility. Recorded body temperatures of 138 active *C. c. collaris* ranged from 30.5 to 41.5° C, $\bar{x}$= 37.4 ± 2.6° C (McAllister, 1980). Body temperatures obtained from six lizards which quickly swam back to shore ranged from 21.5° to 24.0° C, $\bar{x}$= 22.7 ± 0.8° C. During these observations, water temperatures at a depth of 10 cm ranged from 20.0° to 23.5° C in this portion of the quarry pond.

Interestingly, during the study recapture data for 43 marked lizards indicated a loss of 48.8% (9 males, 12 females) of the animals before they entered winter dormancy (McAllister, 1980). An occasional loss may have resulted from lizards which entered the quarry pool and may have simply drowned or were eaten by the resident predacious fish population of largemouth bass *(Micropterus salmoides)*. Although no actual predation was observed, adult *M. salmoides* will occasionally consume frogs, mice, and other small animals that swim or fall into the water (Pflieger, 1975).

ACKNOWLEDGMENTS

This information is based on a portion of a thesis prepared in partial fulfillment of the requirements for a Master's degree in biology at Arkansas State University. I thank my major advisor, Dr. V.R. McDaniel, and other members of my thesis committee for encouragement, suggestions, and assistance in field work. I also thank Drs. T.L. Beitinger and E.G.Zimmerman, North Texas State University, for helpful comments on the manuscript. I further wish to acknowledge that this study was supported in part by a grant from the Arkansas Herpetological Society.

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THE REPRODUCTIVE BIOLOGY OF THE INDIAN SKIPPER FROG *Rana cyanophlyctis*

Frogs and toads have been important resources for developmental and other studies for a number of years all over the world. However, the study of Indian amphibians has not equalled the progress made in recent years in other vertebrate groups (Daniel, 1963). This is especially true in the area of developmental biology due to the lack of standardized methods for maintenance and reproduction of the amphibians of India. For the first time, we have been able to successfully domesticate the Indian skipper frog *Rana cyanophlyctis*.

The skipper frog is common in India and is mainly aquatic. Ramaswami and Lakshman (1954) had indicated the suitability of this frog for embryological studies in India and had successfully induced ovulation. In our laboratory, we have been able to standardise the methods for maintenance, husbandry and multiple ovulations of this species.

Sexually mature frogs are collected during the breeding season. They are numbered, toe clipped and ovulated by induced ovulation. The animals are maintained under conditions standardised by Mohanty-Hejmadi (1977a and b). Up to 15 specimens can be kept in an aquarium (about 45 cm by 25 cm and 25 cm deep) containing conditioned tap water. Rocks are placed at one end providing a dry surface. The water is changed daily. The frogs are force-fed with goat liver. They are kept under two food regimes: one group is fed daily and the other group is fed on alternate days.

Starting one month after collection, the frogs are given half of a female (or one male) heteroplastic *Rana tigerina* pituitary or one female (or two male) homoplastic pituitary to induce ovulation. The unmacerated pituitaries are injected into the peritoneal cavity by a #18 gauge needle. Onset of egg release varies, beginning as soon as six and as late as 16 hr after injection depending on the temperature. On rare occasions, the eggs are released after a second pituitary injection, 24 hr after the first injection. In these frogs, eggs are released 30 hr after the first injection.

Table 1. Ovulation and survival record of laboratory conditioned *Rana cyanophlyctis*.

Food	N	Ovulation Frequency[1] (%)						No. of eggs[2]		Survival
		1	2	3	4	5	6	Control	Expt.	%
Alt. days	15	0	45.5	54.5	0	0	75.0	296	274.5	87
Daily	15	17.0	14.0	20.0	26.6	33.0	75.0	296	438.0	60

[1]Percent frogs ovulating in each of 6 attempts.
[2]Average per ovulation.

The frogs which are fed daily can be ovulated at 30 day intervals (Table 1). However, the percent of death is high. Frogs fed on alternate days ovulate less frequently, however, the survival is better. Fecundity is directly controlled by nutrition; the frogs fed daily yield more eggs in comparison to the controls (eggs ovulated just after collections).

The animal is hardy and easy to take care of. Eggs can be obtained throughout the year. An average female (snout-vent length 6.0 cm) can produce 150-500 eggs at each laying. The eggs are 1.0 mm in diameter and are suitable for experimental manipulations. The methods for rearing and life cycle have been reported (Mohanty-Hejmadi and Dutta, 1980). The larvae grow to 52 mm in total length and weight is approximately 1100 mg. The average snout-vent length at metamorphosis is 17 mm and weight is 750 mg.

We have successfully domesticated the Indian skipper frog for the first time in India. We recommend daily feeding for short term study and alternate day feeding for long term. The procedures developed by us can provide encouragement for workers to use amphibians for teaching and research in India.

ACKNOWLEDGMENT

This work has been supported by CSIR, India. The authors would like to thank Dr. B. K. Behura, the Head of the Department of Zoology for his encouragement throughout this study.

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MORPHOLOGIC EVIDENCE OF TOXIC SALIVA IN COLUBRID SNAKES: A CHECKLIST OF WORLD GENERA

Reports of toxic colubrid snakebites involving humans and prey animals have appeared sporadically during the past one hundred years. Recent interest in colubrid toxinology is reflected by several reviews (Gans, 1978; Kochva, 1978; McKinstry, 1978; Mebs, 1977; Mebs, 1978; Minton, 1976; Minton, 1978; Minton and Mebs, 1978). This interest parallels recent reports, some widely distributed, of mild to severe or even fatal envenomations in man (Anonymous, 1975a, 1975b; Grogan, 1974; Mamonov, 1976; Mebs *et al.*, 1978; Mittleman and Goris, 1978).

The primary morphologic indicator of toxicity in colubrids is thought to be the presence of Duvernoy's gland. This branched tubular salivary gland is "located in the postocular region, reaching the angle of the mouth posteriorly and the level of the eye dorsally" and drains to the posterior maxillary teeth. Serous cells, rich in protein, are the main secretory cells of Duvernoy's gland; however, mucous cells, rich in carbohydrates, may also occur, particularly in the duct system (Kochva, 1978). Aaron Taub (1967), in his definitive monograph on the occurrence and comparative morphology of Duvernoy's gland, lists this gland in 100 of 112 colubrid genera examined. While the actions of Duvernoy's gland secretions are very incompletely studied, the above reviews indicate that mild reactions in humans usually involve inflammation while the most severe reactions involve serious impairment of the hemostatic mechanisms leading to hemorrhage. Reactions in prey animals involve a variety of findings.

The secondary morphologic indicator of toxicity in colubrids is the presence of enlarged rear maxillary teeth, either grooved (opisthoglyphous, commonly termed rear fangs) or solid (aglyphous). These dentition types may vary within a given genus, *e.g.*, *Rhabdophis* and *Erythrolamprus* (Malnate, 1960; Peters and Orejas-Miranda, 1970).

While Duvernoy's gland is present in many colubrids, regardless of tooth form, it is absent in some which lack enlarged rear maxillary teeth.

This checklist of colubrid generic names, based on the above morphologic indicators, is divided into five tables. Dentition, being more completely documented than the presence of Duvernoy's gland, forms the basis for Tables 1-4 as follows: Tables 1 and 2, opisthoglyphous genera, New and Old World; Tables 3 and 4, aglyphous genera showing marked enlargement of the rear maxillary teeth, New and Old World. References for accepted generic names and dentition as well as notations of Duvernoy's gland presence and geographic distribution are included. Table 5 lists the aglyphous genera of the world, with unmodified rear maxillary teeth, examined by Taub (1967) for Duvernoy's and supralabial glands. References for dentition and geographic distribution are included. Listing of a given genus indicates that one or more species of the genus has the characteristic in question. Dual listing indicates that the dentition type varies among the species of the genus or that authorities differ as to their description of the dentition type. In some cases a generic name was traced from an earlier synonym.

Two African genera of venomous snakes, the elapid genus *Elaps* and the viperid genus *Atractaspis* (FitzSimons, 1974), will probably be accepted as colubrids. Two recent reports (Branch, 1981; Harding and Welch, 1980) group *Atractaspis* with the colubrids. Since this matter seems unsettled, (Bourgeois, 1968; Kochva *et al.*, 1967; Kochva and Wollberg, 1970; McDowell, 1968), I have not included them in the checklist but do mention the likelihood of future inclusion.

This checklist is provided as an aid to those conducting literature and laboratory investigations in colubrid toxinology and to those collecting and keeping colubrid snakes for a variety of purposes. The importance of awareness as to the toxic nature of certain colubrid snakes is illustrated by the recent sale of dangerously toxic *Rhabdophis* specimens, as harmless snakes, in England (Mather *et al.*, 1978).

Given the fluid nature of colubrid taxonomy and nomenclature, the data in this checklist are subject to change. Thus this checklist should be periodically revised. Any suggestions for a future revision will be gratefully received.

Geographic distribution abbreviations from Bellairs (1970) are as follows: Af., Africa south of the Sahara; As., Asia; Aus., Australia; E.As., East Asia, mainly China; E.I., East Indies including southern Malaya, Borneo and Indonesia; Eu., Europe; Mad., Madagascar; N.Af., Africa north of and including the Sahara; N.Am., North America including Mexico; Phil., Philippines; S.Am., southern America including Central America (south of Mexico); S.As., southern Asia including India and Ceylon, Burma, the Indo-Chinese region and in some cases, southern China; W.As., western Asia including Arabia, Persia, West Pakistan, *etc.*; W.I., West Indies. For some genera, sources other than Bellairs were used to provide geographic distribution data. Abbreviations for these data conform to those of Bellairs.

Other abbreviations used in the tables are: S, D-S, serous Duvernoy's gland; SM, D-SM, serous-mucous Duvernoy's gland; S-M, supralabial gland, mucous; S-MS, supralabial gland, mucous-serous; ND, no data (in reference to Taub, 1967); NP, not present.

Reference notations (numbers not in parentheses) in the tables correspond to the numbered reference citations.

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TABLE 1. Opisthoglyphous colubrid genera of the New World (numbers in parentheses refer to number of species examined).

Genus	References for Listing	Duvernoy's Gland Type[53]	General Distribution[4]
Amastridium	4, 44, 12	ND	S.Am.[10]
Apostolepis	4, 44, 45, 1, 12	ND	S.Am.
Calamodontophis	44, 1	ND	S.Am.[1]
Chilomeniscus	4, 44, 31	ND	N.Am.
Chionactis	4, 44, 31	ND	N.Am.
Clelia	4, 44, 45, 12	S(1)	S.Am.
Coniophanes	4, 44, 45, 12	S(1), SM(1)	N.Am., S.Am.
Conophis	4, 44, 45, 1	S(1)	N.Am., S.Am.[6]
Crisantophis	44, 55	ND	S.Am.[55]
Ditaxodon	44, 45	ND	S.Am.[45]
Drepanoides	4, 44, 12, 31	ND	S.Am.
Elapomorphus	4, 44, 45, 1, 12	ND	S.Am.
Erythrolamprus	4, 44, 45, 1, 12	S(2), SM(1)	N.Am., S.Am.
Gomesophis	44, 45	ND	S.Am.[45]
Ialtris	4, 44, 6, 12	ND	W.I.
Imantodes	4, 44, 45, 1, 12	S(2)	N.Am., S.Am.[6]
Leptodeira	4, 44, 1, 54, 12	S(2), SM(1)	N.Am., S.Am.
Manolepis	4, 44, 6, 12, 31	ND	N.Am.
Oxybelis	4, 44, 45, 1, 54, 12	S(1)	N.Am., S.Am.
Oxyrhopus	44, 45, 31	ND	N.Am., S.Am.[45]
Parapostolepis	44, 1	ND	S.Am.[1]
Philodryas	4, 44, 45, 1, 12	S(1)	S.Am.
Phimophis	44, 45, 1	ND	S.Am.[45]
Platyinion	4, 44, 1, 12	ND	S.Am.
Pseudablabes	4, 44, 45, 1, 12	ND	S.Am.
Pseudoboa	4, 44, 45, 1, 12	S(1)	S.Am., W.I.
Pseudotomodon	4, 44, 45, 12	ND	S.Am.
Ptychophis	4, 44, 1	ND	S.Am.
Rhachidelus	4, 44, 1, 31	ND	S.Am.
Rhinobothryum	4, 44, 54, 12	S(1)	S.Am.
Scolecophis	44, 45	ND	S.Am.[45]
Siphlophis	4, 44, 45, 1, 12	ND	S.Am.
Sonora	4, 44, 12, 31	ND	N.Am.
Stenorrhina	4, 44, 54, 12	S(1)	N.Am., S.Am.[6]
Tachymenis	4, 44, 45, 1, 12	S(1)	S.Am.
Tantilla	4, 44, 45, 1, 12	S(1)	N.Am., S.Am.
Thamnodynastes	4, 44, 45, 12	ND	S.Am.
Toluca(=Ogmius)	4, 44, 6, 51, 12	ND	N.Am.
Tomodon	4, 44, 45, 1, 12	ND	S.Am.
Trimorphodon	4, 44, 54, 12, 31	S(2)	N.Am., S.Am.
Tripanurgos	4, 44, 45, 1, 12	S(1)	S.Am.
Tropidodryas	44, 10	ND	S.Am.[10]
Xenopholis	4, 44, 6, 12	ND	S.Am.

TABLE 2. Opisthoglyphous colubrid genera of the Old World.

Genus	References for Listing	Duvernoy's Gland Type[53]	General Distribution[4]
Ahaetulla	4, 44, 28	S(3)	S.As
Alluaudina	4, 44, 6, 5	ND	Mad.
Amblyodipsas	4, 44, 46	S(1)[27]	Af.
Amplorhinus	4, 44, 9	ND	Af.
Aparallactus	4, 44, 46	S(1)	Af.
Bitia	4, 44, 22	ND	S.As., E.I.[48]
Boiga	4, 44, 46, 52	S(4)	Af., S.As., E.I., Aus.
Brachyophis	4, 44, 6	S(1)	N.Af.
Cantoria	4, 44, 22	ND	S.As., E.I.[48]
Cerberus	4, 44, 22	S(1)	S.As., E.I., Aus.[41]
Chilorhinophis	4, 44, 9	S(1)[27]	Af.
Chrysopelea	4, 44, 52	S(1)	S.As., E.I.
Crotaphopeltis	4, 44, 46	S(1),NP(1)	Af.
Dipsadoboa	4, 44, 46	S(1)	Af.
Dispholidus	4, 44, 46	S(1)	Af.
Ditypophis	4, 44, 6	ND	Socotra
Dromophis	4, 44, 46	ND	Af.
Dryophiops	4, 44, 6	ND	S.As.
Elachistodon	4, 44, 6	ND	S.As.[48]
Elapotinus	44, 6	ND	Af.?[6]
Enhydris	4, 44, 22	S(3)	S.As., E.I., Aus.[48]
Erpeton	4, 44, 22	S(1)	S.As.[48]
Fordonia	4, 44, 22	S(1)	S.As., E.I., Aus.[48]
Geodipsas	4, 44, 6, 5	ND	Mad.
Gerarda	4, 44, 22	ND	S.As.[48]
Hemirhagerrhis	4, 44, 46	ND	Af.
Heurnia	44, 22	ND	E.I.[22]
Hologerrhum	4, 44, 6	ND	Phil.
Homalopsis	4, 44, 22	S(1)	S.As., E.I.[48]
Ithycyphus	4, 44, 6, 5	ND	Mad.
Langaha	4, 44, 6, 21, 5	ND	Mad.
Lycodryas	4, 44, 6, 5	ND	Mad.
Macrelaps	4, 44, 56	ND	Af.
Macroprotodon	4, 44, 6	ND	Eu., N.Af.
Madagascarophis	5	ND	Mad.
Malpolon	4, 44	S(1)	Eu., N.Af., W.As.
Micrelaps	4, 44, 46	ND	Af., W.As.
Mimophis	4, 44, 6, 31, 5	ND	Mad.
Myron	4, 44, 22	SM(1)	E.I., Aus.[48]
Polemon(=Miodon)	4, 44, 46, 24, 31	S(1)	Af.
Psammodynastes	4, 44, 52	SM(1)	S.As., E.I.
Psammophis	4, 44, 46, 52	S(2)	Af., S.As.[41]
Psammophylax	4, 44, 56	S(1)	Af.
Pythonodipsas	4, 44, 6	ND	Af.
Rhabdophis	44, 29	SM(2)	E.As., E.I.[41]
Rhamphiophis	4, 44, 46	S(1)	Af.
Stenophis	4, 6	ND	Mad.
Telescopus	4, 44, 46, 31	S(2)	Eu., N.Af., Af., W.As.
Thelotornis	4, 44, 46, 31	S(1)	Af.
Xenocalamus	4, 44, 9	S?(1)[27]	Af.

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TABLE 3. Aglyphous colubrid genera of the New World with enlarged rear maxillary teeth.

Genus	References for Listing	Duvernoy's Gland Type[53]	General Distribution[4]
Alsophis	4, 44, 12	S(2)	W.I.
Amastridium	4, 44, 6	ND	S.Am.[10]
Arrhyton	4, 44, 6, 12	ND	W.I.
Cemophora	4, 44, 41	ND	N.Am.
Diadophis	4, 44, 18, 12	S(1),SM(1)	N.Am.
Drepanoides	4, 44, 12	ND	S.Am.
Eridiphas	44, 50, 10	ND	N.Am[10]
Erythrolamprus	4, 44, 45, 12	S(2),SM(1)	N.Am., S.Am.
Heterodon	4, 44, 6, 12	S(1),SM(1)	N.Am.
Hydrodynastes	44, 45, 11	S(1)	S.Am.[45]
Hydrops	4, 44, 45, 1, 12	S(1)	S.Am.
Hypsiglena	4, 44, 45, 12	S(1)	N.Am., S.Am.
Leptophis	4, 44, 45, 12	S(2)	N.Am., S.Am.[6]
Lioheterophis	44, 45, 1	ND	S.Am.[1]
Liophis	4, 44, 45, 1, 12	S(2)	S.Am.
Lystrophis	4, 44, 1, 12	S(1)	S.Am.
Pliocercus	4, 44, 19	S(1)	N.Am., S.Am.[41]
Pseustes	4, 44, 14	NP(1)	N.Am., S.Am.[6]
Ptychophis	4, 44, 45	ND	S.Am.
Rhachidelus	4, 44, 45	ND	S.Am.
Rhadinaea	4, 44, 13	SM(1)	N.Am., S.Am.
Rhadinophanes	43	ND	N.Am.[43]
Storeria	4, 44, 31	S(1)	N.Am., S.Am.
Tantalophis	44, 43	ND	N.Am[43]
Uromacer	4, 44, 6, 12	S(1)	W.I.
Uromacerina	4, 44, 45	ND	S.Am.
Urotheca	4, 6, 12	ND	S.Am.
Waglerophis	44, 47	ND	S.Am.[10]
Xenodon	4, 44, 45, 1	S(1),SM(1)	S.Am.

TABLE 4. Aglyphous colubrid genera of the Old World with enlarged rear maxillary teeth.

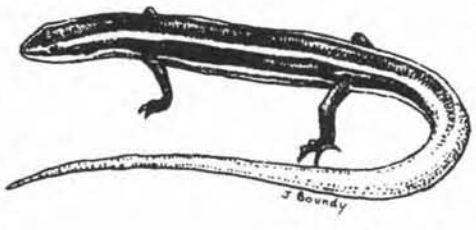
Genus	References for Listing	Duvernoy's Gland Type[53]	General Distribution[4]
Cyclocorus	4, 44, 41	S(1)	Phil.[48]
Dinodon	4, 44, 6, 52	S(1)	S.As., E.As.
Lioheterodon	4, 44, 6	ND	Mad.
Lycodon	4, 44, 6, 52	S(1)	S.As., E.I.
Macropisthodon	4, 44, 6, 52	S(1)	S.As., E.I.
Oligodon	4, 44, 6	S(1)	S.As., E.I.
Prosymna	4, 44, 6, 46	ND	Af.
Pseudoxenodon	4, 44, 6, 52	S(2)	S.As., E.I.
Pseudoxyrhopus	4, 44, 6	ND	Mad.
Rhabdophis	44, 29	SM(2)	E.As.[29]
Spalerosophis	44, 31	S(1)	N.Af., W.As.[41]
Thrasops	4, 44, 6	S(1)[27]	Af.

TABLE 5. Aglyphous colubrid genera of the world, with unmodified rear maxillary teeth, examined for Duvernoy's and supralabial glands.

Genus	References for Dentition	Duvernoy's Gland Type[53]	General Distribution[4]
Amphiesma	29	D-SM(1)	E.As.,E.I., Aus.[41]
Arizona	6, 12	S-M(1),S-MS(1)	N.Am.[48]
Boaedon	6	S-M(1)	Af.
Bothrophthalmus	6	D-SM(1)	Af.
Calamaria	52	D-S(1),D-SM(1)	S.As., E.I.
Chironius	1	D-S(1)	S.Am.
Coluber	6, 52	D-S(2)	Eu., N.Am., S.Am., As., E.I., N.Af.[48]
Conopsis	6	D-S(1)	N.Am., S.Am.
Coronella	6	D-S(1)	Eu., Af., As[48]
Dendrelaphis	6	D-S(1)	S.As., E.I., Aus.
Dipsas	6, 12	D-S(2),D-SM(1)	N.Am., S.Am.[41]
Dryadophis	6	D-S(2)	N.Am., S.Am.[41]
Drymarchon	6, 12	D-SM(1)	N.Am., S.Am.[48]
Drymobius	6	D-S(2),D-SM(1)	N.Am., S.Am.
Dryocalamus	6	D-S(1)	S.As.
Duberria	46	D-S(1)	Af.
Eirensis	6, 52	S-MS(1)	W.As., N.Af.
Elaphe	6, 12	S-M(4),S-MS(6)	Eu., N.Am., S.Am., As., E.I.
Farancia(=Abastor)	6, 12	D-SM(2),S-M(1)	N.Am.
Gastropyxis	6	D-S(1)	Af.
Geophis	6, 12	D-SM(1)	N.Am., S.Am.[6]
Gonyophis	6	D-S(1)	S.As., E.I.
Haldea(=Virginia)	6	D-S(1)	N.Am.
Helicops	6	D-S(3)	S.Am.
Lampropeltis	6	S-M(6)	N.Am., S.Am.
Lycophidion	6	S-M(2)[27]	Af.
Masticophis	6	D-S(1),D-SM(2)	N.Am., S.Am.[45]
Mehelya	6, 53	D-S(1),D-S(2)[27]	Af.
Natriciteres	6	D-SM(1)	Af.[46]
Nerodia (=Natrix)	6	D-S(1),D-SM(5)	N.Am.[49]
Oligodon	52	D-S(1)	S.As., E.I.
Opheodrys	52,12	D-S(1)	N.Am., S.As., E.I.
Opisthotrophis	6, 52	D-S(1)	S.As., E.I.
Pareas	52	D-SM(1)	S.As., E.I.
Pituophis	6, 12	S-M(1)	N.Am., S.Am.
Pliocercus	45	D-S(1)	N.Am., S.Am.[41]
Pseudaspis	6	S-M(1)	Af.
Pseudoeryx	6	D-S(1)	S.Am.[6]
Ptyas	52	D-S(1)	S.As.
Rhinocheilus	6	S-M(1)	N.Am.[41]
Salvadora	6	D-S(2),D-SM(1)	N.Am.
Scaphiodontophis	45	S-MS(1)	N.Am., S.Am.[41]
Scaphiophis	6	S-MS(1)	Af.
Sibon	6, 15	D-SM(1)	N.Am., S.Am.[50]
Sibynomorphus	6	D-S(1)	S.Am.
Sibynophis	52	D-SM(1)	S.As., Mad., E.I.[48]
Spalerosophis	52	D-S(1)	N.Af., W.As.[41]
Spilotes	6, 12	S-M(1)	N.Am., S.Am.[41]
Stegonotus	6	D-SM(1)	E.I., Aus., Phil.
Storeria	6, 12	D-S(1)	N.Am., S.Am.
Thamnophis	6	D-S(1),D-SM(2)	N.Am., S.Am.
Trachischium	6, 52	D-S(1)	S.As.
Tretanorhinus	6, 12	D-SM(1)	N.Am., S.Am., W.I.[50]
Xenochrophis	6, 52	D-SM(1)	E.I., S.As.[41]
Zaocys	6, 52	D-S(1)	S.As.

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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Houston Zoological Gardens, Houston, Texas 77001.

HATCHING IN CAPTIVITY OF A CLUTCH OF *SCELOPORUS UNDULATUS HYACINTHINUS* EGGS

This paper reports the hatching of a clutch of eggs laid by a captive female *Sceloporus undulatus hyacinthinus*. The female was captured by noosing in rural Cape Girardeau County, Missouri, on 7 May 1979. At the time of capture, the specimen weighed 17.1 g and had a snout-vent length of 73 mm. She was placed in a plywood box 3' x 4' x 1' which contained rocks, sand and constantly dripping water, was heated by two 250-watt infrared lamps (12:12 L:D) and was illuminated by a 20-watt growlight (14:10 L:D). This enclosure provided a range in surface temperature between 20 and 46° C and contained eleven conspecifics of varying sizes and both sexes. All lizards were fed crickets dusted with calcium-phosphorus powder 4-5 times a week.

On 21 May 1979, this female made a number of trial excavations in warm, dry sand before laying her clutch of 17 eggs in the damp sand beneath the rock upon which the water was dripping. The temperature of the sand was 26.5° C. The excavation process involved an initial burrowing with the nose, with forelimbs folded back along the sides of the body. The propulsive force of this "bulldozing" was hindlimb movement and sinusoidal undulations of the trunk. This was followed by active digging, in which the female would use her forelimbs to dig out the sand, pushing it back to the hindlimbs, which would then kick it further back out of the way. The female would periodically interrupt these activities, turn

around and back into the burrow, with her head and forelimbs sticking out, remain a few seconds in that nearly horizontal position, then reposition herself for more digging. Eventually this head-out position was assumed during ovipositing. The eggs were deposited approximately 4 cm beneath the surface of the sand, resting on the wooden floor of the enclosure. It is not known if this is the normal depth of oviposition for this species, but it is unlikely that deeper oviposition would occur in the wild, since the animal's size and position during egg-laying would preclude achieving much greater depth. Also, Crenshaw (1955) reports that eggs of *S. u. undulatus* laid in artificial nests containing 3 inches of wet sand were found at depths of from 1-1½ inches. It should be noted that the clutch site contained the only damp sand in the enclosure; presumably it was chosen for its dampness rather than its temperature, although a systematic series of choices was not made available to the lizard.

After the eggs were exposed *in situ* by gently scraping away the sand, they were lightly marked on their uppermost surfaces with a soft lead pencil to insure that their subsequent placement would be in the same gravitational orientation. The oval eggs were a creamy white color. Only five of the 17 eggs were weighed and measured, to minimize dessication. Table I summarizes those measurements.

Table I. Dimensions of five *Sceloporus undulatus hyacinthinus* eggs measured from a clutch of seventeen.

	Mean (± 2 s.e.)	Range
Length (mm)	11.6 (± 0.48)	11-12
Diameter (mm)	7.4 (± 0.48)	7-8
Mass (g)	0.34 (± 0.02)	0.32-0.35

A round, thin-walled plastic container (such as a commercial cottage cheese container) was used as an incubation chamber. It was prepared by cutting three equidistant holes in its bottom edge and filling it with wet Vermiculite® as an incubation medium. (I have since become aware of Tryon's (1975) formulation of water and Vermiculite®, which is more precise.) After draining the excess water via the holes, the eggs were buried in the moist Vermiculite® and the container was placed in a large glass jar covered with a watchglass and incubated at 33-34° C under a 12:12 L:D regimen. These conditions were maintained for 20 days until a move to a different facility necessitated the eggs being kept in an environment where temperature varied from 20-29° C with a 14:10 L:D cycle.

On 5 July 1979, 45 days after being laid, 16 of the 17 eggs hatched. Emergence of each hatchling followed the same general sequence: the head emerged through a slit in one end; the animal then lay motionless for 15-45 minutes, after which considerable struggling liberated the anterior half of the body from the shell. This was followed by another rest period of about 30 minutes (although one individual remained motionless for four hours). A final period of activity resulted in the animal becoming entirely free of the shell, after which it lay motionless for 5-10 minutes. The transition from this quiescence to the first running activity was often so rapid that it was impossible to predict and difficult to observe. After each hatchling emerged and dried, it was weighed and measured, the results of which are summarized in Table II.

Table II. Dimensions of hatchlings of *Sceloporus undulatus hyacinthinus*. (n = 16)

	Mean (± 2 s.e.)	Range
Snout-vent Length (mm)	23.38 (± 0.44)	22-25
Tail length (mm)	25.00 (± 0.70)	22-27
Mass (g)	0.48 (± 0.01)	0.45-0.55

Following the measuring, each hatchling was toe-clipped for identification and placed in a wooden box with a heat source (heating pad under one end and 150-watt flood light over the same end), sand, and water dripping on a rock. The latter item is quite important, since these lizards rarely drink from a dish. The hatchlings were fed a variety of insects (2-5 mm long) taken from net sweepings. The yolk sacs began to dry and atrophy within one hour of placement in the box.

One hatchling was placed in the adult enclosure and was promptly attacked by an adult and partially swallowed. Had it not been rescued, the hatchling would have been eaten. It is thus necessary to house the captive hatchlings separate from the adults to avoid such cannibalism.

The increase in mass from freshly-laid egg to hatchling (compare Tables I and II) is undoubtedly due to the uptake of water by the eggs, which is quite common in reptiles (Bustard, 1965; Cunningham and Huene, 1938; Gordon, 1960; Shaw, 1952. Also, Marion, *et al.* (1979) present a brief but clear discussion of previous research done on water absorption by reptile eggs.) Under the incubation conditions described herein, the eggs apparently took up water. Fear of disturbing the embryos precluded measuring the eggs after the initial observations, but periodic visual examination showed an apparent increase in diameter and length consistent with Shaw's (1952) reported increases in egg dimensions of many lizard species, including *Sceloporus undulatus elongatus*.

ACKNOWLEDGMENTS

The author wishes to express his thanks to Dr. Fred Janzow for assistance in collecting and enthusiastic support and to Daniel Green and Todd Robitsch for helpful discussions on problems of incubation and general care. Special thanks go to Mr. Tom R. Johnson of the Missouri Department of Conservation, for invaluable suggestions on lizard husbandry, to Dr. James Edward Heath, Department of Physiology and Biophysics, University of Illinois, Champaign-Urbana, Illinois, for critical reading of the original manuscript, and to Dr. Norman Braasch, Department of Biology, Southeast Missouri State University, for helpful suggestions during manuscript revision. Observations reported herein were made at facilities provided by the Department of Biology, Southeast Missouri State University, Cape Girardeau, Missouri, and the Department of Physiology and Biophysics, University of Illinois, Champaign-Urbana, Illinois.

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CAPTIVE REPRODUCTION IN AN AUSTRALIAN ELAPID SNAKE *Pseudechis colletti*

Collett's snake *(Pseudechis colletti)* is a large (up to 2.5 m) elapid snake of central Queensland. The restricted distribution and rarity of this species have resulted in a dearth of scientific information; the only data on reproduction are reports of viviparity by Worrell (1963) and Gow (1976). Our observations on three pairs of captive specimens indicate that *P. colletti* is oviparous.

Data are most extensive for one female and two male *P. colletti* collected from blacksoil plains near Nonda, Queensland, in June 1980. The snakes were maintained in separate cages at normal temperatures and photoperiods. Immediately after she had sloughed on 30 September 1981, the female (total length 137 cm) was introduced to the cage of a male (190 cm). Copulation commenced immediately (1700 hrs) and continued until at least 2400 hrs when observations terminated. The snakes had separated when next observed (0800 hrs). The same two snakes were placed together on 9 October 1981, and copulation lasting more than two hours was observed.

The female was placed with the second male (160 cm) on 30 October 1981, and again copulated. Bleeding from the female's vent was noticed during the first two matings.

Seven elongate eggs (total mass 250 gm) were laid on 28 December 1981. The female weighed 400 gm after oviposition, indicating a Relative Clutch Mass of 0.63. The eggs were incubated in damp Vermiculite® (50% water by weight) at 27 to 30° C, and hatching commenced after 67 days. Three eggs were slit on 7 March, one on 8 March, and one on 9 March. Dissection of the two remaining eggs on 10 March revealed dead full-term embryos, both of them males. The live young comprised three females and two males. These snakes did not fully emerge from the eggs for 12 to 15 hours after initial slitting of the shells. The neonates averaged 28.3 cm SVL (range 28.0 to 30.0 cm) and 24.0 gm (range 19 to 29 gm). Their first sloughs occurred on 22 to 24 March, approximately 15 days after hatching.

The second breeding pair of *P. colletti* were collected near Nonda in October 1978. The female (137 cm total length) and male (213 cm) were placed together for the first time on 9 August 1979, and were found *in copulo* 90 minutes later. Mating continued for five hours. After the snakes separated, slight bleeding from the female's cloaca was observed. The female continued to feed while gravid (food offered and accepted on 21 July, 2 August, 19 August, 13 October). The female sloughed on 17 August and 26 October; the posterior part of her body was noticeably swollen for about nine days prior to egg-laying. Oviposition of 14 eggs occurred between 0100 and 0600 hrs on 10 October. One egg spoiled and was discarded, and the other eggs incubated on moist Vermiculite® at approximately 31° C (range 29.5-32.0° C). The eggs were large with a mean length of 5.5 cm (S.E. = 0.1), and width of 3.2 cm (S.E. = 0.04). Three eggs hatched on 5 December, six on 6 December, and four on 7 December. Hence, incubation comprised 56 to 58 days. After slitting the eggs, most neonates remained inside their shells (with heads protruding) for approximately 45 minutes before emerging completely. Neonates showed coloration similar to, but more vivid than, their parents. The hatchlings averaged 37 cm in total length, and 25 g in weight. Two hatchlings and two eggshells were placed in the Queensland Museum (registration numbers J 37327-37330).

A third pair of snakes (the female from 10 km WSW of Aramac, Qld.) bred successfully on five occasions. Mating was observed in August (1977) and September (1976, 1978). Oviposition occurred on 30 December 1973, 8 December 1976, 30 November 1977, December 1978 (exact date unknown), and 26 November 1979. Hatching was recorded on 5-9 March 1974 (incubation 66-70 days) and 11 February 1977 (65 days). Clutch sizes of 12 eggs (one year) and 13 eggs (three years) were recorded.

These data from the three breeding pairs of *P. colletti* are consistent with respect to oviparity, seasonal timing of mating and oviposition, clutch sizes and incubation periods. Until recently, authorities have considered all *Pseudechis* species to be viviparous (McPhee 1959, Worrell 1963, but see Gow 1976). Ovipar-



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ity has now been established for *P. guttatus* (Charles, Whitaker and Shine 1980), *P. australis* (M. Fitzgerald and C. Pollitt, pers. comm.; R. Shine, unpubl.), and *P. colletti* (this paper). The common blacksnake, *P. porphyriacus*, is the only member of the genus known to be viviparous. The mode of reproduction of *P. papuanus* is unknown.

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CLEAR PLASTIC HIDING BOXES AS A HUSBANDRY DEVICE FOR NERVOUS SNAKES

Many elapids and other active snakes emit defensive and/or escape-searching behaviors so frequently in captivity that good husbandry dictates the use of dark hiding boxes in order to maintain the animals in top condition (Kauffeld, 1969). Recently we had a similar experience with our colony of *Naja mossambica pallida*. The snakes were too nervous and active to keep without hiding boxes, and providing these boxes meant that the animals could not be seen. Temporary removal of the hiding boxes during experimental sessions resulted in extreme defensiveness, spitting at the observer, and inattentiveness to experimental manipulations (*e.g.*, introduction of prey items). Experience with these and other snakes suggested to the authors that two sensory components might influence the snakes' selection of a hiding place, one being visual (seeking darkness) and the other being thigmotaxic (seeking an enclosed space where the walls contact the snake).

Accordingly, we constructed small hiding boxes made of clear plastic, and a small area in one corner was taped to provide slight shading without making observation impossible (see Fig. 1). These boxes were immediately utilized when they were introduced to snake cages. Defensiveness and escape-searching disappeared completely. The benefits have been even greater than we expected: Snakes are visible at all times, and their presence, health, and behavior can readily be observed. Experimentation no longer requires the disturbing removal of the hide box, and the snakes seem to be habituating to human observers (perhaps because the snakes frequently see humans through the clear plastic). Even though the snake can see and be seen through this box, the animal nonetheless uses the box just as it previously used dark boxes of the sort described by Kauffeld (1969). Removal of the clear box results in the same kind of defensive reactions as were seen upon removal of a dark box, indicating that the clear box has much the same "security value" to the snake.

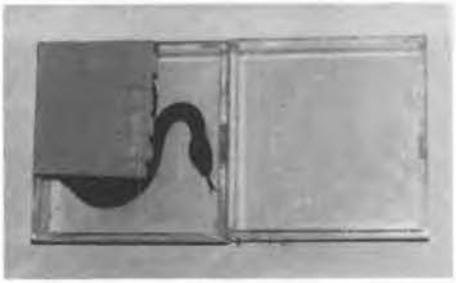


Fig. 1. A specimen of *N. m. pallida* in a resting coil inside of a clear Plexiglas box. Two boxes are present, one with the corner taped.

In addition to these husbandry advantages, the clear boxes facilitate research designed to separate the relative effects of darkness and thigmotaxis on the hole-seeking behavior of cobras (see Fig. 2). Experiments are currently in progress to determine snake preference when offered both dark and clear boxes. As indicated by Figure 2 snakes do not automatically and exclusively prefer the dark box. Hence, it is possible that thigmotaxic cues are not entirely subordinate to scototaxic ones.



Fig. 2. The black box has been turned over to illustrate the entrance hole.

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LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Longevity, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1982. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

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ANURA

RANA PIPIENS (Leopard Frog). **PREDATION.** During a recent study of the trophic ecology of largemouth bass, *Micropterus salmoides*, in Lake Rebecca, Hennepin County, Minnesota (Cochran and Adelman, Env. Biol. Fishes, in press), evidence for a seasonal pulse of predation upon leopard frogs was obtained. Young-of-the-year frogs were first observed along the shoreline of the lake on 20 July 1978. Since reproductive activity was not noted during the spring, and no tadpoles were ever collected during seining, electrofishing, or fish stomach sampling, it is likely that these frogs had dispersed from a reproductive site elsewhere, probably from marshland to the southwest. This would be consistent with Merrell's (1977, Occas. Pap., Bell Mus. Nat. Hist., No. 15) generalization that young frogs disperse to the shores of large

permanent water bodies from breeding sites in temporary ponds without fish.

Although they were observed in the immediate vicinity of the shoreline for the rest of the season, frogs were found in only 2 of 404 bass sampled on 8 dates from 17 May-29 August 1978. On 21 September, however, frogs were found in 4 of 84 stomachs, while on 5 October, 11 frogs were found in 10 of 52 stomachs. Predation on leopard frogs by bass in early autumn was probably enhanced by increased availability due to two factors: (1) a die-off of aquatic macrophytes around the edge of the lake, noted in progress as early as 21 September, may have in effect removed a "buffer strip" which served to minimize contact between bass and frogs earlier in the season (fragments of reeds or other vegetation were found in five stomachs which contained frogs), and (2) the frogs appeared to spend more time in the water with the onset of cooler weather, as also noted by Merrell *(ibid.)*. A sample of frogs collected on 5 October from 1200-1230 were all captured in approximately 15 cm of water with air and water temperatures at 12° C and 14° C respectively. That frogs overwintered in the lake was indicated by the finding of large numbers of dead individuals on the bottom in shallow water after a severe winterkill in March 1979.

Twelve frogs collected on 5 October had a mean snout-vent length of 46 mm (range: 40-56 mm), while 6 relatively intact frogs found in stomachs had a mean snout-vent length of 60 mm (range: 48-73 mm). The range in total length of bass which contained frogs was 206-473 mm. One bass which contained a frog on 21 September contained 2 frogs when recaptured on 5 October.

Submitted by **PHILIP A. COCHRAN,** Department of Entomology, Fisheries, and Wildlife, University of Minnesota, St. Paul, Minnesota. Present address: Laboratory of Limnology, University of Wisconsin, Madison, Wisconsin 53706. ●

SERPENTES

CHARINA BOTTAE BOTTAE (Pacific Rubber Boa). **FOOD.** On 11 June 1982 a *Charina bottae bottae* was collected under a piece of bark. The site was in a pine forest in Amador Co., CA (along West Panther Creek, 15.8 miles NE of Pioneer on Hwy 88 then 1.8 miles SE on a paved road, 1475 m). Within the next five hours the captive snake regurgitated an adult female *Ensatina eschscholtzi platensis* (Sierra Nevada Ensatina Salamander) along with a clutch of 12 eggs. The specimens are deposited in the MVZ collection at the University of California, Berkeley.

It appeared that the *Ensatina* had been swallowed head first, because there were signs of partial digestion of the head. There were no signs of digestion on the eggs, suggesting that they were eaten last. *Charina* had previously been reported to eat rodents and lizards (Stebbins, R.C. 1954. Amphibians and reptiles of western North America. 536 p.), but neither salamanders nor their eggs have been reported previously.

Like other plethodontid salamanders, female *Ensatina* brood their eggs, and egg brooding is presumed to increase survivorship of the egg clutch. At the same time there is a disadvantage in that female salamanders and their eggs are subject to predation. Shaffer (1978, Copeia, 1978:268-277), in a study of 10 species of neotropical plethodontid salamanders, found that in nine out of 10 cases the frequency of tail autotomy was greater in females than in males and he suggested that this was due to predatory attacks on brooding females. The above case of a *Charina* eating a female *Ensatina* and her clutch resulted in a loss of fitness for the individual.

Submitted by **ROBERT J. MACEY,** 1650 La Vereda Rd., Berkeley, California 94709. ●

COLUBER CONSTRICTOR FLAVIVENTRIS (Eastern Yellowbelly Racer). **COLORATION.** An amelanistic partial albino *C. c. flaviventris* was previously reported from Kansas (Capron, 1977, Newsletter Kansas Herp. Soc. 22:7) and a photograph of that specimen was published (Miller, 1978, Herp. Review 9(2):78). Recently, two amelanistic partial albino *C. c. flaviventris* were donated to the Fort Worth Zoological Gardens, Fort Worth, Texas. On 13 August 1977 a specimen was captured in SW Fort Worth, Tarrant Co., Texas. A second specimen (Figure 1) was captured on 22 August 1981, 5 km W Springtown, Parker Co., Texas. Both specimens were apparently born the summer of capture, based on the presence of prominent umbilical scars. The 1981 specimen was 24.7 cm total length at the time of capture.

Both specimens had a normal pattern for juveniles of this species. The ground color was a very pale yellow-orange and the normally brown body markings were orange.

The specimens have been deposited in the Vertebrate Collection, University of Texas at Arlington (UTACV 7197 and 10497).



Figure 1. Amelanistic partial albino *Coluber constrictor flaviventris*. Parker Co. Texas. UTACV 10497.

Submitted by **RICHARD HUDSON** and **GARY CARL,** Department of Herpetology, Fort Worth Zoological Park, Fort Worth, Texas 76110. ●

COLUBER CONSTRICTOR FLAVIVENTRIS (Eastern Yellowbelly Racer). **REPRODUCTION.** Incubation of eggs collected from wild and captive squamates outside a natural nest is common (Murphy and Collins, 1980. Reproductive Biology and Diseases of Captive Reptiles, SSAR Cont. Herpetol. #1). Most frequently, these eggs are obtained after natural oviposition. Thus, the egg shell and shell membranes are completely developed. Incubation to hatching of eggs obtained prematurely by either exogenous hormone (oxytocin or arginine vasotocin) administration or dissection from pregnant females is rarer (Bellairs, 1971. Developmental Processes in Higher Vertebrates. Univ. Miami Press, Coral Gables, Florida). We report here a case of successful incubation of eggs removed from a pregnant, road-killed *C. constrictor*.

An adult, female (71 cm total length) *C. constrictor* was found on 14 June 1982 approximately 19 km W of Newton, Harvey County, Kansas. The female was exhibiting spastic contractions when found and had the cardiac and upper oviductal region of the body crushed. Palpation of the abdominal cavity indicated that the female was gravid. Upon dissection, a clutch of 13 eggs was exposed, 11 of which were not damaged. The eggs appeared to be nearly complete as the egg case was opaque, chalky-white and flexible. Eggs were manually palped from the oviduct and collected in a clean plastic bag. Following transport to the laboratory, the eggs were buried in sterilized (by boiling) peat moss in a sterile 4 liter jar. The substrate was heated to 28-30° C using a 40 watt incandescent bulb suspended approximately 25 cm above the jar. Substrate was kept slightly moist to the touch.

Following an incubation period of approximately six weeks, one young *C. constrictor* hatched on 27 July 1982. One additional egg had a full-term embryo (stage 37: Zehr, 1962. Copeia 1962:322-329) which did not hatch and the remaining eggs exhibited little development (Zehr stages 15-20). Embryonic death of the remaining eggs may have been due to technical problems (burying of eggs/acidic environment due to use of peat moss) not related to the inherent viability of the eggs. These data suggest that some eggs may be saved from road-killed or dying pregnant specimens if (1) they are obtained soon after the mother's death and (2) the shell is fairly well developed. How early during the gestation period (shell development stage) eggs can be removed and still complete embryonic development is unknown. However, eggs in the final stages of shell development can be incubated with a fairly high likelihood of success. The neonatal specimen was deposited in the Museum of Natural History, University of Kansas (#192442).

Submitted by **LOUIS J. GUILLETTE, JR.** and **W. PETER SULLIVAN,** Department of Biological Sciences, Wichita State University, Wichita, Kansas 67208, U.S.A. ●

ELAPHE OBSOLETA LINDHEIMERI. (Texas Rat Snake). **SIZE.** The largest known specimen of *Elaphe obsoleta lindheimeri* was 84.75

in. (Conant, 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America. Houghton-Mifflin). A specimen collected by Cory Fincher in Gretna, LA (a suburb of New Orleans) measured 86 in., thus being the largest known specimen by 1.25 in. The snake was measured live on a flat surface, photographed and released.

Submitted by **ROBERT A. THOMAS** and **VERNON FRILOUX,** Louisiana Nature Center, 11000 Lake Forest Blvd., New Orleans, Louisiana 70127. ●

LAMPROPELTIS GETULUS HOLBROOKI X SPLENDIDA (Speckled X Desert Kingsnake). **COLORATION.** An amelanistic partial albino specimen (75.2 cm total length) of *Lampropeltis getulus holbrooki* X *splendida* was reported by Carpenter (1957, Herpetologica 13:78). On 20 April 1972 an amelanistic partial albino female *L. g. holbrooki* X *splendida* was captured by Clarence R. Brown at the Dallas Naval Air Station, Dallas Co., Texas, and donated to the Fort Worth Zoological Park, Fort Worth, Texas. Based on photographic evidence, the specimen was *ca.* 60 cm total length when captured, and was probably entering at least its second year of life.



Figure 1. Amelanistic partial albino *Lampropeltis getulus holbrooki* X *splendida*. October 1981. 95.0 cm.

The specimen (Figure 1) is completely lacking in melanin and is white except for the retention of normal bright yellow spots and bars on the venter and dorsum and a yellow ring along the inner circumference of the iris. The eyes are otherwise pink. Additional albino specimens resulting from a breeding program are similar in appearance except a few individuals have pale yellow markings.

Upon death, the specimen will be deposited in the Vertebrate Collection, University of Texas at Arlington.

Submitted by **GARY CARL** and **RICHARD HUDSON,** Department of Herpetology, Fort Worth Zoological Park, Fort Worth, Texas 76110. ●

LAMPROPELTIS GETULUS HOLBROOKI (Speckled Kingsnake). **REPRODUCTION.** On 1 June 1982, a gravid *Lampropeltis getulus holbrooki* was collected off of Rt. 87, 2.7 miles east of the junction of Rt. 3 in McCurtain County, Oklahoma. The snake was found coiled inside a hollow log among tall grass on the road side. The snake measured 94 cm SVL (108cm TL).

The snake was housed in a 61 x 33 x 31 cm wooden cage with a glass front at the University of Oklahoma Biological Station, Kingston, Oklahoma. The bottom of the cage was covered with newspaper and a water dish was present in the cage. On 24 June 1982 the snake deposited 18 eggs on the newspaper. All but two of the eggs were adherent in a single mass. Egg length ranged from 27.8 to 32.0 cm ($\bar{x}$= 29.32 cm) and combined weight of the eggs was 127 g.

The eggs were numbered and placed in a one gallon glass jar which had a 4 cm base of Vermiculite®. Water (0.25 L) was added to the Vermiculite® for moisture. The jar was kept tightly closed and was opened intermittently for air circulation. Incubation temperature ranged from 28 to 33° C. On 13 August 1982, at the University of Oklahoma Animal Behavior Laboratory, the eggs were removed from the jar, reweighed (combined wt. of 144.1 g) and placed in an 18.9 L aquarium with a moist Vermiculite® base and glass top.

The young snakes began to hatch on 14 August 1982 after 51 days of incubation. Grimpe and Benefield (1982, Herp. Review 12(3):80) have reported an incubation period of 51 days for a clutch of 9 eggs. Carpenter (pers. comm.) has reported incubation periods of 49 and 54 days. All of the eggs except one had hatched by 17 August 1982. The unhatched egg started to discolor and was opened on 24 August 1982 to reveal a dead mature embryo. The SVL of the 17 live young (7 females, 10 males) ranged from 21.1 to 23.4 cm ($\bar{x}$= 22.42 cm). TL ranged from 24.6 to 27.5 cm ($\bar{x}$= 26.14 cm) and individual weights ranged from 4.6 to 6.5 cm ($\bar{x}$= 5.66 cm). Grimpe and Benefield *(ibid.)* reported for 9 young mean SVL, TL, and weight of 20.5 cm, 24.1 cm, and 6.3 g respectively. Carpenter (pers. comm.) had reported means for SVL, TL, and weight for newborn *L. g. holbrooki* of 23.62 cm, 27.30 cm, and 6.85 g respectively for a clutch of 11 young and 21.54 cm, 24.74 cm, and 5.09 g respectively for a clutch of 8 young.

This is the highest number of eggs reported for a single clutch of this subspecies of *Lampropeltis getulus*. Wright and Wright (1957, Handbook of Snakes of the U.S. and Canada) list a range of clutch size for *L. g. holbrooki* of 6 to 14 eggs. Anderson (1965, The Reptiles of Missouri) also notes 14 eggs as the maximum clutch size for this snake. Carpenter (1958, Herpetologica 14(2):113-115) has reported a female *L. g. holbrooki* (SVL= 98.1 cm; TL= 105.3 cm) laying 16 eggs.

I wish to thank Dr. Charles C. Carpenter for use of his data and James J. Krupa for discovering the gravid snake.

Submitted by **STEPHEN M. SECOR,** Department of Zoology, The University of Oklahoma, Norman, Oklahoma 73019. ●

OPHEODRYS VERNALIS (Smooth Green Snake). **REPRODUCTION.** On 16 August 1982 I found a clutch of 23 snake eggs underneath a weathered black plastic "garbage" bag on Islesboro Island, Penobscot Bay, Waldo Co., Maine. The bag, which contained decomposed bovine manure, had been placed at the collection site the previous summer by the property owner. The eggs were loosely adherent to each other but many separated when they were picked up. One egg that appeared to have a thinner shell than the remainder was accidentally broken at the time of collection; it contained an almost fully developed but apparently non-viable *Opheodrys vernalis* embryo. This embryo and the shell were discarded. The remaining eggs were placed in damp sphagnum moss in a glass jar. Slits first appeared in some of the eggs on 19 August and by the next day 15 had hatched. The six ♂♂ ranged in total length from 134 to 154 mm (mean 146.8), the nine ♀♀ from 133 to 154 mm (mean 147.6). I opened one of the remaining seven eggs on 24 August; it contained a fully developed ♂ embryo. Another five eggs hatched on 26 and 27 August. This second hatching consisted of three ♂♂ (total length 140 to 152 mm, mean 147.7) and two ♀♀ (148 and 151 mm). The one egg that failed to hatch was opened and found to contain an early embryo embedded in coagulated yolk. Beneath the same plastic bag was a juvenile *Opheodrys vernalis*, a juvenile *Thamnophis sirtalis*, and two gravid *Storeria occipitomaculata*, all common species on Islesboro.

Wright and Wright (1957. Handbook of Snakes. Vol. 1, p. 558) reported that clutch sizes for *Opheodrys vernalis* range from three to twelve with an average of 7.4 eggs. It would appear that the present instance is an example of communal egg laying in *Opheodrys vernalis* involving at least two, but more probably three or more females. Communal egg laying in this species has not previously been noted.

Submitted by **ROBIN LAWSON,** Museum of Zoology and Department of Zoology and Physiology, Louisiana State University, Baton Rouge, Louisiana 70893. ●

SONORA MICHOACANENSIS (Ground Snake). **COLORATION.** Color pattern variation in this little-known species has been described in detail by Echternacht (1973, Breviora, no. 410). Of the 31 specimens known at that time, a single specimen (FMNH 37141) is described and figured as being patternless except for a dark mask on the head and a dark nuchal band, characteristics that are relatively invariant in this species.

On 15 July 1981, the senior author and party collected a specimen of *S. michoacanensis* 12.9 km E Apatzingán, Michoacán, that closely matches the pattern described for FMNH 37141, which was also collected at or near Apatzingán. This specimen (LSUMZ 40701) is a female having a total length of 335 mm (285 mm SVL, 50 mm TL) and exhibiting the following scalation characters; 179 ventrals, 39 caudals, 7/7 supralabials, 8/8 infralabials, and a temporal formula of 1-2 on both sides. The color pattern consists of a black head cap covering most of the dorsal head scales, followed by a white collar confluent



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Mr. Dennis is widely known to the scientific community as an artist specializing in watercolors of lower vertebrates and insects. His self-taught artistry is complemented by his academic training in biology and his personal field experience with each of the animals he paints. Mr. Dennis earned his undergraduate degree in zoology from The Ohio State University in 1966 and since then has held a succession of positions as biological illustrator at the Columbus Zoological Gardens, the University of Kansas Museum of Natural History and now at Ohio State. He has illustrated many biology textbooks including one which he co-authored, but is perhaps best known to vertebrate biologists for the exquisite watercolors published in Duellman's *Hylid Frogs of Middle America* (University of Kansas Press, 1970) and in Smith and Brodie's *Field Identification Guide to the Reptiles of North America* (Golden Press, 1982). Originals of Mr. Dennis's watercolors have been exhibited in art galleries and museums throughout the United States and at scientific meetings. He has also won numerous awards for his artwork, most recently in an international competition at Cincinnati where he won the Josephine Rollman Award for "Best of Show".





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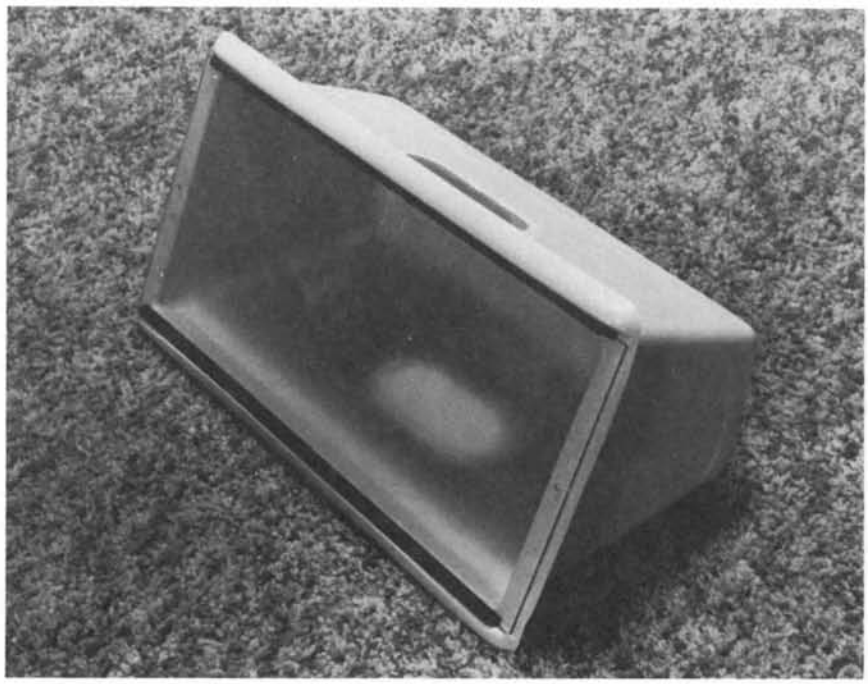
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with the white supralabials, infralabials and throat. This collar is followed by a large black nuchal band (11-12 scales long dorsally), a small off-white band (2 scales long) and, finally, a small black band (2-3 scales long). All of the black bands are interrupted ventrally, being absent on the ventrals and first 3 dorsal scale rows. The rest of the body is unpatterned, and in life was a bright tomato red on the dorsum fading to a pinkish red on the venter and first 3 dorsal scale rows. The 9 anteriormost ventrals were white or pinkish continuous with the white on the throat. Most of the dorsal scales (except those on rows 1 and 2) have a black apical dot.

The specimen was collected in mid-afternoon on a hot, clear, sunny day preceded by heavy rain the previous evening. The snake was seen crawling among rocks a few yards from Mexican highway 120. Extensive rock turning had been carried out in the immediate vicinity about 15 minutes previously. This record is apparently only the second for the almost patternless morph of *S. michoacanensis*, and this report is the first to document its color description from life.

Submitted by **ROBIN LAWSON** and **R.H. VAETH,** Museum of Zoology and Department of Zoology and Physiology, Louisiana State University, Baton Rouge, Louisiana 70893. ●

THAMNOPHIS ORDINOIDES (Northwestern Garter Snake). **BEHAVIOR.** *Thamnophis ordinoides* has been thought to be strictly terrestrial (Stewart, 1968, J. Herpetol. 2:71-86; Hebard, 1951, Herpetologica 7:61-62; Fitch, 1940, Univ. Calif. Publ. Zool. 44(1):1-50). Gayle Gillis and I have seen *T. ordinoides* swimming on two occasions, which indicates that *T. ordinoides* may not always be strictly terrestrial.

Late on a fall afternoon in 1980 we observed a *T. ordinoides* swimming in the Nestucca River at a point between Hebo and Woods, Tillamook County, Oregon. We came upon the swimming snake by canoe. Nothing was in sight that might have alarmed the snake into entering the water. It swam through moderate current to a small vegetated island composed of a partially submerged stump. The river is about 10 meters wide at that point.

Early on the afternoon of 11 July 1982, we saw a *T. ordinoides* near the middle of the Columbia Slough swimming toward the north bank midway between the Union Pacific and the Spokane Pacific and Seattle railroad bridges in the NE ¼ of the SW ¼ of section 5, T1N, R1E, W.M., Portland, Multnomah County, Oregon. We steered our skiff between the snake and the north bank. It dove about 5 meters from the skiff, surfaced a few seconds later on the opposite side of the skiff, and continued to the north bank. We followed it to the bank, where I captured it, verified its identity, and released it.

The Columbia Slough is about 110 meters wide at the site of our observation, and is deep enough for commercial tugs. Both north and south banks are very steep mud with overhanging blackberry canes. Emergent vegetation is absent. At the time of our observation the water was turbid and flowing very slowly upstream due to tidal influence. The wind was nearly calm and the water surface was glassy smooth. The sun was shining and the air temperature was between 27° and 30° C.

Submitted by **JAMES J. KIRK,** 5004 S.E. 44th Avenue, Portland, Oregon 97206. ●

VIRGINIA V. VALERIAE (Eastern Smooth Earth Snake). **DEFENSE.** On 23 October 1982 on a woodland dirt road in Sinking Cove, Franklin County, Tennessee, my wife, Jean, and I found a 61 cm northern black racer, *Coluber constrictor*, attempting to swallow a 20 cm eastern smooth earth snake, *Virginia valeriae valeriae*. In the 5 minutes of my observation, the racer was having difficulty because its intended prey had formed a loop knot with its body. The racer was holding onto the oval knot, which was about 30 mm long and 12 mm wide, as measured with a field ruler. Both appeared sluggish although the weather was warm. When I touched the racer it released its intended prey and left the site. I placed the earth snake in a nearby sunny spot, where it released its knot and crawled under some dry oak leaves. Obviously this knot-formation, whether accidental or instinctive, had survival value for the earth snake. It is doubtful that the racer could have swallowed its captive in its knotted condition, but even a delay in the swallowing attempt enables more time for chance disturbances by other animals to cause the release of intended prey, as in this case. It is common knowledge that toads frequently will react to seizure by a snake by inflating their bodies. This action may not prevent their being swallowed, but the difficulty produced may allow time for life-saving disturbances. These observations are presented here because of their relevance to antipredator behavior and also in hopes that herpetologists, who have observed knot-forming in any species of snakes (including the earth snake) will communicate their observations.

Submitted by **HARRY C. YEATMAN,** Department of Biology, University of the South, Sewanee, Tennessee 37375. ●

TESTUDINES

PLATEMYS PLATYCEPHALA (Twistneck Turtle). **REPRODUCTION.** There is little published information on courtship and mating behavior in most South American chelid turtles. This paper describes such behavior in a captive pair of *Platemys platycephala*.

Origin of the specimens, obtained as adults, is unknown. Turtles were maintained in a 152 l tank, with a water depth of 13 cm and access to a lighted basking platform. Water was heated to 26° C, and incandescent lighting provided a 12 h light/dark cycle. Specimens were fed fish, earthworms, and chopped beefheart supplemented with vitamin powder (Theralin®, Lambert-Kay). The larger male (carapace length= 15.2 cm) was frequently separated from the female (CL= 13.4 cm) for several days; this seemed to stimulate courtship activity upon re-introduction.

On being placed in the tank, the male would pursue the female; the latter normally attempted to escape. He would immediately mount from behind and hook his hind claws under the edge of her carapace at the inguinal area. The front claws were employed to hold the anterior edge of her carapace. The front legs were also used to intermittently and alternately brush at the female's head in a rapid motion. This had the effect of forcibly keeping her head folded under her carapace.

The most active aspect of the courtship ritual involved the male extending his head downward and swinging it rapidly in a horizontal plane over the female's head, often with his chin barbels contacting the top of her head. The head-swinging sequence lasted from about 5 to 20 seconds, and often culminated with the male expelling streams of water at the female's head with pulsations of his throat (water movement confirmed by use of methylene blue dye). This head-swinging sequence is similar to that noted in courting *Pelomedusa subrufa* (Harding, J. 1981. Bull. Chicago Herpet. Soc., 16(4):86-94), but is much more rapid — almost spasmodic — in *Platemys*.

Rarely, the female would seem to cooperate with the male by extending her head upward against the male's chin barbels and following his head movements. More often, she would withdraw under her carapace, or try to escape. On a number of occasions, the female actually dragged the male out of the water by crawling up the basking ramp, effectively curtailing his efforts. The "leg swiping" and "head swinging" behavior by the male was noticeably increased in both frequency and intensity by any escape attempt of the female, and thus may at least partially be explained as ways to immobilize the female prior to copulation.

The male's long, almost prehensile, tail, and distally located anal opening certainly facilitates effecting cloacal contact and penile insertion. Actual copulation was not always obtained by the male *Platemys* during the observed courtship events, and seemed to require at least some acquiescence on the part of the female.

Submitted by **JAMES H. HARDING,** Cranbrook Institute of Science, Box 801, Bloomfield Hills, Michigan 48013 USA. ●

NEWSNOTES

CROCODILIAN PAPERS

The *Zimbabwe Science News* 16(9) September 1982 is an entire issue devoted to papers on crocodilians. This was in recognition of two major scientific gatherings held at Victoria, Zimbabwe this year dealing with crocodilians. ZSN is published by the Zimbabwe Scientific Association, P.O. Box 978, Harare, Zimbabwe. ●

SNAKE SEXUAL DIMORPHISM INFO SOUGHT

I am compiling information for a review of sexual dimorphism in snakes, with particular emphasis on differences between the sexes in body color, head shape and head size. Much information on this topic seems to be unpublished, although is common knowledge among reptile-keepers, or else is hidden in large taxonomic papers. I would be grateful for any information on the topic. Sources of information will be acknowledged.

Richard Shine
Zoology A08
University of Sydney
N.S.W. 2006, Australia ●

COMPUTER REPORT AVAILABLE

The report of an NSF-sponsored committee on COMPUTER APPLICATIONS TO COLLECTION MANAGEMENT IN HERPETOLOGY AND ICHTHYOLOGY is available for distribution to interested parties. The report contains three main sections: (1) Issues involved in museum collection computerization projects, (2) Recommendations to the Biological Research Resources Program (NSF program sponsor of this work), and (3) Report of the site committee on a survey of collection computerization projects contemplated or underway including the results of a workshop convened at Washington, D.C. in March 1982. Individual copies of the report are available (*gratis*, but supplies are limited) from:

Dr. Robert H. Gibbs, Jr.
Division of Fishes
National Museum of Natural History
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AWARDS FOR STUDY AT ANSP

The Academy of Natural Sciences of Philadelphia, through its Jessup and McHenry funds, makes available each year a limited number of awards to support students pursuing natural history studies at the Academy. These awards are primarily intended to assist predoctoral and immediate postdoctoral students. Awards usually include a stipend to help defray living expenses, and support for travel to and from the Academy. Application deadlines are 1 April and 1 October each year. Further information may be obtained by writing to:

Chairman,
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INCUBATOR DESIGNS

A project has been initiated by Marc Colen, a bio-medical engineer, herpetologist and member of SSAR to coordinate all interested parties in the design of an incubator for reptile eggs. The goal is to obtain design(s) that will incorporate all the features and capabilities deemed necessary while permitting low cost construction in a zoological park or laboratory workshop. There will be no cost to the participants. Resulting plans will be published or distributed gratis.

Please send a self-addressed stamped envelope to:

Marc Colen
20137 Gilmore Street
Canoga Park, CA 91306 ●

VERMONT HERP INVENTORY

The Vermont office of The Nature Conservancy is conducting an exhaustive inventory of all herpetological collections, field notes, and albums which house Vermont records. We are interested in communicating with all individuals who might know:

a. The whereabouts of collections and notes of lesser known herpetologists or amateur collectors who collected in Vermont;

b. The names of herpetologists currently active as observers/collectors in the state of Vermont;

c. Individuals interested in reptiles and amphibians who frequent or live in Vermont and who might be willing to assist our ongoing search for selected species.

If you can be of assistance, please contact:

Marc R. DesMeules, Staff Biologist
The Nature Conservancy
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HERP REPRINTS NEEDED IN INDIA

The Madras Snake Park is a self-supporting private Trust with a million visitors a year. It is the only solely herpetological organization in India and the office of the IUCN/SSC Snake Group. We already have the largest collection of herp references in the country but are only just on the way to being a real reference center. Gifts in the form of spare reprints and back issues of herp journals will be gratefully acknowledged. We can reciprocate with reprints from here in your area of interest.

Please contact:

Romulus Whitaker, Director,
Madras Snake Park Trust
Raj Bhavan Post Office
Madras-600 022, INDIA ●

BOOK REVIEWS

Liste Der Rezenten Amphibien Und Reptilien. Testudines, Crocodylia, Rhynchocephalia by H. Wermuth and R. Mertens. 1977. Das Tierreich, W. De Gruyter, New York. xxvii + 174 pp. $105.00.

This paper-bound *das Tierreich* list is a revision of the comprehensive classification and synonym lists of the authors' (1961) earlier hardcovered book, which has been used widely as a reference for all turtles and crocodilians. That previous work was based upon a 1955 check list and urgently needed to be updated. It contains some crocodilian and chelonian surface anatomy, size information, identification keys, German common names, and drawings, all of which are absent from this present revision. However, to the new text the authors have added subfamilies and synonym lists of genera in addition to those for species. In essence the revision has been published primarily for specialized systematists. Final responsibility for this work is Wermuth's since the elder Mertens died 23 August 1975.

The current work opens with an extensive preface containing a discussion of revisions (and nonrevisions!), especially for turtles. No changes are given for the tuatara, and those several for crocodilians are based primarily on Fuchs' (1974) book which emphasizes lateral and ventral scales. There follows the systematic table of contents and systematic synonym lists with current geographical ranges of the species. Concluding the book is a twenty-two-page alphabetical index of scientific nomenclature.

Those hoping for a comprehensively revised taxonomy incorporating the latest published point of view or current usage may be disappointed because this work reflects the personal opinions of its compilers. It is clearly stated that their system of nomenclature and classification should have no official capacity. They say that their intention is to present the turtles as clearly as possible. They are not excited about reorganizing taxonomy on the basis of certain key characteristics (such as aural arterial canals, nasal anatomy or cervical vertebrae) but say they favor reliance upon a variety of characteristics including behavior and habitat. They are, we think, justifiably cautious about avoiding a system which will blow this way or that with every new wind, but we are concerned about some taxonomic selections made without adequate recognition of the conclusions from other international specialists. Although they indicate that any change in their framework must be justified objectively, we cannot help wondering just how much more evidence is needed to get the chelydrids, for instance, away from classification close to kinosternids, when biochemical, karyotypic and macroscopic anatomical data all indicate that they probably are not closely related.

Wermuth and Mertens accept McDowell's (1964) subfamilies Emydinae and Batagurinae but have not used them in a reclassification of genera within their Emydidae. We find

this regrettable and hope that whenever the next edition appears more flexibility will be demonstrated.

Although Wermuth and Mertens resist many changes that we feel are advisable, they do make others that are welcome: separation of *Pelusios subniger* and *P. castaneus;* inclusion of *Batrachemys* and *Mesoclemmys* with *Phrynops;* change of *Podocnemis cayennensis* to *P. erythrocephala.* In some cases they erect subgenera when others have suggested genus, for instance, *Geochelone* after Loveridge and Williams (1957) and *Rhinoclemmys* after McDowell (1964). Although we prefer the full status of these ranks, at least Wermuth and Mertens with their conservatism probably are moving in the right direction.

Currently it is popular to include the *Pseudemys* complex under *Chrysemys*, but, choosing to disagree with McDowell (1964) and Weaver and Rose (1967), the authors retain *Pseudemys* and also keep *Graptemys* separate from *Malaclemys.* Their conservatism here has proved wise based on recent evidence: Dobie (1981), Ernst and Ernst (1980), McKown (1972) and Vogt and McCoy (1980) support their reluctance to use these synonymies.

Regarding sea turtles, they have accepted the opinion of most specialists to accord specific rather than subspecific rank to *Lepidochelys kempi* and *L. olivacea.* Also the subspecies of *Caretta caretta* have been elevated to species.

Writings of those favoring resurrection of *Peltocephalus* for *Podocnemis dumeriliana (tracaxa)* and *Erymnochelys* for *Podocnemis madagascariensis* as well as some new descriptions [as Rhodin and Mittermeier's (1976) *Chelodina parkeri*] apparently are too recent to have been considered for inclusion in this book. Cunha's (1970) description of *Kinosternon scorpioides carajasensis* is not mentioned. Some other matters still requiring attention are to be found in Williams' (1962) review of the 1961 edition as well as in Iverson's (1979) critique of the current revision.

Since *das Tierreich* was published, the hardbacked *Encyclopedia of Turtles* (1979) by P.C.H. Pritchard has come out and this latter also contains a turtles-of-the-world check list. Pritchard has provided his justification for nomenclature used, and these names are more likely to be accepted by today's specialists, in particular turtle groups. Wermuth and Mertens' book is about one-fifth the size of the encyclopedia and more than double the price. For many engaged in turtle studies the Pritchard encyclopedia will suffice, but those involved in taxonomic work will find the Wermuth and Mertens' alphabetical index of scientific names and synonym lists of considerable value for turtles as well as for crocodilians.

Regarding crocodilians, the authors — to the chagrin of crocodilian specialists — have abandoned conservatism and embraced Fuchs' (1974) book, a publication of the reptile leather industry, as the authoritative source for most of their changes. Likewise the citation of "1975 *Alligata* Grawitz" as part of the *Alligator* synonomy is inappropriate. Grawitz's nonscientific article cannot be considered an authoritative treatise bearing on the taxonomy of the genus or species. Citing this sort of nonscientific publication is only a short step from citing newspaper articles as taxonomically important. At the same time, it is puzzling why Oliver's (1958) successful petition to the International Commission on Zoological Nomenclature to have the spelling of *Alligator mississipiensis* emended to *A. mississippiensis* is ignored, inasmuch as the single "p" repeatedly is being rediscovered by present day researchers.

The use of commercial crocodile skins in place of the usual holotypic specimens for the taxa *Caiman crocodilus matogrossiensis, C. c. paraguayensis, Crocodylus cataphractus congicus, C. niloticus africanus, C. n. chamses, C. n. cowiei, C. n. madagascariensis, C. n. pauciscutatus,* and *C. n. suchus* is without precedence. Despite the fact that Fuchs has a great deal of experience in identifying hides, it is highly unlikely that he can pull hides out of commercial lots and unfailingly assign them to the correct country of origin, much less particular drainage systems and lakes (F.W. King and P. Brazaitis, personal communication). How can a fully tanned, dyed, and finished hide taken from a commercial inventory, be used as a holotype? The exact locality of collection is not known. The collector is unknown. The date of collection is not known, and there are no skulls or dorsal scutellation available. Yet this is exactly what happened when these taxa were described by Fuchs (1974) and Fuchs, Mertens and Wermuth (1974). Additionally, voucher specimens of some of the new taxa were not available for deposition in a museum collection when the commercial hides were described and *nomen nudums* were created since no holotypes could be designated (see *Caiman crocodilus matogrossiensis* and *C. c. paraguayensis*).

Although most specialists regard *Crocodylus niloticus* as monotypic (Brazaitis, 1973; Neill, 1971), seven subspecies are presented here. Old names for these new descriptions are resurrected by the authors. While holotypes exist for these old taxa, they very well may not represent the same topotypic populations, demes, or morphotypes as the commercial hides used by Fuchs. In light of the concluding remarks by Fuchs, Mertens and Wermuth (1974) which suggest that much field work remains to be done before there is a final solution for *C. niloticus*, it is disturbing that Wermuth and Mertens simply accept Fuchs' stated characters for the subspecies he says he can recognize among the hides.

Also it is not clear why the authors separate *C. mindorensis* and *C. novaeguineae.* They were regarded as subspecies in their 1961 treatise. Again, without explanation, they accept Fuchs. The use of *C. p. porosus* and *C. p. biporcatus* is another head-scratcher which needs to be addressed properly.

The text fortunately appears relatively free of proofreading errors. On p. xv, line 18, there is accidental substitution of *Podocnemis unifilis* for *Podocnemis erythrocephala;* on p. xxii there is a "v" instead of "y" in *Cuora yunnanensis;* and on p. xxiii the "h" is omitted from *H. t. thurjii.* The alphabetic order for *Malaclemys terrapin tequesta* and *M. t. rhizophorarum* is reversed on p. xxiii and p. 46. The second "e" is missing from *Geoemyda (leytensis)* on p. 30. Under *Pseudemys ornata yaquia* (Legler and Webb's *P. scripta yaquia*), p. 57, the location was reported as "Conicarit", not "Conicarist".

In the forward, twenty-one papers or books are referred to using author(s) and years, but no group of complete references is listed. References are, however, given for three of these papers which include authors Wermuth and Mertens. It is true that most of the quoted works generally will be known by the specialists, and some references can be extracted from the synonym lists. However, we still feel that use of the publication would be facilitated by inclusion of a complete list of literature cited.

It could be argued that *das Tierreich*, which is just a world check list, should not be required to give reasoning behind all taxonomic decisions, but unless the explanations have been given elsewhere it would be appropriate for the authors to provide reasonable justifications for their taxonomy to a greater extent than they have done in this current revision.

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An Annotated Bibliography of the Desert Tortoise, *Gopherus agassizi*, compiled by Judy P. Hohman, Robert D. Ohmart, and James Schwartzmann. 1980. Softbound. Desert Tortoise Council Special Publication No. 1. 121 pp. Available from: Desert Tortoise Council, 5319 Cerritos Drive, Long Beach, California 90805. $8.00 in US. Foreign orders add $1.00 for surface mail and $3.00 for air mail.

The desert tortoise is an increasingly uncommon element of the fauna of the Sonoran and Mojave Deserts. Its populations have been threatened by human interference for centuries and have been severely reduced or exterminated in many parts of its range due to the accelerating pace of agricultural and suburban development of these arid lands.

This publication is designed to provide a readily accessible source of information regarding the current level of knowledge on this species. This it does well, gleaning from wide-ranging sources spanning 100 years and organizing into 22 headings, information on taxonomic relationships, morphology, physiology, geographical distribution, natural history, ecology, conservation, and husbandry. The compilers have demonstrated their ability to summarize previous research in an outline form and telegraphic style without loss of content. This work appears at a time of intense efforts by the Bureau of Land Management and state conservation agencies in California, Arizona, Utah, and Nevada to ascertain the status of natural populations, restock former parts of their range with transplants, and establish preserves for *G. agassizi*. Much of this work has been published in state and federal publications that are not always easily obtainable. I found the summarization of these data particularly enlightening.

Although the compilers do not claim to present an exhaustive survey of the available literature on this species, they have managed to gather 212 articles including four overview papers or other bibliographies. In my opinion the literature-cited section is quite comprehensive and up-to-date. There are two points for criticism though. I found four papers listed in the text that are not found in the literature-cited section. Conversely I found seven articles in the literature-cited section not referenced in the text. Secondly while the function of an annotated bibliography may be to indiscriminately present a brief summation of the conclusions of previous workers, I found two instances where selective screening based on current information would have added to the quality evidenced elsewhere in the manuscript. These are: p. 10, "6. An additional species from Alamos, Sonora, Mexico, may be described in the future (Brame and Peerson, 1969)", and p. 29, "4. Based on genetic content tortoises may have a closer phylogenetic relationship to mammals than to birds." There is a fine distinction between condensation for maximum efficiency in conveying information and the loss of the contextual framework in which that information was originally imbedded. These are two examples where deletion of the conclusions would have been preferable to presenting possibly misleading information. The text is practically free from typographical errors (I found only two minor misspellings). In comparison to book prices in general these days, the price of $8.00 is not unreasonable.

Overall this work serves its intended purpose and will stand as a model for future efforts of this nature. I would like to see a similar treatment of the remaining three species of this genus.

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Turtles in Kansas, by Janalee P. Caldwell and Joseph T. Collins, 1981. AMS Publishing Co., RR 6, Box 1, Lawrence, KS 66044. x + 67 pp. $5.25 postpaid.

The authors of **Turtles in Kansas** skillfully steer a course between a technical monograph and a popular handbook, and should reach a wide audience. At first glance it would seem that limiting the scope of the book to a small group of organisms (14 species) and a single state might be a mistake. But perhaps I underestimate the number of "turtle freaks" in Kansas, and the intensity of their interest. Moreover, this book will be of interest to turtle fanciers in the states surrounding Kansas that share much the same turtle fauna.

The authors provide a detailed species account for each of the fourteen species, and a spot distribution map. The accounts are divided into major topics such as description, habitat, reproduction, food habits, predators, distribution, similar species, and how to observe. These sections appear to have been compiled from the literature, with few original observations.

Each species is illustrated with at least one color photograph, and several with two. The photographs, by Joseph T. Collins, are mostly superb, although two of them (*Kinosternon flavescens*, p. 15; *Chrysemys picta*, p. 43) fail to show the diagnostic characters of these species. The color renditions are variable, but considering the cost of high-quality color printing these plates certainly are an adequate compromise.

There is a technical key to Kansas turtles, well-illustrated with line drawings, and a nontechnical key that the hobbyist can use to identify a living turtle in hand. A brief bibliography (15 titles) provides an introduction to both scientific and popular literature on Kansas turtles. A valuable addition would have been a brief review of techniques for the care of captive turtles.

It is difficult to criticize such a straightforward and potentially useful contribution, but there are two points that should be considered for future editions. First, the long-term value of the booklet could have been enhanced by anticipating taxonomic revisions in press or preparation as the manuscript was being written. Among these are the return to separate generic status for the sliders and painted turtle, *Pseudemys* and *Chrysemys*, and changes in the taxonomy of the false map turtles, *Graptemys pseudogeographica* and *G. ouachitensis*. The second point involves the lack of precision in the information contained in the species accounts. I was surprised to read, for example, that the map turtle is found in a "small area of the northeastern United States" (it ranges from the St. Lawrence River to Oklahoma, and from Alabama to Minnesota), that the Missouri cooter ranges from Virginia to Florida (it is not found east of Alabama), that *Graptemys pseudogeographica ouachitensis* "is found throughout the Sabine River system" (a drainage occupied by the subspecies *sabinensis*), and that the plastron of the western painted turtle has a bright red blotch (it is red with a black blotch). The species accounts contain far too many of these minor errors and inconsistencies, which could easily have been eliminated by having the manuscript reviewed by someone familiar with turtles and turtle biology.

The preparation of readable, authoritative interpretations of scientific knowledge is a responsibility too often avoided by professional biologists. Also, it is usually a profes-

sionally thankless task. I commend the authors of **Turtles in Kansas** for their effort, and I am certain that the turtle-lovers of Kansas will add their thanks for this worthwhile contribution.

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Handbook of Reptiles and Amphibians of Florida. Part I — The Snakes, by Ray E. Ashton, Jr. and Patricia Sawyer Ashton. 1981. 176 pp. completely illustrated with color photographs. Windward Publishing, Inc., Miami, Florida. ISBN 0-89317-033-X. $9.95.

It is perhaps most appropriate that the authors of this well-organized book have selected snakes for the initial volume of their ambitious series, for snakes are, of all groups to be included in the series, the most fascinating to people. The Ashtons have done a remarkable job in organizing and presenting a wealth of information in concise, but highly readable accounts, which give the current scientific and standard common name, and contain sections on descriptions (both adults and juveniles), similar species, natural history and range. An account contains a map of Florida, with a dot in each county in which a given species is known to occur. In addition, one or more excellent color photographs (drawn from many sources) accompany each account, and the whole of them contained in the book are a beautiful display of the serpentine fauna of Florida. The texts and photographs are complemented by well-executed and useful drawings (by Renaldo Kuhler), and the bibliography is divided into four logical sections to allow easy access to pertinent literature. In summation, this book on Florida snakes is an excellent field guide, long awaited by herpetologists and naturalists, both in and out of Florida. I eagerly await the production of the companion volumes.

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Complete guide to snakes of Florida, by William E. Haast and Robert Anderson. Phoenix Publishing Co., Inc., Miami, Florida. 139 pp. LC 81-80463.

Haast and Anderson have attempted to present the snakes of Florida in an effort "to assist the interested reader as well as the young student of Herpetology (the study of reptiles) with a general survey of the important points of identification and facts of habits and habitats relating to generalities of Florida's poisonous and nonpoisonous snakes." Casual perusal of the preceding quote should make the adult reader aware that any young student obtaining this book may learn an entirely new approach to writing English.

This book should never have been published. On its 139 pages, with a casual reading, I noted 18 misspelled scientific names (some with more than one variation), some new scientific name combinations *(i.e., Nerodia rigida, Nerodia septemvittata),* the erroneous inclusion of the "blue racer," *Coluber constrictor foxi,* as a member of the Florida herpetofauna, a mis-labelled "pink rat snake" photograph (page 57), and color photographs in the book of an overall poor quality throughout (except some of those provided by individuals other than the authors). The grammar throughout the book is atrocious, the organization of species accounts is simplistic, and the glossary contains terms that do not need definition (*i.e.,* abandon, description, egg, habit, lake, lung, muscle, pond, puncture, swamp, swelling, vomit, *etc.*) to anyone capable of reading.

The price was not given for this book (and I do not know it), but for herpetologists wishing to obtain information on Florida snakes, no price is needed.

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Horned Lizards. Unique Reptiles of Western North America, by Wade C. Sherbrooke. 48 pp. Southwest Parks and Monuments Association, Box 1562, Globe, AZ 85501. $8.95 + $1.50 postage and handling.

This is a popularly written account of the identification, geographic ranges, habitats, and habits of the seven species of *Phrynosoma* in the USA. The text is a well-written and thoroughly researched account of horned lizard biology, including facts from even the latest studies. Numerous color photographs (88 according to the publisher) nicely supplement the text. Species are keyed to the photographs using head silhouettes unique to each. Sherbrooke also includes sections on the role of horned lizards in mythology and pottery of southwestern Indians, and on the current and future status of horned lizard populations, especially in the National Parks and Monuments.

This is a particularly well-conceived and executed view of horned lizards. The photographs are mostly excellent and the text has good organization and clarity, with a minimum of obvious errors. I noticed only one typographical error (p. 38). The price is a bit high, as with most other things these days, but even so this booklet would make an excellent gift for a budding herpetologist or for anyone interested in lizards.

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A Report on the University of London Union Natural History Society Expedition to Greece 1980, by D. Stubbs, A. Hailey, W. Tyler and E. Pulford. 1981. Price $9.00 surface or $15.00 airmail from University of London Natural History Society, UL Union, Malet Street, W.C.1, London, England.

A well produced, comprehensive report has been prepared on the results of the University of London Union Natural History Society expedition to N.E. Greece in 1980, which describes an investigation on a dense population of *Testudo h. hermanni* near Thessaloniki. The various types of habitat in the site selected from a previous expedition in 1979 are described. A grid reference system was established for the quadrat sampling of tortoises. Size, weight and age are recorded for 791 animals and full mark-capture/recapture programmes initiated to determine the population size and density. Unfortunately, soon after the start of the study, local people rased the site to the ground by burning and rotivation in preparation for gaining planning permission for the building of holiday homes.

This is the first detailed study on any Mediterranean tortoise population. The effects of habitat destruction and fire on individual animals are also witnessed at first hand. The work highlights the problems concerning the conservation of tortoise species and their habitats and the impact of human pressure in the Mediterranean region for commercial purposes. The herpetofauna of the locality is also described and for selected sites in n.e. Greece generally. An annotated check list is given for the birds recorded during the investigation.

The report will be of interest and well worthwhile possessing for those involved with conservation work on reptiles, especially tortoises, and their habitats in southern Europe.

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Geographic Distribution

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific**

Names for North American Amphibians and Reptiles, Second edition. Collins, Conant, Huheey, Knight, Rundquist and Smith, 1982), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address in full — no abbreviations).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Joseph T. Collins, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata*. SSAR Herp. Review 10(1):1.

CAUDATA

NECTURUS MACULOSUS (Mudpuppy). USA: MINNESOTA: Goodhue Co: collected in trash baskets at cooling water intake from Mississippi River to Northern States Power Company Prairie Island Generating Plant, approximately 6.4 km upstream from Red Wing (T 113N, R 15W, Sec. 4). 29 November 1982. K. N. Mueller. University of Wisconsin-Madison, Zoological Museum. One female (UWZH 22544), one male (UWZH 22545). The stomach of the female contained one *Hexagenia* mayfly naiad and the vertebral column of a small fish. First published record for Goodhue County (Breckenridge, 1944, Reptiles and Amphibians of Minnesota, Univ. Minnesota Press). Listed as hypothetical for southeast Minnesota by Minnesota Dept. of Natural Resources (1979, Guide to the Reptiles and Amphibians of Southeast Minnesota - Region 5). An average of 39 mudpuppies were collected annually from the trash baskets at the Prairie Island Plant from 1974 through 1980 (range: 8-116), primarily from mid-winter through early spring.

Submitted by **PHILIP A. COCHRAN,** Center for Limnology, University of Wisconsin, Madison, Wisconsin 53706 and **KENNETH N. MUELLER,** Northern States Power Company, Prairie Island Generating Plant, RR#2, Welch, Minnesota 55089. ●

ANURA

RANA AURORA DRAYTONI (California Red-legged Frog). USA: CALIFORNIA: Santa Barbara Co: vicinity of Pelican Bay, Santa Cruz Island. 17 May 1919. Joseph R. Slevin. California Academy of Sciences (CAS 45230-32). First record for the Channel Islands. These specimens are entered in Slevin's field catalog in sequence with other amphibians and reptiles collected on Santa Cruz and Anacapa Islands on 16-17 May 1919, and were cataloged by Slevin at CAS. Inexplicably, Slevin omitted the locality from his review of western North American amphibians (1928. Occas. Papers Calif. Acad. Sci. 16:1-152), though there is no indication on existing records that the data were felt to be suspect. Slevin was noted for his careful work, and usually tagged and cataloged material daily while in the field, thus an error in locality seems unlikely. *Rana aurora* may be common yet pass undetected in small coastal drainages on the adjacent mainland, where it forages from concealment by night.

A substantial stream with permanent pools reaches the north coast of Santa Cruz Island just E of Pelican Bay; this is presumably Slevin's locality, and may still support a population of *R. aurora* in its rugged upper reaches. This record seems to have been overlooked previously through reliance on Slevin's (1928) listing being comprehensive for CAS holdings up to that time.

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SYRRHOPHUS PALLIDUS. Mexico: Jalisco: Puerto Vallarta, at Posada Vallarta Hotel, 12 June 1982. H. William Peterson. University of Colorado Museum (UCM 55580). The species has been recorded previously only from adjacent, southeastern Nayarit (Lynch, 1970, Univ. Kansas Publs., Mus. Nat. Hist., 20(1):39, 40). Its range is extended southwestward about 70 km, into an area where the genus had not previously been recorded (Lynch, *op. cit.*: 42, fig. 21).

Submitted by **H. WILLIAM PETERSON,** 3612 Lincolnway, Olympia Fields, Illinois, 60461, and **HOBART M. SMITH,** Department of E. P. O. Biology, University of Colorado, Boulder, Colorado 80309. ●

TESTUDINES

PSEUDEMYS FLORIDANA HOYI (Missouri Cooter). USA: ARKANSAS: Pike Co: Caddo River at U.S. Hwy. 70. 10 June 1970. R. McKown. West Texas State University Museum of Natural History (WTSU 1070, 1071). Benton Co: Crystal Lake near Decatur. 7 Aug. 1973. Bob Wallace. (WTSU 7029) Crawford Co: Lake Ft. Smith near Mountainburg. 30 June 1973. Gary Harrison. (WTSU 7030, 7031). Marion Co: Buffalo River near Rush. 7 Aug. 1974. (WTSU 7032). New county records. Fills in gaps between previous localities (H. H. Schwardt, 1938, Arkansas Exper. Station Bull. 357, 47 p.; S. C. Dellinger and J. D. Black, 1938, Occas. Papers Univ. Ark. Mus. 1, 47 p.; H. G. Dowling, 1957, Occas. Papers Univ. Ark. Mus. 3, 51 p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016. ●

SAURIA

ALGYROIDES NIGROPUNCTATUS. GREECE: STEREA: Prefecture of Fokida: Province of Dorida: Tichio village, 27 km NE of Nafpaktos town. 14 May 1977. Collected by B. P. Chondropoulos and M. Doumas. Identified by B. P. Chondropoulos. Deposited in Zoological Museum of Patra University, Patra, Greece (Catalog number 3173). An adult male found basking on a vegetation-free accommodation roadside at 1130 hr. The present record extends the known species range at least 100 km eastwards (Ondrias, J. C., Liste des Amphibiens et des Reptiles de la Grèce, Biol. Gallo-Hellen., 1:111-135, 1968). First record for the Prefecture of Fokida.

Submitted by **B. P. CHONDROPOULOS,** Zoological Laboratory, Patra University, Patra, Greece. ●

GERRHONOTUS PAUCICARINATUS (San Lucan Alligator Lizard) MEXICO: BAJA CALIFORNIA DEL SUR: 1 km W San Ignacio. 18 September 1978. Collected by M. D. Mahlstedt from beneath fallen palm fronds at the edge of a stream bank. Identified by J. R. Ottley. Brigham Young University (BYU 34721). This specimen extends the range approximately 460 km northward from the La Paz area (Lais, 1976, *Gerrhonotus paucicarinatus*, Catalogue of American Amphibians and Reptiles, p. 188). Bostic (1971, Trans. San Diego Soc. Nat. Hist., 16:237-264) commented on specimens he designated *Gerrhonotus multicarinatus* ssp. from the Central Desert of Baja California del Norte and noted that those specimens manifest a number of meristic traits intermediate to *multicarinatus (G. m. webbi)* and *paucicarinatus*. The San Ignacio specimen was taken less than 150 km south of Bostic's (1971) record for *multicarinatus* at Miller's Landing (28° 28' N, 114° 05' W), and thus adds further weight to his suggestion of intergradation and possible conspecific relationship between the two species.

Submitted by **JOHN R. OTTLEY,** Herpetological Research Area, 149 MLBM, Life Science Museum, Brigham Young University, Provo, Utah 84602; and **ROBERT W. MURPHY,** Department of Biology, University of California, 405 Hilgard Ave., Los Angeles, California 90024. ●

HEMIDACTYLUS TURCICUS TURCICUS (Mediterranean Gecko). USA: GEORGIA: Lowndes Co: GA Hwy 31, 0.5 km S of GA Hwy 376. 5 June 1981. H. Bernard Bechtel and Elizabeth Bechtel. Valdosta State College

collection (77). Several adults and juveniles were observed on the side of a concrete block building. Female preserved has one egg protruding from side. First record for the state.

Submitted by **ELIZABETH R. BECHTEL,** Department of Biology, Valdosta State College, Valdosta, Georgia 31698. ●

OPHISAURUS ATTENUATUS LONGICAUDUS (Eastern Slender Glass Lizard). USA: KENTUCKY: HARDIN CO: 6.4 km W Upton. Found dead on east side of Locust Grove-Lone Star Road, 0.8 km S Lucas Grove Church (Rt. 224). 4 October 1982. Norbert Williams. Verified by R. E. Todd, Jr. Collection of R. E. Todd, Jr. (RET 1345); 5.6 km W Eastview on Ky. Rt. 84. DOR. 1 June 1969. Burt Monroe. Verified by Burt Monroe. University of Louisville collection (UL 3550). HART CO: 3.2 km E of I-65 (Bonnieville), jct Locust Grove & James Ragland roads, 7.2 km S Larue County line. 1 June 1980. Robert E. Todd and Becky Todd. Verified by Burt Monroe. Collection of R. E. Todd, Jr. (RET 615). These three specimens supplement those for Kentucky reported by Collins (1962. Herpetologica, 18(3):206) and Holman (1971. Cat. American Amph. Rept., 111).

Submitted by **ROBERT E. TODD, JR.,** Route 1, Box 90-B, Sonora, Kentucky 42776, and **BURT MONROE,** Department of Biology, University of Louisville, Louisville, Kentucky 40208. ●

PHRYNOSOMA CORNUTUM (Texas Horned Lizard). USA: ALABAMA: Baldwin Co: Daphne. May, 1981. Hattie Blanco. Verified by S. D. Carey. Auburn University Museum (AUM 30915). Adult female (SVL 88.2 mm) collected from H. Blanco's flower garden at her residence on Whispering Pines Road. County record and first record from Alabama's lower coastal plain.

Submitted by **STEVEN D. CAREY,** Department of Natural Sciences, Mobile College, Mobile, Alabama 36613. ●

SERPENTES

DIADOPHIS PUNCTATUS REGALIS (Ringneck Snake). USA: ARIZONA: Mohave Co: 36° 58' N, 113° 19' W in 209 Mile Canyon (west side of Colorado River), Grand Canyon National Park. Elev. 442 m 26 April 1982. Not collected; see Fig. 1. This individual extends the range (previously Kingman, Az. area: Lowe 1978) northeast approximately 130 km. In dry rocky wash. When approached, tail was coiled exposing bright orange-red underside. After 2-3 coilings, the individual feigned death. No ring was present around the neck. Verified

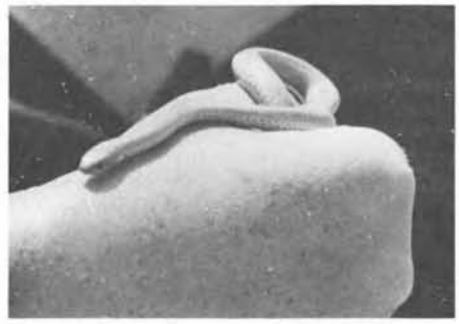


Figure 1. Ringneck Snake found at 209 Mile Canyon, Grand Canyon National Park, Arizona.

by O. Johnson, Northern Arizona University. (Lowe, 1978. The vertebrates of Arizona, University of Arizona Press).

Submitted by **ROBERT A. JOHNSON** and **STEVEN W. CAROTHERS,** Biology Department, Museum of Northern Arizona, Route 4 Box 720, Flagstaff, Arizona 86001. ●

ELAPHE OBSOLETA OBSOLETA (Black Rat Snake). USA: VIRGINIA: Pulaski Co: 3.2 km SE Newbern, near Peak Creek. 7 September 1981. M. W. Klemens. Verified by R. G. Zweifel. American Museum of Natural History (AMNH 123248). First record for Pulaski County. (Linzey, D. W. and M. J. Clifford, 1981. Snakes of Virginia, Univ. Press of Virginia, Charlottesville, 159 pp.).

Submitted by **MICHAEL W. KLEMENS,** Department of Herpetology, American Museum of Natural History, New York, New York 10024. ●

NERODIA SIPEDON SIPEDON (Northern Water Snake). USA: VIRGINIA: Pulaski Co: near confluence of Peak Creek and Claytor Lake. 7 September 1982. M. W. Klemens and P. R. Warny. Verified by R. G. Zweifel. American Museum of Natural History (AMNH 124932). First record for Pulaski County. (Linzey, D. W. and M. J. Clifford, 1981. Snakes of Virginia, Univ. Press of Virginia, Charlottesville, 159 pp.).

Submitted by **MICHAEL W. KLEMENS,** Department of Herpetology, American Museum of Natural History, New York, New York 10024. ●

NERODIA TAXISPILOTA (Brown Water Snake). USA: GEORGIA: Clarke Co: Sandy Creek near confluence with Oconee River, 0.8 km N Athens. 29 March 1982. C. D. Camp and M. C. Harrison. Verified by C. D. Camp. University of Georgia Museum of Natural History (UGMNH 17120). Specimen is an adult male. Immature specimen was collected and released by J. M. Howland 20 March 1982 at same locality. Represents range extension of two counties north of previous recorded localities.

Submitted by **CARLOS D. CAMP** and **JEFFREY M. HOWLAND,** Department of Zoology, University of Georgia, Athens, Georgia 30602. ●

RHINOCHEILUS LECONTEI LECONTEI (Western Long Nosed Snake). USA: ARIZONA: Coconino Co: 36° 58' N, 113° 19' W in Granite Park Canyon (east side of Colorado River). Elev. 442 m 27 April 1982. Not collected; see Figure 2. Individual was found in creosote/grassland habitat approximately 48 km downstream from the one other verified citing in Grand Canyon (Miller *et al.* 1982). Verified by O. Johnson, Northern Arizona University. (Miller, D. M., R. A. Young, T. W. Gatlin, and J. A. Richardson, 1982. Amphibians and reptiles of Grand Canyon. Grand Canyon Natural History Association, Monogr. No. 4).



Figure 2. Western Long Nosed Snake found at Granite Park Canyon, Arizona.

Submitted by **ROBERT A. JOHNSON** and **STEVEN W. CAROTHERS,** Biology Department, Museum of Northern Arizona, Route 4 Box 720, Flagstaff, Arizona 86001. ●

SISTRURUS CATENATUS (Massasauga). USA: TEXAS: Archer Co: 1.5 km S junction of FM 368 and FM 1954; 21 May 1982. Rocky Ward. Verified by E. G. Zimmerman. North Texas State University Herpetological Collection (NTSUHC no. R-682). This is the first record of this species in Archer County. *Sistrurus catenatus* has previously been recorded for all contiguous counties except Jack County (Raun and Gehlbach, 1972. Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **ROCKY WARD,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203. ●

THAMNOPHIS SIRTALIS SIRTALIS (Eastern Garter Snake). USA: VIRGINIA: Pulaski Co: 3.2 km SE Newbern, near Peak Creek. 5 September 1981. M. W. Klemens. Verified by R. G.

Zweifel. American Museum of Natural History (AMNH 123247). First record for Pulaski County. (Linzey, D. W. and M. J. Clifford, 1981. Snakes of Virginia, Univ. Press of Virginia, Charlottesville, 159 pp.).

Submitted by **MICHAEL W. KLEMENS,** Department of Herpetology, American Museum of Natural History, New York, New York 10024. ●

TROPIDOCLONION LINEATUM TEXANUM (Texas Lined Snake). USA: TEXAS: McMullen Co: 32.0 km SSW of Tilden on FM 624, 11.5 km west of intersection of Texas Rt. 16 and FM 624. Collected AOR after rain 21:30 hours, 14 September 1982. Paul S. Freed. Verified by Bern W. Tryon. Carnegie Museum of Natural History (CMFS 39871). This is the first record for this county and fills the gap between records from Bexar County (Raun and Gehlbach, 1972, Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No.2) and Duval County (Benefield, G. E. 1979, Herp Review 10(3):103).

Submitted by **PAUL S. FREED,** Department of Herpetology, Houston Zoological Gardens, P.O. Box 1562, Houston, Texas 77001. ●

LIZARDS AND SNAKES FROM EASTERN LOWER EGYPT IN THE HEBREW UNIVERSITY OF JERUSALEM AND TEL AVIV UNIVERSITY, WITH RANGE EXTENSIONS [1]

The most thorough treatise of the reptiles of Egypt is Anderson's (1898), who details the morphology and localities of his specimens. Flower (1933) extends our knowledge of reptile distribution in Egypt, but often in general terms without precise localities. Some distributional data are incorporated in the ecological projects of Tortonese (1943-48, 1948), Khalil and Hussein (e.g. 1963), Hussein (e.g. 1964) and Hussein and Al-Badry (e.g. 1969). Localities are mapped by Marx (1968), but mainly from material obtained by the United States Naval Medical Research Unit No 3. In the Asian territory of Sinai, there was additional collecting in the Winter of 1956/57 (Werner, 1968), intensified during 1967-81 (Werner, 1973, 1980, in press; Zinner, 1974). Knowledge of reptile distribution in African Egypt has not progressed as rapidly. Hence, several records in the following listing of the lizards and snakes from Lower Egypt east of Nile in the Hebrew University of Jerusalem (HUJ), and Tel Aviv University (TAU), constitute significant range extensions. These are preceded by asterisks and their novelty is explained. Some of the specimens have been in the Hebrew University's Zoological Museum for some time; others were obtained through Israeli zoologists in Winter 1973/74. Spelling of locality names follows listings (or map) in "Egypt and the Gaza Strip, Official Standard Names Approved by the U.S. Board on Geographic Names" (Office of Geography, Dept. of the Interior, Washington, D.C., 1959).

**Stenodactylus sthenodactylus sthenodactylus* (Lichtenstein, 1823). HUJ-R 12779, SW (outskirts of) Ismailiyah [30°35'N 32°16'E], 22.XI.1973, don. E. Frankenberg; TAU-R 10472, Fa'id Airport, 4.XI.1973, don. A. Keller; TAU-R 10497 and 10498, 10 km W of Suez, 6.XII.1973, don. E. Shani. Anderson (1898) and Flower (1933) recorded this gekkonid only along the Nile Valley and west coast of the Red Sea and Gulf of Suez, where the northernmost specified locality is Ras Gharib (28°21'N); Marx (1968) has a specimen from Kutamiya (ca. 29°56'N, 31°49'E). The Ismailiyah specimen extends the recorded range by ca. 75 km E from the Nile Valley and 250 km N from Ras Gharib. The species is widespread in Sinai but has not been recorded within 50 km of Ismailiyah.

**Tropiocolotes nattereri* Steindachner, 1901. HUJ-R 12801, Jabal Ataqah [29°55'N, 32°20'E]: opposite of township of Ataqah [29°53'N, 32°28'E], 1.XXII.1973, don. A. Haim. Identified according to Leviton and Anderson (1972). Most authors (e.g. Guibé, 1966) do not distinguish between this and *T. steudneri* (Peters, 1869), but this possibly sibling species has been reported from the west and east sides of the Gulf of Aqaba (Flower, 1933), as well as Libya (16°00'E, 25°30'N - Schnurrenberger, 1962).

Agama pallida pallida Reuss, 1833 (about this terminology, see Werner, 1971). HUJ-R 1126, 5202 & 5203, Qassassin [30°49'N, 32°00'E], 10.IV.42, O. Theodor. This common agamid has since been reported from Qassassin and vicinity by Tortonese (1948).

Agama savignii Duméril & Bibron, 1837. HUJ-R 1144, Nafishah [5 km SW Ismailiyah], 20.IV.1942, O. Theodor. Anderson (1898) mentions 17 specimens from between Ismailiyah and Suez; Flower saw the species at Ismailiyah, and the nearest record of Marx (1968) lies ca. 85 km to the SSW of Nafishah.

Uromastyx aegyptius (Forskål, 1775). HUJ-R 1149, Cairo, July 1936, G. Witenberg. Known from the area.

Chalcides guentheri Boulenger, 1887. HUJ-R 1486, Cairo, July 1936, G. Witenberg. This skink is endemic to northern Israel and adjacent areas (mesic-Mediterranean), and our single record should be verified by another before acceptance.

Chalcides ocellatus ocellatus (Forskål, 1775). HUJ-R 1431, Ismailiyah, October 1942, O. Theodor; HUJ-R 12835, ca. 8 km S Ismailiyah (UTM 430377), 10.II.1974, don. E. Frankenberg; HUJ-R 13379, 13380 & 13381, Cheops pyramid, nr. Al Jizah, August 1976, R. Mathewson. Known from these areas.

Mabuya quinquetaeniata (Lichtenstein, 1823). HUJ-R 1429, Ismailiyah, October 1942, O. Theodor; HUJ-R 12736, 4 km SE Ismailiyah, 26.I.1974, don. U.N. Safriel; TAU-R 10487, Ismailiyah (fresh water lake), 12.XII.1973, don. R. Gainon. Specimen HUJ-R 12736 was more colourful than indicated by Anderson's (1898) fine plate 24 (Fig. 2). Anderson knows this skink only along the Nile; Flower (1933) adds that it appears to be extending its range along waterways; and Marx (1968) has a specimen from Abu Suwayr [ca. 15 km W of Ismailiyah]. This species is not known in Sinai.

**Mabuya vittata* (Olivier, 1804). HUJ-R 12834, ca. 8 km S Ismailiyah (UTM 430377), January 1974 (died 7.II.1974), don. E. Frankenberg. Anderson (1898), Flower (1933) and Marx (1968) record this skink from the Nile and Delta areas, but not from the Eastern Desert. It has not been found in Sinai.

Scincus scincus scincus (Linnaeus, 1758). HUJ-R 1359 & 5981-5985, Cairo, 1936, G. Witenberg; HUJ-R 13382, Cheops Pyramid near Al Jizah, August 1976, R. Mathewson. Known from the area.

Sphenops sepsoides (Audouin, 1827). HUJ-R 1478 & 5161-5164, Cairo, July 1936, G. Witenberg; HUJ-R 1480, Qassassin, June 1942, O. Theodor. Known from the general area; Marx's (1968) record nearest to Qassassin is from At-Tall al Kabir (15 km W of Qassassin) whence Tortonese (1948) also mentions it.

Acanthodactylus boskianus asper (Audouin, 1829). HUJ-R 1344, E of Cairo, July 1936, G. Witenberg; HUJ-R 1348 & 6151-6153, Cairo, July 1936, G. Witenberg. Known from the area.

Acanthodactylus scutellatus scutellatus (Andouin, 1829). HUJ-R 1318, nr Ismailiyah, 2.IV.1942, O. Theodor. According to Flower (1933), abundant about Ismailiyah, but Marx (1968) records no specimens between the Nile system and the Suez Canal. Found on the eastern shore of the Suez Canal (Werner, 1973).

**Eremias rubropunctata* (Lichtenstein, 1823). TAU-R 10533, W of Suez town, 16.XII.1973, don. E. Shani. The nearest earlier records are no. 3 tower on Cairo-Suez road (Flower, 1933) and Ain Sukhna [ca. 50 km SW Suez] (Marx, 1968). Known from NW Sinai.

**Eremias guttulata guttulata* (Lichtenstein, 1823). HUJ-R 12800, Jabal Ataquah [29°55'N, 32°20'E] (opp. Township of Ataqah [29°53'N, 32°28'E]), 1.XII.1973, don. A. Haim. Previous records are hard to evaluate because previous authors did not distinguish between this and *E. olivieri* (Haas, 1951).

Leptotyphlops cairi (Duméril & Bibron, 1844). HUJ-R 3031 & 3032, Cairo, December 1943 and 1944, H. Waly; HUJ-R 3710 & 3711, Abu Rawash (Al Jizah Prov.), 24.IX.1950, don. Chicago Natural History Museum. Known from both localities.

Coluber florulentus Geoffroy, 1827. HUJ-R 3309, Cairo, June 1936, G. Witenberg. Known from Cairo.

Coluber nummifer Reuss, 1834 (about this nomenclature see Werner and Avital, 1980). HUJ-R 3174, Cairo, August 1936, G. Witenberg. Anderson (1898) and Flower (1933) report this mesic-Mediterranean snake from the Cairo and Delta areas, but Marx (1968) records no specimens. Two are known from Wadi Feiran in Sinai (Barbour, 1914; Werner, 1973).

**Natrix tessellata tessellata* (Laurenti, 1768). HUJ-R 8580, freshwater canal ca. 8 km S Ismailiyah (UTM 430377), 9.I.1974, don. E.

(1) Dedicated to the memory of Professor Georg Haas, deceased 13.IX.1981, who broke the ground.

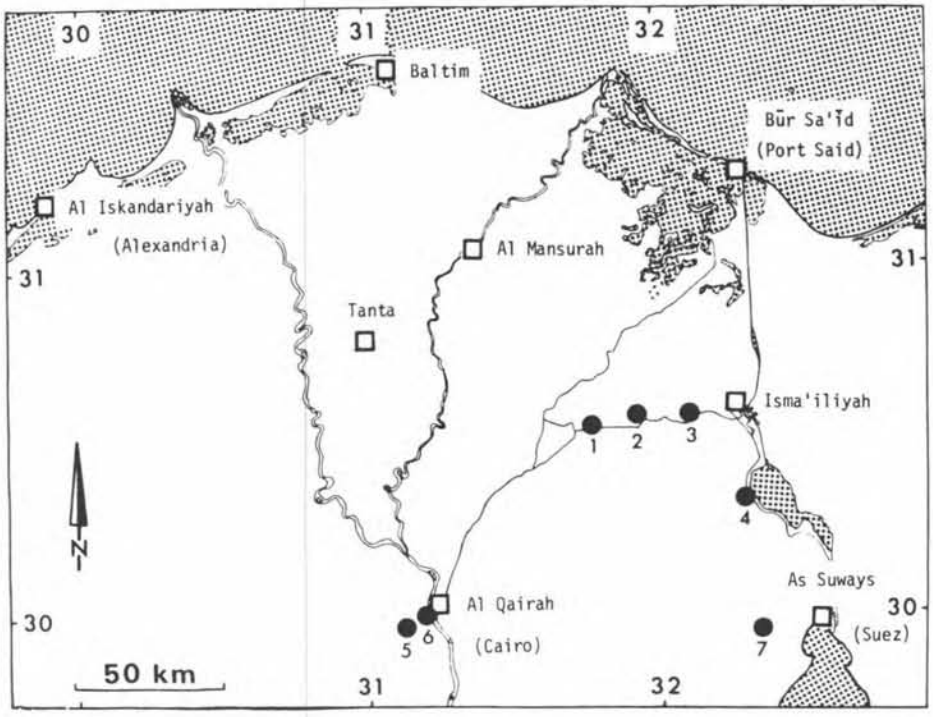


Figure 1. Sketch-map of eastern Lower Egypt with selected major components of the water system. Hollow squares indicate main localities for orientation. Solid circles indicate other localities of material: (1) At-Tall al Kabir, (2) Qassassin, (3) Abu Suwayr, (4) Fa'id, (5) Pyramids, (6) Al Jizah, (7) Jabal 'Ataqah.

Frankenberg; TAU-R 10470, Bitter Lake (W of Canal), 10.XI.1973, don. Y. Shoshani; TAU-R 10510, Ismailiyah, 30.XII.1973, don. M. Frianti; TAU-R 10526, Ismailiyah, 5.II.1974, don. Y. Shoshani. Anderson (1898), Flower (1933) and Marx (1968) know the diced water snake only from the Nile delta area; Tortonese (1948) only saw a specimen (not preserved) near Qassassin (halfway from the Delta area to Ismailiyah); there is no convincing record from Sinai (Hoofien, 1965; Werner, in press). Thus these specimens, presumably indicating a breeding population, constitute a range extension of ca. 105 km SE from the nearest record in the delta and ca. 230 km WSW from the nearest localities in Israel (Werner, unpublished).

Psammophis shokari (Forskål, 1775). HUJ-R 3227 & 3228, Cairo, July & August 1936, G. Witenberg; TAU-R 10455, Fa'id, 11.XI.1973, don. M. Cohen. Known from both areas. Because in Sinai *P. shokari* and *P. aegyptius* Marx, 1958, may be sympatric (Werner, 1973), most records antedating the description of the latter are useless. But Anderson (1898) lists scale counts by which the specimens from these areas are clearly assignable to *shokari*. Marx (1968), too, has material from near Cairo.

Psammophis sibilans sibilans (Linnaeus, 1758). HUJ-R 3240 (two specimens), Cairo, July 1936, G. Witenberg. Known from the area.

**Spalerosophis diadema cliffordi* (Schlegel, 1837). HUJ-R 8579, Fa'id, January 1974, don. E. Habibi; TAU-R 10475, Ismailiyah, 22. XI.1973, don. R. Gainon. According to Flower (1933) it is common along the Suez Canal; Tortonese (1943-48, 1948) observed the species at Tall al Kabir (45 km W Ismailiyah, 55 km NW Fa'id); Hussein (1964) obtained it ca. 75 km WSW of Fa'id; and Marx (1968) has specimens from ca. 30 km N and 50 km SW Fa'id. In Sinai known from 55 km SE Fa'id (Werner, 1973).

Telescopus dhara obtusus (Reuss, 1834). HUJ-R 3109, Cairo, 20.VIII.1930, O. Theodor. Known from the area.



Figure 2. *Mabuya quinquetaeniata*, HUJ-R 12736 (rostrum-anus, 87 mm; tail, 146 mm) from near Ismailiyah. Freshly dead, the coloration, in terms of Ostwald colors (Streller and Ostwald, 1939) was recorded as follows: Dorsum blackish brown, between 3pn and 4pl. Five lighter, light brown to beige longitudinal bands, between 2gc and 31e. Lemon yellow band covering supralabials (beginning gradually) and continuing through lower half of ear back to above axilla, about 2na. Sides of neck above this, dark black-brown, 6pn, speckled with light yellowish dots, 1ea. Gular area, and backwards to line between axillae, mottled blackish brown, 6pn, with yellowish, 1ea, and white spots. Belly very light grey, about d. (From a kodachrome diapositive.)

Cerastes cerastes (Linnaeus, 1758). TAU-R 3192, Cairo, Spring 1941, don. A. Shulov. ("at least three years old . . .died 5.I.1959" - from specimen label.) Known from the area.

In conclusion, of the 24 species included, the records of six constitute significant refinements of distribution maps or even range extensions. These, particularly the discovery near Ismailiyah of *Mabuya vittata* and *Natrix tessellata*, previously known only from the Nile and Delta, indicate the need for further herpetological field work in Egypt.

ACKNOWLEDGMENTS

I am deeply indebted to all persons who donated specimens to the Hebrew University and Tel Aviv University collections and to Prof. H. Mendelssohn for permitting my using the latter. For references to the literature (particularly the commonly overlooked papers by Tortonese) and other helpful comments on the manuscript I am much obliged to J.H. Hoofien, although I have not followed his advice concerning *Tropiocolotes*. I also thank E. Avital for curatorial help, A. Bouskila who helped me with the Italian literature, A.B. Niv for photographic assistance, P. Amitai who drew the map, and M. Rosenthal who coped with the typing.

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BUFO HAEMATITICUS COPE: AN ADDITION TO THE ANURAN FAUNA OF HONDURAS

As part of a survey of the Río Platano area in eastern Honduras as a potential national park site, the senior author sampled the herpetofauna. In those collections are four specimens of the toad *Bufo haematiticus* Cope, 1862. These specimens represent a new record for this species in Honduras.

As indicated by Villa (1972), *B. haematiticus* is otherwise known to occur from Nicaragua to Colombia at low and moderate elevations. He also noted that in Nicaragua this toad occurs on the Caribbean versant in low, hot, and humid regions. The closest Nicaraguan record (Cerro Masique, Depto. Boaco) is approximately 315 to 340 kilometers SSE of the Honduran records (Jaime Villa, pers. comm.). In Costa Rica, Savage (1980) indicated the species occurs in the Caribbean and the southwestern Pacific lowlands and adjacent foothills. In Panamá, this toad apparently occurs on both versants (Breder, 1946; Taylor, 1952), as is also the case in Colombia (Cochran and Goin, 1970).

One specimen (UNAH 5446) was collected 14 May 1977 at Sin Sin Warra (15°40'N, 84°57'W) in the department of Gracias a Dios at an elevation of 70 meters. A second specimen (UNAH 5471) was found on 20 May 1977 at "Cañon del Chimelca" (15°36'N, 85°05'W) on the Río Chimelca near its confluence with the Río Platano in the department of Colón at an approximate elevation of 280 meters. The third specimen (UNAH 5694) was collected on 13 May 1979 at Portillo de Will (15°23'N, 85°23'W) near the Río Paulaya as it crosses the Colón-Olancho departmental border in the department of Colón at an elevation of 450 meters. The last specimen (UNAH 5706) was found on 17 May 1979 along the Río Mata de Guineo, a tributary of the Río Camalotal in the department of Colón at an approximate elevation of 400 meters.

All four specimens came from the area of eastern Honduras known as the Mosquitea in the Tropical Moist Forest formation of Holdridge (1967).

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Gymnophthalamus pleei BOCOURT: AN ADDITION TO THE LIZARD FAUNA OF DOMINICA, WEST INDIES.

In 1966-67, I was a member of the Bredin-Archbold-Smithsonian Biological survey of Dominica mainly interested in the biology of *Leptodactylus fallax*. Monthly collections of the lizards *Anolis oculatus*, *Ameiva fuscata* and *Mabuya mabouya* were also made by me, Robert Gatten and Eugene Nicholls. The lizard collections were not thoroughly examined until the reproductive cycles of the three species were studied (Somma and Brooks, 1976). While examining the collection, two individuals were found that had been misidentified as *Mabuya*. These specimens were later shown to George Zug at the U.S.N.M. who identified them as *Gymnophthalamus* cf. *pleei*. In 1980, I obtained two more specimens from Dominica through the efforts of Jay Blankenship, a Peace Corps member on assignment to the Montserrat National Trust. On September 19, 1980, Ronald Crombie was able to collect seven additional specimens (U.S.N.M. 218274-218279 and U.S.N.M. 218283, a cleared and stained skeleton).

The first two specimens (CWM - 2608 and CWM - 2609; 2 April, 1966; CWM = College of William and Mary) were collected by Nicholls from the Cabrits, two small hills on a point separated from the mainland by a low, swampy area just north of the town of Portsmouth, St. John Parish. The specimens collected by Blankenship (CWM - 6651 and CWM - 6652; 19 April, 1980) were also taken in the Cabrits area. Blankenship also saw several individuals on the grounds of the Botanical Gardens in Roseau but was unable to collect any for positive identification. In both cases the lizards were found amidst litter in well drained, fairly open canopied sites similar to the habitat in which they have been found on Martinique (LeClair, 1978). All seven specimens collected by Crombie were found

Table 1. Scale counts and snout-vent lengths (mm) for *G. pleei* from Dominica.

Museum Number	Dorsal Scales	Ventral Scales	Midbody Scales	Femoral Pores	SVL
CWM— 2608	36	26	17	—	35
CWM— 2609	35	26	15	—	41
CWM— 6651	33	25	15	—	26
CWM— 6652	34	24	17	6-6	41
USNM 218174	33	25	13	—	28
USNM 218275	34	25	13	—	33
USNM 218276	35	24	13	—	28
USNM 218277	33	22	13	—	33
USNM 218278	35	24	13	—	26
USNM 218279	34	24	13	—	30

in open, grassy pasture along the banks of the Canari River, just east of the Castle Comfort Estate, St. George Parish.

Previous records of *G. pleei* are from the island of Martinique and St. Lucia (Thomas, 1965) and Guadeloupe (Schwartz, *et al.*, 1978; Crombie, personal observation, 1972). Dominica is approximately 40 km north of Martinique and 40 km south of Guadeloupe.

Pertinent scale counts and snout-vent lengths of the specimens are given in Table 1. All values, except for the number of midbody scales, fall within the range of variation found for specimens from Martinique (Thomas, 1965). Specimens from the mainland of Martinique had a mean midbody scale count of 17. Note that all of the individuals from the Canari River Valley had 13 midbody scales. The one male was reproductively mature.

As indicated above, these specimens are tentatively assigned to *pleei*. To clarify their relationship to other *Gymnophthalamus*, the entire genus is in need of revision.

I thank George Zug for his assistance and Ronald Crombie for constructive comments.

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THE DISTRIBUTION AND STATUS OF *Gonatodes collaris* IN THE GALAPAGOS ARCHIPELAGO

The description of *Gonatodes collaris* by Gorman (1892) was based on two specimens collected by G. Baur at Wreck Bay on Chatham (San Cristobal) Island. Subsequent unsuccessful searches for the species at the type locality led Van Denburgh (1912) to conclude that Baur's specimens may have been mislabeled. He suggested that they might have originated from the mainland at Guayaquil where Baur had collected en route to the Galapagos. Slevin (1935), who had extensive collecting experience in the Galapagos, reiterated Van Denburgh's conclusions. Wood (1939) reestablished the presence of the species in the Galapagos with the report of a specimen from the type locality. Unaware of Wood's paper, Mertens (1963) reported the rediscovery of the species based on another specimen from the same locality. Vanzolini (1965:18) summarized the history of *G. collaris* and concluded on the basis of the type description and Merten's paper that " . . . it seems fairly safe to assume that *Gonatodes collaris* is either a strict synonym or a subspecies of *G. caudiscutatus*."

In the course of two expeditions to the Galapagos (1972 and 1974), I visited Wreck Bay where I found *Tropidurus bivittatus*, *Phyllodactylus darwini* and *P. leei* to be abundant, but not a hint of the presence of *G. collaris*. During the second trip, I visited Progreso, a small farming community situated on an elevated plateau in the humid zone some three miles inland from Wreck Bay. There I found the species to be common and obtained a series of 21 specimens (LACM 106412-32) with little difficulty. They were especially abundant in coffee groves near an abandoned sugar mill on the southeastern edge of the village.

A comparison of the color and color pattern based on specimens and Kodachrome slides of living individuals of both *G. collaris* and *G. caudiscutatus* (from coastal Ecuador, LACM 13157-58) left no doubt that the two represent the same species, as suggested by Vanzolini (1965). As such, it is the only terrestrial species of reptiles that is shared between the Galapagos and the mainland. All others are represented in the Galapagos by at least endemic species. Based on this and their apparent restriction in the Galapagos to man-modified habitats, it is likely that *G. caudiscutatus* was introduced to the island by man. The lizards could easily have been transported from the Guayaquil area concealed in shipments of nursery stock destined for Progreso. The first settlers arrived at Progreso from Guayaquil in 1869 (Slevin, 1959:106). Today there are extensive plantings of various citrus trees, avocados, bananas, coffee (and associated introduced large shade trees) and guavas. The apparent rarity of this gecko at Wreck Bay may be due to a major habitat difference. Wreck Bay is located in the dry coastal zone and with the exception of small garden plots in some yards, there is no agriculture.

The field work for this study was accomplished by joint logistical and financial cooperation of the Museum of Vertebrate Zoology and the Natural History Museum, Los Angeles during the second expedition to the Galapagos in January-February, 1974. The Janss Foundation provided most of the financial support. I sincerely thank Mary Bergen, Janet S. Dock and Dorothy Woods for valuable assistance in the field. The cooperation from the staff of the Charles Darwin Research Station, especially Peter Kramer, Tjitter De Vries and the captain, Bernhard Schreyer and crew of the *Beagle* III is gratefully acknowledged. Ing. Carlos Gonzales, Director General de Desarrollo Forestal and Jose Villa, Oficial de Conservacion, Parque Nacional Galapagos kindly provided scientific research and collecting permits.

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THE BRITISH HERPETOLOGICAL SOCIETY

The British Herpetological Society was founded in 1947 with the broad aim of catering for all aspects of interest in reptiles and amphibians. Initiated by a small number of enthusiastic and well-known naturalists, including the first president and author of the standard textbook on British herpetofauna, Dr. Malcolm Smith, the Society expanded rapidly and today enjoys national status with many international connections.

Activities of members range over a number of interrelated fields. In many cases the prime interest is in maintaining, breeding and observing various species in captivity and the Society acts as a forum for the interchange of experiences in this area. Others are concerned with the observation of animals in the wild state. There are active sub-committees which help to cater for these various tastes: the *Captive Breeding Committee* and the *Conservation Committee*. The former encourages the development of effective breeding techniques for captive specimens, thus providing animals for observation and study in vivaria, while simultaneously reducing the need to take fresh stock from wild and possibly declining populations. The Conservation Committee is actively engaged in field study, conservation management and political lobbying with a view to improving the status and future prospects for our native British species. It is the accepted authority on the conservation of reptiles and amphibians in the U.K. and has an advisory role to the Nature Conservancy Council (the statutory government body).

Meetings

About ten meetings covering a broad sphere of interests are held each year.

Publications

British Journal of Herpetology, published twice yearly, each June and December, contains papers of original research in herpetology.

British Herpetological Society Bulletin, also published each June and December, contains notices, news items, articles and original papers on all aspects of herpetology.

The Care and Breeding of Captive Reptiles, a book containing a collection of papers on recent developments in breeding reptiles in captivity. This publication is not included in members' subscriptions, but is available to members at a price of £3.00. Purchase orders should be sent to the Chairman of the Captive Breeding Committee.

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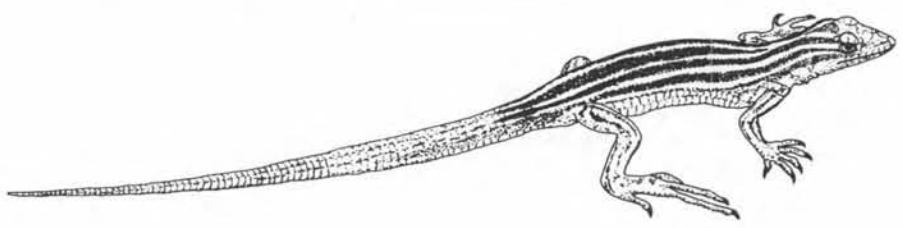
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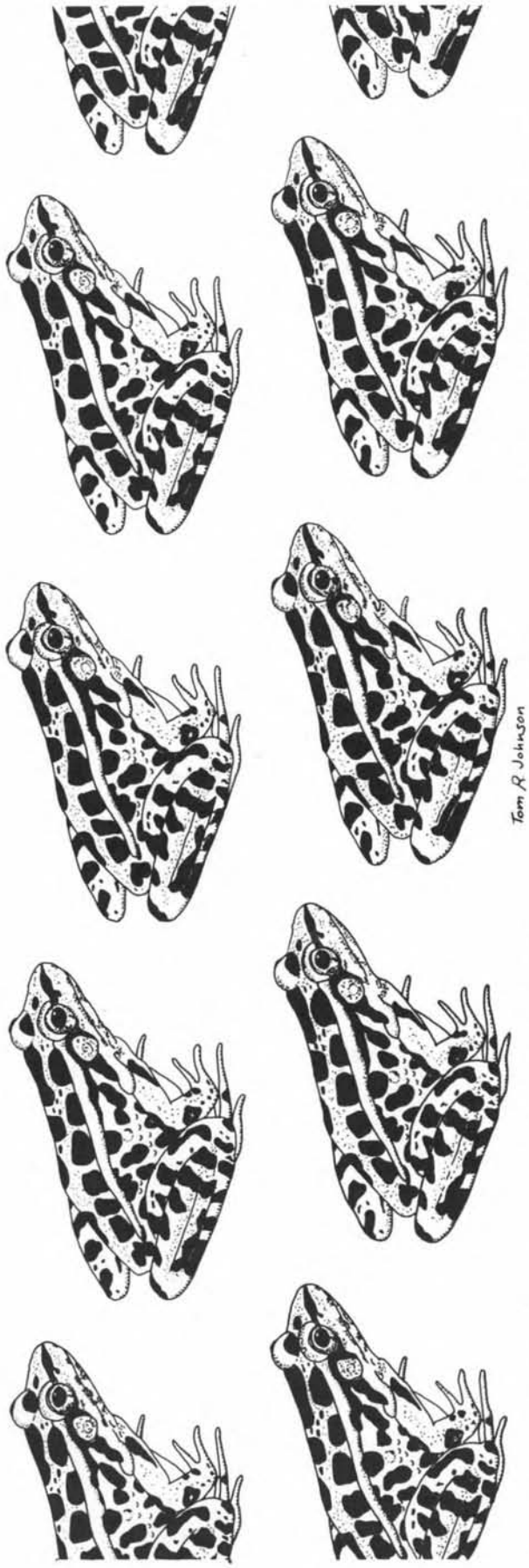
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SSAR CELEBRATES SILVER ANNIVERSARY

The 25th Annual Meeting of the Society for the Study of Amphibians and Reptiles was held jointly with the Herpetologists' League in Raleigh, North Carolina, during 1-6 August 1982. Under the leadership of Ray E. Ashton, Jr., the conference was hosted by the North Carolina State Museum of Natural History. By every measure, the event was a resounding success and is believed to be the largest herpetological meeting ever held, with an official registration of 530 and an estimated attendance in excess of 600. The meeting took place on the campus of Meredith College in Raleigh, where all sessions were held and most persons were housed and took their meals. This self-contained aspect added to the friendly and productive nature of the meeting.

There were registrants from many countries including Australia, Canada, England, France, India, Italy, Japan, México, the Netherlands, New Zealand, Panamá, Poland, Puerto Rico, South Africa, South Korea, Spain and West Germany, as well as officers from all of the world's major herpetological societies whose presence highlighted the Society's Silver Anniversary. As one measure of the continuing success and drawing power of the Society's joint meetings, two satellite conferences were held at nearby sites immediately before and after the Raleigh meeting: the "Sixth Symposium on Propagation and Husbandry of Captive Reptiles" (Washington, D.C., 29-31 July) and the "Conference on Plethodontid Salamanders" (Highlands Biological Station, North Carolina, 7-10 August).

Letters of greetings on the Society's anniversary were received by SSAR President Kraig Adler from leading herpetologists, societies and other persons. Among them was a congratulatory letter from Ronald Reagan, President of the United States, noting the Society's rapid growth since 1958 and its innovative service to the entire herpetological community. Governor James A. Rhodes of Ohio wrote that "We are proud that the Society had its beginnings in Ohio" and to note the growth of SSAR into the largest society devoted to the scientific study of amphibians and reptiles.

It was a highly successful meeting, both in terms of scientific discussions and in the informal interactions that occurred. Certainly it was a most fitting way to celebrate the Society's first 25 years and set a standard for the future.

THE WHITE HOUSE

WASHINGTON

June 30, 1982

I am delighted to send warmest greetings and congratulations on the 25th anniversary of the Society for the Study of Amphibians and Reptiles.

As members of the largest professional herpetological society, you can take great pride in your organization's record of growth and innovation. In a short time you have grown from a small regional group of amateur herpetologists to an international organization of professionals. Your rapid progress has been the result of increased and imaginative service to the herpetological community in the areas of science, education, and conservation. You have harnessed the energies and talents from the entire herpetological community and, in so doing, have created a society that demonstrates the greatness that can be achieved through a spirit of cooperation and initiative.

Again congratulations at this milestone and my best wishes for every continued success in the years ahead.

Sincerely,

Ronald Reagan

Letter of congratulations from President Ronald Reagan, sent on the occasion of the Society's Silver Anniversary.

SSAR Board of Directors Meeting

The annual meeting of the Board was held on Sunday, 1 August, under the chairmanship of Kraig Adler. All Board members were present plus other officers, editors, committee chairs and a large number of visitors, most of whom remained throughout the 12-hour meeting to consider a vast range of topics. With six different publication series and an active committee system, there were many important and often highly complex issues to resolve. The main decisions were announced at the Business Meeting on 5 August (see below).

The Board adopted the largest annual budget in the Society's history ($80,000, for 1983). In addition, it reviewed plans to publish Peter C. H. Pritchard's book, the "Turtles of Venezuela," in 1983; this project alone will cost about $90,000. The Treasurer, Henri C. Seibert, announced that Society membership was at its highest level ever for a comparable month of the year and that, by the end of 1982, he confidently expected membership to reach a new record, a tribute to the continuing attractiveness of Society programs and the enormous progress made by the Society in the relatively short span of 25 years.

Opening Ceremonies

At the official start of the meeting, 8:00 AM on 2 August, Ray Ashton, Chairman of the Local Committee, welcomed the group, followed by greetings from Quentin W. Lindsey, Science Advisor to and on behalf of the Governor of North Carolina, and John B. Funderberg, Director of the North Carolina State Museum of Natural History.

The meeting was officially called to order by Kraig Adler who welcomed and individually introduced the many official representatives of national and international herpetological societies, who were asked to stand and be recognized. Because of the special anniversary, Adler then introduced each of the present and past officers and editors of SSAR and its predecessor, The Ohio Herpetological Society, who rose to enthusiastic applause in recognition of their enormous collective efforts over 25 years. To further honor these persons, they were asked to chair the various paper sessions at the meeting.

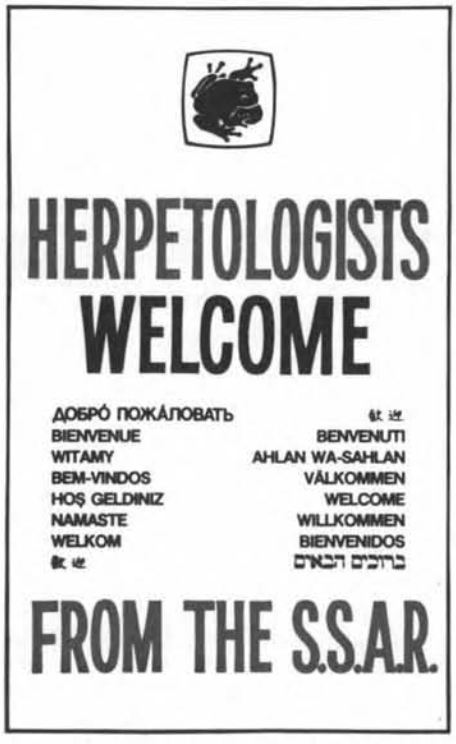
Following these introductions, Robert F. Inger, President of the Herpetologists' League, added his welcome and introduced the League's Distinguished Speaker, Thomas

M. Uzzell, who presented a special lecture entitled "In Praise of Common Widespread Frogs." Immediately afterward the official group photograph was taken.

International Congress

On a recommendation of the joint SSAR-HL-ASIH Herpetological Resources Committee at last year's Memphis meeting, a temporary committee (David B. Wake (ch.), William E. Duellman and John W. Wright) was established to investigate the feasibility of having a Congress of Herpetology. Comments were solicited by the committee from leading herpetologists around the world and, because of the large international representation at Raleigh, it was decided to convene a dinner meeting, on 2 August, to discuss a Congress. The group included officers and official representatives of all the world's major herpetological societies and other international visitors, all of whom were enthusiastic about establishing an International Congress to be held in four or five years at a site to be decided.

Nominated by Marinus S. Hoogmoed of the Netherlands, Kraig Adler was presented as the sole candidate for Secretary-General, and he was unanimously elected and given the responsibility to establish an international advisory committee. After the committee establishes its plans they will be announced officially via herpetological and other journals.



Several multilingual signs were used at the meeting. Registrants represented some 18 different countries from all parts of the world.

Special Symposia, Workshops, and Shows

In addition to the traditional scientific paper presentations, a large number of other events took place at Raleigh, most of them sponsored by SSAR. The highlight of the meeting was an extremely successful two-day symposium arranged and funded by SSAR and organized by David B. Wake entitled "Molecular and Genomic Evolution of Amphibians and Reptiles," consisting of 22 invited papers and an open panel discussion by an international group including the leading specialists in the field. As an adjunct to this symposium, Herbert C. Dessauer arranged informative demonstrations of equipment and techniques illustrating many of the procedures used in gathering the kind of data presented in the symposium. In a special minisymposium organized by Ray E. Ashton, Jr., five well-known researchers presented lengthy talks on controversial aspects of their work, followed by often highly-spirited discussion with the audience. This resurrection of an old idea in paper presentation was highly popular; it was chaired by Herndon G. Dowling.

The Regional Herpetological Societies Conference, now in its 6th year, was sponsored by the SSAR Regional Herpetological Society Liaison Committee, chaired by Janice Perry. This year's program included semi-popular lectures by leading authorities on many topics, all of them richly illustrated with slides and films. The format proved to be highly popular and the two-day event was well attended. Another successful program, sponsored by the SSAR Zoo Liaison Committee chaired by Bern Tryon, was a one-day session entitled "Funding Possibilities for Herpetological Research in Zoos, Museums and Universities". Gary W. Ferguson arranged for representatives from several granting agencies to speak and, later, they held private consultations with interested persons concerning their ideas for research projects.

Two extraordinary multi-media slide shows, simultaneously involving three screens and six projectors, were presented. "Amphibians of the Appalachians," arranged by David M. Dennis and Eric Juterbock, featured a seasonally-changing display of breathtaking photographs of animals and scenery. A second show entitled "Herpetologists Past and Present," produced by David Dennis and Kraig Adler, included a 200-year historical panorama, often highly humorous, of herpetologists and their activities. Both shows attracted standing-room-only crowds and were repeated several times by popular demand. These were followed by an open session where many members brought their own slides to show; this session lasted into the early morning hours!

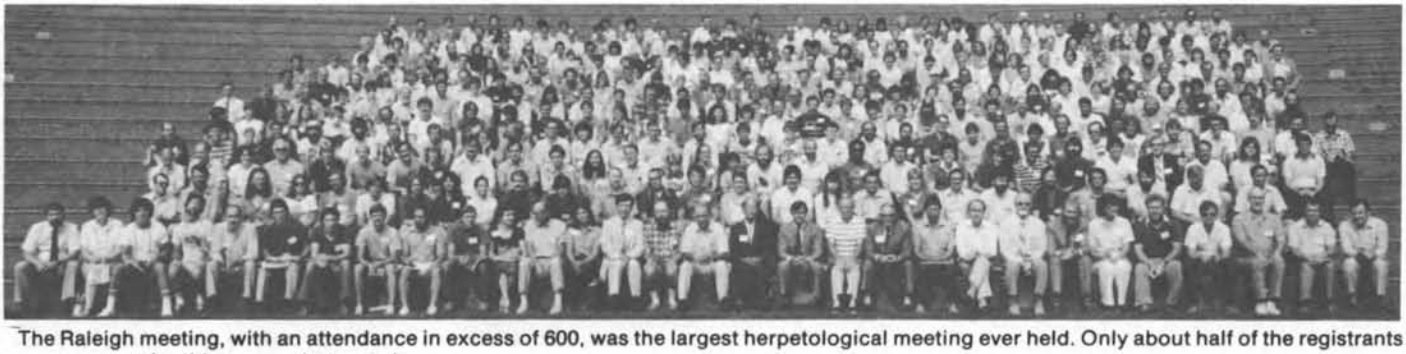
Several workshops were also held at Raleigh. The IUCN Tortoise Group, chaired by Peter Pritchard, had a public meeting and discussion, followed by a session of the Gopher Tortoise Council arranged by Robert Mount. David Dennis, Eric Juterbock and Ray Ashton ran a photography workshop, a how-to-do-it session that was most popular.

Social Events and Tours

Several social events were organized, allowing for informal discussions. One evening social was held at the State Fairgrounds during which, under the deft hand of auctioneer Joseph T. Collins, nearly $1700 was raised to support the local meeting expenses by selling books and other herpetological paraphernalia including many SSAR publications donated for the purpose. The auction itself was great fun, having become an instant tradition after being started at the Memphis meeting last year. Another evening was spent at the VFW Lodge in Carey which included a pig pickin', the North Carolina version of a barbecue. No one left hungry!

Past and present SSAR officers and editors gathered at a special banquet on 4 August to celebrate the Society's Silver Anniversary. SSAR President and co-founder Kraig Adler reviewed the history of the Society with the assistance of slides provided by David Dennis, the other co-founder. Most of the officers of the old Ohio Herpetological Society also were present for the reunion, to join in for a champagne toast to the Society's future.

A number of tours were sponsored by the Local Committee including the North Carolina State Museum of Natural History, local historic sites, the Governor's mansion, the



The Raleigh meeting, with an attendance in excess of 600, was the largest herpetological meeting ever held. Only about half of the registrants were present for this group photograph.

North Carolina State University Arboretum, textile mills, etc. On the last day of the meeting, 6 August, all-day field trips were taken to the unique Sand Hills of Southeastern North Carolina, arranged by Alvin Braswell, and to the McKaine Tract in the Carolina coastal plain, led by David S. Lee.

Business Meeting

The annual business meeting of SSAR was called to order by President Kraig Adler at 13:30 hr on 5 August. President Adler welcomed SSAR members and visitors.

Treasurer Henri Seibert reported that (1) SSAR's membership will reach a new record by the end of 1982; (2) there has been a deceleration in the rate of growth, however, mostly in student members; (3) Society finances are intact and there will be no increase in dues for 1983; (4) the SSAR Board of Directors approved a budget of $80,000 for 1983; and (5) the Society mailing list is being computerized and any changes of address should be sent immediately to the Treasurer.

Secretary James Jacob asked members to encourage colleagues and students who are not SSAR members to apply for membership. A domestic membership drive is ongoing and its success will be partially dependent upon the support of SSAR members.

Journal of Herpetology Editor Rodolfo Ruibal reported that (1) the *Journal* is receiving some 170 manuscripts per year of which about 45% are accepted; (2) the *Journal* is publishing approximately 70 manuscripts per year, but this may increase with the new printing format employed by Allen Press; and (3) time between *original submission* and publication is less than one year. Ruibal acknowledged the dedicated efforts of the *Journal* reviewers during the past year.

Adler announced a change in the editorship of *Herpetological Review* effective 1 January 1983. George Pisani will resign as Editor and assume the position of Managing Editor. Martin J. Rosenberg will be the new Editor.

Catalogue of American Amphibians and Reptiles Editor Stephen Tilley announced that (1) 25 accounts are being published again this year, with the first group scheduled to appear in the fall of 1982 and the second early in 1983; (2) a *Catalogue* index (thru account 320) will be provided with the second group of 1982 accounts; and (3) all past *Catalogue* accounts, a complete set of tabs, and a 1982 subscription will soon be available for a limited period of time for the special discount price of $95 (details are announced elsewhere in this issue of *Herpetological Review* 13). (see page 114)

Facsimile Reprints Editor Kraig Adler announced that (1) Anderson's "Herpetology of Arabia," with an introduction by Alan Leviton, will appear in 1983, and (2) SSAR will reprint Daudin's "Histoire Naturelle des Rainettes, des Grenouilles et des Crapauds" in 1984, jointly with Société Herpétologique de France, with an introduction by Jean Lescure. As Editor of the *Contributions to Herpetology* series, Adler also announced that Peter Pritchard's "Turtles of Venezuela" will appear in 1983.

President Adler noted that the second edition of "Standard Common and Current Scientific Names for North American Amphibians and Reptiles" has been published in the *Herpetological Circulars* series and is selling rapidly. He announced that SSAR will publish and sell a membership list (dated 31 December 1982) as a *Herpetological Circular* in early 1983. It will also include addresses of all herpetological societies in the world. He also announced that, beginning 1 January 1983, J. T. Collins will move from Editor to Associate Editor and that Neil Ford will assume the Editorship of *Circulars*.

Publications Secretary Douglas Taylor reviewed the activities of his office during 1981, noting that (1) $18,564 was received from about 6,000 transactions, (2) a 10-year index for the *Journal of Herpetology* is now available for purchase, and (3) there will be limited-time special discounts available on SSAR publications in the near future (details are announced in this issue of *Herpetological Review*). (see page 167)

Lynne Houck, Chair of the joint SSAR/HL Meeting Site Committee, announced that (1) John Legler will host the 1983 meeting on the campus of The University of Utah in Salt Lake City during 7-12 August, (2) a site for the 1984 meeting has yet to be chosen [later, it was decided to meet at The University of Oklahoma, jointly with HL and ASIH, 29 July - 4 August 1984], and (3) a meeting in Mexico City is being considered for a later date.

Grants-In-Herpetology Committee Chair Martin J. Rosenberg announced the names of the winners in each category for 1982 and the titles of their proposals (see *HR* 13(3):70). Rosenberg acknowledged the excellent work of his committee. He also announced that the awards for 1983 will be increased to $450 per category.

The report of the Nominating Committee was presented by John Wright, Committee Chair. The nominees for SSAR office in 1983 are:

President-Elect:
James Bacon and Carl Gans
Secretary:
James Jacob (unopposed)
Treasurer:
Henri Seibert (unopposed)
Board of Directors:
John Behler, Hugh Quinn, Linda Maxson, and Larry Wilson

No additional nominations were received from the floor. The ballot for 1983 appeared in the September issue of *Herpetological Review*.

President Adler announced that Christine Maguire was the winner of the 1982 Kennedy Award for the best student paper published in *Journal of Herpetology* in 1981, for her paper entitled *"Plethodon glutinosus* metabolism: applicability to natural populations."

The floor was opened to new business and Paul Hertz made a motion (seconded by Itzchak Gilboa) to adopt the following resolution:

Whereas, an Equal Rights Amendment has been reintroduced in the U.S. Congress and will require ratification by state legislatures for eventual incorporation into the U.S. Constitution and,

Whereas, the ratification of the Equal Rights Amendment is intended to guarantee the equality of professional opportunities and remuneration,

Be It Resolved, that the membership of the SSAR make every effort to schedule annual meetings of the Society in states whose legislatures have ratified the ERA.



Commemorative poster by David M. Dennis which was issued to all meeting registrants. Copies of this full-color drawing of an Arizona Gila Monster *(Heloderma suspectum)* are available for purchase from the SSAR Publications Secretary, Douglas H. Taylor, at a cost of $10 including postage.

Henri Seibert introduced the following amendment to the motion: If the proposed resolution endangers the Society's tax-free status, the resolution becomes null and void. The amendment to the motion was defeated, and the motion to adopt the resolution made by Paul Hertz was approved.

There being no further new business, President Adler yielded the floor to Norman J. Scott, Jr. of the Resolutions Committee for presentation of the following resolutions:

1. *Whereas*, the Society owes the Local Committee a great debt of gratitude for their work and dedication, which have provided us with a well organized, informative, and very enjoyable meeting. *Be It Resolved*, that we extend our thanks to the Local Committee Chairman, Ray Ashton, and Committee members: Jesse Perry, Kaye Cross, Marlene Donabedian, William Palmer, Bill Faircloth, David Lee, Alvin Braswell, John E. Cooper, Alexa Williams, David Dennis, Robert Bader, Wayne Van Devender, Sandy Echternacht, George Barthalmus, Mary Kay Clark, and John Funderburg. We would also like to thank the following people for their assistance: Art Pitzer; C. R. Parkhurst; Dan Hudson; Dan Smith; Paul Kumhyr; David Stephan; Maryruth Reiss; Marie Mason; Eloise Cofer; Marjorie Shaw; Mrs. R. P. Ballard; The Cary V.F.W. Post; Western



Seal engraved by Hajime Fukada, President of Herpetological Society of Japan, to commemorate the Silver Anniversary of SSAR. The Chinese characters read, from right to left, "Dragon Snake Avoid Viciousness" in the *Chuàn* (in Japanese, *Ten*) style of 1000-200 B.C. In ancient times, men who went into the mountains or deep forests carried this seal as a charm to avoid dangerous snakes.

Wake 4-H Club; The N.C. State Museum's Junior Naturalists, Junior Curators, and volunteers; Members of the North Carolina Herpetological Society; The North Carolina Natural History Society; The International Affairs and Conservation Departments of the Women's Club of Raleigh; and North Carolina State University.

2. *Whereas*, the Symposium on Molecular and Genomic Evolution has stimulated timely discussion of techniques and ideas pertinent to evolutionary biology, *Be It Resolved*, that we thank Dave Wake and Herb Dessauer for organizing the symposium and coordinating the demonstrations.
3. *Whereas*, we have also enjoyed several excellent programs, *Be It Resolved*, that we thank Jan Perry, for organizing the Regional Society Conference; Gary Ferguson, for the session on grant possibilities for herpetological research; and David Dennis and Eric Juterbock, for their superb slide shows and photography workshop.
4. *Whereas*, the Society officers who retired last year have proved their devotion to the Society by promoting its aims, *Be It Resolved*, that we thank: Bob Webb, for serving as Immediate Past President; George Pisani, for his work as Editor of *Herpetological Circulars;* Barb Paschke, for her efforts as Associate Editor of *Herpetological Review;* Herb Dessauer and Ed Moll for their service as Directors; J. T. Collins for his service as Secretary of the Society; and the late "Duke" Campbell, for serving as Crocodilian Section Editor of the *Catalogue of American Amphibians and Reptiles*.
5. *Whereas*, the Society has celebrated its 25th Anniversary during this meeting, and
   Whereas, the Society has been sustained during these years by the dedication of many people,
   Be It Resolved, that we express our appreciation by singling out a few of the more prominent contributors, to wit: Henri Seibert, who has served the SSAR since 1962 in various capacities, we hope that he will continue to assist for the next 20 years; Joseph T. Collins, who has also served the Society for 20 years in a record number of positions; Kraig Adler and Dave Dennis, co-founders of the Society; and Doug Taylor, for his long years in the critical job of Publications Secretary.
6. *Whereas*, during our Silver Anniversary meeting we have been honored by the presence of many official delegates and officers of national and international herpetological societies;
   Be It Resolved, that we are delighted to welcome the following: William R. Branch (Herpetological Association of Africa); Gregory A. Mengden (Australian Society of Herpetologists); Michael R. K. Lambert and G. A. D. Haslewood (British Herpetological Society); Marinus S. Hoogmoed (Societas Europaea Herpetologica); Jean-M. Exbrayat (Société Herpétologique de France); Konrad Klemmer (Deutschen Gesellschaft für Herpetologie und Terrarienkunde); Benedetto Lanza (Italian Herpetological Group); Hajime Fukada and Richard C. Goris (Herpetological Society of Japan); James D. Fawcett (New Zealand Herpetological Society); Jorge Luis Piñero (Sociedad para el Estudio de los Quelonios, Puerto Rico); and Marvalee Wake (American Society of Ichthyologists and Herpetologists).

The resolutions were adopted unanimously to enthusiastic applause.

President Adler then introduced Ralph Axtell, who will assume the presidency of SSAR in 1983, and presented him with the richly-decorated Society gavel. There being no further business, President-elect Axtell adjourned the meeting at 14:18 hr.



To celebrate the Society's Silver Anniversary, representatives of all major national and international herpetological societies were present. Pictured, from left: **Row 1,** Mrs. Haslewood, G. A. D. Haslewood and Michael R. K. Lambert (England): Jorge Luis Piñero (Puerto Rico); James D. Fawcett (New Zealand); Marinus S. Hoogmoed (the Netherlands); Hajime Fukada and Richard C. Goris (Japan); **Row 2,** Jacek M. Szymura (Poland); Kraig Adler (SSAR); Marvalee H. Wake (ASIH); David J. Ball (England); Robert F. Inger (HL); Konrad Klemmer and H. S. R. Glaser (West Germany); Benedetto Lanza (Italy); W. R. Branch (South Africa); Mrs. Lanza (Italy). Other official representatives present but not pictured: Jean-Marie Exbrayat (France) and Gregory A. Mengden (Australia). This group, together with other international members, also met to consider the feasibility of an International Congress of Herpetology.

Papers and Posters Presented

About 200 papers were presented during the five-day meeting, in three concurrent sessions. Titles are presented below in order of session. Extra copies of the 117-page Program Booklet, which includes abstracts for most of these papers, are available from the SSAR Publications Secretary, Douglas H. Taylor. These can be supplied at cost, $6 within continental USA, $6.50 overseas (prices *include* book rate surface postage; airmail would be an additional charge).

Sixth Annual Regional Society Workshop

EXOTIC PLACES, EXOTIC HERPS: TRAVELS THROUGHOUT THE WORLD
Cosponsored by SSAR Regional Herpetological Society Liaison Committee and The North Carolina Herpetological Society
Moderator: Janice Perry, Dallas Zoo

A VISIT TO STEPHEN'S ISLAND, HOME OF THE TUATARA, *SPHENODON PUNCTATUS*. Ron Goellner, St. Louis Zoo.

CAPTIVE BREEDING AND THE CURRENT STATUS OF THE HERPETOFAUNA OF THE INDIAN OCEAN. Sean McKeown, Honolulu Zoo, Hawaii.

THE EPIDEMIOLOGY OF GRAM NEGATIVE BACTERIA IN REPTILES (film). Richard Ross, Palo Alto, California.

THE SUCCESSFUL BREEDING OF LIZARDS FROM TEMPERATE REGIONS. B.A.W.A. Langerwerf, The Netherlands.

THE HERPETOFAUNA OF THE ANDES. William E. Duellman, University of Kansas.

AUSTRALIAN CHELID TURTLES. John Legler, University of Utah.

THE LIZARDS OF EUROPE AND THE CAUCASUS. B.A.W.A. Langerwerf, The Netherlands.

CROCODILE FARMS IN THAILAND. Robert Bader and Elliot Jacobson, University of Florida.

GOLIATH FROGS IN FACT AND FICTION—HUNTING THE WORLD'S LARGEST FROG. John Behler, Bronx Zoo.

GRANT POSSIBILITIES FOR HERPETOLOGICAL RESEARCH IN ZOOS, MUSEUMS AND UNIVERSITIES
Sponsored by SSAR Zoo Liaison Committee

OPENING REMARKS: Gary Ferguson, Texas Christian University.
NATIONAL SCIENCE FOUNDATION PROGRAMS. Harold Voris, National Science Foundation.
U.S. DEPARTMENT OF INTERIOR PROGRAMS. C. Kenneth Dodd, Office of Endangered Species.
NEW YORK ZOOLOGICAL SOCIETY GRANTS PROGRAM. John Behler, New York Zoological Park.
SMITHSONIAN PROGRAMS. Dale L. Marcellini, National Zoological Park.
FUNDING IN THE PRIVATE SECTOR. Robert A. Thomas, Louisiana Nature Center.
THE CENTER FOR FIELD RESEARCH (EARTHWATCH). Elizabeth McMahan, University of North Carolina.
BUREAU OF LAND MANAGEMENT PURCHASE ORDERS AND CONTRACTS. Kristin H. Berry, Bureau of Land Management.
PANEL DISCUSSION — RESEARCH OPPORTUNITIES IN ZOOS. Panel Members: Hugh Quinn, Moderator (Houston Zoo), Charles Carpenter (University of Oklahoma), James Bacon (San Diego Zoo), Dale Marcellini (National Zoo), John Behler (New York Zoo), and Elliot Jacobsen (University of Florida).

SSAR 25TH ANNIVERSARY SYMPOSIUM
MOLECULAR AND GENOMIC EVOLUTION OF AMPHIBIANS AND REPTILES
Organized by David B. Wake, University of California at Berkeley

INTRODUCTORY COMMENTS: David B. Wake
Introductory Lecture: **GENETIC INFERENCE FROM ELECTROPHORETIC PHENOTYPES OF PROTEINS, AN INTRODUCTION.** Herbert C. Dessauer, Louisiana State University Medical Center.

Session I: PROBLEMS AT THE LEVEL OF POPULATIONS. Moderated by David B. Wake.
IS THE NEWT METAPOPULATION MODEL GENERAL? Douglas E. Gill, University of Maryland.
GENETIC RECOMBINATION IN ZONES OF SECONDARY INTERGRADATION IN AMPHIBIANS AND REPTILES. David L. Jameson, University of Houston.
THE CLONAL NATURES OF THE *AMBYSTOMA JEFFERSONIANUM* COMPLEX. James P. Bogart, University of Guelph (Ontario, Canada).
HYBRID ZONES IN TOADS, GENUS *BUFO*: PATTERNS AND PREDICTIONS. David M. Green, University of California at Berkeley.

Session II: PROBLEMS IN SPECIATION AND SPECIES INTERACTIONS. Moderated by Herbert C. Dessauer.
GENIC DIFFERENTIATION AND ITS CORRELATES IN THE *DESMOGNATHUS OCHROPHAEUS* AND *FUSCUS* COMPLEXES. Stephen G. Tilley, Smith College.
THE CORRELATION BETWEEN REPRODUCTIVE ISOLATION AND GENETIC DIFFERENTIATION IN EASTERN LARGE *PLETHODON*. Richard Highton, University of Maryland.
NATURAL HYBRIDIZATION BETWEEN *BOMBINA BOMBINA* AND *B. VARIEGATA* (ANURA: DISCOGLOSSIDAE): A COMPARATIVE STUDY OF HYBRID ZONE STRUCTURE IN SOUTHERN POLAND AND WESTERN YUGOSLAVIA. Jacek M. Szymura, Jagellonian University (Krakow, Poland).
HYBRIDIZATION BETWEEN SUBSPECIES OF *ENSATINA*. Kay P. Yanev, University of California at Berkeley.
THE RECOGNITION AND RELATIONSHIPS OF SPECIES IN A HIGHLY PAEDOMORPHIC LINEAGE: A BIOCHEMICAL STUDY OF THE MEXICAN AMBYSTOMATID SALAMANDERS. H. Bradley Shaffer, University of Chicago.
SPECIES WITH EXTREME AMOUNTS OF GENETIC DIFFERENTIATION: THE SPECIES PROBLEM IN *RHYACOTRITION* AND *PSEUDOEURYCEA*. David B. Wake, University of California at Berkeley.

Session III: PHYLOGENETIC INFERENCE. Moderated by W. Ronald Heyer, National Museum of Natural History, Washington.
MOLECULAR PHYLOGENIES: FRAMEWORKS FOR ADDRESSING MAJOR EVOLUTIONARY QUESTIONS. Linda R. Maxson, University of Illinois at Urbana-Champaign.
OPPORTUNITIES AND LIMITATIONS OF MICROCOMPLEMENT FIXATION TECHNIQUES. Thomas Uzzell, Academy of Natural Sciences of Philadelphia.
MOLECULAR GENETICS AND SYSTEMATICS OF THE CROCODILIA. Llewellyn D. Densmore, Louisiana State University Medical Center.
THE NEOTROPICAL COLUBRID SNAKE FAUNA: LINEAGE COMPONENTS AND BIOGEOGRAPHY. John E. Cadle, University of California at Berkeley.
BIOCHEMICAL CHARACTERS AND THE RECONSTRUCTION OF TURTLE PHYLOGENIES: RELATIONSHIPS AMONG BATAGURINE GENERA. J. W. Sites, Brigham Young University.

Session IV: ANALYTICAL AND TECHNICAL ADVANCES. Moderated by John W. Wright, Los Angeles County Museum of Natural History.
PATTERNS OF KARYOTYPIC EVOLUTION IN REPTILES. John W. Bickham, Texas A&M University.
CHROMOSOMES, DNA SEQUENCES AND EVOLUTION IN NEWTS AND SALAMANDERS. Herbert C. Macgregor, University of Leicester (United Kingdom).
MITOCHONDRIAL DNA SEQUENCES ANALYSIS AND REPTILIAN SYSTEMATICS: APPLICATIONS IN THE LIZARD GENUS *CNEMIDOPHORUS*. Wesley M. Brown, University of Michigan.
GENOMIC COMPOSITION OF REPTILES: EVOLUTIONARY PERSPECTIVES. Ettore Olmo, University of Naples (Italy).
THE SIGNIFICANCE OF SEX CHROMOSOMES IN THE EVOLUTION OF SALAMANDER GENOMES. Stanley K. Sessions, University of California at Berkeley.
CHROMOSOME BANDING ANALYSIS IN ELAPID SNAKES AND ITS PHYLOGENETIC IMPLICATIONS. Gregory A. Mengden, Australian National University (Canberra City).

Session V: Open Panel Discussion: RESEARCH OPPORTUNITIES AND PROSPECTS. Moderated by David B. Wake.



Eighty present and past Society officers and editors — about three-fourths of all persons serving over the past 25 years — gathered at Raleigh for a special banquet to celebrate the anniversary. Pictured are those individuals who were active during the early days when the Society was The Ohio Herpetological Society (1958-1966), from left: Kraig Adler, Ray Ashton, Paul Daniel, Stephen Tilley, David Dennis, Barry Valentine, Roger Conant, Corson Hirschfeld, Joseph Collins, Ronald Brandon and Henri Seibert.

TECHNIQUES FOR SYSTEMATICS STUDIES FOCUSED AT THE CHROMOSOMAL AND MOLECULAR LEVELS (part of featured symposium).
Demonstrations organized by
Herbert C. Dessauer, Louisiana State University Medical Center

ELECTROPHORETIC METHODS. Robin Lawson, Louisiana State University; Reed Kaltenbach, University of New Orleans; and Herbert C. Dessauer.

PROTEIN FINGERPRINTING AND IMMUNODIFFUSION METHODS. Llwellyn D. Densmore and Herbert C. Dessauer, Louisiana State University Medical Center.

MICROCOMPLEMENT FIXATION. Stanley K. Sessions, University of California at Berkeley.

TISSUE COLLECTION, PACKAGING, AND STORAGE. All contributors.

Special Paper Session
CONTROVERSIAL IDEAS IN HERPETOLOGY
Moderated by Herndon G. Dowling (former SSAR Editor), New York University

TAXONOMIC RECOGNITION OF BIOCHEMICALLY DIFFERENT POPULATIONS. Richard Highton, University of Maryland.

HOMOLOGUES OF PORTIONS OF THE ADDUCTOR-MANDIBULAR IN SNAKES. Samuel B. McDowell, Rutgers University, Newark.

DO MOLECULES EXHIBIT CLOCKLIKE BEHAVIOR. Linda Maxson, University of Illinois at Urbana-Champaign.

FORM, FUNCTION AND EVOLUTION: A SYSTEMATIC PANACEA? Linda Trueb, University of Kansas.

THE AMPHISBAENIA, AN ORDER OF REPTILES? Carl Gans, University of Michigan. [After repeated interruptions by the audience, the author switched his topic to functional morphology.]

POSTER SESSION
Chairman: Arthur Echternacht, University of Tennessee at Knoxville.

TEMPERATURE RELATIONSHIPS IN *CROTALUS HORRIDUS*. Lauretta M. Bushar, Lehigh University.

EMBRYONIC DEVELOPMENT AND GROWTH WITH *TYPHLONECTES COMPRESSICAUDUS* (APODA: AMPHIBIA). CONSTITUTION OF AN ECTOTROPHOBLAST. J. Delsol, J. Flatin, J.-M. Exbrayat and J. Bons, Laboratoire d'Etude du Développment post-embryonnaire des Vertébrés Inférieurs et Laboratoire de Biogéographie et Ecologie des Vertébrés de l'Ecole Pratique des Haustes Etudes - Laboratoire de Biologie de la Faculte Catholiques des Sciences de Lyon, France.

SEASONAL ANDROGENIC AND TESTICULAR ACTIVITY IN ROUGH GREEN SNAKES. James J. Greenhaw, James S. Jacob, and Michael V. Plummer; Memphis State University (JJG, JSJ) and Harding University (MVP).

LAMPBRUSH CHROMOSOMES AND THEIR DEVELOPMENT IN *PSEUDOBRANCHUS*. James Kezer, University of Oregon.

AN ANALYSIS OF HYBRID ZONE BETWEEN TWO SUBSPECIES OF *ENSATINA ESCHSCHOLTZI*. Robert J. Macey, Berkeley, California.

A USEFUL COLOR GUIDE FOR FIELD STUDIES. Roy W. McDiarmid, Fish and Wildlife Service, National Museum of Natural History, Washington.

INTER- AND INTRASPECIFIC CHANGES IN TURTLE POPULATIONS DURING THE LAST DECADE IN AN OZARK RIVER. Max A. Nickerson and Mark Tohulka, Milwaukee Public Museum and Max Allen's Zoological Gardens.

SYNTHESIS OF INSULIN IN ANOLIAN PANCREAS. William B. Rhoten, University of Medicine and Dentistry of New Jersey - New Jersey Medical School.

ANATOMY OF THE NECK OF THE WESTERN PAINTED TURTLE, *CHRYSEMYS PICTA BELLI*. Tom Scanlon, University of Michigan.

CONTRIBUTED PAPER SESSIONS
Coordinator: R. Wayne VanDevender, Appalachian State University

Session A-1, Chairman: James R. Dixon (former SSAR President), Texas A&M University.

ZOOGEOGRAPHY OF SOUTH AMERICAN TURTLES. Peter C.H. Pritchard, Florida Audubon Society.

GEOGRAPHIC VARIATION IN THE NEOTROPICAL TURTLE, *PLATEMYS PLATYCEPHALA*. Carl H. Ernst, George Mason University.

SYSTEMATICS OF NEOTROPICAL GASTROPOD-EATING SNAKES: THE GENUS *SIBON*, WITH COMMENTS UPON *DIPSAS* AND *SIBYNOMORPHUS*. Christopher P. Kofron, Louisiana State University.

PRELIMINARY COMMENTS ON THE ZOOGEOGRAPHY OF TRINIDAD'S HERPETOFAUNA. John C. Murphy, Plainfield, Illinois.

THE *RANA PIPIENS* COMPLEX IN LOWER CENTRAL AMERICA. David M. Hillis and John S. Frost, University of Kansas.

SPECIATION IN BUFONID GENUS *OREOPHRYNELLA*. Roy W. McDiarmid and S. Blair Hedges, Fish and Wildlife Service, National Museum of Natural History, Washington and University of Maryland.



Poster sessions, arranged by the Herpetologists' League, allowed for an alternative to oral presentation of research results. Authors were present at prescribed times to allow for personal discussions. This productive format will be continued and expanded at future meetings.

LIZARD TAIL AUTOTOMY: FUNCTION AND ENERGETICS OF POST-AUTOTOMY TAIL MOVEMENT. Benjamin E. Dial, Texas A&M University.

Session A-2, Chairman: Harry W. Greene (former SSAR Director), University of California at Berkeley.

SEASONALITY IN TROPICAL LIZARD REPRODUCTION: CONSEQUENCES OF FORAGING MODE? Laurie J. Vitt, Savannah River Ecology Laboratory and University of Georgia.

WHY NEST BURROW PIRACY DOESN'T WORK FOR IGUANAS. A. Stanley Rand, Smithsonian Tropical Research Institute, Panama.

SELECTION FOR A RESTRICTED NESTING SEASON IN THE GREEN IGUANA *(IGUANA IGUANA)*. Brian C. Bock, University of Tennessee at Knoxville.

DIET SELECTION AND DIGESTION IN *IGUANA IGUANA*: THE IMPORTANCE OF AGE AND NUTRIENT REQUIREMENTS. Katherine Troyer, University of California at Davis and Smithsonian Tropical Research Institute.

THE FUNCTION AND UTILIZATION PATTERN OF POSTHATCHING YOLK STORES IN A HERBIVOROUS LIZARD, *IGUANA IGUANA*. Katherine Troyer.

LIFE HISTORIES FOR TWO SPECIES OF *SPHAERODACTYLUS* (GEKKONIDAE) IN PUERTO RICO. Ava Gaa, University of Puerto Rico.

Session A-3, Chairman: Carl Gans (former SSAR Director), University of Michigan.

TAXONOMIC SIGNIFICANCE OF VERTEBRAE FROM RECENT COLUBRID SNAKE GENERA OF NORTH AMERICA (NORTH OF MEXICO). Barbara Brummer, New York University.

ARE THE SCALE COUNTS USED IN SNAKE SYSTEMATICS HERITABLE? Stevan J. Arnold, University of Chicago.

SYSTEMATIC IMPLICATIONS OF ONTOGENETIC CHANGES IN THE CRANIAL MORPHOLOGY OF SNAKES. Randy H. Vaeth, Louisiana State University.

CHARLES CAMP AND THE PHYLOGENETIC RELATIONSHIPS OF THE LIZARD FAMILIES. Scott M. Moody, Ohio University.

MORPHOLOGY AND FUNCTION OF THE TONGUE IN ANT-EATING LIZARDS. Kurt Schwenk, University of California at Berkeley.

THE USE OF THE TONGUE AND HYOID APPARATUS DURING FEEDING IN LIZARDS. Kathleen K. Smith, Duke University Medical Center.

LOCOMOTOR PATTERNS IN SOME CREPUSCULAR SKINKS OF AUSTRALIA. Carl Gans and Allen Greer, University of Michigan and the Australian Museum, Sydney.

Session B-1, Chairman: Barry D. Valentine (former SSAR Vice President), Ohio State University.

DIGITAL LOSS AND REDUCTION IN AMPHIBIANS: AN APPROACH THROUGH ONTOGENY, PHYLOGENY AND EXPERIMENTAL EMBRYOLOGY. Pere Alberch, Harvard University.

TAIL MORPHOLOGY, TAIL INJURIES, AND DEFENSIVE BEHAVIOR IN SAND BOAS, GENUS *ERYX:* A PRELIMINARY REPORT. R.A. Sajdak, D.H. Sorensen, and M.A. Strand; Milwaukee County Zoo and University of Wisconsin-Milwaukee.

THE STATUS OF THE *BILINEATA* GROUP OF WEST INDIAN *LEPTOTYPHLOPS*. Richard Thomas, University of Puerto Rico.

EMPIRICAL APPROACHES TO THREE PROBLEMS IN REPTILE ECOLOGY. Harry W. Greene, University of California at Berkeley.

***ANOLIS SAGREI* AND *A. CRISTATELLUS* IN SOUTHERN FLORIDA: A CASE STUDY IN INTERSPECIFIC COMPETITION.** Mark A. Salzburg, University of Miami.

A COMPARISON OF REPRODUCTIVE CHARACTERISTICS IN PARTHENOGENETIC AND BIPARENTAL SPECIES OF *CNEMIDOPHORUS* (LACERTILIA: TEIIDAE). James M. Walker, University of Arkansas.

RATTLESNAKE ENVENOMATION IN TUCSON, ARIZONA: 1973-1980. David L. Hardy, University of Arizona.

Session B-2, Chairman: James Christiansen (former SSAR Assistant Publications Secretary), Drake University.

OSTEOLOGY AND ONTOGENY OF CANNIBALISTIC LARVAE IN *AMBYSTOMA TIGRINUM*. Dave Darda, University of California at Berkeley.

PHYSIOLOGICAL-ECOLOGY OF THERMOREGULATION IN SNAKES. Andrew F. Dull, Ohio University.

HEART RATE-TEMPERATURE RELATIONSHIP IN JAPANESE RAT SNAKES. Hajime Fukada, Kyoto, Japan.

EVOLUTION OF THERMAL SENSITIVITY OF SPRINT SPEED IN SOME AGAMID LIZARDS. Paul E. Hertz, Raymond B. Huey, and Eviatar Nevo; Barnard College, University of Washington, and University of Haifa, Israel.

CORRELATES OF TEMPERATURE AND BEHAVIOR IN *SCELOPORUS MALACHITICUS*. James L. Vial, University of Tulsa.

MORPHOLOGY AND FUNCTION OF THE FEEDING APPARATUS IN *DERMOPHIS*. Marvalee H. Wake, William E. Bemis, and Kurt Schwenk; University of California at Berkeley.

Session B-3, Chairman: J. P. Kennedy (former SSAR Editor), University of Texas Health Center, Houston.

AMERICAN TOADS AND SWEDISH LUMBERJACKS: A UNIFIED VIEW OF PATTERNS IN EXERCISE PHYSIOLOGY. Theodore L. Taigen and Carol A. Beuchat, University of Connecticut and University of Arizona.

HOW BODY SIZE AFFECTS SWIMMING PERFORMANCE IN THE CLAWED FROG, *XENOPUS LAEVIS*. Kirk Miller, Franklin and Marshall College.

ANAEROBIC METABOLISM IN SWIMMING TADPOLES. R.E. Gatten, Jr., J.P. Caldwell, and M.E. Stockard; University of North Carolina at Greensboro and Savannah River Ecology Laboratory.

ASYMMETRICAL DIFFUSION OF SODIUM AND WATER THROUGH SEA SNAKE SKIN. William A. Dunson and Glenn D. Stokes, Pennsylvania State University.





Live displays, arranged by the North Carolina Herpetological Society, occupied several rooms and included nearly every species of amphibian and reptile from North Carolina and surrounding states. This traditional display, inaugurated at the 1968 SSAR meeting, helps to conserve local fauna by allowing people to remove and photograph captive specimens; many terrestrial and aquatic stages were set up in adjacent rooms for use as photographic backgrounds. In addition, a popular photographic workshop was conducted at Raleigh.

SODIUM LOSS IN AMPHIBIAN LARVAE EXPOSED TO LOW pH. Joseph Freda and William A. Dunson, Pennsylvania State University.

LOCALIZATION OF FOUR HORMONES IN OPHIDIAN PANCREAS. William B. Rhoten, University of Medicine and Dentistry of New Jersey-New Jersey Medical School.

NOSTRIL CLOSING MECHANISMS IN FROGS. Rebecca Pyles and Carl Gans, University of Kansas and University of Michigan.

Session C-1, Chairman: Stephen R. Edwards (former SSAR Secretary and Editor), University of Kansas.

MATING CALLS OF HYBRID TOADS AT LONG POINT, ONTARIO. David M. Green, University of California at Berkeley.

SYNCHRONIZED CALLING AND OTHER PREDATOR DEFENSES OF THE FROG *SMILISCA SILA*. Michael J. Ryan and Merlin D. Tuttle, Cornell University and Milwaukee Public Museum.

MORPHOMETRICS AND HABITAT PARTITIONING OF CLOUD FOREST *ELEUTHERODACTYLUS*. Linda S. Ford, University of Kansas.

NEST DEFENSE BY BROODING MALES OF A SUBTROPICAL FROG. Daniel S. Townsend, State University of New York at Albany.

SYNCHRONIZED RESPONSES TO CONSPECIFIC AND HETEROSPECIFIC CALLS IN THE NEOTROPICAL FROG *HYLA EBRACCATA*. Kentwood D. Wells and Joshua J. Schwartz, The University of Connecticut.

GENETIC RELATIONSHIPS OF THE CHORUS FROGS, GENUS *PSEUDACRIS*. S. Blair Hedges, University of Maryland.

FM SIGNALS AND SPECIES RECOGNITION IN A NEOTROPICAL FROG. Michael J. Ryan, Cornell University and Smithsonian Tropical Research Institute.

Session C-2, Chairman: Joseph T. Collins (former SSAR President, Secretary, and present Editor), University of Kansas.

MAINTENANCE OF POSTMETAMORPHIC RANIDS ON ARTIFICIAL FEED. Joseph K. Buttner and George W. Nace, University of Michigan.

MULTIPLE EGG CLUTCHES IN *HYLA REGILLA, HYLA CINERA* AND *HYLA GRATIOSA*. Stephen A. Perrill and Richard E. Daniel, Butler University and Savannah Science Museum.

A SEASONAL SHIFT IN CHOICE OF EGG-LAYING SITES IN THE SOUTHERN LEOPARD FROG, *RANA UTRICULARIA*. Janalee P. Caldwell, Emory University.

PHYLOGENETIC RELATIONSHIPS OF THE OLD WORLD TREEFROGS — I. INTERFAMILIAL RELATIONSHIPS. Darrel Frost and David Cannatella, University of Kansas.

PHYLOGENETIC RELATIONSHIPS OF THE OLD WORLD TREEFROGS — II. INTRAFAMILIAL RELATIONSHIPS. David Cannatella and Darrel Frost, University of Kansas.

RELATIONSHIPS OF EASTERN NORTH AMERICAN RANID FROGS. Barbara Pytel, New York University.

REPRODUCTIVE PARTITIONING AND SPECIES DIVERSITY: AN HYPOTHESIS BASED ON STUDIES OF LEOPARD FROGS. John S. Frost, University of Kansas.

Session C-3, Chairman: Douglas H. Taylor (present SSAR Publications Secretary), Miami University.

BEHAVIORAL AND PHYSIOLOGICAL CORRELATES OF FORAGING MODE IN LACERTIDS. Raymond B. Huey, Albert F. Bennett, Henry John-Adler, and Kenneth A. Nagy; University of Washington, University of California at Irvine, University of California at Los Angeles.

ACTIVITIES AND MOVEMENTS OF THE WESTERN SLENDER GLASS LIZARD, *OPHISAURUS ATTENUATUS ATTENUATUS*. David M. Morton, Miami University.

A COMPARISON OF THE MOVEMENTS OF EASTERN BOX TURTLES, *TERRAPENE C. CAROLINA, ON AND AWAY FROM THEIR HOME RANGES*. Stephen Porter Hall, University of North Carolina at Chapel Hill.

SHORELINE MOVEMENT IN A NONBREEDING POPULATION OF *RANA CATESBEIANA*. M.L. Manis, Miami University.

VISUAL CUES: FEEDING RESPONSE OF *HYLA CINEREA* TO NATURAL PREY. Arthur N. Freed, University of Florida.

SURVIVAL OF EMBRYOS AND LARVAE OF THE FROG, *POLYPEDATES LEUCOMYSTAX* IN MALAYSIA. Callyn D. Yorke, University of Arkansas.

RED, WHITE AND BROWN: PRELIMINARY OBSERVATIONS ON THE COLOR OF CENTROLENID TADPOLES (AMPHIBIA: ANURA: CENTROLENIDAE). Jaime Villa and Carlos

Valerio, University of Missouri-Kansas City and University of Costa Rica, San Jose.

Session C-4, Chairman: Henri C. Seibert (former SSAR Director and Publications Secretary, present Treasurer), Ohio University.

CONSPECIFIC SUBSTRATE PREFERENCES IN THREE SYMPATRIC WATER SNAKES, *NERODIA CYCLOPION CYCLOPION, NERODIA FASCIATA CONFLUENS,* AND *NERODIA RHOMBIFERA RHOMBIFERA.* Barbara Allen, Daniel S. York, and Gordon M. Burghardt, University of Tennessee at Knoxville.

COMPARATIVE STUDY OF DEFENSIVE BEHAVIOR IN THREE SPECIES OF *NERODIA.* Roy M. Scudder and Gordon M. Burghardt, University of Tennessee.

ALTERNATIVE MATING STRATEGIES IN AMPHIBIANS. T.R. Halliday and P.A. Verrell, The Open University (England).

PREDATORY BEHAVIOR OF THE RED SPITTING COBRA *(NAJA MOSSAMBICA PALLIDA).* Charles W. Radcliffe, Karen Estep, and David Chiszar, University of Colorado.

AN ANALYSIS OF FEEDING BEHAVIOR IN A BICEPHALIC BLACK RAT SNAKE. Gordon M. Burghardt, Bruce G. Batts, and Brian C. Bock, University of Tennessee at Knoxville.

SPECIES DENSITIES OF SNAKES AND THEIR POTENTIAL PREY: A RE-EVALUATION. Kenneth Miyata, National Museum of Natural History, Washington.

Session D-1, George Pisani (present SSAR Editor), University of Kansas.

SEASONAL TIMING OF MATING, SPERM STORAGE AND MULTIPLE PATERNITY IN SINGLE LITTERS IN THE COPPERHEAD, *AGKISTRODON CONTORTRIX.* Gordon W. Schuett and James C. Gillingham, Central Michigan University.

FIELD STUDY OF POPULATIONS OF THE TIMBER RATTLESNAKE, *CROTALUS HORRIDUS.* William S. Brown, Skidmore College.

ECOLOGY OF PRAIRIE RATTLESNAKE, *CROTALUS VIRIDIS,* AT THE NORTHERN LIMIT OF ITS RANGE. V.P.G. Gannon and D.M. Secoy, University of Regina (Canada).

GEOGRAPHIC VARIATION IN REPRODUCTIVE CYCLES AND STRATEGIES OF *THAMNOPHIS MARCIANUS.* John P. Karges, University of Texas at Arlington.

THE REPRODUCTIVE CYCLE OF THE SOUTHEASTERN CROWNED SNAKE. R.D. Aldridge and R.D. Semlitsch, St. Louis University and Savannah River Ecology Laboratory.

COMPARATIVE ECOLOGY OF THE RACER, *COLUBER CONSTRICTOR.* Philip C. Rosen, Wayne State University.

ECOLOGY OF A POPULATION OF PLAINS GARTER SNAKES *(THAMNOPHIS RADIX)* IN SOUTHERN SASKATCHEWAN. Marie Selinger, University of Regina (Canada).

Session D-2, Chairman: James L. Vial (former SSAR President and Director), University of Tulsa.

PATTERNS OF RELATIVE CLUTCH MASS IN SNAKES. Richard A. Seigel, University of Kansas.

COTTONMOUTH ACTIVITY PATTERNS IN NORTHWEST FLORIDA. David G. Cook, University of Florida and Tall Timbers Research Station.

DIFFERENTIAL HABITAT UTILIZATION BY SYMPATRIC *CROTALUS HORRIDUS* AND *AGKISTRODON CONTORTRIX:* A MULTIVARIATE APPROACH. Howard K. Reinert, Lehigh University.

GEOGRAPHICAL VARIATION IN THE SEX PHEROMONE DISCRIMINATION ABILITY OF THE PLAINS GARTER SNAKE, *THAMNOPHIS RADIX.* Neil B. Ford, University of Texas at Tyler.

CRYPSIS AND FITNESS IN A SNAKE INTERGRADE COMPLEX. Samuel S. Sweet, University of California at Santa Barbara.

Session D-3, Chairman: Paul M Daniel (former SSAR Vice President), Miami University.

MT. ST. HELENS: THE SURVIVING HERPETOFAUNA. James A. MacMahon, Utah State University.

AMPHIBIANS AND REPTILES OF THE SOMALI DEMOCRATIC REPUBLIC. Benedetto Lanza, University of Florence (Italy).

HOLOCENE EXTINCTION OF A HERPETOFAUNA FROM ANTIGUA, BRITISH WEST INDIES. Gregory K. Pregill, San Diego Natural History Museum.

RECENT STUDIES OF THE LADDS HERPETOFAUNA, LATE PLEISTOCENE, NORTHWESTERN GEORGIA. J. Alan Holman, Michigan State University.

A MOST REGRETABLE TANGLE OF NAMES REVISITED: THE THOMPSON-VAN DENBURGH FEUD IN THE EARLY 20th CENTURY. Alan E. Leviton and Michele L. Aldrich, California Academy of Sciences and American Association for the Advancement of Science.

VARIABILITY IN RATE OF MITOCHONDRIAL DNA EVOLUTION IN AMPHIBIANS. Christina Spolsky, Academy of Natural Sciences of Philadelphia.

MITOCHONDRIAL DNA ORIGINS IN AN INTERSPECIFIC *RANA* HYBRID. Christina Spolsky and Thomas Uzzell, Academy of Natural Sciences of Philadelphia.

Session D-4, Chairman: Thomas Fritts (present SSAR Director), U.S. Fish and Wildlife Service.

EFFECTS OF TEMPERATURE AND SALINITY ON GROWTH RATES OF HATCHING CROCODILES AND ALLIGATORS: IMPLICATIONS FOR THEIR DISTRIBUTION IN SOUTHERN FLORIDA. Frank J. Mazzotti, Pennsylvania State University.

GROWTH RATES OF AMERICAN ALLIGATORS IN NORTH CAROLINA. M.K. Fuller, P.C. Smithson, S.E. Klause, and P.D. Doerr; North Carolina State University.

THE ORINOCO CROCODILE IN SOUTHERN VENEZUELA. Richard Franz, Florida State Museum.

A BIO-TELEMETRY STUDY OF THE BEHAVIOR AND THERMAL BIOLOGY OF THE AMERICAN ALLIGATOR. Larry D. Vangilder, Richard T. Hoppe, and Robert A Kennamer; Savannah River Ecology Laboratory.

THE RANGE AND DISTRIBUTION OF THE AMERICAN ALLIGATOR IN NORTH CAROLINA. P.C. Smithson, P.D. Doerr, and O.T. Sanders; North Carolina State University.

HOMOLOGIES OF THE DORSAL ARMOR OF CROCODILIANS. Gregory C. Mayer and Franklin D. Ross, Harvard University.

COURTSHIP, MATING AND COMBAT IN THE TUATARA, *SPHENODON PUNCTATUS.* J.C. Gillingham, C. Gans, and D. Clark; Central Michigan University and University of Michigan.

Session E-1, Chairman: Max A. Nickerson (former SSAR President, Editor and present Director), Milwaukee Public Museum.

SEASONAL REPRODUCTIVE CHANGES IN *CRYPTOBRANCHUS ALLEGANIENSIS.* Chris A. Ingersol and Robert F. Wilkinson, Southwest Missouri State University.

REPRODUCTION, GROWTH, AND MATURITY OF *PLETHODON WEBSTERI* IN SOUTH CAROLINA. Raymond D. Semlitsch and Carolyn A. West, Savannah River Ecology Laboratory and University of South Carolina at Sumter.

THE EFFECTS OF TEMPORAL ISOLATION AND THE DURATION OF BROODING ON CLUTCH RECOGNITION BEHAVIOR BY THE MOUNTAIN DUSKY SALAMANDER. Don C. Forester and Keith Harrison, Towson State University.

REPRODUCTIVE EFFORT IN THE SALAMANDER *DESMOGNATHUS FUSCUS:* A PRELIMINARY REPORT. J. Eric Juterbock, Ohio State University, Lima Campus.

AGGRESSION IN THE SALAMANDER *DESMOGNATHUS MONTICOLA.* W. Hubert Keen and Steven Sharp, State University of New York College at Cortland and University of Tennessee.

THE ENERGETIC COST OF COURTSHIP AND AGGRESSION IN THE PLETHODONTID SALAMANDER *DESMOGNATHUS OCHROPHAEUS.* Albert F. Bennett and Lynne D. Houck, University of California at Irvine and University of Chicago.

THE CLOACAE OF MALE DESMOGNATHINAE. David M. Sever, Saint Mary's College.

Session E-2, Chairman: Ronald A. Brandon (former SSAR President and Director), Southern Illinois University at Carbondale.

PARALLELISM, CONVERGENCE AND NOVELTY IS THE RULE IN LIMB EVOLUTION IN *THORIUS.* James Hanken, Dalhousie University (Canada).

PATTERNS OF INNERVATION IN THE TONGUE OF PLETHODONTID SALAMANDERS. Gerhard Roth, D.B. Wake, and M.H. Wake, University of Bremen (West Germany) and University of California at Berkeley.

SALAMANDERS OF THE GENUS *BOLITOGLOSSA* FROM OAXACA AND GUERRERO. Theodore J. Papenfuss, David B. Wake, and Kraig Adler; University of California at Berkeley and Cornell University.

THE ECOLOGY OF BEHAVIORAL THERMOREGULATION IN NEOTROPICAL SALAMANDERS. Martin E. Feder, University of Chicago.

OLFACTORY COMMUNICATION OF THE SALAMANDER *PLETHODON GLUTINOSUS.* Ellen M. Dawley, University of Connecticut.

FURTHER OBSERVATIONS ON THE TAXONOMIC STATUS OF TWO COLOR PATTERN MORPHS OF *EURYCEA QUADRIDIGITATA* (HOLBROOK) IN NORTH AND

SOUTH CAROLINA. Julian R. Harrison, The College of Charleston.

THE *AMBYSTOMA* SALAMANDER OF LAGUNA ALCHICHICA, PUEBLA, MEXICO. Ronald A. Brandon, Edward J. Maruska, and William T. Rumph; Southern Illinois University at Carbondale, Zoological Society of Cincinnati, and Staten Island, N.Y.

Session E-3, Chairman: Robert E. Gordon (former SSAR President), University of Notre Dame.

LARVAL BIOLOGY OF *EURYCEA* IN THE SOUTHERN APPALACHIANS. Richard C. Bruce, Highlands Biological Station and Western Carolina University.

GROWTH OF LARVAL RED SALAMANDERS, *PSEUDOTRITON RUBER*, IN NORTHWESTERN NORTH CAROLINA. Robert Wayne VanDevender, Appalachian State University.

THE INTERACTION BETWEEN LARVAE OF *AMBYSTOMA OPACUM* AND *AMBYSTOMA MACULATUM*. Christopher R. Chambers, Duke University.

CHROMOSOME EVOLUTION IN SALAMANDERS OF THE GENUS *NECTURUS*. Stanley K. Sessions and John E. Wiley, University of California at Berkeley and St. Paul's College, Virginia.

CHROMOSOME VARIATION IN THE DWARF SIREN *PSEUDOBRANCHUS STRIATUS*. James Kezer, University of Oregon.

POSSIBLE ORIGIN OF A POPULATION OF *HYLA VERSICOLOR*. J.E. Wiley, St. Paul's College, Virginia.

PROTEIN DIVERGENCE OF *NECTURUS BEYERI* AND *N. PUNCTATUS*. Reed M. Kaltenbach, University of New Orleans.

Session E-4, Chairman: Diane M. Secoy (former SSAR Assistant Publications Secretary), University of Regina, Saskatchewan, Canada.

FURTHER STUDIES OF TEMPERATURE DEPENDENT SEX DETERMINATION IN *CHELYDRA SERPENTINA*. E.C. Houghtaling and D.C. Wilhoft, Rutgers University, Newark.

EGG SIZE IN TURTLES: CONSTRAINT ON OPTIMAL EGG SIZE. Justin D. Congdon and J. Whitfield Gibbons, Savannah River Ecology Laboratory.

OVERWINTERING OF HATCHLING *CHRYSEMYS PICTA*. Gary L. Breitenbach, University of Michigan.

EMBRYONIC DIAPAUSE IN TURTLE EGGS. Michael A. Ewert, Indiana University.

SYSTEMATICS OF *LEPIDOPHYMA* POPULATIONS IN THE SIERRA MADRE ORIENTAL OF MEXICO. Robert L. Bezy, Natural History Museum of Los Angeles County.

ENVIRONMENTAL FACTORS OF ONSHORE FEMALE *CHELYDRA SERPENTINA* ACTIVITY. D.C. Wilhoft and E.C. Houghtaling, Rutgers University, Newark.

NEST-SITE SELECTION, NESTING BEHAVIOR, AND HATCHLING EMERGENCE IN THE SOUTHERN BLACK-KNOBBED SAWBACK, *GRAPTEMYS NIGRINODA*. Pete N. Lahanas, Auburn University.

Session F-1, Chairwoman: Margaret M. Stewart (former SSAR President), State University of New York at Albany.

NESTING OF THE GREEN TURTLE, *CHEONIA MYDAS*, IN FLORIDA. C.K. Dodd, Jr., U.S. Fish and Wildlife Service.

LIFE HISTORY ASPECTS OF *CHRYSEMYS PICTA* AND *STERNOTHERUS ODORATUS* POPULATIONS IN VIRGINIA. Joseph C. Mitchell, University of Richmond.

REPRODUCTIVE VARIATION BETWEEN TWO POPULATIONS OF *STERNOTHERUS ODORATUS* IN THE SAME GEOGRAPHIC AREA. R. McPherson and K.R. Marion, Clarion State College and University of Alabama in Birmingham.

EFFECTS OF PHOTOPERIOD AND TEMPERATURE ON REPRODUCTIVE CYCLE AND BEHAVIOR OF *STERNOTHERUS ODORATUS*. Mary T. Mendonca, University of California at Berkeley.

THE STRIPED MUD TURTLE *KINOSTERNON BAURI* IN SOUTH CAROLINA: A CONFIRMATION THROUGH MULTIVARIATE CHARACTER ANALYSIS. Trip Lamb, Savannah River Ecology Laboratory.

REPRODUCTIVE ECOLOGY AND POPULATION STRUCTURE OF THREE TROPICAL TURTLE COMMUNITIES. Richard C. Vogt, Instituto de Biología, UNAM (Mexico).

Session F-2, Chairman: Sherman A. Minton (former SSAR Director), Indiana University School of Medicine.

SOME FACTORS INFLUENCING THE DISTRIBUTION OF *TESTUDO GRAECA* L. (TESTUDINES, TESTUDINIDAE) IN MOROCCO PRECLUDING ITS SURVIVAL IN COLD, TEMPERATE EUROPE. M.R.K. Lambert, British Herpetological Society, London.

THE CONGENER-INDUCED DISPLACEMENT OF COLOR PATTERN FEATURES IN FOUR KENTUCKY HERPTILES, WITH EVIDENCE FOR THE SPECIFICITY OF *LAMPROPELTIS ELAPSOIDES*. John R. MacGregor, Kentucky Department of Fish and Wildlife Resources.

A PROPOSED ORIGIN OF NESTING LOCATION DIVERGENCE AND A SHARED FEEDING RANGE IN BRAZILIAN GREEN TURTLE POPULATIONS. Don Moll, Southwest Missouri State University.

BODY TEMPERATURES, MOVEMENT AND DIVING CYCLES OF A JUVENILE LEATHERBACK TURTLE, *DERMOCHELYS CORIACEA*. E.A. Standora, J.R. Spotila, J.A. Keinath, and R.C. Shoop; State University College at Buffalo and University of Rhode Island.

ASPECTS OF LARVAL TOAD ECOLOGY. Thomas J. Berger, University of Kansas.

THE MALE REPRODUCTIVE CYCLE OF THE QUEEN SNAKE, *REGINA SEPTEMVITTATA* IN WESTERN PENNSYLVANIA. J.J. Minesky and R.D. Aldridge, St. Louis University.

REPRODUCTIVE CYCLE IN *TYPHLONECTES*. J.-M. Exbrayat, Laboratoire de Biologie de la Faculte Catholique des Sciences de Lyon, France.

Session G-1, Chairman: George Zug (former SSAR Director and Editor), National Museum of Natural History, Washington.

KINGSNAKE SYSTEMATICS: STATUS OF *LAMPROPELTIS GETULUS GOINI*. D. Bruce Means, Tall Timbers Research Station, Florida.

ANURAN SEX-LINKED GENES BEHAVE DIFFERENTLY THAN MAMMALIAN ONES. Richard P. Elinson, University of Toronto (Canada).



Herpetological art and craft displays and commercial exhibits and sales have become a major and popular attraction at Society meetings. Pictured are a display of color photographs by Society members and the work of Thomas McFarland (seated), an artist who specializes in hand-painted ceramic turtles. Other sales included T-shirts, books, carvings, scientific equipment and other herpetological materials.

BIOCHEMICAL SYSTEMATICS OF THE THAMNOPHIINI: THE GENERA *NERODIA* AND *REGINA*. Robin Lawson, Louisiana State University.

AN ELECTROPHORETIC ANALYSIS OF SOME GERRHONOTINE LIZARDS. David A. Good and John W. Wright, University of California at Berkeley and Los Angeles County Museum of Natural History.

GENETIC ISOLATION OF TWO SUBSPECIES OF *ANOLIS DISTICHUS*? S.M. Case and E.E. Williams, Salem State College and Harvard University.

GENETIC VARIATION IN MAINLAND *ANOLIS CAROLINENSIS*. J.K. Wade, A.C. Echternacht, and G. McCracken; Pennsylvania State University and University of Tennessee at Knoxville.

GEOGRAPHIC VARIATION IN CRICKET FROGS. Wendy Gorman, University of Kansas.

Session G-2, Chairman: C.J. McCoy (former SSAR President), Carnegie Museum of Natural History.

AN EMBRYONIC STUDY OF FIVE SPECIES OF *ANOLIS* USING GROWTH CURVES AS A BASIS FOR STAGING. Lisa Levinson, New York University.

GENETIC VARIATION IN THE COTTONMOUTH WATER MOCCASIN *AGKISTRODON PISCIVORUS* AT THE NORTHERN EDGE OF ITS DISTRIBUTION. Donald A. Merkle, Longwood College.

CHANGES IN THE DISTRIBUTION OF *CROTALUS HORRIDUS*. W.H. Martin, Harper's Ferry, West Virginia.

MORPHOMETRICS OF HIGH-ANDEAN *ATELOPUS* IN ECUADOR, SOUTHERN COLOMBIA, AND NORTHERN PERU. Peter Gray, University of Kansas.

DIGITIZED HERPETOLOGY. Itzchak Gilboa, City University of New York.

THE COMBAT RITUAL OF THE MALAYSIAN PIT VIPER *(CALLOSELASMA RHODOSTOMA)*. Daniel S. York, University of Tennessee at Knoxville.

CHROMOSOME MORPHOLOGY OF AFRICAN SNAKES. W.R. Branch, Port Elizabeth Museum (South Africa).

Committees for 1982-1983.

Following the Raleigh meeting, President Adler appointed the following committees, coordinators and representatives for the current year, to report to the Board at the Salt Lake City Meeting in August of 1983. Individuals with important matters pertaining to these activities should contact the relevant committee chair. Addresses for committee chairs are included on the inside rear cover of each issue of **Herpetological Review.**

Grants-in-Herpetology: Linda Maxson (ch.), Donald Forester, Dale L. Marcellini, Robert Mount, Malvin Skaroff.

Conservation (formerly Herpetological Habitats Committee and incorporating Legislative Alert Committee): John Behler (ch.), James P. Bacon, C. Kenneth Dodd, René Honegger, Paul E. Moler, Patricia Riexinger, Laurie J. Vitt.

Kennedy Student Award: Gary Ferguson (ch.), W.R. Branch, Janalee Caldwell, Eric Juterbock, Murray J. Littlejohn, P.E. Vanzolini, Ernest E. Williams.

Nominating: James Vial (ch.), Theodore L. Taigen, Diane Secoy, Douglas H. Taylor, John W. Wright.

Regional Society Liaison: Janice Perry (ch.), Robert Bader, Jeffrey Black, James Harding, William Holmstrom, Michael R.K. Lambert, Joseph Mitchell.

Zoo Liaison: John D. Groves (ch.), Hans Boos, Julian Duval, W.-E. Englemann, Gary Ferguson, Ronald Goellner, William Holmstrom, Hans-Günter Petzold, Bern Tryon.

Long-range Planning: James Jacob (ch.), Kraig Adler, James Christiansen, Carl Gans, Samuel McDowell, James Murphy, Henri Seibert, Margaret Stewart.

Meetings (SSAR/HL) (formerly Meeting Site Committee and incorporating Symposium Coordinator): Lynne Houck (ch.), Ray Ashton, Jr., Michael Seidel, James Jacob, Ronald Brandon.

Local Meeting (Salt Lake City): John Legler (ch.), others to be appointed by Legler.

Resolutions (SSAR/HL): Daniel Wilhoft (ch.), others to be appointed at Salt Lake City meeting.

Herpetological Resources (SSAR/HL/ASIH): Roy McDiarmid (ch.), Pere Alberch, Alan Leviton, Scott Moody, Charles Myers, Linda Trueb.

Translations Coordinator: Robert Aldridge.

Special Meeting Topics Coordinator: Ray Ashton, Jr.

Representative to Association of Systematic Collections: C.J. McCoy.

JAMES S. JACOB
SSAR Secretary ●



SSAR TRANSLATIONS PROJECT

The object of this project is to make available to SSAR members accurate translations of foreign language research articles. Since SSAR has not budgeted money for translation of articles, we must rely on contributions from members. If you have an article that has been translated, please send a copy (or reprint) of the original and the translation to the editor. A few people have volunteered to translate articles and we are interested in hearing from any others who are willing to contribute their time.

If you have an article for translation that you feel would appeal to a large segment of the herpetological community, send a copy or reprint to the editor and we will try to have it translated.

Since the first list of translations was published (Herp. Review 10(3): 82-83, 1979) we have added 16 new titles (marked SSAR). Copies of these are available (.05/page) through the Translation's Project Editor, Robert D. Aldridge, Department of Biology, Saint Louis University, St. Louis, MO 63103.

In addition a list of articles available through the National Museum of Natural History is included (marked SHIS). Copies of these are free and may be obtained by writing SHIS, Division of Reptiles and Amphibians, National Museum of Natural History, Washington, DC 20560.

Beuchelt, Hans. 1936. Bau, Funktion und Entwicklung der Begattungsorgane der Mannlichen Ringelnatter (*Natrix natrix* L.) und Kreuzotter (*Vipera berus* L.). Part 6. Erection of the Penes. Morph. Jahrb. 78:445-516 **(avail. SSAR).**

Bons, J. and B. Girot. 1962. Cle Illustree des Reptiles du Maroc. Key to the Reptiles of Morocco. Travaux de L'Institut Scientifique Cherifien. Serie Zoologie No. 26, 9-51 **(avail. SSAR).**

Chernov, S. A. 1968. The Systematic position of the poisonous snake *Ancistrodon rhodostoma* (BOIE) (Serpentes, Crotalidae) based on its cranial ostelogy **(avail. SHIS).**

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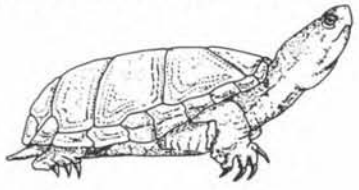
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GOPHER TORTOISE COUNCIL ANNUAL STUDENT AWARD

The GTC offers a cash award to a student pursuing an undergraduate or graduate degree who is planning or actively conducting research involving the gopher tortoise, *Gopherus polyphemus*. The 1982 award was $400.00. The only obligations of the recipient, other than conducting the proposed research, are to submit to the GTC a copy of their final report within 6 months of the project completion date, acknowledgement of the GTC in appropriate scientific papers, and copies of any papers that originate from the research. Proposals should be short, no more than 3 double-spaced typed pages, and should include a brief biographical section, a description and justification of the research, and a budget indicating how the money will be spent. Further information is available from: Dr. Dale R. Jackson, Florida Natural Areas Inventory, 254 E. Sixth Avenue, Tallahassee, FL 32303.



NEW *HR* EDITOR

With a certain and definite regret, I decided late last year to resign as **HR** editor effective with this issue. It's been fun, challenging, educational and a chance to serve a society I truly enjoy. But there are now many more demands upon my time than ever before, and SSAR is blessed with abundant talented members to fill its roles. As each editor perhaps does, I've developed a very personal feeling about **HR** and its readership, and have attempted to structure each issue to serve as broad a cross section of that readership as possible. I'm confident that **HR** will continue to move ahead under the new editor (Martin J. Rosenberg, Dept. of Biology, Case Western Reserve University, Cleveland, OH 44106). Please direct all manuscripts, advertising and correspondence about **HR** to Marty. I've agreed to serve as Managing Editor through 1983, and thereafter hope to serve SSAR in some other capacity.

The very first thing an editor learns is that a hell of a lot of dedicated help is needed to produce a publication, especially one as diverse as **HR.** Hence, my sincere thanks to all of the Section Editors for their considerable investment of time and energy the past six years, and also to Barb Paschke, who invested so much effort developing **HR's** advertising program and helping in numerous other ways. The Biology Department here at KU is certainly to be commended for providing a host of oft unsung support facilities. Thanks also to the various officers and board members for their support of **HR,** and to our printer, Steve Meseraull, and his staff for making the job vastly easier and being patient with my faux pas. Sincerest thanks to you, the readership, for your written and vocal support, as well as your support via submission of excellent material — it's tough to publish a quality product if no one sends any articles !! Hopefully, some plans on the not too distant horizon will reduce our abominable lag time in publishing feature articles. Finally, but by no means least, my very special thanks to Joseph T. Collins for his invaluable assistance and guidance as co-editor for three years and his unswerving support and advice all along.

Cheers!
GRP ●

FUTURE ANNUAL MEETINGS

1983 The University of Utah, Salt Lake City, Utah, 7-12 August (John M. Legler, Chairman).

1984 University of Oklahoma, Norman, Oklahoma, 29 July - 4 August (Victor H. Hutchison, Chairman). ●

HR REVIEWERS

We gratefully acknowledge the help of the following persons who reviewed manuscripts.

Miguel Alvarez del Toro
Ralph Axtell
J. Kevin Bowler
Charles C. Carpenter
William Coil
Daler Khan
Robert Henderson
Hobart M. Smith ●

SSAR ACKNOWLEDGES COMMITTEE SERVICE

In addition to its many publications series, SSAR also serves the herpetological community through its active committee system. During the past year nearly 80 persons served on committees and the Society would like to acknowledge their important service. Although space prevents us from noting each person here we would like to thank them all by listing the following retiring committee chairs and representatives for 1982:

Martin J. Rosenberg (Chair, Grants-in-Herpetology Comm.)
James Gillingham (Chair, Kennedy Student Award Comm.)
Hugh Quinn (Chair, Legislative Alert Comm.)
John W. Wright (Chair, Nominating Comm.)
Bern Tryon (Chair, Zoo Liaison Comm.)
Gordon Burghardt (Chair, Symposium Comm.)
Frances Irish (Chair, Resolutions Comm.)
Alan Leviton (Chair, Herpetological Resources Comm.)
Max A. Nickerson (Representative to the Association of Systematics Collections)

Current committee chairs are listed on the inside rear cover of this issue. ●

LEGISLATIVE ALERT

PROTECTION OF THE SPANISH HERPETOFAUNA

Royal Decree 3181/1980 of 30 December 1980, published in the *Boletín Oficial del Estado* 6 March 1981, protects all but ten amphibian and reptile species (B.O. del E., Núm. 56).

Hunting, capturing, trafficking in, or exportation of any protected species without a permit is now punishable under Spanish law. Permits for collection may be granted if requests are accompanied by a detailed statement of purpose from the applicant's institution. Applications for permits may be sent, in letter form, to:

El Subdirector General
Instituto Nacional para la Conservación de la Naturaleza
Gran Via de San Francisco, 35
Madrid 5, Spain

Permission to export collected specimens is **not** implicit in collection permits and, presumably, must also be granted by the above agency. Anyone wishing to work in Spain would be well-advised to obtain all necessary permits well in advance of anticipated arrival date.

STEPHEN D. BUSACK
Museum of Vertebrate Zoology
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SSAR GRANTS-IN-HERPETOLOGY

The Society for the Study of Amphibians and Reptiles is pleased to announce that proposals are now being accepted for the 1983 Grants-In-Herpetology Program. This Program is designed to provide financial support to deserving individuals or organizations engaged in research on or conservation of amphibians and reptiles. Grant proposals will be considered in the following areas:

1) **GRADUATE STUDENT HERPETOLOGICAL RESEARCH.** Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only, with a letter of support from the student's major advisor or committee chairperson.

2) **HERPETOLOGY-ORIENTED CONSERVATION.** Proposals should address research on endangered or threatened species at the state, national or international levels, or address research or critical herpetological habitats. Proposals may be received from individuals only.

3) **REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS.** Proposals may address any herpetological research endeavor or projects, provided said endeavor or project concerns herpetology within the implied geographic limits of the regional society. Proposals may be submitted by regional herpetological societies or by individual members of the society. If the latter, a sponsoring letter from the current societal president or an advisor should accompany the proposal.

4) **HERPETOLOGICAL RESEARCH IN ZOOS.** Proposals may address any herpetological research endeavor which is conducted at a zoo. A letter from the represented zoo or supporting institution should accompany the proposal.

Each proposal should include the following information: A) **Background & Objectives** of the proposed project, in terms of its relevance to herpetology, B) **Methods** of carrying out the research or conducting the project, C) **Budget for the project**, which should not exceed $400 in each category, and D) **Curriculum Vitae** and **Letter of Support** (if applicable). The proposal must be typed double spaced and must **not** exceed 5 pages, excluding cover page, abstract, budget, curriculum vitae, and bibliography.

Successful applicants will be expected to submit to SSAR a written report of their research or project, within a reasonable time after the project year is completed. They are also encouraged to submit for publication the results of their research or project, preferably to **The Journal of Herpetology** or **Herpetological Review.**

Members of the SSAR Grants-In-Herpetology Committee will evaluate all proposals, projects or programs. Committee members are: Linda R. Maxson (Chairperson), Robert Mount (Conservation Research), Malvin L. Skaroff (Regional Herpetological Society Projects), Donald C. Forester (Graduate Student Research), and Dale L. Marcellini (Zoo Research).

Individuals submitting proposals must designate to which of the four areas their proposals applies. All proposals must be typewritten and submitted in duplicate no later than **15 APRIL 1983** to:

Dr. Linda Maxson
Department of Genetics
and Development
University of Illinois
515 Morrill Hall
505 South Goodwin Avenue
Urbana, Illinois 61801

SPECIAL INTRODUCTORY SUBSCRIPTION OFFER

CATALOGUE OF AMERICAN AMPHIBIANS AND REPTILES

The Society for the Study of Amphibians and Reptiles is extending, for a limited period, a special offer to new subscribers to the *Catalogue of American Amphibians and Reptiles*. Individuals who subscribe before *30 June 1983* may purchase their one-year subscription (25 accounts), a complete set of accounts (numbers 1-320), two imprinted post binders, and a set of index tabs for $95. For individuals this represents a savings of $24.50. Institutions who subscribe before *30 June 1983* may obtain the same offering for $139.50 (a savings of $36.00). This includes postage within the U.S.A. — overseas orders must be assessed an additional charge of $5.00.

The *Catalogue of American Amphibians and Reptiles* is a series of loose-leaf accounts treating species and higher taxa of New World amphibians and reptiles. Each account is prepared by an expert on that taxon and occupies 2-4 pages (8½ x 11 inches). It provides a wealth of information, including common and scientific names (with a synonymy), a definition and description, information on fossil occurrence, a detailed map of geographic distribution, and a comprehensive introduction to the literature.

The *Catalogue* is an essential reference for all biologists who use amphibians or reptiles in their research. The loose-leaf format allows individual additions and updating, and provides the option of arranging the accounts in serial, alphabetic, geographic, or taxonomic order.

Individuals wishing to take advantage of this special offer should fill out the form below and send it to:

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IN MEMORIAM

RICHARD (DICK) M. JOHNSON
1924-1982

On April 28, 1982, our dear friend and comrade was overcome by the ravages of lung cancer that he had been valiantly and courageously battling for eight months. Dick has left behind his wife, Lyn, two daughters, Lt. Commander Judith M. Johnson and Beth P. Young, and a host of friends.

Richard Johnson, as his friend Gordon Moulton wrote, "was an individual concerned about man and his ultimate destiny. He would slight his accomplishments while praising others — one who openly shared his warm love and personality with his family and friends. He lived close to God's earth and its many creatures and has found true contentment within himself. He was a man of integrity, high ideals, sensitivity, compassion and love. As a disarmingly learned man, he became a successful scientist, educator, administrator, father and husband."

We first became acquainted with Dick when he came to Tulane University to pursue an M.S. degree in herpetology under Fred R. Cagle in 1950. It was there that our bonds of friendship were secured and even though our paths took us separate ways in the intervening years we had kept in touch.

One of us, Liner, had for years made collecting trips into Mexico to study the herpetofauna there. In 1970, while attending the ASIH meetings in New Orleans, Dick decided that he would participate in one of these expeditions. He was so impressed after that first trip that he made each annual one thereafter and several additional ones to Yucatan with his wife. When the other member of the trio (Chaney) joined them in 1972, a close working relationship and a three musketeers (margariteers) arrangement was established. We were "mothered" by Dick; he planned the menus, supervised the purchases, cooked most of the meals and fastidiously cleaned the utensils after each meal.

In addition to the menial chores, he was "the finder of the unusual," usually a snake and most often a rattlesnake of some kind. He never seemed to tire, spurred on by his need to see, need to know and need to experience. Not only was he active during the day, but was "up and at 'em" before breakfast, and after the last dish had been cleaned at night. He provided us with expertise in many areas, recreation through musical tapes, relaxation, humor through practical jokes, and most of all love and affection.

Dick was born in Carey, Ohio on March 4, 1924, and spent his formative years there. He served in the Army during WWII in the Philippines, Okinawa and Japan. He returned to college after the war and received his B.S. degree in 1950 from Ohio State University, majoring in Wildlife Management. He received his M.S. from Tulane University in 1952 and Ph.D. from the University of Florida in 1958. He spent two summers at National Science Foundation summer institutes, Duke University in Marine Biology and The University of North Carolina at Chapel Hill in Botany. He became Professor of Biology and Head of Biology Departments at Asheville-Biltmore College, West Georgia College, and Wesleyan College. Recently, until his retirement in 1975, he was Professor and Associate Dean of the College of Arts and Sciences at the University of South Alabama. Since his retirement he had been self-employed with his wife as artistic potters, except for the academic year 1979-1980, when he was asked to assume the deanship of the Coordinate College for Health Professions at the University of South Alabama.

Dick was a member of Sigma Xi, Gamma Sigma Delta, and Phi Sigma honor societies, as well as Beta Theta Pi, a social fraternity. He belonged to the following professional societies: American Association of University Professors, Ecological Society of America, American Institute of Biological Sciences, American Society of Ichthyologists and Herpetologists, Herpetologists' League, and Society for the Study of Amphibians and Reptiles. He is listed in *American Men of Science, Who's Who in South* and *Southwest*, and *Who's Who in American Education*.

Dick was a long-time student of the herpetofauna of the southeastern United States, but in later years extended these interests to northern Mexico. As a result, he had received various grants and had published some 23 papers concerning the herpetofauna of these regions.

His premature death is a blow to us and an irreparable loss to the herpetological community. So adios Amigo until we meet again in the hereafter, rolling rocks, tearing open logs or rubber-banding lizards. Vaya con Dios.

ALLAN H. CHANEY
1208 W. Richard
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and
ERNEST A. LINER
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Houma, LA 70360-2598

BULLFROG ELIMINATING LEOPARD FROGS IN COLORADO?

The bullfrog *(Rana catesbeiana)* apparently is not a native member of the Colorado herpetofauna. Ellis and Henderson (1913, 1915) knew of no native bullfrog populations in Colorado and stated that introductions of bullfrogs into several ponds and reservoirs in the upper South Platte River valley during the early 1900s were not very successful. In 1943, Rodeck reported that bullfrogs were then known only from Kit Carson County. Swenson and Rodeck (1948) added Denver and the Cimarron River to the areas known to be inhabited by bullfrogs. Maslin (1950) stated that the bullfrog was well established in the vicinity of Wray in Yuma County, in the Cimarron River drainage, and in the Arkansas River valley as far west as Pueblo. In addition to previously known sites, Maslin (1959) recorded bullfrogs from near Fort Morgan, Morgan Co., and from the vicinity of Two Buttes Reservoir, Baca Co. Since 1959 the number of areas known to be inhabited by bullfrogs has increased greatly. Smith *et al.* (1965) listed 12 new county records for bullfrogs in Colorado. Hammerson (1982) mapped all areas known to be occupied by bullfrogs, reporting them in 24 counties. No special study has been made of the bullfrog in Colorado, and the distribution of the species in the state is incompletely known. However, it is clear that the range of the bullfrog has expanded greatly in recent decades and continues to do so.

The presence and range expansion of the bullfrog in Colorado undoubtedly are a result of artificial introductions and the creation of naturally rare, favorable habitat. Prior to human settlement, permanent lakes and ponds were practically nonexistent in lowland areas of Colorado. Today there are hundreds of them, created in response to agricultural, domestic, and recreational water needs, and for flood control. These bodies of water were rapidly colonized by native leopard frogs *(Rana blairi, R. pipiens)* which probably inhabited stream pools and seasonally flooded areas along streams in the lowland areas of Colorado. In 1915, Ellis and Henderson reported that leopard frogs were "very abundant near all of the ponds and lakes in eastern Colorado." The mechanism by which bullfrogs have become widely established in these habitats is somewhat enigmatic. The Colorado Division of Wildlife does not actively introduce or propagate bullfrogs (J. Bennett, pers. comm.). It is possible that bullfrogs are unintentionally introduced during the Division's fish stocking operations; bullfrogs sometimes invade fish hatchery ponds and perhaps bullfrogs occasionally are present among the fishes routinely stocked in Colorado's ponds and reservoirs. Bullfrog larvae can survive among predatory game fishes, which are averse to eating them (Kruse and Francis 1977). I suspect that bullfrogs sometimes are introduced by private citizens hoping to establish a local "huntable" population or to hear their calls on warm summer nights, but I have no information on the extent of such activity. Once a bullfrog population becomes established in an area, frogs may quickly colonize adjacent bodies of water; in southeastern Colorado I have found bullfrogs in recently rain-filled, temporary stock ponds more than a mile (1.6 km) from the nearest permanent water.

Concurrent with the establishment and range expansion of the bullfrog in Colorado has been the decline of the leopard frogs. A few examples will illustrate this obvious but poorly documented trend. Specimens in the University of Colorado Museum indicate that *R. blairi* was relatively abundant and that the bullfrog was present in the area of Sand and Gallinas canyons in Baca County in the late 1940s. A few specimens of *R. blairi* were obtained there in the early 1960s. I visited the same area several times from 1978 to 1982 and all of the approximately 100 metamorphosed frogs and numerous larvae that I observed were bullfrogs; *R. blairi* apparently has been extirpated. Museum records indicate that ponds and pools along the South Platte River in the vicinity of Denver were inhabited by *R. pipiens* in the late 1800s. Today the bullfrog is abundant along the

Platte, but few (if any) leopard frogs remain. At the Sawhill Ponds Wildlife Preserve in eastern Boulder County, 96% of the 93 ranid frogs (not including larvae or newly metamorphosed frogs) that I observed during 1978 and 1979 were *R. pipiens;* only 4% were bullfrogs. In contrast, only 26% of 117 ranid frogs observed from 1980 to 1982 were *R. pipiens;* 74% were bullfrogs. In 1978 I observed bullfrogs in only one of the 12 ponds that I regularly surveyed at the Sawhill Preserve; bullfrogs occupied all of the 12 ponds in 1982. During the last few spring breeding seasons leopard frog egg masses have become increasingly difficult to find. Of the newly metamorphosed ranids observed in 1982 at Sawhill Ponds, bullfrogs outnumbered leopard frogs by at least 20 to 1. Other biologists also have noted the decline of the leopard frog and the increase in the bullfrog population in Colorado (D. Pettus, pers. comm.). I know of 24 areas in Colorado where leopard frogs at least formerly occurred and where bullfrogs are now known to occur. Leopard frogs apparently have been extirpated from several of these areas and currently coexist with (but generally are outnumbered by) bullfrogs in several other areas. Leopard frog status in many of the areas is unknown.

Bullfrogs have been implicated as the cause of the decline of certain native ranid frogs in western North America. Dumas (1966) noted that the spread and increase of the introduced bullfrog in the Pacific Northwest was concurrent with a large decline in the *Rana pretiosa* population. Moyle (1973) felt that the bullfrog was "probably the single most important factor" in the elimination of *Rana aurora* from most of the San Joaquin Valley of California. Presumably the large bullfrog eliminates smaller native ranids through intense predation and competition (Moyle 1973). Inhibitory effects of bullfrog larvae on larval leopard frogs (Rose 1960, Licht 1967) possibly are important. The observations presented here do not conclusively demonstrate that the bullfrog is responsible for the decline of the leopard frog in Colorado. Water pollution, introduced game fishes, and other habitat changes may differentially affect the frogs and account for all or part of the apparent population trends. Moreover, leopard frog populations are declining in areas where bullfrogs are absent (D. Pettus, pers. comm.). The extent and possible causes of the decline of the leopard frog in Colorado have not been adequately studied. However, evidence implicating the introduced bullfrog as the major cause of the decline in native leopard frog populations in at least some areas of Colorado is strong enough to warrant an in-depth study of this possibility. At the very least, systematic monitoring of bullfrog and leopard frog populations at selected localities would be prudent. The Colorado Division of Wildlife, responsible for the management and conservation of both game (bullfrog) and nongame (leopard frog) wildlife, is the logical agency to conduct or support such a study. Hopefully, a leopard frog recovery plan can be formulated and implemented before leopard frogs disappear as important components of lowland ecosystems in Colorado.

I thank Hobart M. Smith for his valuable comments on the manuscript.

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LEECH *(PLACOBDELLA PARASITICA)* INFESTATIONS ON THE WOOD TURTLE, *CLEMMYS INSCULPTA*

The presence of leeches on turtles is a common occurrence in nature and is well documented in the literature (see Ernst and Barbour, 1972 for a review). Until recently however, the occurrence of leeches on the Wood Turtle *(Clemmys insculpta)* was poorly documented. Holbrook (1842) and Babcock (1919) mentioned the occurrence of *Clepsina scabra* (= *Placobdella parasitica*) on *Clemmys insculpta* and Ernst and Barbour (1972) also reported the presence of *P. parasitica* on *C. insculpta,* but none of the above authors gave any details. More recently Koffler *et al.* (1978) reported on the seasonal occurrence of *P. parasitica* on *C. insculpta* from New York and New Jersey. Their's was the first paper to discuss in detail the association between leeches and wood turtles. The present paper documents a high level of leech infestation on a population of *C. insculpta* from western Pennsylvania.

Field work was conducted in early April and mid-October of 1978 at Yellow Creek State Park, Indiana County, Pennsylvania. *Clemmys insculpta* were collected adjacent to, but never in, a small woodland stream that enters the southwestern portion of Yellow Creek Reservoir. The stream is slow flowing with a sandy to muddy bottom. Five adult turtles were collected in April and three adult turtles were collected in October. All individuals from both samples were parasitized by *P. parasitica.* Infestations appeared to be heaviest in the October sample, with a total of 8 adults and 142 young leeches on the three turtles. The five turtles from April had a total of seven adults and 153 young. Adults were found on both the shell and exposed soft parts of the body, whereas the young were always found on the soft body parts. Although leeches were found on all exposed areas of the skin (*e.g.* head, neck, legs, arms) certain areas appeared to be preferred. Among these were the inguinal cavity and the nuchal area of the neck and adjacent axillary cavity. These areas are the most inaccessible to the external environment and would afford the leeches the greatest possible protection from desiccation and abrasion while the turtles engaged in terrestrial activity.

Sawyer (1972) stated that adult *P. parasitica* leave the host animal to become free living during mating and incubation. He further stated that the majority of animals remain free living while brooding the young, although an occasional parent may be found brooding on the host. One turtle from the October sample had a brooding individual attached to the left hind leg. The parent had 28 young attached to the ventral surface of its body. Koffler *et al.* (1978) also found brooding individuals on the host. The brooding young were similar in size to the other young found in both the April and October samples. The distribution of the young leeches on the turtles suggests that *P. parasitica* may frequently brood on this population of wood turtles. Of the 267 young leeches found on the turtles, 211 were in eight groups that varied from 14 to 29 individuals per group. All groups were tightly packed, with virtually no space between individuals. The number and positioning of the young in these groups is similar to what one would expect to find in brooding leeches. It is highly probable that these groups represent individual broods deposited by the parents. Koffler *et al.* also noted that the young leeches formed tightly packed masses.

The April sample of turtles had recently emerged from hibernation and the October sample was preparing to enter hibernation. It may be that brooding individuals attach to the turtles in the fall and that they and their young spend the winter dormancy with the host animal, thus assuring a continuous supply of food over the winter. This would account for the heavy infestations on the turtles so early in the season. *Clemmys insculpta* were not

collected between May and September, so we do not know if the leeches remain with the turtles during the summer. Koffler *et al.* noted a marked decline in leech infestations during the summer.

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VARANUS "MONITOR": AN INVALID NAME FOR *VARANUS BENGALENSIS*

Prior to the monograph and checklist on the family by Mertens (1942, 1963), the specific name *"monitor"* had been used by various authors for both *Varanus bengalensis* and *V. Salvator* to a lesser extent, for the African *V. niloticus*. Since 1935 when Smith referred *bengalensis* to *monitor*, most of the subsequent confusion involves that single species. The misuse of *monitor* is still used in the literature (Banerjee and Banerjee 1969; Dutt 1968; Jacob and Ramoswami 1976; Sabnis and Rangnekar 1967; and others) causes consternation not only for zoologists, but for agents charged with protecting the endangered species, *V. bengalensis*, as well. *V. monitor* is not a valid specific name (Mertens, 1957) and should not be used.

Proper use of the name *bengalensis* is important because that species is currently listed on Appendix I of the CITIES treaty, legally limiting the exploitation of the lizards, especially on the commercial level. Because many dealers illegally obtain the animals by listing them as *V. "monitor"*, the effect of this use is to negate the protection accorded the species.

At the time that the varanids in this paper were described, the source material for that description was often an illustration from a book about newly explored regions of the globe. The names *Lacerta monitor*, *L. Dracaena* (Linnaeus 1758 and 1766, respectively) and *Stellio salvaquardia* (Laurenti 1768) were all given to a composite specimen illustrated in Seba's (1734) Thesaurus; the illustrated specimen was later identified as *V. salvator* (Laurenti 1768) by Mertens (1957), Thus, *monitor* becomes the oldest available name for *salvator*, while *dracaena* would be a junior synonym.

Daudin (1802) used the combination *Tupinambis bengalensis* fourteen pages after introducing the name *T. cepedianus*, leading Deraniyagala (1953) to propose that the latter name be retained instead of the former. However, Article 24(a) of the International Code of Zoological Nomenclature provides that synonyms for a single taxon appearing in a single work are not given priority by page precedence, and that the final determination of the official name is decided by the first revisor. In this case, the first revisors were Dumeril and Bibron (1936), who retained *bengalensis*.

The name *monitor* became attached to *bengalensis*, in error, by Flower (1929) and has subsequently been used in that sense by some later authors. As both *bengalensis* and *cepedianus* properly apply to this species, and *monitor* does not, the threat to *bengalensis* was not nomenclatural, but a matter of actual usage.

Laurenti (1768) introduced the combination *Stellio salvator*, identifiable in part as *Lacerta monitor* of Linnaeus (and in part as both *bengalensis* and *niloticus*). The name *salvator* was, however, widely used in the literature and became a more stable name for that species.

In order to protect and recognize the most stable names for these varanids, Opinion 540 of the International Commission on Zoological Nomenclature (1957) suppressed the names *dracaena, salvaquardia,* and *monitor.* Since then, most references to *Varanus "monitor"* pertain to *bengalensis*, the authors are apparently unaware of this nomenclatural action or are mislead by animal dealer invoices.

The status of *V. bengalensis* as an endangered species requires its correct identification by law enforcement officials. Most price lists from Asian reptile dealers list the "Bengal Monitor", but use the specific names *"monitor", cepedianus,* or *nebulosus.* As a result of Opinion 540, there are, and cannot be, any varanids with the specific names *monitor* or *cepedianus.* The species *bengalensis* does, however, contain a subspecies *nebulosus,* which could conceivably be elevated to specific names rank; as a subspecies of an endangered species, it too is protected.

Occasionally a dealer will list **any** Varanus with the specific catch-all *"monitor"* — often a clue that the animal was obtained illegally. Since there is no such species, those responsible for examining animal imports should be alert if *"V. monitor"* occurs on the document.

I wish to express my gratitude to Walter Auffenberg and Joseph T. Collins for their comments and help. I particularly want to thank Dr. Hobart Smith for his numerous comments and suggestions on the manuscript from start to finish.

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THE ORIGIN OF THE NAME "CANTIL" FOR *Agkistrodon bilineatus*

The widely used vernacular names of copperhead and cottonmouth, for *Agkistrodon contortrix* and *A. piscivorus*, respectively, are readily explained. Copperheads have copper-colored or reddish heads and many cottonmouths, when first encountered in the field, hold their mouths open so the whitish interior can be seen. On the contrary, a satisfactory explanation of the name "cantil" for *A. bilineatus* has eluded us, even though it has long been used by herpetologists in the United States and Middle America, as well as by residents of parts of the latter region.

The Spanish word *cantil* means a steep rock, cliff, or precipice, translations that are difficult to associate with the snake. In response to an inquiry that I addressed to a number of colleagues and correspondents, a variety of suggestions were received. Common among them was the thought that perhaps the name was bestowed because *bilineatus* usually is found in rocky habitats near cliffs, but that supposition is contraindicated by the notes and writings of many persons who have encountered the snake in the field. The idea was also expressed that perhaps the type specimen came from a cliff, but Günther (1863) described the species simply as from the "Pacific coast of Guatemala" and mentioned neither habitat nor common name. Another suggestion was that the strongly developed canthus rostralis is shaped like a cliff, an ingenious thought but a far-fetched one.

The statements of several authors (Sumichrast, 1880; Günther, 1895; and Martín del Campo, 1937) that the name *cantil* was used in Tehuantepec offered a clue, but confirmation of what I had long suspected, that the origin of the word was associated in some way with a native language in a region inhabited by *bilineatus*, was not obtained until recently.

The solution to the problem was discovered by Dr. Miguel Alvarez del Toro, the distinguished naturalist and director of the Instituto de Historia Natural, Departamento de Zoología, in Tuxtla Gutiérrez, Chiapas, and who is the principal authority on the vertebrates of his native state. He wrote, "In a new vocabulary of indigenous languages of Chiapas (Corzo Espinosa, 1980), I found the Tzeltal word "kantiil" was given to this snake. It means yellow lips, from "kan" = yellow and "tiil" = lips. So you see it is very well applied. Such a word was very easily changed to the Spanish *cantil*. The Tzeltals are an indigenous people of Chiapas, and it is certain they have long had communication with the people of Tehuantepec and other adjacent areas."

The wide usage of *cantil* for *Agkistrodon bilineatus* by herpetologists is probably traceable to the popular writings of Raymond L. Ditmars, who employed the name for the species in the many printings of his "Reptiles of the World" (first published in 1910) and "Snakes of the World" (first published in 1931). It is highly likely that Ditmars found the word in Günther's profusely and beautifully illustrated "Biologia Centrali-Americana: Reptilia and Batrachia," the publication of which was completed in 1902, just at the time when Ditmars' career as an author was beginning to flower.

I am grateful to the late Howard K. Gloyd for encouraging me to pursue the subject of this note, and to Hobart M. Smith for suggesting I publish it now instead of waiting until the completion of the long Gloyd-Conant monograph on the genus *Agkistrodon*.

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INSTITUTIONS

DEPARTMENT OF ICHTHYOLOGY AND HERPETOLOGY ROYAL ONTARIO MUSEUM

A phased expansion-renovation project closed the public areas of the Royal Ontario Museum on January 11, 1981. Parts of these areas including the Reptile Gallery are scheduled to reopen in September 1982. This gallery is an interim exhibit derived from the older *Gallery of World Reptiles*, but is now moved to another floor and remounted in new cases with new labels and backgrounds. Within the financial, time, and manpower budgets available, and using very few additional specimens, an effort was made to convey new story lines, and to include more about the identification of local reptiles. Some features of the old gallery, like the American Alligator diorama, were used unchanged.

Planning of the totally new permanent Ichthyology Gallery and Herpetology Gallery, to be opened in the late 1980's, will begin soon. The Herpetology Gallery will place equal emphasis on reptiles and amphibians, the first extensive and "permanent" exhibit of amphibians to be mounted at ROM.

Both of these new and ambitious galleries will result from totally new conceptual designs and story lines.

We ask that readers keep our need for display material in mind. It would be very helpful if we could be made aware of possibilities to acquire specimens of species now difficult to procure. Knowledge of the location of reference specimens posed naturally before fixing and suitable for moulding, or moulds used for models in existing galleries which could be borrowed, would also be most useful.

This department — staff, equipment, collections and all — moved back to ROM in August 1981 after four years in off-site quarters. We now occupy one-half of one of the three underground floors of a nine storey building referred to as the Curatorial Centre. The Curatorial Centre will house all of the collections and labs, and the offices of most curatorial departments.

The old wings (built 1913 and 1933) are being completely renovated and the space occupied in the past by offices, collections, and labs will be used as additional exhibit space. Filling this space with good exhibits will be a challenging task.

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BOREAL AMPHIBIAN BIOLOGY

AMPHIBIANS OF CANADA by Barbara Froom, 1982. McClelland and Stewart Limited, Toronto. 120 pp. paperback. $14.95 Canadian.

In 1975 T. Burton and G. Likens reported a most pleasing herpetological discovery. They had found that the resident biomass of salamanders in the hardwood forest of their Hubbard Brook study site equalled the resident mammalian biomass and was about twice that of birds during their yearly peak. Here, at last, was proof that amphibians are an important component of a north temperate ecosystem. The climate and biota at Hubbard Brook, New Hampshire, is very similar to that of large portions of Quebec and the eastern Canadian Maritime provinces, suggesting that amphibians are a major part of the vertebrate biomass in Canada as well as in northern New England. The early spring salamander slicks that cover highways in many parts of southern Canada subjectively reinforces that idea that much of Canada is bountiful in amphibians. Indeed, a quarter of the fresh water on this planet is in Canada and much of that water is in the kettleholes, ponds, pools and puddles left by retreating glaciers — an ideal amphibian habitat.

Admittedly, when one thinks of countries rich in amphibians Canada is not likely the first one that comes to mind. Certainly more tropical countries have higher species diversity. Yet parts of Canada are not doing too badly, at least compared to other northern industrialized countries. There are, for example, six species of *Rana* that can be collected in less than an hour's drive of downtown Halifax despite 280,000 metropolitan area residents.

Amphibians in Canada receive disproportionately little formal study by biologists, certainly less than their biomass, or even their diversity, would warrant. Range boundaries for several of the more cosmopolitan Canadian species are unknown and honest herpetologists (*e.g.*, Conant, 1975) draw range maps for those species with dashed lines separated by question marks every two to four hundred miles.

It is really not surprising that Canadian amphibians have received so little attention. Naturalists in Canada are more readily drawn into the study of either fish or mammals because of their greater economic importance. Herpetologists who like field work traditionally head for the tropics whenever they can. There are signs, however, that the situation is changing and that herpetology, particular amphibian biology, is beginning to develop in Canada. Whereas, for example, there was only one herpetologist from Nova Scotia identified in the 1974 *HISS Yearbook of Herpetology*, now there are at least four biologists in that province with primary research interests in amphibians and who publish on those organisms.

As governments in tropical countries look more and more like road side pools in Kansas in August — overheated, overgrown, and very ephemeral — field oriented herpetologists are likely to look for more politically stable hunting grounds. Canada is a place where one can still make contributions to herpetology by just getting out there and looking.

If, as most evolutionary biologists believe, major evolutionary events take place in peripheral populations then Canada should be a great place to study evolution in progress. After all, most species that extend into Canada meet the limits of their distribution there. Triploid *Ambystoma* populations are relatively common in eastern Canada and the more we learn about their strange genetics (Bogart, 1982) the more one feels that they are witnessing a dynamic evolutionary process.

The most species rich parts of Canada are the coastal regions. These are also the regions with the greatest insularity and peninsularity. Genetic isolation among populations of Canadian amphibians may be substantial given this geography. Considering the number of cryptic species of amphibians that have been discovered in recent decades in southern North America, there may still be amphibian species to be discovered in Canada.

The recent study by Schmid (1982) on freezing in anurans opens up a whole area of study on the cold tolerance of amphibians. What are the limits of cold tolerance for different species, and for those same species from different parts of their range? What is the relationship between temperature, time (rate of freezing, rate of thawing) and survivorship for different species? Does cold tolerance change with development? How does cold tolerance affect species' ranges?

Against this background of much herpetology to do and too few people to do it, one looks enthusiastically to books with titles like *Amphibians of Canada* to identify key problems and inspire investigation. A book with this title has, in fact, just been published by McClelland and Stewart Limited, Toronto. Regrettably the book is far more popular pulp than propaedeutic boreal herpetology. The author, Barbara Froom, is an amateur herpetologist and a long time activist in the Canadian Amphibian and Reptile Conservation Society, CARCS (pronounced "carcass" by more than one of its members). From the book's cover one is lead to believe that the *Amphibians of Canada* is aimed at a general adult audience. Cutsy-pooh prose and the presumption of human emotions in amphibians belie the publishers claim that this is an "indispensable guide for students, teachers, and naturalists." What is one to make of the author's confession that her pet redback salamander *(Plethodon cinereus)* ran away after becoming "very angry because I did not give him a slug that was small enough for him to eat," or her assertion that tiger salamander *(Ambystoma tigrinum)* courtship includes "love-play"? Such prepubescent silliness could be excused if the book didn't have as many inaccuracies.

Some conspicuous errors are the claims: that "only frogs, toads, and salamanders are true amphibians." (p. 20); that salamanders in contrast to anurans have "short little tongues . . . which serve more as organs of scent than as means to catch food" (p. 35) and that "with the exception of British Columbia's Tailed Toad" *(Ascaphus Truei)* . . . "fertilization takes place externally in frogs and toads" (p.

37). (See Lombard and Wake, 1977 for a lead to the literature on tongue protrusion in plethodontid salamanders and Townsend *et al.* 1981 for a recent reference on internal fertilization in *Eleutherodactylus.*)

The *Amphibians of Canada* has neither keys nor range maps, but does have a short list of references. Included are some classics, like Logier's 1952 book and his 1955 monograph with G. C. Toner; however, other important references, such as J. S. Bleakney's 1958 zoogeographic treatise on the amphibians and reptiles of Eastern Canada, are not mentioned. A few species are neither illustrated nor described in this self-proclaimed "comprehensive book". A table purported to list all the amphibians in Canada does not properly identify *Rana clamitans.* Basic taxonomy is particularly poorly handled. Thus, for example, the reader is told that all frogs and toads belong in the order Salientia but, thereafter, only the ordinal name "Anura" is used and there is no explanation for the naive that Anura equals Salientia.

Most, if not all, of the problems in this book could have been avoided if the manuscript had been critically reviewed by a few professional herpetologists. One senses, however, some displeasure with academic herpetologists on behalf of Ms. Froom since she fills a lot of space chiding research and educational institutions for what she feels is an excessive use of amphibian specimens. I can not agree with her that plastic models could and should replace real biological materials in anatomical instruction.

If there is antagonism between amateur and professional herpetology in Canada this is regrettable, for their all-out collaborative effort may be necessary in areas such as lobbying for legislation on acid rain. Amphibian eggs and embryos are particularly sensitive to low pH (Pough and Wilson, 1977). Canada's acid rain problem is severe and of international scope since Canada catches corrosive winds blown north from the United States.

With so much to deal with and still so few herpetologists in Canada, good communication between professional and amateur herpetologists is essential. Hopefully, these two groups will work more closely in the future.

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DEADLINE: Applications must be received by 15 January 1983. Notification to applicants will be made by 20 February 1983.

APPLICANT RESPONSIBILITIES: Selected Landreth Fellows are responsible for preparing a summary report of their research in publishable form and presenting a seminar to the Animal Research Council at the end of their tenure.

HOW TO APPLY: While proposals are not intended to be exhaustive documents, they should provide sufficient information for members of the reviewing committee to decide the following:

1. Significance of the proposed research to the scientific field, which would include a brief theoretical background and pertinent literature review.
2. A list of major objectives and a reasonably detailed proposal which you propose to pursue, including your methodology, experimental design, schedule (estimated starting and completion dates) and appropriate references.
3. Attach a resume of your academic background, your research experience and a letter of recommendation from a professional in your research field who is willing to serve as your adviser on this project.

Submit three copies of your research proposal along with the appropriate documents to Dr. Ronald L. Tilson, Research Curator, Oklahoma City Zoo, 2101 N.E. 50 Street, Oklahoma City, OK 73111. Telephone: (405) 424-3344. ●

SMITHSONIAN PROGRAMS OF RESEARCH TRAINING

The Smithsonian Institution announces its program of research training in higher education for 1983-1984 in the fields of American

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HERPETOLOGICAL PUBLICATIONS AVAILABLE

Two publications of interest to herpetologists have recently been published by the U.S. Fish and Wildlife Service:

Bury, R. B. (ed.). 1982. North American tortoises: conservation and ecology. U.S. Fish and Wildlife Service, Wildl. Res. Rep. 12. 126 pp.

Scott, N. J., (ed.). 1982. Herpetological communities: a symposium of the Society for the Study of Amphibians and Reptiles and the Herpetologists' League, August 1977. U.S. Fish and Wildlife Service, Wildl. Res. Rep. 13. 239 pp.

They may be ordered free of charge from the Publications Unit, Department of the Interior, U.S. Fish and Wildlife Service, 18th and C St. NW, Washington, D.C., 20240, as long as supplies last. ●



ASC MOVES TO REACH MORE SYSTEMATISTS

The Association of Systematics Collections, which has worked for a decade to promote the interests of systematics, is moving towards a wider representation of this field to present a broader, more cohesive front to government, funding sources and the public. ASC's interdisciplinary Council on Systematics and Evolutionary Biology has prepared a report (published in *ASC Newsletter* 10(4):38-40, August 1982) that strongly endorses amendment of ASC Bylaws to provide for membership of individual systematists at non-member institutions; thus, membership would be open to the bulk of the systematics community. In anticipation of the acceptance of this recommendation, *ASC Newsletter* will be available on a subscription basis beginning in 1983. Subscriptions (which will include the planned member's discount privilege on many ASC publications) will be at the proposed dues rate of $15.00 annually ($12.00 for students)—U.S. funds only, please. *ASC Newsletter* (edited by George Pisani) publishes a diverse range of notes, book reviews and articles of interest to the systematics community. Herpetological articles on collection management, color preservation, important yet poorly known collections, legislation, museum computer projects and similar topics are welcomed.

For further information, or to subscribe, write to:

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MONITO GECKO LISTED AS ENDANGERED

The U.S. Fish and Wildlife Service has determined that the Monito gecko, *Sphaerodactylus micropithecus,* known only from Isla Monito in the Commonwealth of Puerto Rico, is an Endangered Species under provisions of the Endangered Species Act of 1973, as amended. This action is being taken because of the extremely small population size coupled with suspected predation by rats. In addition, the Service determines that the entire island of Monito be declared Critical Habitat. All provisions of Sections 7 and 9 of the Act would now apply to this species. This rule became effective on November 15, 1982.

Questions concerning this action may be addressed to Director (OES), U.S. Fish and Wildlife Service, Washington, D.C. 20240.

FOR FURTHER INFORMATION CONTACT: Mr. John L. Spinks, Jr., Chief, Office of Endangered Species, U.S. Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C. 20240 (703/235-2771) or the Endangered Species Staff of the Service's Regional Office, Richard B. Russell Federal Building, 75 Spring Street, S.W., Atlanta, Georgia 30303 (404/221-3583).

NEW ZEALAND HERPETOLOGY

Proceedings of a 1980 symposium

This volume is a collection of 27 papers and transcripts of the ensuing discussions. Research work is reviewed, research and management needs discussed and priorities for research identified. Four papers cover New Zealand amphibians, both native *Leiopelma* species and introduced *Litoria* species. Ten papers address the tuatara *Sphenodon punctatus,* topics covered include current distribution, water relations and excretion, locomotion, thermoregulation, ecology on Stephens Island and breeding in captivity. Eleven papers deal with New Zealand lizards: taxonomic issues (7 papers), ecological studies (3 papers) and a physiological investigation. The list of parasites recorded from New Zealand reptiles is updated, and the role of New Zealand amateur herpetologists is reviewed.

Price NZ $25.00 includes packing and postage (overseas: surface mail only). Orders should be sent to: The Accountant, Department of Internal Affairs, Private Bag, Wellington, New Zealand. Please make cheques payable to: Department of Internal Affairs. ●

AMERICAN MUSEUM ANNOUNCES 1982 AWARDS TO 143 SCIENTISTS

The American Museum of Natural History has awarded grants to 143 scientists from three major funds: The Frank M. Chapman Memorial Fund, the Lerner-Gray Fund for Marine Research and the Theodore Roosevelt Memorial Fund.

"We are proud to assist so many scientists beginning their careers in the natural sciences," said Museum Director Thomas D. Nicholson in announcing the awards. These funds provide financial assistance primarily to graduate students or persons who have recently earned their doctorate degrees. Fifty-seven ornithologists received Chapman awards, 43 marine researchers were given Lerner-Gray awards, and 43 scientists received Roosevelt awards for work in entomology, herpetology, ichthyology, invertebrates, mammalogy and vertebrate paleontology.

The 5 herpetological projects funded from the Theodore Roosevelt Memorial Fund are:

"The population biology of two species of hybridizing tree frogs." Guy D. Walton, Tuskegee Institute, Alabama.

"Sexual selection and mating system variation in the Great Plains toad and Woodhouse's toad of Arizona." Brian K. Sullivan, Arizona State University, Tempe.

"Analysis of ecological correlates of exercise physiology among Panamanian frogs." Theodore L. Taigen, University of Connecticut, Storrs.

"A non-fatal immunological technique for sexing sea turtles." Debra Dick, Florida International University, Miami.

"The maintenance of pattern polymorphism in Lake Erie Watersnakes." Richard B. King, Purdue University, Indiana. ●



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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Houston Zoological Gardens, Houston, Texas 77001.

REPRODUCTION IN CAPTIVE *HELODERMA SUSPECTUM*

Several authors have commented on reproduction in *Heloderma suspectum* (Bogert and Del Campo, 1956, for a prior review; Gates, 1956; Shaw, 1964; Funk, 1966; Tinkham, 1971; Wagner *et al.*, 1976; Anon., 1980). This paper will deal with successful reproduction of *Heloderma suspectum cinctum* at the Houston Zoological Gardens in 1979.

MATERIALS AND METHODS

Five specimens of the banded gila monster, *Heloderma suspectum cinctum* were obtained from various sources from 1970 to 1978. Collecting data were not available. The lizards were kept in a glass-fronted exhibit 130x 88x140 cm. The substrate was river sand. Rocks, plastic foliage and a tree stump provided cover. A glass water dish 30x20x5 cm was provided in which the lizards could soak. Light was provided by two 40W Vita-lites® (Duro-Test Corp.). No basking spots were available. The lizards were exposed to a 20W fluorescent sun lamp (Westinghouse Corp.) 15-20 minutes every day to provide additional ultraviolet light. While on exhibit the lizards were exposed to a 14L:10D photoperiod. Average temperature was 28° C. Each lizard's diet consisted of three or four freshly killed 30g mice per month. The mice were occasionally dipped in egg yolk. One year prior to observed copulation it was thought that the lizards were obese, therefore their food intake was restricted to the above amount.

The lizards were hibernated in a metal stock tank 217x76x760 cm. The substrate was river sand, with rocks to provide cover. Water

was available in a small glass bowl to prevent soaking, for it was feared respiratory problems would occur. The specimens exhibited increased aggression toward their keeper in both years during hibernation.

The hibernation cycle began at 25° C and a photoperiod of 12L:12D 7 December 1979. Over a three week period the temperature and photoperiod were gradually decreased to 13° C and 8L:16D respectively. These conditions were held constant until 28 February 1979 when the temperature and photoperiod were gradually raised to 25° C and 14L:10D respectively by 15 March 1979. The specimens were returned to their exhibit 18 March 1979.

Eggs were placed in a clear plastic container 33x16x8 cm containing Vermiculite® and water (Tryon, 1975). A mixture of one part water to four parts Vermiculite® was used. This was drier than the mixture used by Tryon (1975), as it was felt the eggs needed less moisture than that of other reptile eggs. Wagner, *et al.* (1976) expressed the opinion that *Heloderma suspectum* eggs may need less moisture than other reptile eggs and Anon. (1980) also reported incubating *Heloderma suspectum* eggs in a drier medium than other reptile eggs. Our eggs collapsed and required several mistings to maintain their turgor. The incubation temperature was 28° C.

RESULTS AND DISCUSSION

Sexing the zoo's *Heloderma suspectum cinctum* was difficult. Wagner *et al.* (1976) mentioned probing (Laszlo, 1975), and Tinkham (1971) suggested comparing several characteristics in order to determine sex, including differences in scalation, size dimorphism, shorter claws on forefeet of males, tail more tumid and shorter in females than males, and lateral postanal areas on the ventral side showing hidden peni. In the zoos lizards, probing was inconclusive, and dimorphic differences were not noted in scalation or physical appearance. I eventually sexed our lizards by observing copulation and egg laying. Lengths, weights and sexes are presented in Table 1.

I observed copulation involving male A and female B 27 April 1979 and again on 6 May 1979. Copulation in nature has been reported in July (Ortenburger, 1924; Ortenburger and Ortenburger, 1926). In captivity it has been reported in May (Shaw, 1964) June and September (Gates, 1956), December, January, March and May (Wagner *et al.* 1976) and June (Potter, pers. comm.). Copulation in the zoo's lizards lasted 40 min-1 hr. Gates (1956) reported copulation lasting almost 30 minutes, Wagner *et al.* (1976) reported three, five and 15 minutes. Potter (pers. comm.) reported 20 minutes. The copulatory position of the zoo's lizards were identical of that described by Gates (1956) and Wagner *et al.* (1976).

On 31 May 1979 while in a holding pen, female B laid a clutch of four eggs (70x33 mm, 49.6 g; 64x32 mm, 39.9 g; 59x29 mm, 31.1 g; 69x31 mm, 44.0 g). On 14 June 1979 female A laid an egg in the exhibit. The following day a second egg was deposited. Measurements of the eggs were 58x33 mm, 34.4 g; and 55x30 mm, 30.6 g. One egg was found in a crevice in the tree stump and the other was lying on the sand. The eggs laid in the exhibit by female A appeared to be unmolested. Bogert and Del Campo (1956) cited *Heloderma suspectum* eggs apparently eaten by adult lizards, and Shaw (1964) also noted that *Heloderma suspectum* will eat their eggs. Dates of oviposition, number, size and weight of eggs recorded in the literature are given in Table 2.

On 30 September, after an incubation period of 122 days, a slit appeared in an egg laid by female B. Since the lizard had not emerged from the egg by the following day, it was gently removed. It was 121 mm snout-vent length, 187 mm total length, and weight was 31.0 g. It was not known from which of four eggs laid by female B this hatchling emerged.

The second egg to hatch was one of two laid by female A. Since no record was kept of which egg was laid which day by female A, the incubation period was 112 or 113 days. The hatchling had a great deal of yolk to be absorbed, as well as a very bloated abdomen, spindly limbs, poor motor control, and a tail greatly reduced in length and girth compared to the first hatchling. It was 90 mm snout-vent length, 105 mm total length, and weight was 23.0 g. After one day it died, was preserved and deposited in the vertebrate collection of The University of Texas at Arlington. Shaw (1964) noted an incubation period of 117 days in one case, noting the hatchling had a great deal of yolk to be absorbed, which led him to believe the lizard hatched prematurely.

The third egg to hatch was also one of four laid by female B. The hatchling slit the shell and emerged 4 October 1979, after incubating 126 days. Snout-vent length was 125 mm, total length 191 mm, and weight 37.0 g. Data previously recorded in the literature concerning incubation period of eggs and hatchling size are given in Table 3.

Ground color of the zoo's hatchlings was milk white as opposed to yellow or orange and no significant pattern difference was

Table 1. Sex, Size and Period in Captivity of *Heloderma suspectum cinctum.*

	Weight (g)	Length (mm)	In Captivity
Female A	362	270 SV, 410 Total	3 years, 2 months
Sex unk.	514	290 SV, 415 Total	3 years, 2 months
Female B	448	310 SV, 460 Total	3 years, 10 months
Sex unk.	1,100	360 SV, 535 Total	1 year, 4 months
Male A	689	320 SV, 452 Total	9 years, 3 months

Table 2. Egg laying and eggs of *Heloderma suspectum* (c indicates captivity, w indicates wild).

Authority	Date of oviposition	Number of eggs	Egg measurements (mm)	Weight (g)
Anon. (1980)	July (c)	6	—	—
Arrington (1930)	—	6-10	—	—
Bogert and Del Campo (1956)	June (c)	1,4	75x35, 70x33, 67x39, 72x37	—
Ditmars (1904, 1910, 1936)	July, August (w)	3-5, 4, 6-13	—	—
Funk (1966)	July (c)	6	63x33, 75x31, 64x33.8, 65.1x33.7 63.2x34.8, one unrecorded	—
Potter (pers. comm.)	July (c)	6	—	—
Shaw (1964)	July (c)	5	63.5x31.75 (average of five eggs)	39.69 (average of five eggs)
Van Denburgh (1922)	—	5-13	—	—
Wagner *et al.* (1976)	May (c)	4,6	—	—
Werner (1913)	—	3-4	—	—
Woodson (1944)	—	6-10	—	—

Table 3. Incubation and Hatching in *Heloderma suspectum*

Authority	Incubation Period (days)	Hatchling size (mm)	Weight (g)
Anon. (1980)	123	—	—
Arrington (1930)	—	88*	—
Ditmars (1936)	—	102*	—
Shaw (1964)	117, 124, 126, 130	160*	—
Wagner *et al.* (1976)	124-129	158 (average of 4)*	32.5 (average of 4)

***not stated whether snout-vent or total length of neonate.**

noted between them and the adults. The hatchlings' white ground color gradually turned yellowish and at the time of this writing (20 July 1980) are pink-tinged. Ditmars (1936) stated that hatchlings are more vividly colored than adults, while Shaw (1964) indicated hatchlings patterns are less reticulated. Tinkham (1971) also mentioned hatchlings having a less reticulated pattern, noting the color being yellowish and black. He further stated that many adult *Heloderma suspectum* are pink or orange and black when freshly caught, but seem to fade after being in captivity a number of years. I have seen no color loss in the zoo's adult lizards.

Of the other three eggs, one severely desiccated and was discarded, one mildewed and was discarded, and the third was thought dead, was opened, and contained a decomposed embryo. The dead embryo was neither measured or preserved.

ACKNOWLEDGMENTS

I am grateful to Hugh R. Quinn, Bern W. Tryon and the staff of the Department of Herpetology of the Houston Zoological Gardens for assistance rendered.

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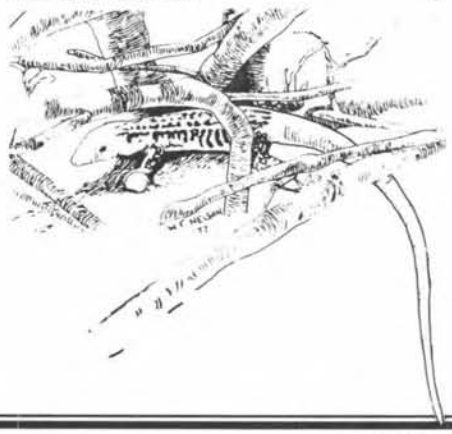
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COMMERCIAL FEED FROGS AS A SOURCE OF TREMATODE INFECTION IN REPTILE COLLECTIONS

Heavy infestations of digenetic trematodes can be associated with the deaths of reptile and amphibian-eating snakes in captivity. A recent review of this phenomenon at the Baltimore Zoo revealed that snakes hatched and reared in captivity were being infected by trematodes. Studies were undertaken to determine if commercially purchased feed frogs were a source of these infections, and what effect freezing of the frogs would have on the viability of the infective cysts.

Feed frogs, *Rana pipiens,* were obtained from a commercial source. They were held under refrigeration in glass containers with moist paper toweling for the initial study. Frogs were frozen for the second study by individually wrapping them in plastic bags. They were then placed in the freezing compartment of a standard household refrigerator.

In the initial study, five pithed and five recently dead frogs were dissected. The thigh muscles were removed and spread on a glass Petri dish with several drops of saline. This preparation was then mashed by another Petri dish and examined under a 10 power stereo dissecting scope, using transmitted light. The presence of cysts or migrating young flukes (marita) and their viability was determined.

In the second study, two groups of ten frogs were frozen and then thawed under refrigeration 24 hours and 10 days after being placed in the freezer. Two additional groups of 12 frogs were frozen and thawed similarly, 60 hours and 72 hours after placement in the freezer. All frogs were examined using the same techniques as the first study to determine if the frog was infected with trematodes. No attempt was made to quantitate the infection in a single frog. A frog was considered infected or uninfected on the basis of examination of the thigh muscles. Differences in cyst and marital morphology suggested that more than one species of trematode were present in the frogs. Only the percentage of living versus dead organisms was determined.

The first study with live and recently killed frogs revealed viable trematode cysts in 50% of the frogs. It was interesting to note that while the trematodes remained firmly encysted in the live frogs examined, the trematodes in the recently dead frogs had unencysted and were highly motile. These unencysted trematodes were most numerous in the subcutaneous tissues and fascial planes rather than in the muscle tissue itself.

The second study confirmed the first study. Infected frogs were found in all groups. At 24 hours both live cysts and free moving trematodes were seen. At 60 hours, 72 hours and 10 days only dead parasites were encountered. (Table 1)

DISCUSSION

Commercial feed frogs are a possible source of trematode infections in frog-eating snakes. Infected frogs were found in all groups. The actual percentage of infected frogs is probably higher than indicated by our study, since only the rear legs were examined for cysts. Close examination of the entire frog including the internal organs would have assuredly revealed a higher percentage of infected frogs (Reichenbach-Klinke and Elkan, 1965).

A standard kitchen refrigerator's freezing unit was used to test methods readily available to most reptile keepers. Time periods used in this study were not based on the time the frog was actually frozen. The end points of placing the frog in the freezer and removing it for thawing are much easier to monitor than actual freezing times. Some variation in the speed of freezing should be expected depending on the age and condition of the freezer used.

The unencystment of trematodes at the death of frogs is worthy of note. It is thought that young trematodes unencyst by the digestion of the cyst wall by the new hosts' digestive enzymes (Georgi, 1974). This study provides evidence that the death of the intermediate host and not necessarily digestive enzymes triggers unencystment for at least some trematodes. This could have important implications on the possibility of trematode infection of abnormal hosts.

Of practical importance, this study indicates that conversion of frog-eating snakes to dead food and the freezing of feed frogs for at least 60 hours prior to use should significantly reduce if not eliminate trematode transmission. It suggests the need to study the role of feed snakes in the transmission of trematodes to ophiophagus reptiles.

Table 1. The occurrence of trematode cysts in *Rana pipiens* and their susceptibility to freezing conditions over various time periods.

Trial	N	Number infected	% live cysts & trematodes
Live and recently killed frogs	10	5	100%
Frogs frozen 24 hours	10	5	100%
Frogs frozen 60 hours	12	11	0%
Frogs frozen 72 hours	12	7	0%
Frogs frozen 10 days	10	2	0%

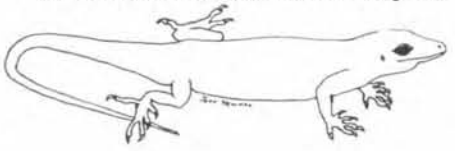
ACKNOWLEDGMENTS

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LIFE HISTORY NOTES

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General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1978. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

SAURIA

EUMECES ANTHRACINUS PLUVIALIS (Southern Coal Skink). **REPRODUCTION.**

Collins (1975. Trans. Kansas Acad. Sci., 77:126-127) summarized four known egg clutches of this taxon, which numbered eight to eleven eggs per clutch.

On 1 May 1982 I collected a gravid female *E. a. pluvialis* under a rock in Cherokee County, Kansas, (Sec.10, T35S, R25E) on the edge of an oak-hickory stand and osage-orange secondary growth. The skink was maintained in captivity until egg deposition, whereupon the lizard and its clutch were preserved. Unfortunately, the exact date of deposition was not recorded, but was known to be in the last quarter of May. The female (KU 192368) measured 61 mm SVL and 152 mm TL. The ten eggs (KU 192369) measured 9.0 mm to 11.0 mm in length ($\bar{x}$=9.79 $\pm$ 0.63 SD) and 6.0 mm to 7.0 mm in width ($\bar{x}$=6.15 $\pm$ 0.30 SD).

A second female (KU 192174) measured 60 mm SVL and 133 mm TL, and was collected by J. T. Collins and L. Miller on 17 April 1982 at Sec.36, T33S, R25E, in Cherokee County, Kansas, beneath a dead log. The body cavity contained nine oviducal eggs of which eight were measured (the ninth egg was damaged

on extraction and was not measured). These eggs measured 5.1 mm to 7.0 mm in length ($\bar{x}$=6.15 ± 0.62 SD) and 5.0 mm to 6.1 mm in width ($\bar{x}$=5.43 ± 0.49 SD).

Submitted by **KELLY J. IRWIN,** Animal Care Unit, University of Kansas, Lawrence, KS 66045. ●

XANTUSIA VIGILIS (Yucca night lizard). **LONGEVITY.** 0.0.3 adult specimens obtained from a California reptile dealer 22 April 1962. The death of one specimen was not recorded; the other two died 16 April 1966 and 19 June 1966; the latter surpassing the record of the Arizona Sonora Desert Museum (Bowler 1977. *Longevity of reptiles and amphibians in North American collections.* SSAR Herp. Circ., 6:1-32.) The new record of 4 years, 1 month, 27 days surpasses the old one by 3 months, 14 days.

Submitted by **HENRY J. COHEN,** 24 St. John's Place, Buffalo, NY 14201 U.S.A. ●

SERPENTES

CEMOPHORA COCCINEA (Scarlet Snake). **REPRODUCTION.** Anecdotal information has been published (see Fitch, 1970. Univ. Kansas Publ. Mus. Nat. Hist. 52:1-247) on the reproductive biology of the scarlet snake, *Cemophora coccinea,* and only one egg clutch has been reported (Woolcott, 1959. Copeia 1959:263). Below I present data on a second clutch.

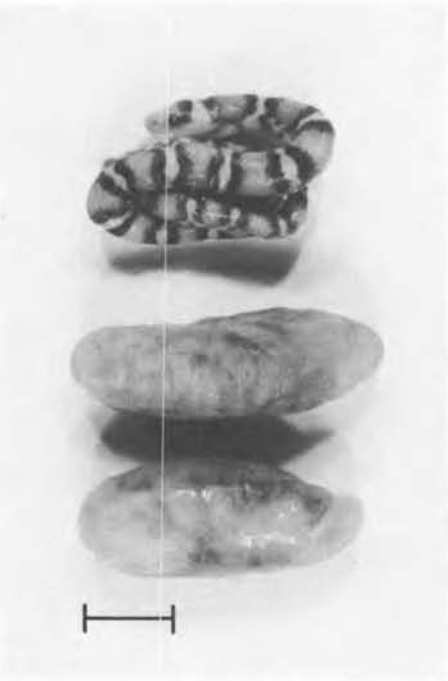
While seeking *Cnemidophorus sexlineatus* eggs, I unearthed a clutch of three scarlet snake eggs from beneath the pine straw and humus covering the red clay soil of a south-facing embankment along a rural highway in Coweta Co., Georgia, on August 13, 1978. The eggs were not adherent and were spaced several cm apart. All were elongate, irregular in shape (Fig. 1) and off-white in color as described by Woolcott *(op. cit.).* The clutch was placed in formalin soon after collection and is currently deposited in the Georgia Southwestern College Museum (GSCM 2138-40).

Average egg measurements two and one-half years after preservation were: length x width, 34.5 mm x 12.5 mm; weight, 2.40 g, and yolk mass weight, 0.53 g. Embryo weights averaged 1.52 g (1.47 - 1.57). Snout-vent lengths averaged 111.3 mm (108.6 - 114.2), and all tail lengths were 18.0 mm. The yolk mass of each egg was dispersed so as to completely surround the embryo.

With their well documented dietary preference for reptile eggs (*e.g.,* Martof, *et al.,* Amphibians and Reptiles of the Carolinas and Virginia), it is not surprising to find scarlet snakes nesting in proximity to this potential food source. In the past, I have collected adult scarlet snakes (from Alabama, Arkansas, and Georgia) in a manner similar to that which I used in locating the present nest. Two of these snakes, incidentally, were removed from hibernation dens in red clay embankments.

I thank Dr. Robert H. Mount of Auburn University and an anonymous reviewer for their critical comments on the manuscript, and also Alfred C. Lamb, III, and Charles W. Seyle, Jr., for field assistance.

Figure 1. Eggs and an embryo of the scarlet snake, *Cemophora coccinea.* The yolk mass has been removed from the embryo. Line equals 10 mm.



Submitted by **STANLEY E. TRAUTH,** Department of Biology, Georgia Southwestern College, Americus, GA 31709. Present address: Department of Biology, Southern Methodist University, Dallas, TX 75275. ●

EUNECTES (Anacondas). **MATURATION.** The attainment of sexual maturity and its relationship to size and age in boids is little understood. Rates of growth are variable and are probably accelerated under captive situations. The second generation birth in captivity of two species of *Eunectes* at the New York Zoological Park however helps to pinpoint maturation parameters for those species.

Eunectes murinus. A sibling pair of *E. murinus* born 5 February 1978 (Holmstrom, 1980, Herp. Rev. 11(2):32-33) was placed together on 2 December 1979. Courtship was noted on numerous occasions from 14 March to 4 June 1981. The pair was 3 years, 1 month, and 9 days (1133 days) of age when courtship began. On 18 July the female was evidently gravid and on 8 December 1981 she gave birth to 18 young at 3 years, 10 months, and 3 days (1402 days) of age. Her post parturient weight was 25.12 kg and she was 3.63 m in total length (=TL) and 3.16 m in snout-vent (=SV) length. At that time the male weighed 21.43 kg and was 3.53 m TL and 3.0 m SV.

Eunectes notaeus. A female E. notaeus ($♀_1$) born 29 April 1978 (Holmstrom, 1982, Int. Zoo Ybk. 21:92-94) was introduced to an adult male and two adult females of unknown origin on 10 November 1981. Courtship between the male and one of the females (parent of $♀_1$) was observed during November and December of 1981. On 17 January 1982 $♀_1$ appeared gravid. She was 3 years, 10 months, and 19 days (1390 days) of age and weighed 8.82 kg and was 2.48 m TL and 2.13 m SV. On 16 February 1982 a radiograph revealed large egg masses of uniform opacity and on 10 July 1982, at 4 years, 2 months, and 11 days (1533 days) of age, she gave birth to 18 young.

Submitted by **WILLIAM HOLMSTROM,** Department of Herpetology, New York Zoological Park, 185th St. and Southern Blvd., Bronx, New York 10460. ●

TESTUDINES

DERMOCHELYS CORIACEA (Leatherback Sea Turtle). **NESTING.** On 24 April 1981, a *Dermochelys* crawl was observed on the ocean beach of Cumberland Island, Camden County, GA. The nest cavity was not located but the site was marked and checked no less than bi-weekly during the incubation period except between 19 and 25 July. Thereafter, the site was checked daily until a single track of an emerging hatchling was observed on the 31st of July, 98 days after the nesting. At that time there were two live hatchlings at the surface of the nest so it was not excavated until 5 August. A conservative estimate of the number of eggs laid was 67, based on the number of eggs and egg shells found when the nest was excavated. From the shell fragments 10 animals were judged to have hatched, 43 eggs were undeveloped, three were partially developed, and 11 were full-term, dead in the egg. Of the estimated 10 that hatched, at least 5 were dead and decomposing in the nest, at least 3 emerged alive from the nest and 2 were not accounted for. Exceptionally high tides during the early incubation period eroded the beach to within 50 cm. of the nest, probably accounting for some mortality.

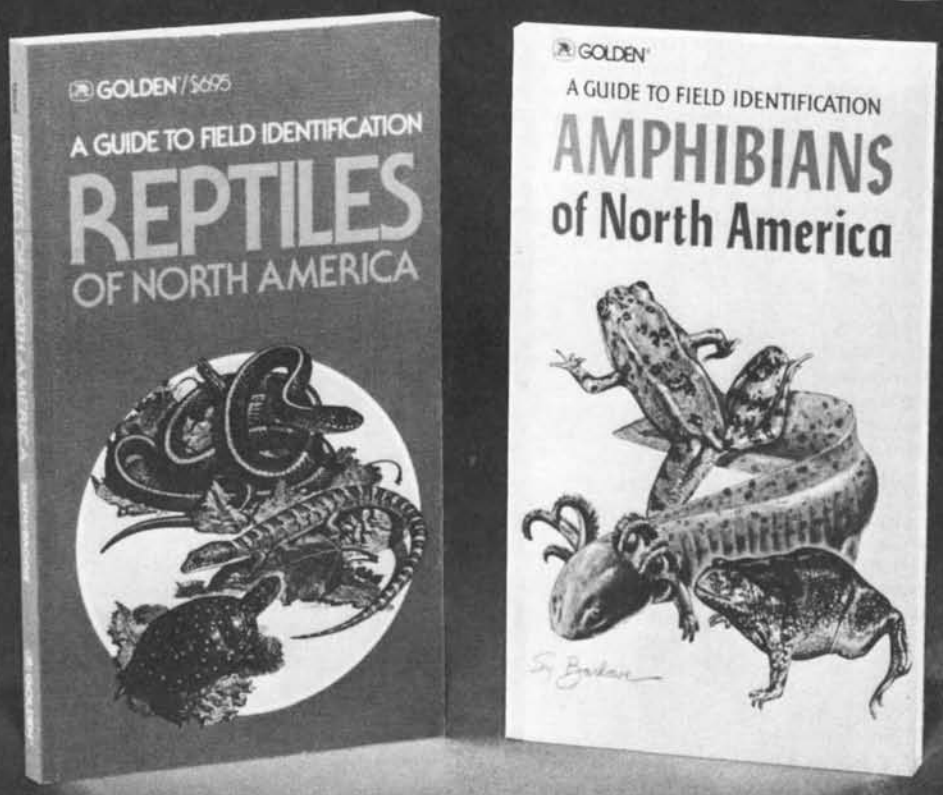
On 14 June 1981, on Blackbeard Island National Wildlife Refuge, McIntosh County, GA the nesting of a *Dermochelys* was photographed. Carapace measurements of this nesting female were: length on contour, 163 cm.; width, 112 cm. The turtle was apparently searching for a nest site when encountered at 0235 hr. and laid 89 eggs which were moved to a hatchery. Initial emergence of the hatchlings occurred on 18/19 August, after a 66 day incubation period.

Cumberland Island is approximately 95 miles north of the northernmost confirmed *Dermochelys* nesting at Flagler Beach, FL. (Carr, A. 1952, Handbook of Turtles. Comstock Pub. Assoc., Ithaca, NY. 542 pp.) and Blackbeard Island is 145 miles north. These two nestings are the first recorded for *Dermochelys coriacea* in Georgia.

Voucher specimens have been deposited in the Savannah Science Museum and the U.S. National Museum.

Submitted by **CAROL RUCKDESCHEL, LEIGH ELLIS,** and **C. ROBERT SHOOP.** Box 796 St. Marys, GA. 31558; Institute of Ecology, University of Georgia, Athens, GA. 30601; Dept. of Zoology, University of Rhode Island, Kingston, RI 02881. ●

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BOOK REVIEWS

Common Indian Snakes: A Field Guide, by Romulus Whitaker. 1978. xiv + 154 pp. The MacMillan Co. of India, Ltd. Price 12 Rs (postage extra).

This concise, informative and well illustrated guide provides an excellent introduction to the snake fauna of India (and adjacent SE Asia). The book deals only with the 30 most common Indian species, and contains essentially three major sections. The first is a series of accounts of non-venomous and venomous species, each following what has long served as a standard format for such accounts (English name, scientific name, description, range, etc.). The accounts are well done, and succeed in presenting a thorough profile of each species. The illustrations in this section are generally very good (as are most through the book), and those few which do not look very good (*Macropisthodon plumbicolor* — p. 21; *Dendrelaphis tristis* — p. 36) are still suitable for identification purposes. I suspect several photos would have reproduced better if more finely screened during printing. This section would have been further enhanced were it preceded by an artificial key to species constructed from the DISTINCTIVE FEATURES given for each one. Instead, a key derived from Minton (1962) is included back on page 139; this key, while good, utilizes a variety of scale characters which laymen may have difficulty discerning. In fact, Whitaker implies (p. 145) the value of the sort of key I've mentioned by stating, "Identification of the living snake in the field is usually made on the basis of colour, pattern, habitat and behaviour." I agree with him in that ". . . the clues used do not lend themselves well to brief verbal description", but a better key could have been constructed for thirty species. Oh, well; enough of being picky. The accounts are, as I've said, very well done.

The second major section, general information, is a useful potpourri of life history and anatomical features of snakes, plus brief accounts of their economic value and Indian mythology. It also includes, as a separate chapter, a very good discussion of snakebite in India.

The last section is essentially nomenclatorial, and contains a revised version of Smith's (1961) checklist of Indian snakes, a list of vernacular names for the thirty species treated in the book, and the aforementioned key from Minton (1962). The selected bibliography is thorough, but omits one of the references cited in text (Hartline, 1971) on page 74. A rainfall chart is a useful addition to the book and is in this last section.

Typography is generally good, and I saw few errors (most are handled in the Errata on the book's last page). On page 139, *Trimeresurus* is broken into two words; on page 102, hospital should be plural; on page xii about is divided in two; and throughout the text, up to is combined in one word (upto). These are presented as notations rather than criticisms, since editors quickly learn not to point derisively at the typographical errors of others!

I recommend this book highly to those interested in the Indian herpetofauna, and hope it will accomplish one of the author's objectives, to ". . . help stir up some popular interest in this group of reptiles."

LITERATURE CITED

Minton, S. A. 1962. Annotated Key to the Amphibians and Reptiles of Sind and Las Bela, West Pakistan. Amer. Museum of Nat. Hist. Novitates, No. 2081.

Smith, M. A. 1961 (reprint). Fauna of British India, Vol. III Serpentes. Dehra Dun.

GEORGE R. PISANI
University of Kansas

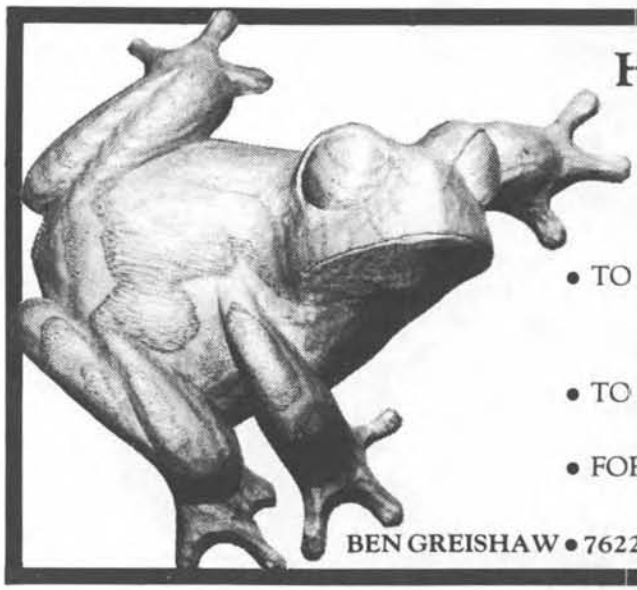
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Comparative Ecology of Two Colubrid Snakes in Northern Utah: *Masticophis t. taeniatus* and *Pituophis melanoleucus deserticola*, by William S. Parker and William S. Brown. Milwaukee Public Museum, Publications in Biology and Geology Number 7, 104 pp.

This outstanding treatise on snake ecology is based upon a unique combination of individual marking and recapture on a large scale, and of radiotelemetric monitoring of selected individuals. It is noteworthy for the great amount of detailed data which were gathered and analyzed, and for the thorough coverage of literature putting the original findings in perspective. Comparisons are made of every aspect of the findings concerning *Masticophis t. taeniatus* and *Pituophis melanoleucus deserticola* with whatever was known previously about these or other kinds of snakes.

Brown and Parker shared the field work in a collaborative project which yielded doctoral dissertations for both. These two workers were heirs to the snake den complexes in Tooele County, Utah, studied by Dr. Angus M. Woodbury and his students throughout the 1940s, and later investigated by Dr. Harold F. Hirth and associates. The early studies by Woodbury and his co-workers were concerned mainly with rattlesnakes (*Crotalus viridis*), but by the last decade most of the rattlesnake population had disappeared from the dens. The main species still present were the gopher snake, the striped whipsnake and the western yellow-bellied racer (*Coluber constrictor mormon*). The latter is not formally dealt with in the present report, but is often mentioned in comparison.

Like earlier studies at the Tooele County den complexes, this one involved fencing of the separate dens with mass capture and marking (by scale-clipping) of the emerging or returning snakes in spring or fall. The data base included 1264 captures of 242 whipsnakes and 411 captures of 211 gopher snakes. However, the mark-and-recapture procedures were supplemented by radio-



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telemetry which was the focus of the present study. A total of 14 *Masticophis* and 10 *Pituophis* were followed for 604 cumulative snake days. The paper has the following topic headings: Acknowledgments, Abstract, Introduction, General Methods, Hibernation, Thermoregulation, Activity, Movements, Trailing Ability, Reproduction, Fat Bodies, Ecdysis, Growth, Population Dynamics, Predation, Food Habits, General Discussion. Under some of these topic headings there are several (up to 9) subheadings, including "Methods", "Results" and "Discussion". For the two kinds of snakes trinomials are used throughout in the tables and the legends for figures, but in the text they are referred to simply as *Masticophis* and *Pituophis*. Many of the figures could have been further reduced, resulting in some saving of space and neater appearance.

Among the more significant findings were the following: both whipsnakes and gopher snakes are active mostly by day, but the former tend to stay in the open and the latter under shelter. After morning basking each kind thermoregulates to keep its body temperature within a narrow range throughout the day, mean 31.2° for the whipsnake vs 27.9° for the gopher snake. Average dispersal distance from dens was about 509 m for gopher snakes of both sexes, but was 992 m for 6 male whipsnakes and 1455 m for 4 females. Polygonal home ranges plotted from recorded stations averaged 1.05 ha in male gopher snakes, 2.09 in females. Home ranges were not demonstrable in whipsnakes. Eggs of both species were laid in abandoned mammal burrows, sometimes in communal nests. Experimentally displaced whipsnakes homed over distances up to 850 m, and were consistently successful in homing over distances up to nearly 400 m. In gopher snakes homing ability was less well developed. Males of both species usually attained sexual maturity at 1 year; female gopher snakes laid their first clutches at ages 3-5, female whipsnakes were always mature at 3 years, some possibly at 2. Population density of whipsnakes was calculated as .11 to .33 per ha (biomass 14.3 - 30.9 g per ha) and for gopher snakes .32 per ha (65.4 g per ha). The den population of whipsnakes, not including first-year young, consisted of about 1/3 old adults (more than 5 years old) and two-thirds young adults and immatures. In gopher snakes the proportion of old adults was somewhat higher — above 40%. Female whipsnakes emerging from hibernation were found to move to individual areas within 200 m and remain for several days or weeks during a mating period, before the relatively long distance dispersal to summering areas. During this same spring period males were active in sexual search, and those successful in finding a female often remained with her over periods of days. During this breeding season a whipsnake of either sex might have a succession of partners, with occasional combat or pursuit, and displacement of a smaller mated male by a larger one.

Snakes from outside the study area were sacrificed to obtain information that could be gained only by dissection. In contrast to the hundreds of records obtained of movements and body temperatures, relatively few records were obtained of predation on the snakes, of food and of clutch size. Mean clutch size was 5.8(3-10) in 13 *Masticophis* and 7.4(4-10) in 9 *Pituophis*. Food items of whipsnakes included 18 lizards (12 *Uta*, 3 *Phrynosoma*, 2 *Sceloporus*, 1 *Cnemidophorus*), 2 snakes (*Masticophis, Coluber*), and 8 mammals. Small whipsnakes ate only lizards. Food of gopher snakes included 14 mammals (*Microtus, Perognathus, Peromyscus*) 1 lizard (*Uta*), and 1 grasshopper! The 4 instances of predation obtained were of 1 gopher snake taken by a Red-tailed Hawk, 1 small whipsnake eaten by a large one, and 2 whipsnakes killed by mammalian predators, probably weasels.

The Utah study will be an indispensible reference to anyone concerned with ophidian ecology. The authors and the Milwaukee Public Museum are to be congratulated.

HENRY S. FITCH
University of Kansas
Natural History Reservation ●

Inventory of Reptiles and Amphibians in Captivity, 1982. Frank L. Slavens. Privately printed, July 5, 1982. 212 pp., ill. (Available from author only, P.O. Box 30744, Seattle, Washington, 98103; $20 paper, $25 hardbound, postpaid).

Single-handedly Frank Slavens of the famed Woodland Park Zoological Gardens of Seattle has issued the fifth in a series of annual compilations of live amphibians and reptiles in both public and private collections in the United States, Canada and Mexico. The first was issued in 1976, followed by editions in 1977 (not distributed), 1980, 1981 (a few still available, same price) and 1982.

The 1982 edition reports on 176 (69 public and 107 private) collections representing 382 genera, 952 species and 1352 species-group taxa extant in those collections as of January 1, 1982. The first part of the work (pp. 10-44) lists alphabetically under family and order in systematic sequence the 314 species reported to have bred in captivity during 1981 or previous years, with all available related information, such as dates of copulation, oviposition or parturition, incubation or gestation, developmental temperatures, sex ratios of neonates, *etc.*

The second part of the work (pp. 46-182) lists, in the same arrangement as in the first part, all live specimens, breeding or not, in the reporting collections, noting sexes and number of each.

A family and generic index to both parts is given in the Table of Contents (pp. vii-xv). The book terminates with a 4-page bibliography and a 6-page alphabetical list of the codes used for designation of collections. Numerous vignettes and a colored frontispiece cartoon embellish the work throughout, adding materially to the pleasure of using it either seriously or casually.

For many years European terrarists have been essentially alone in their devotion to private maintenance and propagation of amphibians and reptiles, as attested by their near monopoly on terrarist magazines and books. Partly because of the world-wide expansion of concern for conservation of threatened species, a prodigious growth of interest in care of herpetozoa in captivity has taken place in North America in the past decade or two, now approaching equivalence to the long-established European tradition.

Never before, however, has there been an attempt to list all live herps maintained in all collections of such a large area as North America. It is a unique and highly useful service to not only public and private collections in their attempts to establish strong breeding programs, but to a wide variety of experimentalists, ethologists, physiologists, etc., who are in need of examples of particular species of particular sex that would otherwise be unobtainable or obtainable only with great difficulty. Loans, gifts and exchanges are greatly facilitated by knowledge of where what exists already in captivity.

Plans are laid already for the 1983 editon, which, profiting from the experience gained the past five years and the recent acquisition of a word processor, is to be greatly expanded in scope (worldwide) and content (including a synoptic bibliography of works — books and articles — on all aspects of herpetological breeding and husbandry, and greater emphasis upon breeding information), while maintaining the current listings of inventory and reproductive data.

Participation of both private and public caretakers, even of the smallest collections, in the 1983 edition is strongly urged. Advice of works on husbandry is also solicited by the author. There is no charge for entries of any sort, and because of the attribution of data to specific coded sources, data may be cited under the name of the originator (*e.g.* an entry under (*Caiman crocodilus*, pp. 18-19 of the 1982 edition, is attributable to Pat Jacobs in Slavens, 1982, *etc.*).

Especially in the present era of well-deserved concern for the welfare of the many threatened and endangered species of herpetozoa, all biologists, ecologists and conservationists owe an enormous debt of gratitude to Slavens for the incomparable service provided by this "Inventory," produced on a shoestring, without governmental or other subsidy, by dint of heroic effort rarely paralleled in any field of endeavor. The self-sacrificial devotion required for single-handed production of this work, from solicitation and collation of data to typing, duplication and binding, is almost inconceivable, yet has not only been demonstrated repeatedly over the past six years but is anticipated with total equanimity and self-confidence at an even more rigorous level in the future, as an ongoing lifetime project. Fortunately the author is young, strong and healthy, and merits the support of the entire herpetological world in promotion of the success of his long-term goals.

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Department of Environmental, Population and Organismic Biology
University of Colorado 334
Boulder, Colorado 80309
(page charges paid by author) ●



Geographic Distribution

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles** , Collins, Huheey, Knight and Smith, 1978), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Joseph T. Collins, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

CAUDATA

BATRACHOSEPS ATTENUATUS (California Slender Salamander). USA: CALIFORNIA: Tehama Co: 0.8 km south of Williams Butte, 335 m (T23N, R6W, Sec. 8) (one specimen) and 0.4 km west of Williams Butte, 366 m (T23N, R7W, Sec. 12) (four specimens). Collected by M. R. Jennings and D. Kerwin on December 14 and 15, 1981. Verified by D. B. Wake and S. D. Busack, University of California, Berkeley. Museum of Vertebrate Zoology, U. C. Berkeley (MVZ 158894, 158895-158898). First records for Tehama County and extends the distribution of this species some 24 km north than previously reported (Yanev, K. P. 1980. Biogeography and distribution of three parapatric salamander species in coastal and borderland California. Pages 531-550 *in* D. M. Power (ed.). The California islands: proceedings of a multidisciplinary symposium. Santa Barbara Mus. Nat. Hist.). Specimens taken under logs and debris in oak woodland with chamise, mazanita, and digger pine present. Three other salamanders captured on the afternoon of December 15th were released.

Submitted by **MARK R. JENNINGS,** California Department of Fish and Game, P.O. Box 607, Red Bluff, California 96080. Present address: School of Renewable Natural Resources, 210 Biological Sciences East Building, The University of Arizona, Tucson, Arizona 85721. ●

ENSATINA ESCHSCHOLTZI KLAUBERI (Large-blotched Ensatina). USA: CALIFORNIA: San Diego Co: 4.8 km E of Ramona (by road) on State Highway 78. 27 March 1970. R. P. Yingling and C. Croulet. Verified by V. N. Scheidt and R. P. Yingling. Extends known range 21.4 km WSW. Specimen observed on road through Southern Oak Woodland habitat. Two forms of *Ensatina* occur in San Diego County — *E. e. klauberi* typically in montane coniferous habitat, and *E. e. eschscholtzi* at lower elevations, primarily in riparian oak woodland habitat. Specimen observed may have been washed downstream from typical habitat at higher elevations E of site of observation; however, since date of observation, other *E. e. klauberi* have been found in Southern Oak Woodland habitat E of this locality. Because of the restricted distribution of this form, the specimen was not collected. The specimen was photographed at the site of observation, however, and a voucher photograph is presented here in lieu of a catalogue number for verification.



Submitted by **VINCENT N. SCHEIDT,** 4434 Bannock Avenue, San Diego, California 92117, and **R. PETER YINGLING,** 6328 49th Street, San Diego, California 92120. ●

GYRINOPHILUS PORPHYRITICUS PORPHYRITICUS (Northern Spring Salamander). USA: MASSACHUSETTS: Worcester Co: 3.6 km E of Holden Center at 29 Oregon Trail, 750 m, 27 April 1982, George Ginerelli and Paul Rugg. Verified by T. E. Graham. Harvard University, Museum of Comparative Zoology (MCZ 100978). Bright salmon-red specimen (14.7 cm total length) found fully exposed beside back yard steps and retaining wall at 1130 hr. Second record for the county; extends range roughly 17 km southeast of its only previously known locality of Wachusett Mountain, Princeton (Lazell, 1974, Reptiles and Amphibians in Massachusetts, 2nd. Ed., Publ. Massachusetts Audubon Society).

Submitted by **TERRY E. GRAHAM,** Department of Natural and Earth Sciences, Worcester State College, Worcester, Massachusetts 01602 and **LEWIS STEVENS,** Worcester Science Center, Harrington Way, Worcester, Massachusetts 01604. ●

PSEUDOBRANCHUS STRIATUS (Dwarf Siren). USA: FLORIDA: Walton Co: Sec 5-T2S-R18W. 9.6 air km SE Freeport. 19 May 1980. K. Thomas and P. Moler. Fla. State Mus. (UF 47165-47172). First records for county. Extends known range 90 km SW and represents the westernmost locality for *Pseudobranchus* (Martof. 1972. Cat. Amer. Amphib. Rept., 118.1)

Submitted by **PAUL E. MOLER,** Florida Game and Fresh Water Fish Commission, 4005 S. Main St., Gainesville, Florida 32601 and **KELLY THOMAS,** Rt. 2, Box 27, Florala, Alabama 36442. ●

ANURA

ELEUTHERODACTYLUS PLANIROSTRIS PLANIROSTRIS (Greenhouse Frog). USA: Alabama: Baldwin Co: Fairhope, from under masonary debris on the campus of the Marietta Johnson School of Organic Education. 11 April 1982. S. D. Carey. Identified by S. D. Carey. Auburn University Museum (AUM 30914). Striped phase female (SVL 31 mm) with mature ova. This is the first record of this subspecies in Alabama. Observations at this location in September 1982 revealed both striped and mottled phase individuals, and numerous juveniles.

Submitted by **STEVEN D. CAREY,** Department of Natural Sciences, Mobile College, P.O. Box 13220, Mobile, Alabama, 36613. ●

HYLA GRATIOSA (Barking Treefrog). USA: Maryland: Caroline Co: collected 1.1 km east of Henderson on Bee Tree Road. 18 June 1982. K. Anderson and H. G. Dowling. New York University (HGD 74875). Verified by K. Anderson and H. G. Dowling. Adult female with immature ova found on dirt road between two bean fields. Head width/tibio-fibula length = 0.831. Individual in desiccated condition. This represents the first published record of *H. gratiosa* in Maryland. Known range extends north to the mouth of Chesapeake Bay, in southeastern Virginia (Conant, 1975. A Field Guide to the Amphibians and Reptiles of Eastern and Central North America. Houghton Mifflin Co., Boston). Specimen may be a member of a small relict population, part of an unreported introduced sample, or represent an individual release event. Field studies supported in whole by BRSG Grant RR07062 awarded by the Biomedical Support Grant Program, Division of Research Resources, NIH to HGD and KA.

Submitted by **KAREN ANDERSON** and **HERNDON G. DOWLING,** Department of Biology, New York University, Washington Square, New York, New York 10003. ●



LIMNAOEDUS OCULARIS (Little Grass Frog). USA: FLORIDA: Bay Co: Sec 27-T1S-R15W. 23 June 1980. (UF 47376-47377). Washington Co: 1) Fla. Hwy 284, 5.6 km N jct. Fla. Hwy 284A. 2 Aug. 1979. (UF 45286); 2) 4.5 km N Hinson's Cross Roads. 2 Aug. 1979. (UF 45287). Walton Co: 1) Fla. Hwy 20, 0.8 km E Bruce. 24 May 1979. (UF 45190-45191); 2) Fla. Hwy 282 at Alaqua Creek. 4 July 1979. (UF 45285); 3) Fla. Hwy 20. 0.5 km W Basin Bayou. 27 June 1980. (UF 47378); 4) Fla. Hwy 20, 7.2 km E Walton-Okaloosa Co. line. 27 June 1980. (UF 47379). P. Moler. All specimens Fla. State Mus. First records for each county. Extend known range 75 km SW. (Franz and Chantelle. 1978. Cat. Amer. Amphib. Rept. 209.1).

Submitted by **PAUL E. MOLER,** Florida Game and Fresh Water Fish Commission, 4005 S. Main St., Gainesville, Florida 32601. ●

RANA PIPIENS (Northern Leopard Frog). USA: MINNESOTA: Winona Co: Bob Virchota Landing, Mississippi River near Winona (T 107N, R 7W, Sec. 7). 25 September 1974. P. A. Cochran. Bell Mus. Nat. Hist., Univ. Minnesota (10842). First published record for Winona County (Breckenridge, 1944, Reptiles and Amphibians of Minnesota, Univ. Minnesota Press; Minnesota Dept. of Natural Resources, 1979, Guide to the Reptiles and Amphibians of Southeast Minnesota - Region 5). Leopard frogs were also observed at this site 10 May 1980.

Submitted by **PHILIP A. COCHRAN,** Laboratory of Limnology, University of Wisconsin, Madison, Wisconsin 53706. ●

TESTUDINES

STERNOTHERUS CARINATUS (Razorback Musk Turtle). USA: ARKANSAS: Pike Co: Little Missouri River at Ark. Hwy. 84. 4 October 1969, 11 June 1970. R. McKown and D. Brooks. West Texas State University Museum Natural History (WTSU 447, 448, 1089). Only one previous specimen recorded from this county (H. G. Dowling, 1957, Occas. Papers Univ. Ark. Mus. 3, 51p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016. ●

STERNOTHERUS ODORATUS (Stinkpot). USA: ARKANSAS: Crawford Co: Lake Ft. Smith. 30 June 1973. F. C. Killebrew. West Texas State University Museum of Natural History (WTSU 7028). Verified by F. C. Killebrew. New county record. Extends range 100 km S of nearest locality in Washington County (H. G. Dowling, 1957, Occas. Papers Univ. Ark. Mus. 3, 51p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016. ●

TERRAPENE CAROLINA TRIUNGUIS (Three-toed Box Turtle). USA: ARKANSAS: Searcy Co: *ca.* 5 km S St. Joe on St. Rt. 65. 10 May 1982. Collected by Thomas Vance and G. W. Stratton, Corsicana, Texas. Verified by Thomas Vance. The specimen is deposited in the preserved specimen collection at Navarro College (NC 1982.5.12.1Tu), is one of several sighted, and is the first record for Searcy County which helps fill the hiatus in its Arkansas range. (Dellinger and Black, 1938, Occ. Pap. Univ. Ark. Mus., 1:3-47; Schwardt, 1938, Univ. Ark. Exptl. St., 357:2-47; Dowling, 1957, Occ. Pap. Univ. Ark. Mus., 3:4-51).

Submitted by **THOMAS VANCE,** Biology Department, Navarro College, Corsicana, Texas 75110. ●

SAURIA

ANOLIS EQUESTRIS (Knight Anole). USA: FLORIDA: Monroe Co: Mile Marker 87.5, US Highway 1, Plantation Key. Summer 1981. J. Scurlock. Fla. State Mus. (UF 52748). First record for county. Approx. 60 km SW of nearest reported locality on Elliott Key, Dade County (L. D. Wilson and L. Porras. The ecological impact of man on the south Florida herpetofauna. *In Press*).

Submitted by **KAREN L. ACHOR,** 116 S. Bay Harbor Drive, Key Largo, Florida 33037 and **PAUL E. MOLER,** Florida Game and Fresh Water Fish Commission, 4005 S. Main St., Gainesville, Florida 32601. ●

HELODERMA SUSPECTUM CINCTUM (Banded Gila Monster). USA: CALIFORNIA: San Bernardino Co: 45 km NW of Needles at Piute Creek (Fort Piute). 9 May 1982. A. K., R. A. and E. G. Curran. Specimen photographed - not collected. Verified by James Bicket. Individual observed in streambed among vegetation and ground litter. Dominant plant assemblage: *Salix* sp., *Prosopis* sp., *Tamarix* sp. and *Baccharis viminea*. First verified record of this subspecies for the Piute Range, San Bernardino County, California. A substantial distributional gap exists for this subspecies in southeastern California.



Submitted by **JAMES C. BICKET,** U.S. Bureau of Land Management, Box 305, Needles, California 92363. ●

SERPENTES

NERODIA SIPEDON (Northern Watersnake). USA: MINNESOTA: Carver Co: Dead on U.S. Highway 169 just north of Minnesota River crossing into Shakopee. 2 June 1979. P. A. Cochran. Bell Mus. Nat. Hist., Univ. Minnesota (10848). First published record for Carver County (Breckenridge, 1944, Reptiles and Amphibians of Minnesota, Univ. Minnesota Press; Minnesota Dept. of Natural Resources, 1979, Guide to the Reptiles and Amphibians of Metropolitan Minnesota - Region 6).

Submitted by **PHILIP A. COCHRAN,** Laboratory of Limnology, University of Wisconsin, Madison, Wisconsin 53706. ●

STORERIA OCCIPITOMACULATA (Redbelly Snake). USA: MINNESOTA: Fillmore Co: Dead on trail about 15 m southwest of the confluence of Canfield Creek (= South Branch Creek) and the South Branch of the Root River (T 102N, R 12W, Sec. 24). 29 June 1980. R. Newman. Bell Mus. Nat. Hist., Univ. Minnesota (10850). First published record from Fillmore County and only second record from southeast Minnesota (Breckenridge, 1944, Reptiles and Amphibians of Minnesota, Univ. Minnesota Press; Minnesota Dept. of Natural Resources, 1979, Guide to the Reptiles and Amphibians of Southeast Minnesota - Region 5).

Submitted by **PHILIP A. COCHRAN,** Laboratory of Limnology, University of Wisconsin, Madison, Wisconsin 53706. ●

A RANGE EXTENSION FOR *CROTALUS MOLOSSUS NIGRESCENS* IN TAMAULIPAS, MEXICO

Crotalus molossus nigrescens is chiefly a resident of temperate pine-oak forests of Mexico's Central Plateau (Murphy, 1979). Klauber (1972) lists the range of *C. m. nigrescens* as the tableland of Mexico from southern Sonora, southwestern Chihuahua, and southern Coahuila, south and east through Durango, Zacatecas, Aguascalientes, western San Louis Potosi, Guanajuanto, Queretaro, northwestern Hidalgo, northern Michoacan, Mexico (state) Distrito Federal, east-central Veracruz and southeastern Puebla. He lists eastern Jalisco, Morelos, Tlaxcala and northern Oaxaca as problematic areas. Gloyd (1940) lists the range of *C. m. nigrescens* as throughout the highlands from southern Chihuahua, northern San Luis Potosi and southern Nuevo Leon, south to northern Oaxaca and western Veracruz. He lists southern Nuevo Leon as an area of intergradation between *C. m. molossus* and *C. m. nigrescens*.

On 7 August 1979 a male *C. m. nigrescens* measuring one meter in length was observed at 2000 hours crossing a caliche road from west to east. This locality was 7 km north of Pamillas, Tamaulipas, on the road to Miquihauna, Tamaulipas, at an elevation of 1,280 meters. The habitat type was arid tropical scrub as defined by Leopold (1950). On the morning of 8 August 1979, at 1000 hours a second male specimen was collected among the broken rock and Coyotillo (*Karwinskia humboltiana* (R&S) Zucc.) at an elevation of

2,286 meters. A third male specimen was collected at 0100 hours on 9 August at an elevation of 2,377 meters.

All three specimens were found on the base or lower elevations of hills with a southeastern exposure. Martin (1958) states that he obtained a specimen of *Crotalus durissus totonacus* in an open oak-pine woodland near La Joya de Salas where *Crotalus molussus* might be expected instead; however, he does not list *C. molussus* as occurring in the cloud forest at Rancho del Cielo, Tamaulipas. Barbara Warburton (pers. com., 1980) observed *Crotalus molussus* in early April 1961 at Rancho del Cielo at an elevation of 1,524 meters. Similarly, L. O. Sorenson (pers. com., 1980) observed specimens which he identified as *Crotalus molossus* at an elevation between 1,372 and 1,524 meters in a cloud forest in an area which had earlier been denuded by fire. Unfortunately, no voucher specimens are available from this locality, but both of the aforementioned individuals are familiar with *Crotalus durissus totonacus* and *C. molussus*.

Both the coloration and pattern characters of all three of our specimens were very different from each other. The ground color of the first specimen was dark rust with darker brown diamond markings with a nearly pure black crown. The second specimen was overall a creamy ground color with cinnamon-colored diamonds which interchanged with crossbands several places on the body. The third specimen possessed a creamy yellow ground color with a combination of burnt sienna-colored diamonds and diamond crossbands. The pattern variation of these three specimens exhibits characters of both *C. m. molossus* and *C. m. nigrescens*, and I feel that these specimens are intergrades like those found near Galeana, Nuevo Leon earlier described by Gloyd (1940).

Our three specimens from Miquihauna establish *C. m. nigrescens* as occurring in Tamaulipas, and there is strong evidence that it occurs in the cloud forest of the Gomez Farias Region of Tamaulipas as well.

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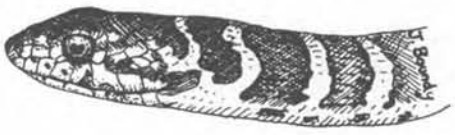
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Distributional Records for Mexican Reptiles

These records of occurrence of Mexican reptiles are based on specimens in the Laboratory for Environmental Biology, The University of Texas at El Paso (UTEP). All verification of identifications is by the author. All specimens were collected by the author unless otherwise noted.

PHYLLODACTYLUS LANEI RUPINUS. JALISCO: Isla Cocinas, Bahía de Chamela, ca. 4 km WNW (offshore) Chamela, 22 July 1976, Rollin H. Baker, UTEP 4907-08. Record fills in geographic hiatus between specimens from southern Nayarit and adjacent Jalisco (Puerto Vallarta area) and central Michoacán (Dixon, J. R., 1964, New Mexico State Univ. Scientif. Bull. 64-1:1-139). Other species observed on this small island included *Iguana iguana, Ctenosaura pectinata,* and *Cnemidophorus lineatissimus;* many skulls and skeletal elements of sea turtles (seemingly mostly *Lepidochelys*) littered the restricted sandy beach of disembarkation. On this date brown boobies *(Sula leucogaster)* nested on the brim of a rocky precipice where the birds are said to chase ctenosaurs away from their basking sites at the beginning of the nesting season.

SCELOPORUS HETEROLEPIS SHANNONORUM. Nayarit, ca. 1 km S and 27 km E Huajicori, 3 December 1970, UTEP 7413-15. First state record, extending range of subspecies some 70-75 km SE into northern Nayarit from localities near El Palmito, Sinaloa and Revolcaderos, Durango (Webb, R. G., 1969, Herpetologica 25:300-307).

SCELOPORUS MERRIAMI (Canyon Lizard). DURANGO: Sierra de la Campana, 7 km NW La Campana, 30 June 1973, UTEP 4276-79; 4 km NW La Campana, 26 June 1980, UTEP 6052-56. First state record and extends range ca. 75 km WSW of nearest locality in Coahuila (Olson, R. E., 1979, Cat. Amer. Amph. Rept. 227 [map]); specimens not readily identifiable to subspecies.

SCELOPORUS MUCRONATUS MUCRONATUS. HIDALGO: ca. 10 road km (Hwy 45) W Huichapan (17.5 km E Hidalgo-Queretaro state line), 31 July 1979, R. G. Webb and Jerry D. Johnson, UTEP 4580-81. Extends range of subspecies NNW ca. 55 km from nearest locality at Jilotepec, México (Alvarez, T. and P. Huerta, 1973, An. Esc. Nac. Cienc. Biol. Méx. 20:177-184). The two young individuals were taken with the more frequently observed *Sceloporus torquatus* (UTEP 4582-88).

CNEMIDOPHORUS DEPPEI INFERNALIS. JALISCO: 1 km E Atenquique, 12 June 1964, UTEP 5398-99. First state record and extends range some 80 km W of nearest localities in vicinity of Apatzingán, Michoacán (Duellman, W. E. and Wellman, J., 1960, Misc. Publ. Mus. Zool. Univ. Michigan, 111:1-81).

LEPTOTYPHLOPS HUMILIS SEGREGUS (Trans-Pecos Blind Snake). COAHUILA: San José del Aguaje (north side Río Aguanaval, the Coahuila-Durango state line), ca. 21 km NW San Juan de Guadalupe, Durango, 16 July 1975, UTEP 5212. Extends range of subspecies ca. 155 km SE of nearest record south of Tlahualilo, Durango (Williams, K. L., P. S. Chrapliwy, and H. M. Smith, 1961, Nat. Hist. Misc. 177:1-8; Hahn, D. E., 1979, Cat. Amer. Amph. Rept. 232 [map]). Specimen drowned at edge of large flooded area with breeding *Bufo cognatus* (UTEP 5210-11).

MASTICOPHIS BILINEATUS BILINEATUS (Sonoran Whipsnake). AGUASCALIENTES: 2 road km (Hwy 70, DOR) W Calvillo, 31 July 1969, UTEP 7747. Durango: 2 km E Villa Corona, 4 July 1974, received from local resident, UTEP 3977. First state records (Smith, H. M. and R. B. Smith, 1976, Synopsis of the Herpetofauna of Mexico, Vol. 3, John Johnson, N. Bennington, Vermont).

RHADINAEA LAUREATA. ZACATECAS: Sierra de Valparaiso, ca. 16 km WSW Valparaiso, 2680 m, 3 August 1970, Rollin H. Baker, UTEP 7311. First state record; fills in geographic hiatus between specimens from Durango and Michoacán (Myers, C. W., 1974, Bull. Amer. Mus. Nat. Hist. 153:1-262).

STORERIA STORERIOIDES. ZACATECAS: 15 km NW Jalpa, 2515 m, 4 August 1969, UTEP 5236. First state record (Smith, H. M. and R. B. Smith, 1976, Synopsis of the Herpetofauna of Mexico, Vol. 3, John Johnson, N. Bennington, Vermont).

Submitted by **ROBERT G. WEBB,** Department of Biological Sciences, University of Texas at El Paso, El Paso, Texas 79968. ●

On the occurrence of cooter turtles (subgenus *Pseudemys*) in the upper Ohio River Valley

Well documented disjunct colonies of the Ouachita map turtle, *Graptemys pseudogeographica ouachitensis,* and the red-eared slider, *Pseudemys scripta elegans,* in the upper Ohio River system represent probable remnants of preglacial turtle invasions from the Mississippi Valley through the old Teays River (Richmond, 1953; Conant *et al.,* 1964; Thornburg, 1965; Adler, 1968; Seidel and Green, 1981). The relatively recent origin (Kansan) of the middle Ohio River Valley could explain the absence of these species from that portion of the river. Extant cooters of the *P. concinna-floridana* turtle complex have been reported to range from the Mississippi up the Ohio River only as far as western Kentucky and southwestern Indiana (Fig. 1; Minton, 1972; Conant, 1975). The first evidence that these turtles once occurred in the upper Ohio Valley was published by Guilday and Tanner (1965). They reported on a collection of carapace and plastron bones (CM 44459) which were identified by Neil Richmond as *P. floridana.* These bones, estimated to be 1,000 years old (Adler, 1968), were collected from a midden at Mount Carbon, an

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watercolors by Giorgio Voltolina

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•

THE BOOK. This outstanding new book will be the first in-depth treatment of a major South American turtle fauna. It covers all turtles known from Venezuela including the mata mata and other side-necks (11 species), tortoises, pond and land turtles (6 species) and the sea turtles (5 species), together comprising fully half of the turtle species described from the South American continent and all species recorded from Trinidad, Guyana, Surinam and French Guiana. The monograph is based on a study of existing museum specimens, an in-depth review of the relevant literature and, most important, the results of intensive field study by both authors in all parts of Venezuela. They made many original observations and discovered two new forms, described here for the first time. Following a discussion of the zoogeography of South American turtles there is an illustrated key to species (in both English and Spanish). Each species account consists of a synonymy followed by a diagnosis; a detailed description (including shell, soft parts, color and sexual dimorphism); and sections on size and growth; distribution and geographic variation; habitat; feeding; reproduction; economic importance; vernacular names; and additional notes where appropriate. There is also a comprehensive bibliography and list of locality records.

The book is beautifully illustrated. There are 48 full-page plates in color, 26 of which are original watercolors and the remainder a collection of 160 photographs of both turtles and their habitats. Samples of both are reproduced on the following pages. In addition, there are two distribution maps for each species: a spot map showing the detailed Venezuelan distribution and a map showing the continent-wide range.

THE AUTHORS. Peter C. H. Pritchard, an Englishman trained at Belfast and Oxford and later, as a student of Archie Carr, at the University of Florida, is currently Vice-President for Science and Research of the Florida Audubon Society. He is one of the world's leading authorities on turtles and is particularly well known for his two previous books, *Living Turtles of the World* (1967) and *Encyclopedia of Turtles* (1979), and over 75 scientific papers, many of them on the ecology and conservation of sea turtles. Dr. Pritchard is intimately involved in conservation, having served the World Wildlife Fund as Executive Officer for its Marine Turtle Specialist Group from 1969 to 1973. For his research he has travelled world-wide, with major field programs in Mexico, the Galapagos Islands, Central and South America, the West Indies, Papua New Guinea and Micronesia.

Pedro Trebbau is now Director of the Caricuao Zoological Park in Venezuela. Trained in Germany as a veterinarian, his work has been largely in zoo administration and he is well known in Venezuela for his natural history television programs. His research and conservation activities have dealt largely with mammals, but he is known to herpetologists for his films on Orinoco turtles and his taxonomic work, with Janis Roze, on coral snakes.

THE ARTIST. Giorgio Voltolina, an Italian, was trained at the Liceo Artistico in Venice and, after emigrating to Venezuela in 1955, worked as artist and taxidermist for several natural history and academic institutions. His illustrations have appeared regularly in scientific publications and in high school and university textbooks, and include all vertebrate groups. Voltolina's drawing of the jaguar, giant armadillo and cock-of-the-rock were chosen for reproduction in a series of gold and silver medals commissioned by the World Wildlife Fund. His magnificent and lifelike watercolors of Venezuelan turtles will, we believe, set a new standard for comparison.

PRICES. Following the sample plates.



PLATE 16: *GEOCHELONE CARBONARIA*

PLATE 26



A



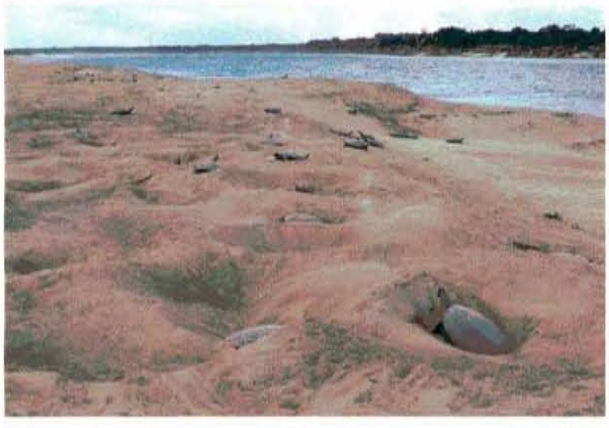
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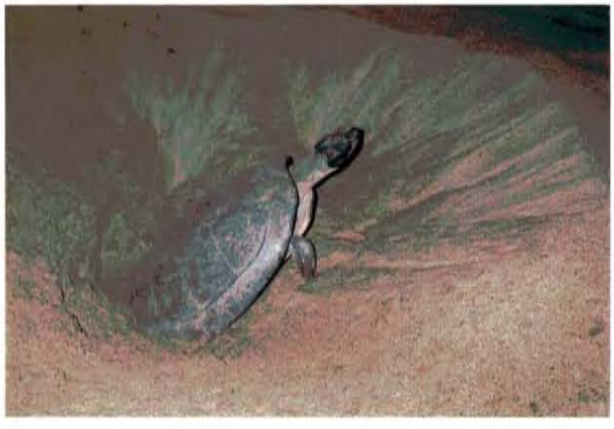
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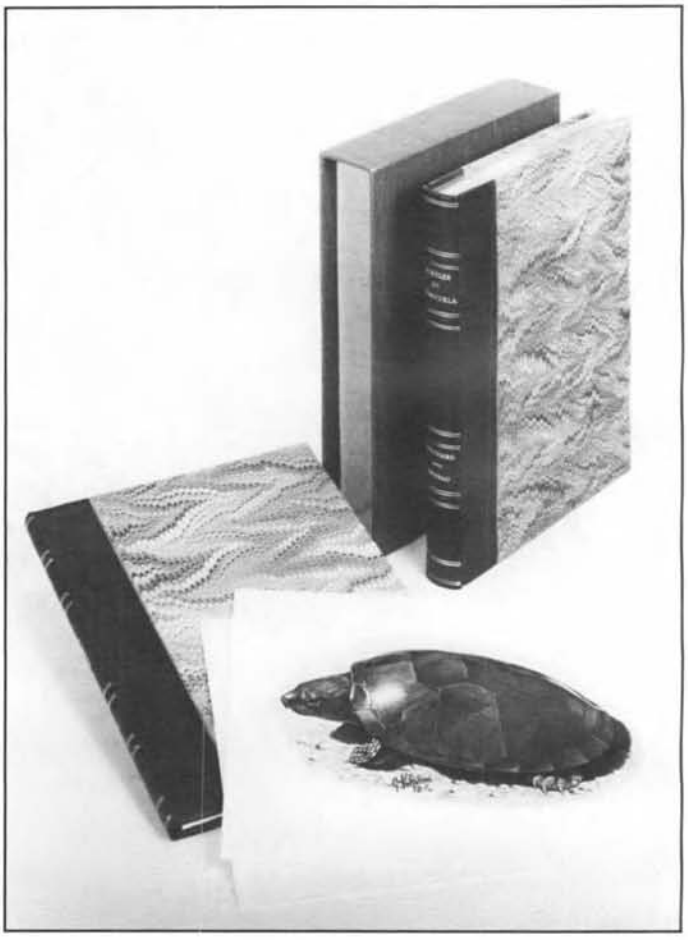
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archeological site near Boomer, Fayette County, West Virginia. This locality is in the old Teays River Valley below Kanawha Falls (Fig. 1).

Adler (1968) re-identified the Mount Carbon bones as *P. scripta*. His decision was based primarily on the presence of longitudinal ridges on the first pair of peripheral bones. Longitudinal carapace ridges, however, are also characteristic of other *Pseudemys* species (Carr, 1952). Examination of two shells of *P. concinna-floridana* from southern Indiana (UMMZ 128176 and 133845) shows strong longitudinal ridges on the posterior margins of the first peripheral bones. An examination of the ventral surface of the nuchal bone from the Mount Carbon specimen (Adler, 1968, illustrates dorsal surface only) indicates an area of nuchal (= cervical) scute underlap which is broader than long, typical of *P. concinna* and *P. floridana* (Weaver and Rose, 1967). For comparison, nuchal scute underlap of six adult *P. scripta* from the Kanawha and Little Kanawha Rivers, West Virginia (WVBS 3763, 3764, 3964, 4453, 4454 and MES 862) was analyzed and all were found to have nuchal scutes which are ventrally longer than broad. Although the nuchal bone from the Mount Carbon site is not entire, it was possible to accurately estimate total length. This allowed calculation of nuchal scute underlap according to the method of Weaver and Rose (1967). A value of 21.7 was obtained, which places the specimen at the upper range limit of *P. floridana* and well below the lower limit (26.0) for *P. scripta* (Weaver and Rose, 1967). Therefore, evidence for the probable occurrence of cooters in the upper Ohio River System is resurrected. A questionable record based on a skull from Franklin County, Ohio (Fig. 1) is worthy of mention. This specimen (MCZ 57019), examined by the authors, is from a juvenile and accompanied by the following data: *Pseudemys floridana hieroglyphica;* collector, K. Barnobey; 1956; Big Walnut Creek, Rt 33, Columbus, Ohio. Difficult to determine on such a small cranium, there is evidence of a denticle at the anterior end of the middle ridge of the upper triturating (alveolar) surface, a distinguishing characteristic of *P. concinna-floridana* (McDowell, 1964). Although the collection locality is near the old Teays Valley, it is above the terminal moraine. It is quite possible this specimen was a released pet.

Two recent turtle specimens collected in Mason County, West Virginia, 91-106 Km downstream from the Mount Carbon site, near the junction of the Kanawha and Ohio Rivers (Fig. 1), provide additional support for the presence of *P. concinna-floridana* in the upper Ohio (Teays) Valley. An adult male (WVBS 3965, carapace length 248 mm) collected alive by Larry Sawyers, May 1969, at the mouth of Nine Mile Creek (a small Kanawha River tributary) has the following characteristics typical of cooters (Ernst and Barbour, 1972): cutting edge (tomium) of upper jaw rounded without a notch, ridges of the alveolar surfaces strongly tuberculate (dentate), nuchal scute underlap short, anterior plastral seams with a dark pattern, very weakly keeled carapace with light-colored linear reticulate markings on laminae, head and neck stripes narrow with no evidence of a wide postorbital stripe or blotch. A second Mason County specimen (WVBS 3155), formerly identified as *Graptemys geographica* (Green, 1969), also fits the above description and is referrable to *P. concinna-floridana*. This turtle is a large female (carapace length 325 mm) collected by Leo Calandros, July 1963, in the Ohio River near Point Pleasant. Recent efforts to collect cooters and map turtles in Mason County, utilizing trammel nets and bait traps, have failed. However, absence of suitable basking sites and heavy siltation in the rivers due to dredging activities, in addition to the shy behavior, preference for deep water, and herbivorous food habits of cooters, make collecting very difficult. A third specimen of *P. concinna-floridana* was recently (June 1981) collected by Bryant Williamson 1.0 Km E of Ona, near the Mud River (a Guyandot-Ohio River tributary), Cabell County, West Virginia. This turtle (MES 870, carapace length 238 mm) is an adult male and has markings similar to the Mason County specimens. The locality is also in the old Teays Valley, 30 and 46 Km SW and S of the Mason County sites (Fig. 1).

The three recent specimens from Mason and Cabell Counties and archeological material from Fayette County appear to partially bridge a large gap in the range between the southern Indiana population and an isolated aberrant colony of cooters from the New River (a majority tributary of the upper Kanawha River), Bluestone Reservoir (Fig. 1), Summers County, West Virginia (Bayless, 1972). However, New River *Pseudemys* show little resemblance to the Mason and Cabell County turtles. Examination of 12 adults from Bluestone Reservoir (USNM 192635-7; WVBS 4093, MES 489, 526, 528-9, and four uncataloged) show all having weak cusps on the upper jaw, broad head and neck stripes especially ventrally, and low carapaces. The ratio of shell height to carapace length of five females ranges 0.326-0.394 compared to 0.440 for the Mason County female. Seven adult males range 0.311-0.346 compared to 0.367 and 0.357 for the Mason and Cabell County males respectively. The only entire adult specimen of *P. concinna-floridana* from Indiana available for comparison (UMMZ 101754, male) strongly resembles Mason and Cabell specimens, having a deep shell (0.362), uncusped upper jaw, and narrow head and neck stripes.

We conclude that the natural occurrence of cooters in the upper Ohio Valley of West Virginia is likely. Severe disturbance of the mainstream habitats in this area may be responsible for near extirpation of these turtles which are apparently relicts of a pre-Kansan Teays River dispersal from the Mississippi Valley. Mason and Cabell County cooters are probably conspecific with *Pseudemys* in the New River of West Virginia, but do not appear closely allied to that colony. Although both populations occur in the same drainage system, they are separated by Kanawha Falls, believed to be one of the largest natural river barriers east of the Rocky Mountains (Jenkins *et al.*, 1971). The geographical origin and taxonomy of *Pseudemys* in the New River were investigated by Seidel (1981).

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We are grateful to Jack McCoy (Carnegie Museum), Arnold Kluge (University of Michigan Museum of Zoology), Ernest Williams (Museum of Comparative Zoology), George Zug (United States National Museum), William Palmer (North Carolina State Museum of Natural History) and Larry Bayless (Concord College) for loan of specimens. Stan Mills, Jim Gould, Sam Reynolds, Larry Bayless, Mike Little, Allen Brant and Greg Molter helped with the collection of specimens. We thank Mike Little and Dan Evans for com-

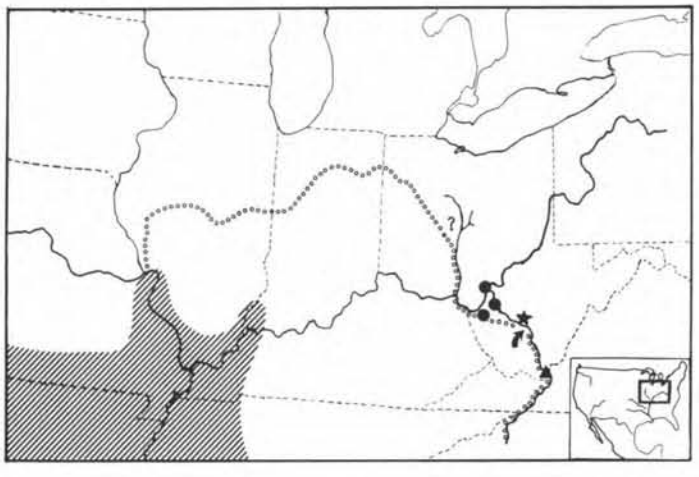


Figure 1. Distribution of cooter turtles in the Ohio and upper Mississippi River drainages. Closed circles are locality records for Mason and Cabell Counties, West Virginia. Star indicates the Mount Carbon archeological site. Triangle represents the population in the New River at Bluestone Reservoir. A questionable record for Franklin County, Ohio is indicated. The course of the old Teays River is represented by small open circles and the location of Kanawha Falls is indicated by an arrow.

ments on the manuscript and Dewey Sanderson for discussions on geomorphology. The study was supported in part by a Marshall University Faculty Grant to the senior author. We extend our appreciation to Vickie Crager for typing the manuscript. Museum acronyms follow Duellman et al. (1978). MES = collection of Michael E. Seidel.

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BOOK REVIEW

Amphibians of Argentina, by J. M. Cei, Monitore Zoologico Italiano, Italian Journal of Zoology, (N.S.) Monogr. 2, 1980 (Via Romana, 17-50125, Firenze, Italia), xii+609 pp., 214 figs., 16 pls., 24 color pls., price for Italy and abroad Lit. 56.000 (for M.Z.I. subscribers Lit. 50.000).

This long-awaited monographic treatise of Argentine amphibians is a product of some 30 years of first-hand experience by Jose Miguel Cei, one of the leading authorities on the South American herpetofauna. The author, formerly professor of general biology at the Universidad Nacional of Tucuman, and since 1958 Director of the Instituto de Biologia Animal at the Universidad Nacional de Cuyo, Mendoza, Argentina, now resides at Rancho Somuncura, Rua Fausto de Fiqueiredo, Birre, 2750 Cascais, Portugal.

Cei's book (text in English) is the most comprehensive contribution on amphibians that has appeared for any South American country, and contains just about everything that one would expect in such a book. The subject matter is parceled into three sections. The introductory section (51 pp.) treats various topics as they apply to all Argentine amphibians — an historical review, remarks on general classification, morphological characters, ecophysiological trends, sex cycles and reproduction, behavior, biochemical-immunological relationships, karyotypes, and zoogeography. There follows 16 plates (each of two photographs) that depict various habitats for amphibians. The second section (49 pp.) is devoted to keys to identification (in both English and Spanish), which treat genera and species of caecilians, and superfamilies, families, genera, and species and subspecies of frogs and toads. The third and most lengthy section (353 pp.), followed by 24 plates of colored paintings (each depicting varying numbers of taxa), is the account of the 138 species and subspecies (2 caecilians, 2 microhylids, 23 bufonids, the monotypic rhinodermatid, 5 ceratophryids, 70 leptodactylids, 4 pseudids, 30 hylids, and 1 centrolenid), with the largest genera being *Hyla* (21), *Telmatobius* (18), *Bufo* (15), and *Leptodactylus* (14). No new taxa are described. The standard format for discussion of taxa includes a diagnosis for each genus, and diagnosis, description, distribution, life history, and tadpole for each species and subspecies (with subsections on Remarks interspersed). The synonymies for each species and subspecies include in chronological order all different name-combinations (type-localities accompany original descriptions and nominal synonyms), with the most important subsequent usages of that same name listed under each synonymic entry. All taxa can be readily found in the text by referring to the paginated Contents (v-xii pp.). Numerous illustrations (line-drawings and photographs; most original by the author, some previously published) are scattered through the accounts of species and aid in identification. The illustrations include primarily entire animals, aspects of heads, hands, feet, pectoral girdles, some skulls, and tadpoles, and also the type-specimens of *Paludicola illotus* Barbour (= *Alsodes nodosus*) and of *Alsodes gargola neuquensis* Cei. There are also 14 interspersed distribution maps, each of southern South America, that show only generalized geographic ranges of taxa in Argentina; lists of specimens examined (or literature records) are lacking, although some specimens are documented by museum numbers and localities in legends of illustrations. Twelve appendices (10 pp.) provide data relevant to Argentine amphibians that were received by the author after this monograph was in press (manuscript received 4 July 1976, published 30 June 1980). A summary (in English and Spanish, 7 pp.) is followed by a list of 593 references (28 pp.) that includes some papers not cited in the text (as noted by author) and generally excludes references mentioned in the synonymies. In the terminal, double-columned index (13 pp.) page numbers in italics indicate illustrations and in boldface type the main accounts for quick reference.

Technically, this work has good quality illustrations, and is relatively free of typos. The book is paper-bound (journal cover format of Italian Journal of Zoology) with the text on good quality glossy paper, is about 38 mm thick, and is covered by a loose, glossy-paper, protective jacket; continued use will soon necessitate cloth-binding. The publisher deserves credit for a good job of editing, printing, and producing a volume of pleasing format. The relatively high price of Lit. 56.000 is perhaps not unreasonable considering the bulk and the inclusion of 24 colored plates and one colored photograph.

Making no pretense of an intimate knowledge of the Argentine amphibians, I have necessarily refrained from commenting on the systematics of the taxa involved. My only complaint is a preference for spot localities on the distribution maps. The author is to be congratulated. His comprehensive, synthetic treatment of a large geographic segment of the amphibian fauna will be ranked among the outstanding contributions to the study of the South American herpetofauna. Amphibians of Argentina is recommended without reservation.

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University of Texas at El Paso ●



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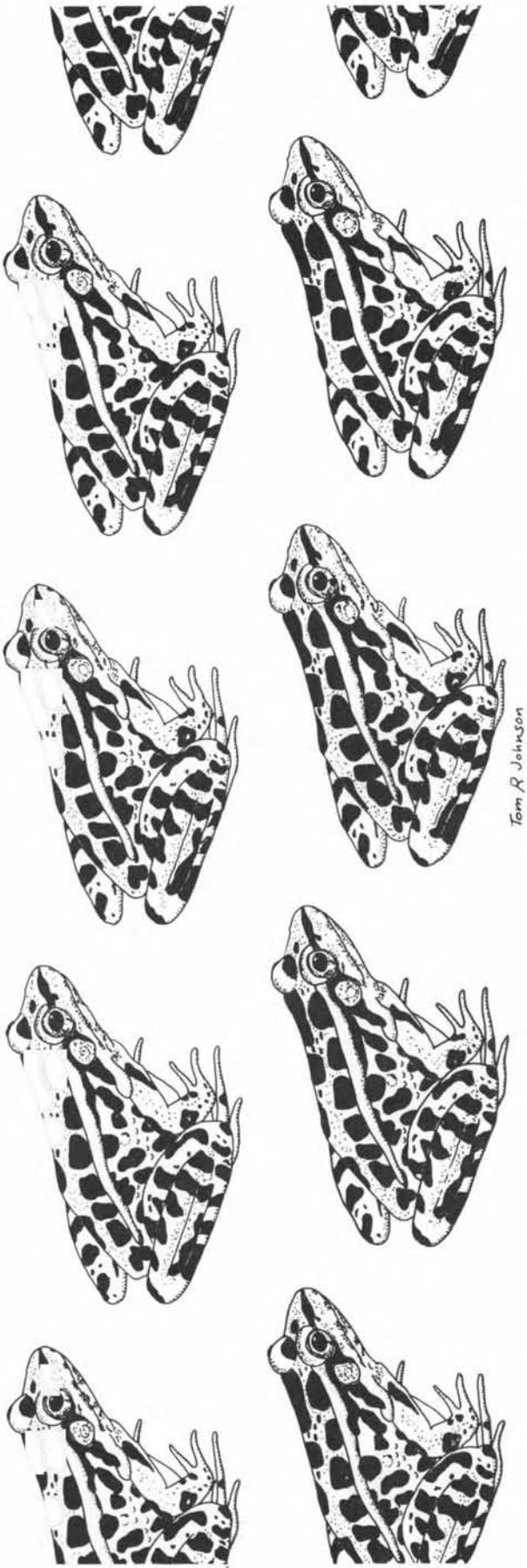
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1982 SSAR GRANTS-IN-HERPETOLOGY AWARDS

The Society for the Study of Amphibians and Reptiles is pleased to announce the following awards in the 1982 Grants-In-Herpetology Program:

GRADUATE STUDENT RESEARCH:

David M. Hillis, Museum of Natural History, The University of Kansas, Lawrence. "A Quantitative Analysis of Hybrid Dysgenesis Among Members of the *Rana pipiens* Complex." $400.

HERPETOLOGICAL CONSERVATION:

Debra Dick, Department of Biological Sciences, Florida International University, Miami, Florida. "A Non-Fatal Immunological Technique for Sexing Sea Turtles." $370.

HERPETOLOGICAL RESEARCH IN ZOOS:

Susan M. Barnard, Department of Herpetology, Atlanta Zoological Park. "Diagnostic Atlas of Reptile Intestinal Parasites." $300.

Richard Hudson, Fort Worth Zoo, and Bonnie Raphael, Dallas Zoo. "A Limited Antibiotic Study in Turtles." $100.

REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS:

John Cebula, 345 W. Ethel Avenue, Lombard, IL. "The Herpetology of DuPage County, Illinois." $250.

Bob Belmore, Hope High School, Providence, Rhode Island. "The Status and Distribution of the Bog Turtle, *Clemmys muhlenbergi*, in Massachusetts." $150.

SSAR extends its congratulations to all recipients of awards and encourages the submission of proposals for next year's program. SSAR also expresses its thanks to the 1982 Grants-In-Herpetology Committee, composed of: Martin J. Rosenberg (Chairperson), Terry E. Graham (Conservation Research), John B. Iverson (Regional Herpetological Society Projects), Linda Maxson (Graduate Student Research), and Lyndon A. Mitchell (Herpetological Research in Zoos). ●



AUTHORS SOLICITED FOR SALIENTA ACCOUNTS IN *CAAR*

A number of species in the anuran fauna of the United States have had no authors assigned, or the assignments have been relinquished by their prospective authors. If you would care to volunteer to write the *Catalogue* account for one or more of the species listed below, please contact the undersigned. Accounts available are: *Bufo americanus, B. boreas, B. cognatus, B. debilis, B. exsul, B. microscaphus, B. punctatus; Hyla chrysoscelis, H. cinerea, H. crucifer, H. eximia, H. regilla, H. versicolor; Hypopachus variolosus; Pseudacris clarki, P. nigrita; Rana berlandieri, R. catesbeiana, R. onca, R. pipiens, R. utricularia (sphenocephala); Syrrhophus cystignathoides, S. guttilatus, S. marnocki.* A number of accounts on the generic level are open, too. Richard G. Zweifel, Salientia Editor, Catalogue of American Amphibians and Reptiles, Department of Herpetology, American Museum of Natural History, New York, NY 10024. ●

STRIPED PATTERN MORPHISM IN THE PRAIRIE KINGSNAKE, *Lampropeltis c. calligaster*

INTRODUCTION

Dorsal striping in normally blotched snakes has been noted for several species. Klauber (1936, 1939) described striped *Lampropeltis getulus* and Riemer (1958) studied *Pituophis melanoleucas.* Tryon (1979) described a partially striped *Lampropeltis mexicana blairi* and Williams (1978) and Gehlbach (1962) mentioned partially striped specimens of *Lampropeltis triangulum.*

Contrary to Ashton (1973) several instances of striping in *Lampropeltis calligaster calligaster* are mentioned in the literature. Blanchard (1921), Schmidt and Davis (1941) and Wright and Wright (1957) described ontogenetic pattern modification in the prairie kingsnake wherein older individuals may have faint longitudinal stripes in addition to the usual blotches. Miller (1902) mentioned a similar occurrence in *L. c. rhombomaculata.* Minton (1972), Smith (1961), Anderson (1965) and Cox (1972) discussed dorsal striping in prairie kingsnakes.

Specimens of *L. c. calligaster* mentioned in the literature were examined (if possible) and compared to several that were previously unreported. Prairie kingsnakes were obtained from the United States National Museum (USNM), Chicago Academy of Sciences (CA), Eastern Illinois University, Charleston and the University of Kansas Museum of Natural History (KU).

RESULTS AND DISCUSSION

Striped prairie kingsnakes have been collected from throughout the northern portion of its range.

Blanchard (1921) described a *Lampropeltis c. calligaster* from Jersey Co., Illinois which exhibited the striping noted in darkened specimens. This snake (USNM 61726) had faint pattern, but did not possess any pronounced striping. Minton (1972) mentioned three striped specimens from Indiana and Kentucky. Apparently none are extant (pers. com.).

Anderson (1965) described in detail three striped hatchlings from DeKalb Co., Missouri (KU 82198, 82199, 82200). They were hatched in captivity along with nine normal littermates. The mother was also patterned normally. Anderson (1965) also collected a single hatchling in Clay Co., Missouri (KU 84136). All hatchlings had well pronounced, but incomplete striping.

Ashton (1973) described a single striped hatchling (KU 154482) from a clutch of 13 eggs. Two others possessed slight aberrations in pattern and the remaining ten were normal. The female was collected in Osage Co., Oklahoma during June, 1972 and was patterned normally.

Smith (1961) mentioned a striped adult collected near Springfield, Sangamon Co., Illinois (CA 17198). Another adult, collected east of Charleston, Coles Co., Illinois during October, 1966, is uncatalogued in the collection of Eastern Illinois University, Charleston. Both possess two dorsal stripes which start immediately posterior to the parietals and end just anterior to the vent. The stripes pass through an occasional blotch, and laterally a series of small blotches are fused to form an incomplete stripe.

Four prairie kingsnakes were hatched from a clutch of eight eggs laid by a normal female collected in St. Clair, Co., Illinois (Cox, 1972). Two had prominent dorsal stripes and two were normal. Two hatchlings, one striped and one normal, have been lost. The remaining striped specimen has many fragmented ventrals, while its littermate is normal. The striped specimen is being maintained alive for further study.

Of the specimens examined, those with prominent dorsal stripes are patterned similarly. The stripes are approximately two to four scales wide and are located one to two scales on either side of the mid-dorsal line. With one exception, scutellation is normal.

Vinegar (1974) described pattern modification as a function of incubation temperature in *Python molurus* and also noted gross abnormalities in scutellation and morphology. Bechtel and Bechtel (1978) discussed the inheritance of dorsal striping in *Elaphe g. guttata* and indicated that the striping was probably due to recessive alleles. Either mode is a possible cause for the striping in *Lampropeltis c. calligaster.* The consistency of the pattern changes implies a genetic relationship.

ACKNOWLEDGMENTS

I wish to thank Bruce Bury, Stephen Busack, George Iannarone, Ed Moll and Roy McAllister, Jr. for the loan of specimens, and C. J. McCoy and Burt Monroe for inspection of their respective collections. Also thanks are due to Richard S. Funk and George R. Pisani for critically reviewing the manuscript.



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BREEDING OF THE GREEN SEA TURTLE, *Chelonia mydas*, ON THE ISLAS REVILLAGIGEDO, MEXICO

Little is known about the biology of green turtles, *Chelonia mydas*, on the Islas Revillagigedo, Mexico. The islands are located 350 to 650 km south and southwest of Baja California. A few expeditions have stopped at the islands (Richards and Brattstrom, 1959) but little has been reported on the breeding of the sea turtles (Brattstrom, 1955). I have had an opportunity of visiting the four islands in the archepelago on numerous occasions during geological and biological investigations of Bárcena Volcano, 1952, on San Benedicto Island (Brattstrom, 1963; in press). I here report (Table I) on breeding times and numbers of turtles (or the presence of tracks on beaches).

Green sea turtles nest only in one large bay (Sulphur) on Clarion Island, and on two places (Fig. 1) on Socorro Island (Playas Blancas at Cape Henslow on the northwest corner of the island and three beaches in the vicinity of Academy Bay on the northern most portion of the island). The breeding season started in 1978 about mid-April. In 1953 breeding had obviously started earlier (March 18) and in May, 1955 there were tracks on both Clarion and Socorro. Mating has been observed in May and November. This suggests a long breeding and nesting season.

Diurnally, emerging sea turtles have a precarious time getting from nests to the sea. I have discovered young sea turtles in the stomach of the Clarion Island Racer, *Masticophis anthonyi*, and in the pellets of the Clarion Island Burrowing Owl. I have also observed the Socorro Red-tailed Hawk, which normally eats mostly lizards, soaring over the beach at Academy Bay as young turtles were emerging.

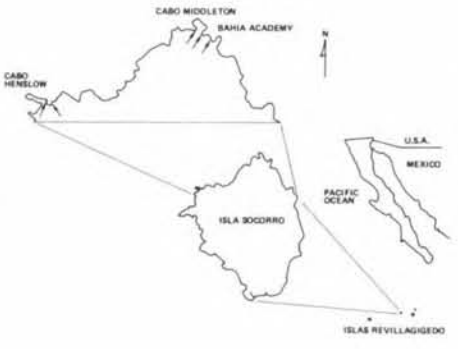


Fig. 1. Map of the Islas Revillagigedo, Mexico, showing the location of beaches where nests and tracks of green turtles were found on Socorro Island.

TABLE I. Reproductive observations for Green Sea Turtles, *Chelonia mydas*, on The Islas Revillagigedo, Mexico.

1953: March 18, Socorro, fresh tracks at Playas Blancas
March 25, Clarion, fresh tracks at Sulphur Bay
November 20, Socorro, fresh tracks and young emerging, Academy Bay.

1955: May 3, Socorro, fresh tracks, at Academy Bay
May 7, Clarion, fresh tracks, Sulphur Bay, pair mating in bay in afternoon.

1971: November 8, 9, Clarion, about 30 old tracks, one fresh track morning of 9th, mating observed in the bay and young emerging, Academy Bay; 18 nests, at least four, less than 3 days old, Playas Blancas.

1977: Socorro, estimates from 1978 observations indicate that there were 23 old nests at Playas Blancas and 47 on the three beaches at Academy Bay. This is probably not a true measure of total breeding at these sites as later females would obliterate earlier nests.

1978: April 11, Socorro, no fresh turtle nests or tracks at Playas Blancas indicating no nesting here yet this year.
April 14, Socorro, seven fresh nests and tracks on three beaches at Academy Bay, all apparently made in last two to three days; no older tracks.

1981: April 5, Socorro, 16 fresh turtle tracks on the three beaches at Academy Bay, 12 tracks about a week old; 96 old (last years) nest sites.
April 7, Socorro, no tracks on the beaches at Playas Blancas, indicating no breeding on this beach yet this year; 32 old nest sites.

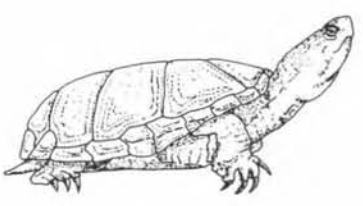
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COURTSHIP BEHAVIOR OF THE QUEEN SNAKE, *Regina septemvittata*

Studies of courtship and mating behavior of snakes have only recently been conducted carefully enough so that evolutionary aspects of this activity can be examined. In particular, Gillingham has used methods of frame by frame analysis of movie films to make comparative studies of snake reproductive behavior (Gillingham, 1979). His work has been primarily with species exhibiting what Davis (1936) defined as "coluber" type courtship. Several other authors have examined the reproductive patterns of the natricine snakes (Blanchard and Blanchard, 1942; Pisani, 1976; Mushinsky, 1979), but species differences have not been discussed. *Regina* is known to be a quite distinct genus of natricine snake, particularly in several behavioral characteristics, *i.e.* feeding behavior. Its reproductive behavior might therefore also exhibit variation from the typical pattern. This report is the first dealing with courtship activity of any member of *Regina* and examines the mating behavior of the Queen snake, *Regina septemvittata*.

Male and female *Regina septemvittata* were collected in the springs of 1978 and 1979 from southwestern Ohio. Within a few days of capture, these snakes were placed together in a large aquarium (1.5m x ½m) containing a gravel substrate. Courtship behavior of four males was observed and filmed with a super 8 movie camera. The films were then analyzed frame by frame for certain behavioral components of courtship.

In most regards, male queen snakes showed courtship behavior closely paralleling other natricines. The male approached and tongue flicked the female repeatedly. The male mounted the female and proceeded to move forward until aligned on her dorsum. At this time the male queen snakes began a behavior different from other colubrids. They proceeded to "bounce" dorsoventrally on the female. This movement was a vertical oscillation of the first 6 to 20 cm of the neck. It did not involve any lateral sliding of the body but in other regards did appear to be similar to the writhe-bump seen by Gillingham in *Elaphe* (1979). Each bounce lasted 0.05 seconds and the bounce rate alternated between 60 to 70/min. up to 91 to 115/min. The slower rate involved higher dorsoventral movement (1 to 2 cm off the female, Fig. 1). The faster rate occurred with oscillations in which the male did not lose contact with the female's dorsum. After a variable period of this behavior, the males would begin the tail-search copulatory attempts. As the typical natricine caudal-cephalic waves were absent this suggests the vertical oscillations substitute for this reproductive cue.

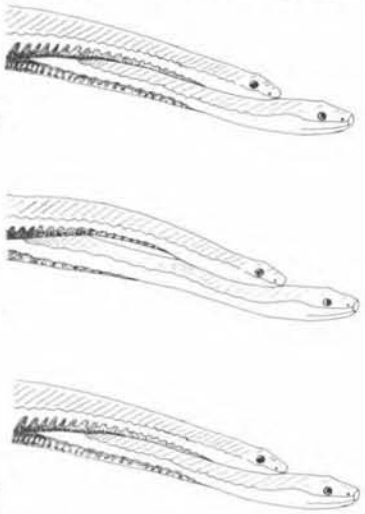


Figure 1. The sequence of movements in a single "bounce" of a male queen snake, *Regina septemvittata*, courting a female.

Male activity while mounted on the female's trunk appears to show more evolutionary variability than do other stages of courtship. Gillingham (1979), for example, compared the variation in caudal-cephalic waves and writhe-bumps in *Elaphe* occurring during this period. *Regina septemvittata's* different tactile behavior also supports this idea. It, therefore, seems likely that these species differences in tactile activity of males while aligned on the female have evolutionary implications. The most logical explanation is that they convey species specific identification designed to bring about female passivity. Examination of the tactile-alignment behavior of both closely related and evolutionarily distinct species should give more insight into this possibility.

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PLASTIC BAGS IN THE INTESTINAL TRACTS OF LEATHERBACK MARINE TURTLES

While collecting skeletal material of *Dermochelys coriacea* at a site in coastal Peru where leatherback carcasses were discarded by fishermen, I found evidence of plastic in the intestinal tracts of these specimens to be common. Plastic bags and film were noted in 19 of 140 (13%) specimens examined in November 1980 near Pucusana, Depto. Lima, Peru. The xeric climate of coastal Peru had mummified many carcasses and slowed biological decomposition of tissues. Although all specimens examined had been butchered some considerable time before discovery (perhaps more than 14 months earlier), the intestines had been left in the carapaces and had dried *in situ*. No attempt was made to open or examine the entire digestive tract due to the dried, rotted, and often incomplete nature of the viscera. Consequently, all cases where plastic was noted involved sizable pieces of plastic which protruded or were exposed from the intestine. In all cases the plastic was noted to be within the lumen of the digestive tract and in a twisted, elongate form suggesting peristalic transport. Because of the limiting conditions under which observations were made, the actual occurrence of plastic in *Dermochelys* is probably much higher than recorded.

Hays and Brown (1981) found plastic bags in 9 of 39 (23%) specimens of *Chelonia mydas* captured near Pisco, Depto. Ica, Peru. Coastal Peru is an area of low human population density. Consequently, the high incidence of plastic bags in the intestinal tracts of marine turtles is noteworthy.

Brongersma (1969; 1972) recorded plastic materials in the intestinal tracts of two leatherbacks from European waters. Carr (in Cornelius, 1975) attributed a mass mortality of *Chelonia* in Costa Rica to the ingestion of plastic bags. Pritchard (1971) mentioned that plastic is found in leatherback intestines. Carr and Pritchard did not detail their observations. Mrosovsky (1981) recently reviewed data from 16 leatherback turtles, 7 of which (44%) contained plastic. He also noted that 7 of 8 leatherbacks studied in France by Duron and Duron (1980) had swallowed plastic. The information on plastic bags in *Chelonia* and *Dermochelys* in Peru is important in confirming the incidence in a specified number of animals. Frazier (1980) noted that plastics are indigestible and they may impact the gut. The green turtles studied by Hays and Brown (in press) and the leatherbacks described herein were butchered animals which presumably were captured alive. Therefore the plastics found had not yet caused death. Thus, the incidence of turtles dying because of plastics is unknown. The possibility of death or malnutrition resulting from plastic bag impaction of the gut should be carefully considered and investigated in dead or distressed animals from other sources. Marine turtles actively feed on jellyfish, and plastic bags floating in water potentially resemble jellyfish in color,

form, and texture. Therefore, it is possible that plastics are consumed whenever encountered by foraging marine turtles. Since plastic film products are used and disposed of worldwide, the potential for effecting marine organisms, including turtles, is great.

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TECHNIQUES

A TIME-EFFICIENT, LOW COST METHOD FOR THE LABORATORY REARING OF FROGS.

INTRODUCTION

There has long been a need for a reliable method whereby laboratory populations of anurans could be both maintained and perpetuated at modest cost and with minimal time expenditure. The availability of reliable methods for the raising and maintenance of anurans in a time-efficient operation and at modest cost is important to biologists in many disciplines. However, small scale frog rearing operations are not common because of several fundamental problems. These include: design inadequacies of many commercially available rearing tanks; lack of an adequate food supply for transformed frogs; labor intensive service operations; high operating costs; and contagious diseases. Large scale operations (Nace, 1968) generally are not practical for use by individual research laboratories because they demand a considerable investment of time and/or are prohibitively expensive.

During the past several years, I have reared modest numbers of frogs through one or more generations. A review of the literature on frog culture techniques (e.g., List, 1957; Culley, 1976) has proven to be helpful, as have been the personal accounts of colleagues. The following report describes a generalized procedure for frog rearing that incorporates both the products of my own efforts of the past several years, as well as information obtained from other sources (G. Nace and C. Richards, pers. comm.). In this system, traditional problems associated with food supply and diet, containment and disease, serviceability, and cost are minimized by emphasizing simplicity without sacrificing animal welfare considerations. By utilizing the basic procedure and materials described herein, it is possible to rear hundreds of adult frogs annually from eggs at a modest cost and with a minimal time expenditure. In the present study, leopard frogs (*Rana pipiens, R. blairi, R. sphenocephala, R. berlandieri, R. magnaocularis, R. chiricahuensis, R. forreri,* and the lowland form of Platz and Platz, 1973) as well as *Hyla chrysoscelis, Bufo woodhousii, Bombina orientalis,* and *Pachymedusa dacnicolor* were used. With minor modifications the basic system should be suitable for many other anuran species.

METHODS AND MATERIALS

The method relies on three major components. The construction, preparation, and operation of each component are described below. Included with the description of each component is a section detailing costs.

I. Cricket colony

Rearing boxes. — An individual cricket rearing box is shown in Figure 1. Basically, the box is constructed from a single 4 X 8 ft sheet of one half inch plywood and miscellaneous hardware. The box incorporates a light bulb heat source, ventilation holes, an escape barrier, and a hinged access lid with an inspection window. The individual components and specifications required to construct the basic box are provided in Fig. 1.

Figure 1.

Rearing procedure. — Crickets *(Acheta domestica)* thrive under the appropriate temperature and humidity conditions when provided with adequate water and food. Commercial pelletized rabbit feeds provide an excellent food source for crickets of all ages. Alternatively, chicken mash can be used, but it is subject to mold. A 100 watt incandescent light bulb will maintain an inner box temperature of about 32-40° C when the box is placed in a room at 20-25° C. In a cooler room, a bulb or higher wattage or multiple bulbs can be used to bring the internal box temperature to about 32-40° C. Alternatively, the entire box can be placed in a high temperature room. An escape barrier is necessary to prevent the crickets from reaching the lid area of the box. Construction of the foil barrier is explained in Figure 1. The cricket life cycle lasts about eight to 10 weeks and is temperature-dependent. Therefore, the colony should be started several weeks prior to the anticipated need for crickets. The colony can be operated efficiently using just three cricket boxes. To start the colony, 1,000 adult crickets can be obtained from a commercial supplier (*e.g.,* Fluker's Cricket Farm, Inc., 2625 Beech Street, Baton Rouge, LA 70805). On arrival, the crickets and packing material should be carefully emptied into a rearing box. Spread one cup of feed on the floor of the box. As an alternative, the food can be placed on a paper plate. Use a plastic poultry waterer (available at farm supply stores) as a source of water for the crickets. The waterer should be fitted with a sponge "rubber" insert to prevent the crickets from drowning. Figure 2 illustrates the design of the insert. Fill a greenhouse seedling tray (plastic) or similar container (measuring about 30 X 30 X 7 cm deep) with damp peat moss and place the tray against the wall in a corner of the box near the light bulb. The adult female crickets will promptly begin to deposit eggs beneath the surface of the moss. Do not permit the surface of the moss to dry out and do not add water to the point of saturation. Keep the tray in the box for about 48 hours in order to acquire several thousand eggs. Cricket eggs are white, cylindrical structures about three to four millimeters in length. Next, place the egg tray in a second cricket box (beneath light bulb) and cover lightly with a sheet of newspaper. Do not allow paper or other flammable materials within several centimeters of the light bulb. Check the eggs daily and add water if neces-



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sary to prevent desiccation. The eggs will hatch in about nine to 12 days. Alternatively, a drying oven (vents closed) or heated room (chamber) at about 35-38 C can be used to incubate the eggs. When the newly hatched crickets begin to emerge, provide them with several slices of fresh potato placed on the surface of the moss and on the floor of the box near the tray. Newly hatched crickets appear to prefer the potato slices to pulverized chow. Cover with a single sheet of newspaper. Newly hatched crickets often will drown in the sponge rubber waterer, so wait about 10 days before placing a waterer in the box. In the meantime, keep the peat moss damp as it will serve as a source of moisture for the young crickets. Supplement the potato slices with pulverized rabbit chow (use a blender to disaggregate the chow). Sprinkle 50-100 grams of the pulverized chow on the floor of the box and on the newspaper covering the tray each day for two weeks. After about 10 days, most of the young crickets will be large enough to use a waterer. Discard the egg tray contents at this time and position the waterer against the side of the box to facilitate access to the crickets. The sides of the plastic waterer should be rough-sanded in order to increase traction for the small crickets. The surface area of the box (important in determining the carrying capacity of the system) can be increased substantially and hiding places can be created by placing packing dividers (*i.e.*, cardboard partitions commonly used to provide separation in shipping cartons of small bottles, *etc.*) on the floor of the box near the lighted (warmest) end. Rusted metal cans are also useful as they provide hiding places as well as a convenient means to handle the crickets. Cover with a sheet of newspaper.

About 10-14 days after the eggs hatch, start to shift the feed from pulverized rabbit chow to the intact pellet form. Place a small quantity of pellets on a paper plate or directly on the box floor. The correct amount of pellets to be used depends on both the number and size of the crickets in the box. Generally, 200-400 cubic centimeters (whole pellet volume) per box per day is adequate. If the quantity provided is not consumed in about 24 hours, decrease feeding and vice versa. From this point onward, the box must be kept reasonably free of dead crickets, feces, and any decaying chow. Lift the cardboard material and use a metal-edged dust pan or similar device to scrape waste material into a pile at one end of the box. The crickets will disperse from their hiding places when disturbed, so the scraping and discarding operation should be performed on alternate days. That is, on one day, scrape waste material to the unlighted end of the box. On day two, discard the waste pile of the previous day first and then scrape the floor as was done on the previous day, *etcetera.* This approach reduces the loss of large numbers of crickets. A surgical mask (or similar air filtering apparatus) should be worn as some individuals are allergic to the dust created during the cleaning operation (C. Richards, pers. comm.).

About four weeks after receiving the original shipment of starter crickets, an identical second order of crickets should be placed in the third rearing box along with a tray for collecting eggs. When sufficient eggs have been obtained, remove any remaining crickets from the first box and add the new tray of eggs. The crickets in the second box will mature about six to seven weeks after hatching. Retain at least 1,000 adults from this group for breeding stock. These will supply the eggs for the next generation (to be started in the third box as those adult crickets are utilized). Mature females will exhibit long ovipositers and males will begin to "call." Be certain that no adult crickets are in a box before adding an egg tray. When the colony has been established, one box should contain eggs or newly hatched crickets, a second box can be expected to contain half-grown individuals, and the third box should contain adults. This general, staggered pattern can be maintained indefinitely and without the purchase of additional crickets. The system will produce about 1,000-4,000 crickets each week. Three rearing boxes are required to maintain a staggered rearing cycle. The use of four or more boxes will increase productivity and moderate any accidental interruption of the rearing cycle.

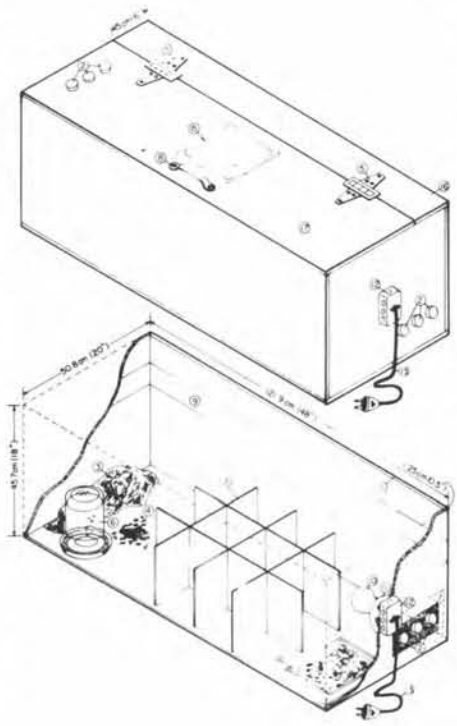


Figure 1. Structural diagram of the cricket rearing box. Components are : 1) ½" plywood (painted inside and outside), 2) number 7 rubber stoppers in 1¼" ventilation holes (covered on inside with wire window screening and bonded to box surface with silicone caulk), 3) waste pile, 4) cricket food (rabbit chow), 5) hinge (4" strap), 6) waterer, 7) cardboard insert, 8) lid handle, 9) aluminum foil barrier, 10) 100 watt light bulb, 11) porcelain socket (sealed against box surface with silicone caulk, 12) outlet box, 13) cord and plug, 14) peat moss tray, 15) inspection window (bonded to lid with silicone caulk) over cutout, 16) lid brace, and 17) lid. The foil or flashing barrier (9) is made by affixing (with aerosol adhesive) a continuous aluminum foil strip (5-8 cm wide) near the inside-top of the box. Similarly, lower ventilation holes (2) require a foil barrier to prevent the escape of very small crickets. The box should be covered (inside and outside) with an oil-base paint in order to protect the wood from moisture.

High humidity appears to favor normal shedding of the exoskeleton by growing crickets. However, extremely high humidity promotes mold growth which is undesirable. To compensate for periods of low humidity, a clean tray of moist peat moss can be kept in the box.

To collect crickets, place a tall, wide-mouth, smooth-sided pitcher or similar vessel on the floor of the box. Lift the cardboard packing material (or metal cans) and knock the crickets into the pitcher.

Cost considerations. — The initial investment in materials (plywood, hardware, etc.) needed to construct and operate a three box colony is about $100.00. The crickets reared in this system will use from 120-150 kilograms of rabbit feed and 45 kilograms of whole potatoes each year. Thus, the estimated annual food cost is approximately $60.00. About one-fourth cubic meter of peat moss (at a cost of about $64.00/m^3) will be used annually in egg trays. Two starter orders of 1,000 adult crickets each (at approximately $15.00/thousand) will be required. Therefore, the investment and operating costs for the first year are around $200.00. The operating cost in subsequent years is about $100.00 per year. The boxes have a life expectancy of at least three to five years.

Servicing (cleaning, feeding, propagating, etc.) requires less than 15 minutes each day (one day can be skipped each week without significant harm). *Failure to maintain regular servicing of the boxes will result in greatly reduced cricket production.*

Assuming that the colony will produce about 2,000 crickets per week, more than 100,000 crickets will be realized annually. The equivalent number of crickets from a commercial supplier would cost approximately $1,500.00 annually. Moreover, commercial suppliers occasionally can not guarantee the safe arrival of orders shipped during periods of extremely hot or cold weather.

II. Tadpole rearing system

Rearing tanks. — Conventional aquaria make convenient containers in which to rear most anuran tadpoles. A tank (*e.g.*, 116 liter size) should be equipped with an aeration device (air stone), filter, gravel bed, and cover (canopy). Figure 3 illustrates the system of rearing tanks used in this laboratory.

Rearing procedure. — Fill the bottom of the tank to a depth of about eight to 10 centimeters with thoroughly washed (autoclaving is recommended) stream gravel or crushed limestone (about 1-1½ cm dia.). Next, fill the tank to within five to eight centimeters of the top with tap water. Add an aeration stone and air-driven filter (available from tropical fish stores, *etc.*). Use clear polyvinylchloride tubing for air hoses as the latex type soon rots. If a compressed air line is available, it can be used to supply the air stone and filter. Gang valves can be used to control the rate of air

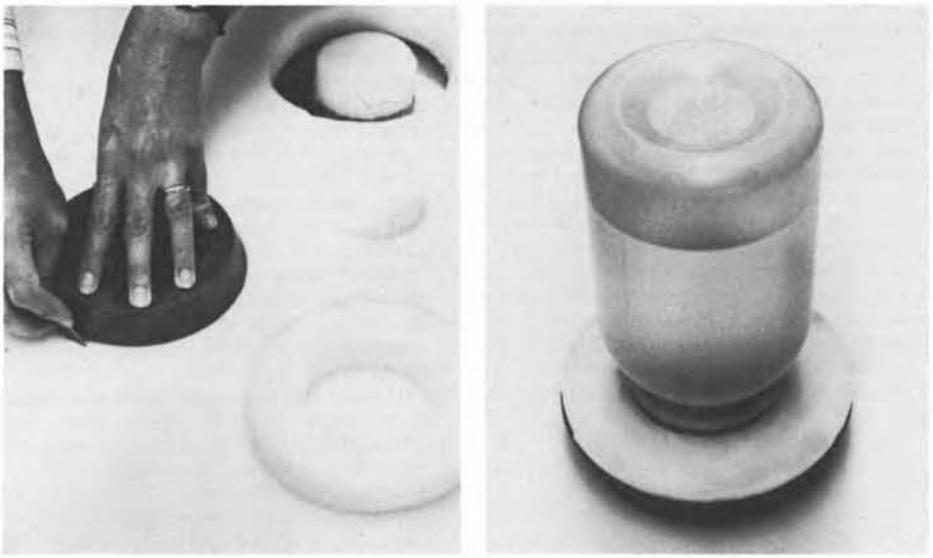


Figure 2. Preparation of the cricket waterer. Invert the waterer device on a piece of one inch thick polyurethane foam (available at fabric stores). Press down firmly and cut the foam by following the edge of the waterer with a sharp razor blade. Repeat this procedure in order to make the inside cutout, this time using the bottle cap as a template. Wash the foam ring insert thoroughly before use. Fill the bottle with tap water and prime the foam insert. Once in operation, rinse (do not use detergent) the foam insert every other day. The adult crickets will deposit eggs in the foam ring and these soon decay. Replace the insert about every two months (or as conditions dictate).

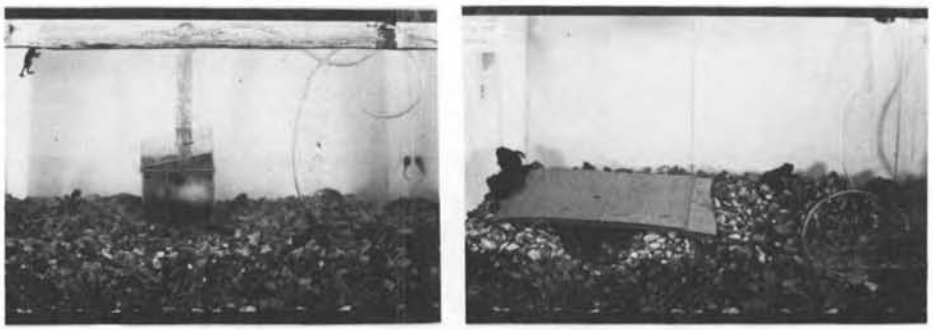


Figure 3. The tank systems used in rearing tadpoles (left) and transformed frogs (right). Pieces of gravel or crushed stone used in tanks containing transformed animals should be sufficiently large that they are not ingested by feeding frogs.

flow into the tank. A ballast jar containing water will trap oil contaminating the air supplied by some compressor systems. The miniature compressor units sold by tropical fish stores can also be used. Permit the tank to "season" with the air supply operating for two days, then *"seed" the tank with several cubic centimeters of bottom debris from a healthy pond.* Avoid the introduction of obvious predators to the tank. The addition of several snails at this time will contribute to a clean tank system as the snails will consume much of the food not used by the tadpoles. Permit the tank to stand for one week with aeration. Where necessary, several tanks can be supported on a framework of 2 X 4's against a wall. The room (or tank water temperature) should be about 20-23° C. A photoperiod of 12:12 was used for rearing both tadpoles and transformed frogs. If embryos or newly hatched tadpoles are to be added to the tank, reduce the air flow through the filter for the first two weeks of operation. This will prevent the small tadpoles from being drawn into the filter apparatus. Alternatively, glue a fine mesh plastic screen across the air filter intake to prevent entry of small tadpoles. Although a 116 liter tank will support several hundred very small tadpoles, after a few weeks, the number should be reduced to about 25-40 individuals. Crowding results in poor growth and development (Richards, 1962). It also contributes to disease problems. Add distilled or deionized water (in small increments) to the tank to compensate for evaporation and replace the polyester filtering material about once each month (or as conditions dictate).

Rabbit chow suspended in a mixture of agar and gelatin was used to feed the tadpoles. The formulation is as follows. Mix 750 cubic centimeters of rabbit chow in one liter of boiling water until the pellets disaggregate. To a second liter of boiling water, add 62 grams of agar while stirring and then add 41 grams of gelatin to the boiling agar-water. Finally, add the hot chow-water mixture to the agar-gelatin-water and stir thoroughly. Pour the mixture into a shallow tray (2-3 cm deep) and place in a refrigerator until it solidifies. Then, cut the material into blocks using the edge of a spatula. Place several blocks in plastic sandwich bags and freeze. Thaw each bag before use, break the individual blocks into portions, and drop into the tank. This formulation (adapted from one developed at the Amphibian Facility, University of Michigan) greatly reduces the chance that the tank water will be fouled by bacterial growth resulting from accidental overfeeding. It also provides the tadpole food in a form that is convenient. Feed the tadpoles every other day using large enough portions per tank so that a little remains about 24 hours after feeding. None should remain in 36 hours. Remove and discard any portion remaining in a tank for more than 48 hours. When waste material accumulates excessively in the crevices between pieces of stone, the tank should be drained (by siphoning) and cleaned (rinsed and refilled). This does not normally occur more often than about every two to four months.

Cost considerations. — The initial investment in tanks, filters and related paraphernalia is modest in comparison to the expense of buying commercially available setups designed for rearing tadpoles. Tanks of the 116 liter size range in price from about $30.00-$50.00 each. Glass top covers are about $12.00-$15.00 per tank. Filters and air stones add approximately $6.00-$8.00 per tank. Gravel (or crushed stone) costs are not significant. Thus, the investment per tank can be as little as $50.00-$70.00. The cost will be greater if it is necessary to purchase compressors and/or build a framework to support multiple tanks. The estimated cost of chow, agar, and gelatin needed to feed tadpoles from hatching through transformation (2½-4 months) is about $2.00 per 100 individuals. Replacement cost for spun polyester (for use in filters) and air stones is about $4.00 per tank per year of operation. Servicing operations (Feeding, filter replacement, tank cleaning, etc.) average about fifteen minutes per day (for 10 tanks).

III. Frog rearing system

Rearing tanks. — The tanks used to rear frogs from the time of metamorphosis through maturity are a modification of the tadpole tank system (refer to Figure 3). Prepare a tank with a gravel bed as described previously. (Pieces of gravel or crushed stone should be of sufficiently large size to prevent ingestion by feeding frogs). Add sufficient tadpole-tank water to bring the water level to within about two to four centimeters of the gravel surface. In one corner, place an air stone beneath the water level and cover with gravel. Most adult anurans (e.g., leopard frogs) require a moist environment; they do not need water in which to swim. Place one or two large rectangular pieces of cardboard, clay flower pot, or clay tile over a depression formed in the gravel so that the frogs will be able to crawl beneath them. Position the top cover on the tank (keep closed) and seal any large cracks with duct tape. This is not only a safeguard against escape by larger frogs; it is very important that the tank environment be kept reasonably

humid at all times for moist-skinned anurans.

Rearing procedure. — An aquarium, so arranged, will support as many as 20-25 frogs measuring four to six centimeters in snout-vent length. Many more smaller frogs can be kept successfully in tanks of this size. Very large frogs should be limited to about 10 or fewer per tank. Segregate frogs on the basis of size. Relatively large frogs are cannibalistic on their smaller tankmates. Replace the cardboard in the tanks when it begins to foul or decay. Add small increments of tap water periodically to compensate for evaporation. If the water level is too high or too low over an extended period, leopard frogs will die. Feed the frogs two or three times each week. Collect crickets suitable to the size of the frogs being fed. Feeding frogs with the largest crickets that they can ingest will maximize the mass productivity of the cricket colony. Newly transformed leopard frogs can handle two or three week old crickets easily.

To determine the number of crickets necessary for a feeding, simply add to each tank about five to eight crickets per frog. If some crickets remain after 24 hours, cut back feeding, and vice versa. Excessive numbers of large crickets in tanks of recently transformed frogs can be detrimental in that the crickets sometimes feed on the frogs. Tanks should be cleaned about every three to four months. Simply remove the frogs, rinse the tank thoroughly and reestablish the water level.

This method has been used to rear many leopard frogs through successive generations in this laboratory. No vitamin or mineral supplements of any sort were provided, however, they might be useful. Such adjuncts to normal feeding can be sprinkled onto a container of crickets before introduction to the frogs.

Do not handle frogs excessively. No evidence of disease was noted in any of the frogs reared (from eggs) using this method. However, some individual frogs that were handled frequently developed inflammations on the body surface and soon died. Other individuals in the same tanks were not affected. Do not introduce wild-caught specimens into tanks of laboratory-reared frogs unless the natural specimens have been quarantined for a month or more beforehand.

Cost considerations. — The expense for tanks and glass covers (see tadpole cost considerations) is the only major cost pertinent to rearing transformed frogs (cricket costs were considered earlier). A plastic, small animal cage, available from biological supply houses, costing about $10.00 per unit is an economical and useful substitute for conventional glass aquaria. Air stones, air tubing and gravel account for $2.00-$3.00 per tank annually. In this study, it was possible to rear the transformed tadpoles using only two tanks in addition to those containing tadpoles. Eighteen tanks were stocked with recently hatched tadpoles. The first of the tadpoles transformed in about 10 weeks. These were toe-clipped for identification and placed into two additional (frog rearing) tanks. As more tadpoles transformed, they too were placed in the nineteenth and twentieth tanks. Soon, several of the tadpole aquaria were empty (of tadpoles). These were drained and prepared for metamorphosing frogs. As transformed frogs were utilized for experiments, tanks were freed for starting more tadpoles. This procedure reduces costs considerably where it applies to a specific protocol.

REMARKS

In the course of establishing the frog rearing methodology described here, many varied approaches were tried. This design was judged the best because of simplicity, low cost, and the convenience of having the entire operation (cricket colony, tadpoles, and frogs) at one location. Commercially available frog rearing systems, although quite attractive, are generally both expensive and inflexible. Their design is often cumbersome for servicing operations and they require frequent cleaning and/or a continuous-flow water and drain system. Most such container designs are more appropriate for the short-term holding of anurans than for a rearing operation. Greenhouse frog rearing (see methods section of Frost and Bagnara, 1977) is: relatively expensive (initial investment); unsuitable in many geographic regions (high heating-cooling costs); and inconvenient (tadpoles and crickets generally must be kept elsewhere). Moreover, a greenhouse is difficult to subdivide in situations where there is a need for segregation of specimens. The system described in this report offers dependably high frog generation potential, relatively modest cost, and minimal servicing operations. Access to specimens is uncomplicated and segregation according to experimental design is easily achieved.

ACKNOWLEDGMENTS

The author wishes to thank C. M. Richards and G. W. Nace for sharing valuable techniques developed at the Amphibian Facility, The University of Michigan, Ann Arbor. George M. Malacinski (and the Axolotl Colony, Indiana University) provided some of the equipment and facilities used in the study. Portions of this project were undertaken while the author was affiliated with the University of Arizona, Tucson, and subsequently with Indiana University, Bloomington. The author would like to acknowledge the support provided by the Center for Biomedical Research — The University of Kansas. This work was incidental to studies for which support was provided by grants (DEB-7620340, DEB-7911561 and DEB-8108266) from the National Science Foundation.

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by

James B. Murphy and Joseph T. Collins

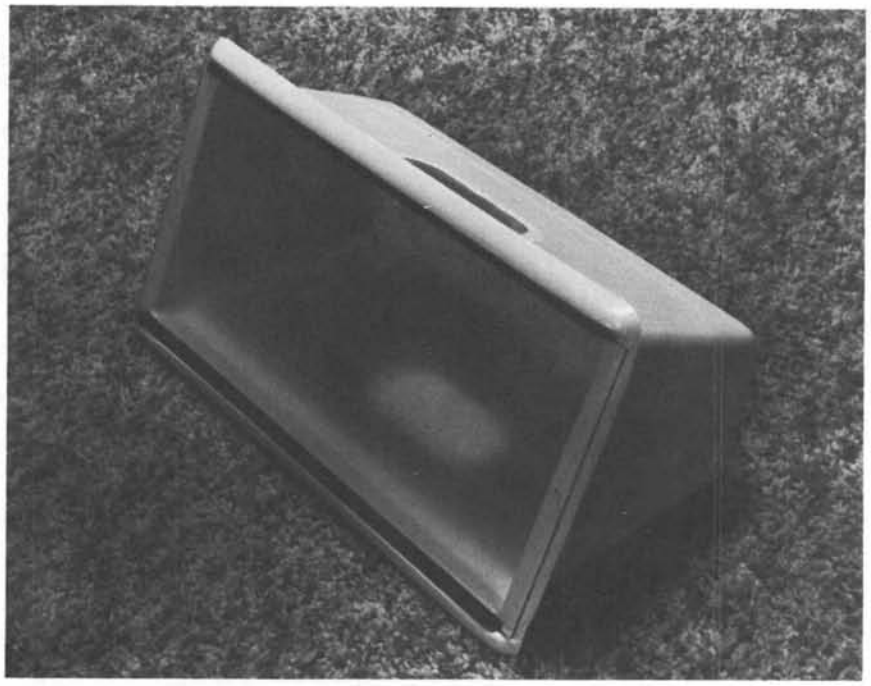
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NEWSNOTES

AMPHIBIANS AND REPTILES IN PENNSYLVANIA

Amphibians and Reptiles in Pennsylvania, by C. J. McCoy. 1982. $4.00/copy plus $1.00 postage and handling (PA residents add .24 tax). Order from Publications Secretary, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, PA 15213. Carnegie Museum of Natural History Special Publication No. 6.

This 91 page book presents a concise and interesting account of the Pennsylvania herpetofauna. Written by Carnegie Museum's Curator of Herpetology, the book contains a checklist of species, species accounts, a complete bibliography and a distribution atlas. This last is especially handy as it shows points of record within counties, rather than just a single, central dot within a county of record. This type of map is very tedious work to prepare, but the information content greatly enhances its utility for users. It will be of interest to teachers, herpetologists and anyone interested in the wildlife of the northeastern states. ●

REPTILES AND AMPHIBIANS OF SOUTHEASTERN NATIONAL FORESTS

Published April 19, 1982, this is a U.S. Forest Service In-Service Publication prepared by Monte E. Seehorn (Regional Fisheries Biologist, Southern Regional Office U.S.F.S., 1720 Peachtree Rd., N.W., Atlanta, GA 30367). The inventory was compiled from both literature search and fieldwork, and is available *gratis* from the Regional Office. An extensive bibliography is provided, as is a tabular reference to species of the region listed by national forest. Species recognized as endangered, threatened, *etc.* are so marked. ●

ABSTRACTS OF PAPERS OF RALEIGH MEETINGS AVAILABLE

Abstracts of the papers presented at the 25th Anniversary meeting of the Society for the Study of Amphibians and Reptiles and the 30th Annual meeting of the Herpetologists' League are available at cost. This was the largest Herpetological meeting in the world in 1982, consisting of 178 contributed papers.

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Geographic Distribution

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles** , Collins, Huheey, Knight and Smith, 1978), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Joseph T. Collins, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

CAUDATA

NECTURUS MACULOSUS (Mudpuppy). USA: WISCONSIN: Dunn Co: Red Cedar River, directly beneath Interstate Highway 94 bridge (T-28N, R-13W, Sec. 13). 17 May 1980. University of Wisconsin-Madison, Zoological Museum (UWZH 22503). Caught at 18:00 on hook and line in 12 feet of water over rocky substrate by Walter Koenst, with James Stewart. A nightcrawler was used as bait. This is the first published record for Dunn County (Vogt, R. C. 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum, Milwaukee, 205 pp.).

Submitted by **PHILIP A. COCHRAN,** Laboratory of Limnology, University of Wisconsin, Madison, Wisconsin 53706. ●

SALIENTIA

HYPEROLIUS LATERALIS. KENYA: Rift Valley Province: Nandi Hills District: 8 km SW of Nandi Hills Town, 2100 m. 14 September 1980. Steve Reilly. Verified by R. C. Drewes, California Academy of Sciences (CAS 152769-70). First known record for the province. Extends the known range 46 km to the east and just into the Kenya highlands, and is a new altitude record. These two specimens represent the easternmost limit for this species.

Submitted by **STEVE M. REILLY,** Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901. ●

RANA CATESBEIANA (Bullfrog). USA: WISCONSIN: Sawyer Co: shallow, weed-choked bay off Hayward Lake, an impoundment of the Namekagon River (T41N,R9W, Sec. 27). 28 May 1982. Philip A. Cochran. University of Wisconsin-Madison, Zoological Museum (UWZH 22504). Female. Several adults and many tadpoles were observed. This is the first published record for Sawyer County (Vogt, R. C. 1981. Natural History of Amphibians and Reptiles of Wisconsin. Milwaukee Public Museum, Milwaukee, 205 pp.).

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SCAPHIOPUS BOMBIFRONS (Plains Spadefoot). USA: ARKANSAS: Pope Co: Holla Bend National Wildlife Refuge, ca 6.4 km SE Dardanelle, T6N, R20W, S24. 7 and 9 June 1978. L. Shott and Arkansas Tech Univ. herpetology class. Identified by M. V. Plummer. Verified by D. C. Forester. Collection of Glyn Turnipseed (GDT 193, 194). First record for the state. Nearest locality is near Muskogee, Oklahoma, ca 240 km W (AMNH #59708-710; J. H. Black, pers. comm.) Although primarily limited to the Great Plains, the range of *S. bombifrons* extends substantially to the east on the floodplain of the Missouri River (Johnson, 1977. The Amphibians of Missouri, Univ. Kansas Mus. Nat. Hist. Pub. Ed. Ser. No. 6). Holla Bend is located within the Arkansas River floodplain. These specimens could be flood-borne waifs brought down the nearby Arkansas River. However, the adult specimen (SVL = 42 mm) and the 2 juveniles (SVL's 17 and 19 mm) suggest a local breeding population. GDT 193 was previously reported as *S. holbrooki* (Turnipseed, 1980. Geographic distribution: *Scaphiopus holbrooki hurteri,* Herp. Rev. 11:1).

Submitted by **MICHAEL V. PLUMMER** and **GLYN TURNIPSEED,** Department of Biology, Harding University, Searcy, Arkansas 72143 and Department of Biology, Arkansas Tech University, Russellville, Arkansas 72801. ●

SCAPHIOPUS COUCHI (Couch's Spadefoot). USA: TEXAS: Archer Co: 3.5 km W of junction of FM 2650 on FM 1954. 21 May 1982. Rocky Ward. Verified by E. G. Zimmerman. North Texas State University Herpetological Collection (NTSUHC A-55). This is the first record for the county which is at the northern part of a hiatus in north central Texas (Raun and Gehlbach, 1972. Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **ROCKY WARD,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203. ●

TESTUDINES

CHRYSEMYS CONCINNA (River Cooter). USA: TEXAS: Rains Co: 8.7 km W of Emory on Texas Rt. 35. 18 June 1982. C. T. McAllister. Verified by R. Ward and E. G. Zimmerman. North Texas State University Herpetological Collection (NTSUHC R-683). This specimen (a female with eggs) found DOR is a new county record and appears to be another *C. c. hieroglyphica* x *texana* intergrade (see Myers, S. 1982. Geographic distribution: *Chrysemys concinna.* SSAR Herp. Review 13 (1):24). Intensive collecting in the North Sabine River drainage and the zone presently separating the ranges of these subspecies may reveal populations for the adjacent counties and east Texas distributional hiatus (Raun and Gehlbach, 1972. Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No. 2; Conant, R. 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston).

Submitted by **CHRIS T. MCALLISTER,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203. ●

GRAPTEMYS GEOGRAPHICA (Map Turtle). USA: ARKANSAS: Pike Co: Caddo River at U.S. Hwy. 70. 4 October 1969; 10 June 1970; 24 July 1973. R. McKown and J. Needham. West Texas State University Museum of Natural History (WTSU 449, 1069, 1079, 1080, 1081, 1651, 1652, 1664, 1696). ARKANSAS: Marion Co: Buffalo River near Rush. 2 August 1974; 15 September 1974. M. Geishler. (WTSU 7026, 7027). Verified by F. C. Killebrew. New county records. Caddo River specimens extend range 110 km W and 110 km N of nearest localities in Saline and Lafayette Counties. (Dellinger and Black, 1938, Occas. Papers Univ. Ark. Mus. 1, 47p; H. H. Schwardt, 1938, Ark. Exper. Station Bulletin No. 357, 47p.). Buffalo River specimens extend range 90 km W of nearest locality in Fulton County. (H. G. Gowling, 1957, Occas. Papers Univ. Ark. Mus. 3, 51p.).

Submitted by **F. C. KILLEBREW,** Department of Biology, West Texas State University, Canyon, Texas 79016. ●

TRIONYX SPINIFERUS (Spiny Softshell Turtle). USA: WISCONSIN: Sawyer Co: Hayward Lake, an impoundment of the Namekagon River (T41N, R9W, Sec. 27). 25 May 1982. Philip A. Cochran and Frank Pratt (Wisconsin Department of Natural Resources). University of Wisconsin-Madison, Zoological Museum (UWZH 22505). One of two females collected in an unbaited fyke net, along with several *Chelydra serpentina* and many *Chrysemys picta.* This is the first published record for Sawyer County (Vogt, R. C. 1981. Natural history of amphibians and reptiles of Wisconsin. Milwaukee Public Museum, Milwaukee, 205 pp.). The specimen was collected at a locality farther north than any Wisconsin specimens examined by Vogt (1981), although he considered as valid records from two localities in Douglas County farther north. A series of artificial impoundments of the Namekagon River may have facilitated a northward range extension or increased population levels of *T. spiniferus* during historical times through the creation of a variety of large riverine habitats, although direct movements may be impeded.

Submitted by **PHILIP A. COCHRAN,** Laboratory of Limnology, University of Wisconsin, Madison, Wisconsin 53706. ●

SAURIA

ANOLIS SAGREI (Brown Anole). USA: VIRGINIA: James City Co: 6 km NW Williamsburg at Lightfoot. 14 December 1978. W. R. Hoilman and L. H. Westermann. Verified by J. C. Mitchell. National Museum of Natural History (USNM 225102). Found on a potted *Schefflera* plant in the greenhouse of the Williamsburg Pottery Shop. This specimen (male, 40mm SVL) rafted northward on potted plants believed to have originated on Estero, Lee County, Florida. This is probably an isolated occurrence and establishment of a breeding disjunct population in this area is unlikely.

This record confirms that *A. sagrei* can disperse long distances by rafting aboard ornamental plants (Godley, et al., 1981. Herp. Rev. 12(3):84-86) and suggests that dispersal may be more widespread than previously recognized. Are there disjunct populations outside peninsula Florida?

Submitted by **JOSEPH C. MITCHELL,** Department of Biology, University of Richmond, Richmond, Virginia 23173. ●

CHAMELEO HOHNELI. KENYA: Nairobi District; Nairobi; Milimani Street. 15 June 1981. Steve M. Reilly. Verified by R. C. Drewes, California Academy of Sciences (CAS 153631-32, 153724). First record for Nairobi where it is found in sympatry with *Chameleo jacksoni.*

Submitted by **STEVE M. REILLY,** Department of Zoology, Southern Illinois University, Carbondale, Illinois 62901. ●

CNEMIDOPHORUS GULARIS GULARIS (Texas spotted whiptail). USA: TEXAS: Briscoe Co: Caprock Canyons State Park, Lake Theo archeological site (41 BI 70). Shrubby savannah between scarp woodland and prairie on dissected terrace above Lake Theo (Holmes Creek), elevation 800 msl. 24 March 1982. 1400 CST. Clear, warm (29° C). R. W. Neck. Verified by F. E. Potter, Jr. Record fills part of gap between southward center of distribution and northern extreme populations in adjacent counties of Texas Panhandle. Specimen placed in Texas Memorial Museum (TNHC-48869).

Submitted by **RAYMOND W. NECK,** Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744. ●

COLEONYX ELEGANS NEMORALIS (Colima Banded Gecko) MEXICO: JALISCO: 14.4 km (by Mex. Hwy 80) N Barra de Navidad. 30 October 1974 (2140 hrs). J. R. Ottley. Verified by W. W. Tanner. Brigham Young University (BYU 41299). First record for state. Extends range approximately 120 km from the locality "Hacienda Paso del Rio, Colima" given by Klauber (1945, Trans. San Diego Soc. Nat. Hist., 10:133-216; also see Dixon, 1970, *Coleonyx,* Catalogue of American Amphibians and Reptiles, p. 95.1)

Submitted by **JOHN R. OTTLEY,** Herpetological Research Area, 149 MLBM, Brigham Young University, Provo, Utah 84602. ●

OPHISAURUS ATTENUATUS (Slender Glass Lizard). USA: TEXAS: Clay Co: 3.2 km NW Lake Arrowhead State Park on FM 1954. 21 May 1982. Rocky Ward. Verified by E. G. Zimmerman. North Texas State University Herpetological Collection (NTSUHC R-684). This is the first record for the county which forms part of a hiatus between Wichita, Archer



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and Young Counties to the west and the distribution of this species in eastern Texas (Raun and Gehlbach, 1972. Amphibians and Reptiles in Texas, Dallas Mus. Nat. His. Bull. No. 2).

Submitted by **ROCKY WARD,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203. ●

SERPENTES

BOA CONSTRICTOR IMPERATOR (Boa Constrictor). MEXICO: SONORA: Near Tetuchie (sometimes spelled Tetuachi), 16 km south of Arispe (sometimes spelled Arizpe). Elev. approximately 750 m. 30° 15' N, 110° 15' W. 7 June 1979. William H. Baltosser. Photo verification (Univ. Kansas Museum of Natural History Color Slide #s 7094-7095), photos verified by Joseph T. Collins. Dead in sandy wash surrounded by non-native tree tobacco *(Nicotiana glauca);* presumably killed by something other than human, no footprints in area surrounding snake, only small unidentifiable depressions in sand. Apparent predation on neck, approximately 30 cm of flesh stripped from area just behind head, head and rest of snake basically intact. Remains measuring approximately 110 cm not collected, several photographs obtained (Figures 1 and 2).



Figure 1. Closeup of head and neck region showing apparent signs of predation.



Figure 2. Overall view of snake showing severed head-neck region along with the rest of the body.

To my knowledge, this represents the northernmost locality of occurrence for this species which ranges from Tamaulipas and Sonora southward along both coasts, including Yucatan, to South America (Smith and Taylor, 1966. Herpetology of Mexico: Annotated checklists and keys to amphibians and reptiles. Reprint, Eric Lundberg, Ashton, Maryland. pp. 24-25). Formerly, the northernmost record for this species in Sonora was reported to be 78 km north of Hermosillo (Zweifel and Norris, 1955. American Midl. Nat. 54:230-249). Pope (Pope, 1973. The Giant Snakes: The natural history of the boa constrictor, the anaconda, and the largest pythons. Alfred A. Knopf, New York, New York. pp. 25-27) stated that the northernmost place where this species has been found in Sonora was within 240 km of the Arizona border. According to Bogert and Oliver (Bogert and Oliver, 1945. Bull. American Mus. Nat. Hist. 83:297-426), from time to time there have been unverified reports of this snake in southern Arizona, but since none were found far from human habitations, it was not certain whether these were native, or accidental importations. The Tetuchie record reported here places the species within 120 km of the Arizona border and approximately 95 km northeast of the previous northern record.

Submitted by **WILLIAM H. BALTOSSER,** Box 3AF Department of Biology, New Mexico State University, Las Cruces, New Mexico 88003. ●

LEPTOTYPHLOPS DULCIS (Texas Blind Snake). USA: COLORADO: Baca Co: 36 km S, 19 km W Pritchett, Furnish Canyon, T34S R50W SE¼ Sec. 32, 1433 m. 31 May 1982. B. Lapin and G. Hammerson. Identified by G. Hammerson, verified by H. M. Smith. Univ. Colorado Mus., Boulder, UCM 54216 (complete shed skin). First documented record for the state. Freshly shed skin found under rock on SW-facing slope. Locality is 10 km N, 8 km W of Oklahoma Panhandle record (Webb, 1970, Reptiles of Oklahoma, Univ. of Oklahoma Press, Norman).

Submitted by **BETH P. LAPIN,** Colorado Natural Heritage Inventory, 1550 Lincoln #110, Denver, Colorado 80203, and **GEOFFREY A. HAMMERSON,** Department of Environmental, Population, and Organismic Biology, University of Colorado, Boulder, Colorado 80309. ●

LEPTOTYPHLOPS DULCIS DISSECTUS (New Mexico Blind Snake). USA: KANSAS: Sumner Co: collected *ca.* 2 km SW Caldwell, Sec. 15-16, R3W, T35S on 15 May 1982 by K. J. Irwin. Verified by J. T. Collins. University of Kansas Museum of Natural History (KU 192197). First record for Sumner County, extends the known range *ca.* 70 km E of nearest Kansas record (Collins, 1982, Amphibians and reptiles in Kansas), and *ca.* 105 km N of northeasternmost Oklahoma record (Webb, 1970, Reptiles of Oklahoma). The specimen is the most northeastern record for the species. Taken under sandstone rock on west-facing slope of hillside. Associated species of amphibians and reptiles: *Gastrophryne olivacea, Terrapene ornata, Cnemidophorus sexlineatus, Holbrookia maculata, Diadophis punctatus, Lampropeltis getulus, Sonora semiannulata,* and *Tantilla nigriceps.*

Submitted by **KELLY J. IRWIN,** 2218 West Second Street, Topeka, Kansas 66606. ●

TRIMORPHODON UPSILON (Broad-banded Lyre Snake) MEXICO: SONORA: 32 km (by Mex. Hwy. 2) E Caborca (DOR). 15 April 1961. J. W. Heinrichs. Identified by J. R. Ottley. Brigham Young University (BYU 21178). Extends the range approximately 470 km northward from the Alamos-Guirocoba area of southern Sonora. The specimen, an adult female (571 mm total length), has 22 dorsal blotches which, though lower than the minimum given by Smith (1941, Proc. U. S. Natl. Mus. 91:149-168), are within the range Zweifel and Norris (1955, Amer. Midland Nat. 54: 230-249) reported for specimens from Guirocoba. Prior to this discovery this species had only been taken in subtropical habitats, several specimens (BYU 36807-36808, 41160) having been found in the desert scrub/thorn forest transition between Navojoa and Alamos. In addition to the specimen of *T. upsilon* reported here, the tree frog *Hyla wrightorum,* which is generally associated with mountain valleys, has been taken near Caborca at Trincheras (AMNH 53033). The discovery of these species in the same region of the Sonoran Desert suggests that these specimens may represent relictual populations, isolated during expansion of the desert during the retreat of Pleistocene glaciers. The stomach of BYU 21178 contains a partially digested sand lizard *(Callisaurus draconoides).*

Submitted by **JOHN R. OTTLEY,** Herpetological Research Area, 149 MLBM, Life Science Museum, Brigham Young University, Provo, Utah 84602. ●

TROPIDOCLONION LINEATUM (Lined Snake). USA: TEXAS: Clay Co: 4.0 km NW Lake Arrowhead State Park on FM 1954. 21 May 1982. Rocky Ward. Verified by T. L. King. North Texas State University Herpetological Collection (NTSUHC R-685). This is the first record for this county and fills the hiatus between Wichita and Archer Counties on the west and Montague County on the east (Raun and Gehlbach, 1972. Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **ROCKY WARD,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203. ●



SECOND FIND OF *PSEUDEMYS RUBRIVENTRIS* AT IPSWICH, MASSACHUSETTS, AND REFUTATION OF THE NAUSHON ISLAND RECORD

Waters (1962) described the find of *Pseudemys rubriventris* skeletal remains in an Indian shell heap at Ipswich, Essex County, Massachusetts originally reported by Bullen (1949). Waters proposed that this, and other evidence, supported his suggestion that this species was at one time continuously distributed along the coastal plain upon the formerly emergent continental shelf. He went on to speculate that Essex County populations may have been extirpated by former human inhabitants of area. In fact, Bullen (1949) did indicate the red-belly shell fragments (identified by Dr. Loveridge at the MCZ) were Indian food remains. Waters (1962) also stated that a dead specimen of *P. rubriventris* was found on Naushon Island, Dukes County, Massachusetts in 1944 (MCZ 46965).

On 23 July 1981 George Gavutis and Mike Bauer found the shell of an unfamiliar turtle near shore in Stage Island Pool at the southern end of Plum Island, Ipswich, Essex County, Massachusetts on the Parker River National Wildlife Refuge. Both Gavutis and Bauer work at the Refuge and had never seen anything like this specimen before. I subsequently identified it as *Pseudemys rubriventris* and deposited it in the Museum of Comparative Zoology (MCZ 162300). Their find was within 2 km of the Clark Pond site at Great Neck (Bullen, 1949). Later, I examined the Clark Pond specimen at the Peabody Foundation Museum at Phillips Andover Academy and asked Dr. Walter Auffenberg to look at it as well. He and I concluded that this material does include *P. rubriventris* (a subadult) and *Terrapene* peripheral bones.

The exciting possibility exists that a colony of *P. rubriventris* has survived undetected in Ipswich since at least 1500 Y.B.P. (the probable age of the Clark Pond artifacts according to Dr. R. S. MacNeish of the Peabody Foundation). Previous rumors of large basking turtles near the Ipswich River Audubon Sanctuary, Topsfield, Massachusetts (Dr. J. D. Lazell, *personal communication*) suggests the possible occurrence of these animals at least 15 km upriver from Plum Island Sound. Shell dimensions of MCZ 162300 are: carapace length = 284.5 mm, plastron length = 264 mm, and shell height = 124 mm. This specimen, an adult female, has a nuchal underlap ratio comparable to those of a set of 37 Plymouth red-bellies I recently examined. Some of its carapacial scutes are intact and the second costals bear the moderately forked distinct light transverse bar which is typical of Plymouth County *rubriventris.* The shell is not scarred, nor does it show evidence of irregular growth which might otherwise indicate captive rearing. It appears the specimen was

a wild endemic that died during the winter of 1981.

After examining the Naushon specimen (MCZ 46965) I became suspicious of its identification; its proportions and markings were not at all like those of nearly 200 Massachusetts red-bellies I have handled in the last three years. Dr. Walter Auffenberg examined this specimen at my request and he agrees with me completely that it is not *Pseudemys rubriventris*. He stated that its markings, streamlining, low profile, bone thickness, and carapacial flaring are more similar to *P. concinna* or *P. floridana*. He was not sure exactly which of these it is, but he said it is definitely not a Florida turtle. It is probable that this individual was introduced to Naushon Island after initial tenure as someone's pet. Two of my assistants and I have unsuccessfully scoped and trapped the waters of Naushon during the past three summers; we also talked with Naushon residents. No one interviewed had ever seen a red-bellied turtle on the Island, and at least two of the people we met were good naturalists quite familiar with the Island's turtle fauna. Lacking hard evidence to the contrary, I must conclude that *P. rubriventris* does not presently inhabit Naushon; and it quite possibly never did.

ACKNOWLEDGMENTS

I commend Mssrs. Gavutis and Bauer for having the presence of mind to retrieve the shell, and I thank Roger Hogan, OES specialist for the U.S. Fish and Wildlife Service, for calling their discovery to my attention. Dr. Auffenberg's generous and prompt accommodation of my urgent requests for assistance is deeply appreciated. José Rosado of the MCZ and Dr. R. S. MacNeish of the Peabody Foundation for Archaeology obligingly afforded me access to the aforementioned material in their collections.

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(Page charges paid by author)

COMMENTS ON THE DISTRIBUTION OF *AMBYSTOMA TALPOIDEUM* (HOLBROOK) IN TENNESSEE

Published range maps (Shoup 1964, Conant 1975) typically depict *Ambystoma talpoideum* as an animal of the Coastal Plain Physiographic Province in the southeastern United States, with several populations known from Appalachian provinces in Alabama, Georgia, North Carolina, and Tennessee. Shoup (1964) speculated that most of the non-Coastal Plain populations are continuous with west Tennessee Coastal Plain populations by way of the Cumberland and Tennessee River drainages. Although shown as continuous on his range map, populations in western North Carolina and eastern Tennessee were considered by Shoup to be disjunct. In contrast, Conant (1975) considered most non-Coastal Plain populations disjunct from the continuous Coastal Plain range of the species. Shoup (1964) stated that the distribution of *A. talpoideum* is in need of study, and his range map shows central Tennessee as an area requiring further study.

Since Shoup (1964) and Conant (1975), additional data on Tennessee populations have been acquired. The objectives of this paper are to update and describe further (1) distribution of *A. talpoideum* in Tennessee, (2) habitats being utilized, and (3) areas in need of further study.

Eighty-four specimens from 26 collecting sites were examined from Austin Peay State University (APSU), Carnegie Museum of Natural History (CMNH), Field Museum of Natural History (FMNH), Louisiana State University Museum of Zoology (LSUMZ), Memphis State University Museum of Zoology (MSUMZ), Tennessee Technological University (TTU), U.S. National Museum (USNM), University of Tennessee Vertebrate Zoology Collection, Knoxville (UTKVZC), and The University of Tennessee, Martin (UTM).

The distribution of *A. talpoideum* in Tennessee, as determined in this study, is shown in Fig. 1. Populations are known from the Coastal Plain, northern portions of Western Highland Rim, eastern edge of Eastern Highland Rim, Cumberland Plateau west of the Sequatchie Valley, and the extreme southern end of the Unaka Mountains (Fig. 1). In agreement with Shoup (1964) and Conant (1975) we believe Tennessee populations in the Unaka Mountains to be disjunct and possibly continuous with the western North Carolina populations reported by Braswell and Murdock (1979). Shoup (1964) considered all middle Tennessee populations to be continuous with those in west Tennessee. In contrast, Conant (1975) illustrated the range of *A. talpoideum* in eastern middle Tennessee as two disjunct entities. Based on locality data gathered for this study, Cumberland Plateau and Eastern Highland Rim populations in middle Tennessee are considered to form a single, continuous geographic unit which is thought to be disjunct. However, these populations are possibly continuous with the population reported by Mount (1975) from Jackson County, Alabama. In concurrence with Shoup (1964) and Conant (1975), we believe populations in the northern portion of the Western Highland Rim to be continuous with those in the west Tennessee Coastal Plain. Further fieldwork is needed to determine the extent of distribution in the Eastern Highland Rim and the possibility of the species occurring continuously across north central Tennessee.

Previous descriptions of suitable habitat for *A. talpoideum* in Tennessee have been

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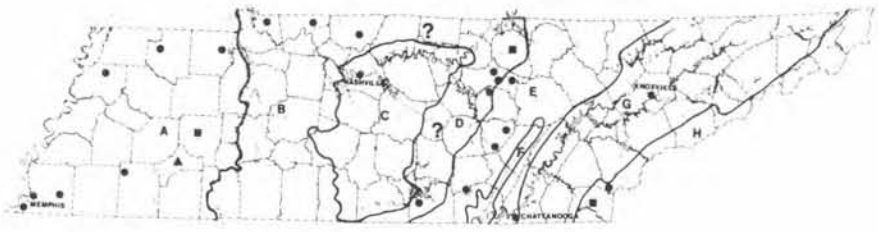


Fig. 1. Distribution of *A. talpoideum* and outline of physiographic features of Tennessee as modified from Miller (1974). Solid circles: localities from which specimens were examined and may denote more than one collecting site. Solid triangle: literature record believed valid. Solid squares: county literature records — locality data lacking. Question marks: areas in need of further investigation. Area A denotes the Coastal Plain, B -Western Highland Rim, C - Central Basin, D -Eastern Highland Rim, E - Cumberland Plateau, F - Sequatchie Valley, G - Valley and Ridge, and H - Unaka Mountains.

extremely brief: Endsley (1954) took one specimen "in the river bottom near Henderson"; Gentry (1955) found individuals in "small ponds" in Henry and Overton Counties; Brigham et al. (1967) collected *A. talpoideum* "from a road adjacent to Booger Swamp, a flooded woodland" in Putnam County; and Scott and Snyder (1968) "observed the species breeding in a woodland pond" in Montgomery County. Clearly, more information is needed for adequate portrayal of the conditions under which the species exists near the northern limits of its distribution. Based on recent field studies by the authors, A. C. Echternacht, and students at The University of Tennessee, the following habitat data are presented. All wetland types mentioned are those proposed and described by Carter and Burbank (1978). On the Western Highland Rim, the species has been found mainly in forested swamps and on one occasion (David H. Snyder pers. comm.) in a lower bottom-land hardwood forest surrounding an abandoned river channel. On the Eastern Highland Rim and Cumberland Plateau, forested swamps, shrub swamps, and dead woody swamps were found to be frequent environs of the species. In Van Buren County, individuals were taken near strip mine ponds.

Specimens Examined

DYER CO.: Maxey, (2 specimens) - USNM 28391-28392. FRANKLIN CO.: Mingo Swamp, 2.3 km (airline) south of Broadview, 15 July 1978, (2) - UTKVZC 04136, 04603. GRUNDY CO.: small swamp approximately 2.3 km south of Tracy, 14 July 1978, (1) - UTKVZC 04587. HARDEMAN CO.: small pond on U.S. Highway 64, west of Whiteville, spring 1942, (1) -LSUMZ uncatalogued. HENRY CO.: woodland pond 11.2 km east of Paris on U.S. Highway 79, 29 December 1946, (2) - CMNH 26560-26561, (1) - LSUMZ uncatalogued, February 1947, (2) - CMNH 27571-27572; 9.6 km east of Paris, 13 February 1949, (3) - CMNH 28976-28978. MONROE CO.: 2.4 km east of Ironsburg, 4 December 1945, (1) - FMNH 84593. MONTGOMERY CO.: sink pond along Dunlop Lane, 2.4 km (airline) northeast of St. Bethlehem, 11 February 1966, (13) - APSU 1959, (2) - APSU 1968, (8) - APSU 1971, 26 February 1966, (1) - APSU 1960, 28 February 1966, (1) - APSU 1957; flatwoods area at Webb Road, 3.04 km west of Port Royal Road, 30 May 1979, (1) - APSU 2823. PUTNAM CO.: Booger Swamp, 4.8 km east of Cookeville, 12 February 1966, (1) - TTU 354, 27 March 1966, (2) - TTU 397, 10 April 1967, (3) - TTU 665, 667-668, 2 May 1967, (2) - TTU 666, 18 July 1967, (1) - TTU 725, 7 April 1971, (1) - TTU 780, 27 April 1971, (1) - TTU 805, 7 May 1971, (1)- TTU 882; edge of City Lake, 6 May 1967, (1) - TTU 661; 6.4 km east of Cookeville on U.S. Highway 70, 12 April 1967, (2) - TTU 664; south side of Monterey Lake, 5 May 1967, (1) -TTU uncatalogued. ROBERTSON CO.: northern end of The Swamps, approximately 6.4 km north-northeast of Springfield, 29 June 1979, (2) - APSU 2824; eastern side of The Swamps, approximately 6.4 km north-northeast of Springfield, 22 February 1980, (1) - APSU uncatalogued. SHELBY CO.: farm pond, Cordova, 3 April 1971, (1) - MSUMZ uncatalogued; T. O. Fuller State Park below bluff east of railroad tracks, 8 October 1978, (8) - MSUMZ uncatalogued. STEWART CO.: State Highway 120, 1.2 km north of U.S. Highway 79, 2 April 1968, (1) - APSU 1016. VAN BUREN CO.: State Highway 111, 1.36 km north of Van Buren and Sequatchie County line, 12 April 1979, (1) - UTKVZC 04426; State Highway 111, 4.4 km north of Van Buren and Sequatchie County line, 12 April 1979, (1) -UTKVZC 04425; State Highway 30, 7.68 km west-northwest of Van Buren and Bledsoe County line, 12 April 1979, (1) - UTKVZC 04418; State Highway 111, 6.08 km south of junction with Archie Rhinehart Parkway, 16 May 1980, (1) - UTKVZC 06485; State Highway 111, 8.96 km south of junction with Archie Rhinehart Parkway, 16 May 1980, (5) -UTKVZC 06491-06495; county road to Falls Creek Falls State Park, approximately 0.16 km east of junction with State Highway 111, (1) - UTKVZC 04586. WEAKLEY CO.: southern edge of Martin near Westview High School, 22 May 1971, (1) - UTM uncatalogued, 2 April 1978, (1) - UTM uncatalogued, 21 April 1978, (1) - UTM uncatalogued. WHITE CO.: swamp, 2.96 km (airline) northeast of Macedonia Community, 17 May 1980, (1) - UTKVZC 06519.

Literature Records

CHESTER CO.: Forked Deer River Bottoms near Henderson (Endsley 1954). DYER CO.: Maxey (Blanchard 1922). HENDERSON CO.: Henderson County (Hon 1970). HENRY CO.: Henry County (Gentry 1955, Hon 1970). MONROE CO.: near Ironsburg (Huheey and Stupka 1967). MONTGOMERY CO.: Montgomery County (Scott and Snyder 1968, Hon 1970). OVERTON CO.: Overton County (Gentry 1955, Hon 1970). POLK CO.: Polk County (Dreyer and Norwood 1973). PUTNAM CO.: Booger Swamp, 4.8 km east of Cookeville (Brigham, et al. 1967).

ACKNOWLEDGMENTS

For access to specimens deposited in their collections and their comments, the authors are grateful to A. C. Echternacht (UTKVZC), J. S. Jacob (MSUMZ), O. R. Jordan (TTU), Hymen Marx (FMNH), C. J. McCoy (CMNH), William Nelson (UTM), D. A. Rossman (LSUMZ), D. H. Snyder (APSU), and George Zug (USNM).

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A CHECKLIST OF THE HERPETOFAUNA OF BUTTE COUNTY, THE BUTTE SINK AND SUTTER BUTTES, CALIFORNIA

This checklist summarizes some 3,000 reptile and amphibian records from various museums and contributors, in addition to over 2,000 personal observations made over five years (1973-1978). A detailed publication on the herpetofauna of this region is in preparation, but this checklist may be useful to workers and agencies until that manuscript is published (Hayes, MS in prep.).

Each species listed is vouchered by at least one museum specimen or recognizable photograph. Photographs are color slides deposited both at California State University, Chico and in the senior author's personal collection. The area covered includes all of Butte County and portions of Glenn, Colusa and Sutter Counties in the Butte Sink, bordered by the Sacramento River and Sutter Buttes.

Although this summary outlines the actual herpetofauna existing within this region, it does not pretend to be complete, but provides baseline data for future work. The region presents numerous herpetological problems, since much of it has been poorly explored. Among species unrepresented is the plethodontid salamander *Hydromantes*, whose occurrence is suggested in foothill limestone outcrops in the Lime Saddle region of Butte County. Recent discoveries of coastal plant disjuncts, such as Licorice Fern *(Polypodium glycyrrhiza)*, suggest that disjunct populations of amphibians such as *Dicamptodon ensatus, Ascaphus truei* and *Aneides flavipunctatus* may be discovered. Further, the Sutter Buttes pose interesting distributional problems, such as the presence of *Cnemidophorus tigris* and the absence of *Masticophis lateralis*, two species closely associated with chaparral vegetation in northern California. Many such problems may be solved by additional field work. It is hoped that future workers will append existing distributional data, since a thorough understanding of an organism's distribution is of essential value in augmenting the knowledge of its biogeography, ecology and evolution.

Major classification categories are those of Goin and Goin (1971) for amphibians and Romer (1956, 1966) for reptiles. Brame (1967) was followed for subordinal groupings of salamanders, and Dowling (1975) was followed for snake classification to the subfamilial level. Tribal classification of colubrids was omitted because these categories have not been well defined and are largely in a state of flux at this time (A. Savitsky, pers. comm.). Common and scientific names follow "Standard Common and Current Scientific Names for North American Amphibians and Reptiles" by Collins *et al.* (1978). Brief comments on distribution are restricted to the checklist area cited.

Class AMPHIBIA - Amphibians
Superorder LEPOSPONDYLI
Order CAUDATA (URODELA) - Salamanders
Suborder AMBYSTOMATOIDEA
Family AMBYSTOMATIDAE - Mole Salamanders

1) *Ambystoma californiense* - California Tiger Salamander
Recorded at a single location in a somewhat alkaline vernal pool at Grey Lodge wildlife refuge in southwestern Butte County.

2) *Ambystoma macrodactylum sigillatum* - Southern Long-toed Salamander
Recorded from lakes, ponds and meadows in the higher reaches of the drainages of Butte Creek and the Little West Branch of the Feather River in northwestern Butte County. All localities are above 1300 m (4330 ft).

Family PLETHODONTIDAE - Lungless Salamanders

3) *Ensatina eschscholtzi platensis* - Sierra Nevada Ensatina
Recorded from most of Butte County over 600 m (2000 ft), but occuring in shaded canyons down to 400 m (1330 ft). The lower limit of its distribution approximates the lower limit of the distribution of Ponderosa Pine *(Pinus ponderosa)*.

4) *Batrachoseps attenuatus* - California Slender Salamander
Found largely in foothill woodland and chaparral areas below 600 m (2000 ft). Its distribution corresponds closely with that of the Interior Live Oak *(Quercus wislizenii)*. It is unrecorded north of Rock Creek in Butte County and has not yet been found in adjacent Tehama County. This species occasionally extends onto the valley floor via well-developed fingers of riparian woodland. It is recorded in the Sutter Buttes. Only rarely sympatric with *Ensatina*, it can be found coexisting with *Ensatina* at the lower fringe of yellow pine forest.

Suborder SALAMANDROIDEA
Family SALAMANDRIDAE - Newts

5) *Taricha granulosa granulosa* - Northern Roughskin Newt
Recorded in the drainage of the Little West Branch of the Feather River and all drainages northward above 500 m (1670 ft).

6) *Taricha torosa sierrae* - Sierra Newt
Found in virtually all drainages below 800 m (2660 ft), but is largely absent where drainages span the valley floor. This species exists in sympatry with *T. granulosa* in the drainages of Butte Creek and the Little West Branch of the Feather River between 500 m (1670 ft) and 800 m (2660 ft). It is not recorded in the Sutter Buttes.

Superorder SALIENTIA
Order ANURA - Frogs and Toads
Suborder ANOMOCOELA
Family PELOBATIDAE - Spadefoot Toads

7) *Scaphiopus hammondi* - Western Spadefoot
Known from higher terrace-type vernal pools and ephemeral drainages on the valley floor between the Pentz area and Honcut in Butte County. All localities are between 30 m (100 ft) and 100 m (330 ft).

Suborder PROCOELA
Family BUFONIDAE - Toads

8) *Bufo boreas halophilus* - California Toad
Bufo boreas halophilus X *boreas* (intergrade)
Virtually ubiquitous throughout the checklist area at all elevations. Intergrades *(B. b. halophilus* X *boreas)* are found in the region of Chico and northward. It is absent above 1800 m (6000 ft) because of lack of breeding habitat.

Family HYLIDAE - Treefrogs

9) *Hyla regilla deserticola* - Pacific Treefrog
Virtually ubiquitous throughout the checklist area at all elevations. This species is also absent above 1800 m (6000 ft) because of lack of breeding habitat.

Suborder DIPLASIOCOELA
Family RANIDAE - True Frogs

10) *Rana aurora draytoni* - California Red-legged Frog
Known only from 2 locations, 2 deep-water springs in the vicinity of Bidwell Bar at approximately 300 m (1000 ft) of elevation.

11) *Rana boylei* - Foothill Yellow-legged Frog
Found in most drainages from the valley edge at 90 m (300 ft) to slightly over 1500 m (5000 ft). It is absent from the valley floor, but occurs in the Sutter Buttes.

12) *Rana cascadae* - Cascades Frog
Found in the higher reaches of the Little West Branch of the Feather River and similar drainages to the north over 1300 m (4330 ft). A single anomalous location on the Anderson Fork places this species at 230 m (770 ft) in a stream through a chaparral location. The locality of this specimen is suspect as no further individuals have been found.

13) *Rana catesbeiana* - Bullfrog
The only established introduced species in the area covered by the checklist. It is ubiquitous at virtually all permanent water locations in the valley and the lowest foothill reaches of streams. This species is also found at isolated outposts at higher elevations (i.e. Kunkle Reservoir, Concow Lake).

14) *Rana muscosa* - Mountain Yellow-legged Frog
Found in the higher reaches of Butte County drainages over 1300 m (4330 ft). It is sympatric with *R. cascadae* at virtually all known locations. Sympatry with both *R. boylei* and *R. cascadae* is recorded at a single location on the Little West Branch of the Feather River.



Class REPTILIA - Reptiles
Subclass ANAPSIDA
Order CHELONIA (TESTUDINES, TESTUDINATA) - Turtles
Suborder CRYPTODIRA
Superfamily TESTUDINOIDEA
Family TESTUDINIDAE
Subfamily EMYDINAE - Pond Turtles

15) *Clemmys marmorata marmorata* - Northwestern Pond Turtle
Occurs in most ponds, reservoirs and low gradient drainages below 1000 m (3330 ft).

Subclass LEPIDOSAURIA
Order SQUAMATA - Lizards and Snakes
Suborder LACERTILIA (SAURIA) - Lizards
Infraorder IGUANIA
Family IGUANIDAE - Iguanid Lizards

16) *Sceloporus occidentalis occidentalis* - Northwestern Fence Lizard
Ubiquitous throughout the checklist area below 1900 m (6330 ft). Its distribution becomes increasingly spotty with increased elevation.

17) *Sceloporus graciosus graciosus* - Northern Sagebrush Lizard
Found from the highest point in Butte County at Humboldt Peak, 2127 m (7082 ft), down to 170 m (570 ft). The distribution of this species becomes extremely spotty below 300 m (1000 ft). This species is frequently sympatric with *S. occidentalis*. It occurs in the Sutter Buttes above 150 m (500 ft).

18) *Phrynosoma coronatum frontale* - California Horned Lizard
Occurs at a few isolated outposts in low grassland and open woodland sites in the vicinity of Oroville and below Paradise. These localities range from 120 m (400 ft) to 450 m (1500 ft).

Infraorder ANGUINOMORPHA
Superfamily ANGUOIDEA
Family ANGUIDAE
Subfamily GERRHONOTINAE - Alligator Lizards

19) *Gerrhonotus multicarinatus multicarinatus* - California Alligator Lizard
Found virtually throughout the checklist area below 1000 m (3330 ft).

20) *Gerrhonotus coeruleus palmeri* - Sierra Alligator Lizard
Gerrhonotus coeruleus palmeri X *shastensis* (intergrade)
Recorded virtually throughout the checklist area above 900 m (3000 ft). It is absent in regions of dense Red Fir *(Abies magnifica)* forest. Sympatry with *G. multicarinatus* is recorded only in Butte Creek canyon. The northeastern portion of the county is an area of intergradation between *G. c. shastensis* and *G. c. palmeri*. Individuals referable to the *palmeri* subspecies are found from the Middle Fork of the Feather River and southward.

Infraorder SCINCOMORPHA
Family SCINCIDAE - Skinks

21) *Eumeces skiltonianus skiltonianus* - Western Skink
Found in scattered sites throughout the checklist area below 1500 m (5000 ft). On the valley floor it is often restricted to the riparian woodland belts.

Family TEIIDAE - Whiptails

22) *Cnemidophorus tigris mundus* - California Whiptail
Scattered isolates are found in regions of chaparral and mixed chaparral-foothill woodland associations between 200 m (670 ft) and 650 m (2160 ft) in Butte County. This species also occurs in the Sutter Buttes between 140 m (470 ft) and 550 m (1830 ft) in isolated pockets.

Suborder SERPENTES (OPHIDIA) - Snakes
Infraorder ALETHINOPHIDIA
Superfamily BOOIDEA
Family BOIDAE - Boas and Pythons
Subfamily ERYCINAE

23) *Charina bottae bottae* - Pacific Rubber Boa
At scattered locations in open coniferous forest above 600 m (2000 ft). It occurs also in shaded canyons down to 400 m (1330 ft).

Superfamily CAENOPHIDIA (COLUBROIDEA)
Family COLUBRIDAE - Colubrid Snakes
Subfamily COLUBRINAE - Colubrine Colubrids

24) *Coluber constrictor mormon* - Western Yellowbelly Racer
Found throughout the checklist area, absent only from heavily shaded coniferous forest. This species becomes very infrequent above 1800 m (6000 ft).

25) *Lampropeltis getulus californiae* - California Kingsnake
Recorded from the valley floor up to 700 m (2330 ft) within the checklist area. Infrequent above 600 m (2000 ft), its distribution corresponds closely with the proximity of available free water.

26) *Lampropeltis zonata multicincta* - Sierra Mountain Kingsnake
Found primarily between 400 m (1330 ft) and 1300 m (4330 ft), infrequently up to 1500 m (5000 ft). In protected canyons, this species is found as low as 350 m (1170 ft). Although it has been recorded in close proximity with *L. getulus* (ca. 1 kilometer (.6 mile)), true sympatry is unrecorded for the checklist area. This species is also unrecorded from the drainages north of Butte Creek and is absent from the Sutter Buttes.

27) *Masticophis flagellum ruddocki* - San Joaquin Coachwhip
Recorded only from the Sutter Buttes between 30 m (100 ft) and 150 m (500 ft).

28) *Masticophis lateralis lateralis* - California Striped Racer
Closely associated with chaparral and brushy vegetation between 100 m (330 ft) and 650 m (2160 ft). It is unrecorded from the Sutter Buttes.

29) *Pituophis melanoleucus catenifer* - Pacific Gopher Snake
Found at all elevations below 1800 m (6000 ft). This species is absent from heavily shaded coniferous forest and becomes infrequent above 1700 m (5660 ft).

30) *Rhinocheilus lecontei lecontei* - Western Longnose Snake
Recorded only from the Sutter Buttes between 30 m (100 ft) and 150 m (500 ft). The existing records are from localities with loose sandy-loam substrates.

Subfamily NATRICINAE - Natricine Colubrids

31) *Thamnophis sirtalis fitchii* - Valley Garter Snake
Found at all elevations below 1800 m (6000 ft). This species would probably extend its range to the highest point in the county at 2127 m (7082 ft), but requisite habitat is absent above 1800 m. Its distribution closely corresponds to lentic sites with emergent vegetation providing cover.

32) *Thamnophis couchi couchi* - Sierra Garter Snake
Found at elevations from 100 m (330 ft) to near 1700 m (5660 ft) within the checklist area. This species, like *T. sirtalis*, would probably extend its range higher in elevation if requisite habitat existed. Closely associated with rocky stream courses, this subspecies of *T. couchi* is absent from the valley floor portion of the checklist area. It is unrecorded from the Sutter Buttes.

Thamnophis couchi gigas - Giant Garter Snake
Restricted to the valley floor freshwater marsh habitats, primarily below 40 m (130 ft). The interface region between the *gigas* and *couchi* subspecies lies at the valley-foothill edge between 40 m and 100 m (330 ft). The degree to which these two subspecies intergrade is incompletely known.

33) *Thamnophis elegans elegans* - Mountain Garter Snake
Found from the lowest foothill slope at 60 m (200 ft) to the highest elevations within the checklist area (Humboldt Peak at 2127 m (7082 ft)). Infrequent above 2000 m (6660 ft), it is absent from the valley floor and unrecorded in the Sutter Buttes.

Subfamily XENODONTINAE - Xenodontine Colubrids

34) *Contia tenuis* - Sharp-tailed Snake
Found from the low foothill slope at 60 m (200 ft) to 700 m (2300 ft). This species is very infrequent above 700 m. Its distribution is spotty and local, corresponding well with the availability of loose surface cover. It is also unrecorded from the Sutter Buttes.

35) *Diadophis punctatus pulchellus* - Coralbelly Ringneck Snake
Found on the foothill slope from 60 m (200 ft) up to possibly 1000 m (3330 ft). The upper limit of distribution is poorly known. It is found much less frequently above 700 m (2300 ft). Its distribution corresponds well with the distribution of Big Leaf Maple *(Acer macrophyllum)* and California Bay *(Umbellularia californica)* within the elevation range cited. Recorded from the Sutter Buttes, it is generally absent from the valley floor. A single record exists for Grey Lodge, but this is undocumented by further collections. Notably, true sympatry with *Contia tenuis* has not been recorded for the checklist area.

36) *Hypsiglena torquata nuchalata* - California Night Snake
Found on the lower foothill slope between 60 m (200 ft) and 300 m (1000 ft). Distribution of this species correlates well with the presence of Blue Oak *(Quercus douglasii)* on an at least partially rocky substrate. It is unrecorded from the Sutter Buttes.

Family Viperidae - Vipers and Pit Vipers
Subfamily Crotalinae - Pit Vipers

37) *Crotalus viridis oreganus* - Northern Pacific Rattlesnake
Found throughout the checklist area up to 1800 m (6000 ft) and infrequently recorded above 1500 m (5000 ft). It is generally absent from *open* grassland on the valley floor.

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BOOK REVIEW

Identification Guide to Pennsylvania Snakes by C. J. McCoy, Jr.; Illustrated by Michael Antonoplos. Price $1.50 + 25¢ postage (PA residents add 9¢ sales tax). Available from Benedum Resource Project, Section of Education, Carnegie Museum, Pittsburgh, PA 15213.

This booklet, similar in format to guides covering Kansas and Florida herps, provides novices with quick, accurate identification of Pennsylvania snakes. More limited in scope than the Kansas or Florida guides, the book is well laid out and introduced to the user. The drawings of species are adequate for most final identifications (PA is blessed with a snake fauna consisting of relatively few and fairly distinct species) and the addition of range maps is an asset. While a couple of the introductory statements could incorrectly be taken as applying to snakes in general, rather than to Pennsylvania species, I found nothing to fault the publication and recommend it highly to Pennsylvanians and residents of adjacent states.

GEORGE R. PISANI
University of Kansas

Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Houston Zoological Gardens, Houston, Texas 77001.



REPRODUCTION IN CAPTIVE ARUBA ISLAND RATTLESNAKES, *Crotalus unicolor*

The Aruba Island rattlesnake *Crotalus unicolor*, is probably derived from a generalized *Crotalus durissus* stock and is found only on Aruba Island off the coast of Venezuela. The species is considered rare by the International Union for Conservation of Nature and Natural Resources (IUCN). Kauffeld and Gloyd (1939) reported some data on a captive-born litter from a wildbred female. Klauber (1972) reported some data on *C. unicolor* born at San Diego Zoo. From 1973 through 1980 nine live litters and one stillborn litter were born at the Houston Zoological Gardens.

A pair of *C. unicolor* (Male A, Female A) collected on Aruba Island were received on 27 May 1969 from a dealer. Male C was received from a dealer on 21 June 1976 and Female B was obtained from the Gladys Porter Zoo sometime previous to 4 May 1976. Collection data are not available for these last two specimens. Subsequent births at the Houston Zoological Gardens produced Male B and Female D on 2 June 1975, Male D on 6 June 1973 and Female C on 6 September 1973.

Some specimens were exhibited in a glass-fronted enclosure (80 X 90 X 140 cm) with a gravel substrate. Large rocks and plastic plants provided cover. Light was from four 20 W Vita-lites (Duro-test Corp.). Temperature averaged 28° C and the relative humidity was *ca.* 85 percent. Specimens off exhibit were kept in various size aquaria with paper substrate and hide boxes. Vita-lites were not used for these specimens. Temperature averaged 28° C with a relative humidity of *ca.* 75 percent.

All specimens were maintained under a 14L:10D photoperiod throughout the year. Water was available *ad libitum* and adult specimens were fed mice every 14-21 days. The specimens were occasionally separated and reintroduced and periodically misted with water in attempts to induce reproduction.

Specimens were weighed on a triple-beam balance and lengths were obtained using the squeeze box technique (Quinn and Jones, 1974).

Copulation was observed on only two occasions, 16 October 1978 (Male C, Female D) and 17 Septmeber 1980, (Male B, female unknown); however, courtship behavior has been variously recorded from 26 July to 21 October. The duration of copulation for the 17 September observation was between 7.5 to 10.0 hrs. The 16 October occurrence was not timed. Klauber (1972) reported copulation occuring on 14 and 21 September in captive *C. unicolor* at the San Diego Zoo. No year was given.

Dates of birth, number of young and their measurements are given in Table 1. Birth dates varied from 27 April to 6 September with births occuring most often in May and June (seven of nine cases). Klauber (1972) reported 5 April, 13 May, 5 and 27 June as

TABLE 1. Data for newborn *Crotalus unicolor*.

Parents		Date	# of young	Total length(mm) $\bar{x}$(range)	Tail length(mm) $\bar{x}$(range)	Weight(g) $\bar{x}$(range)
Female A	Male A	9/6/73	5	—	—	—
A	A	6/9/74	4	—	—	—
A	A	6/2/75	5	—	—	—
A	?	5/23/77	4	283[1]	21[1]	—
A	D	5/13/78	3	276(269-290)	19(17-22)	13.6(12.5-15.0)
Female B	Male A	5/4/76	3	—	—	—
Female C	Male D	4/27/78	4	271(260-282)	21(19-26)	13.6(13.0-14.0)
Female D	Male B	6/17/79	2	285(280-290)	—	14.1(13.0-15.2)
D	B	5/16/80	2	235(231-239)	20(19-20)	11.9(11.6-12.1)

[1]Only one young measured

dates of birth for *C. unicolor* at the San Diego Zoo. It was not stated if all births were the result of captive copulation.

At the Houston Zoo, the number of live young in nine litters was 2-5 ($\bar{x}$=3.6). If the number of stillborn are included to compute potential litter size the number is 3-5 ($\bar{x}$=4.3), and if the number of infertile eggs expelled is then added the number is 3-8 ($\bar{x}$=4.6). The above data include the 2 May 1979 birth of five stillborn and three infertile eggs to Female A. Kauffeld and Gloyd (1939) reported a wild-bred female that gave birth to five young that were stillborn or died shortly after birth. The female died after parturition and contained seven more dead young for a total of 12, which is seven more than the maximum number of live and stillborn for a single birth in this study. Klauber (1972) reported litters of six, seven, nine and 15 young, which is from one to ten more than the maximum number of live and stillborn young reported for a single birth in this study. Based on our data from Female A, age did not appear to be a factor in litter size. In fact, she had progressively fewer young in 1977 and 1978, and on 13 May 1979 she gave birth to five stillborn. She also expelled single infertile eggs in 1974, 1977 and 1978 and three in 1979 along with the five stillborn. This seems to indicate a reduction in reproductive potential with increasing age. Female A was apparently mature (based on size) when received in 1969 and must have been at least 11 years old in 1979. Size of the female can not be shown to be a factor in litter size since Female D was 746 mm in total length when she produced two live young and one stillborn, while the specimen of Kauffeld and Gloyd (1939) was 758 mm, only 12 mm longer. Klauber (1972) gave no length for a mature female. Measurements are not available for any other females at the Houston Zoo at the time of parturition.

The total length of all new-born that were measured during this study was 231-290 mm ($\bar{x}$=269; N=12) while the total length of all stillborn young measured was 211-295 mm ($\bar{x}$=243; N=10). The two smallest newborn were 231 and 239 mm total length and may have been premature since they both died of yolk impaction and unabsorbed yolk sac 3-4 wks after birth. The measurements reported by Kauffeld and Gloyd (1939) of three newborn (187-205 mm; $\bar{x}$-198 mm) apparently indicate a premature birth, since the measured specimens and all others born at the same time or recovered from the dead mother were dead, or died, shortly after birth. Klauber (1972) reported two lengths for newborn *C. unicolor*. The smallest specimen measured 230 mm, the average of an unspecified number of young was 235 mm. Assumedly, these measurements represent *C. unicolor* born at the San Diego Zoo. The tail lengths of all measured live-born young at the Houston Zoo was 17.0-25.5 mm ($\bar{x}$=20.0; N=10) and the weight was 9.2-15.1 g ($\bar{x}$=13.0; N=12). Kauffeld and Gloyd (1939) and Klauber (1972) did not report specimen weights.

The coloration and pattern of newborn and juveniles was as reported by Kauffeld and Gloyd (1939) and Klauber (1972).

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PREDATORY BEHAVIOR OF "NERVOUS" RATTLESNAKES, *Crotalus durissus terrificus*

It has previously been reported that striking prey induces high rates of tongue flicking in rattlesnakes (Chiszar, Radcliffe, and Scudder, 1977; Chiszar, Radcliffe, and Smith, 1978) and cantils (Chiszar, Simonsen, Radcliffe, and Smith, 1979). Further, it has been argued that strike-induced tongue flicking (also called chemosensory searching) is a modal action pattern which normally brings the snake into the vicinity of its now dead prey so that swallowing behavior can be released by cues arising from the carcass (see Burghardt, 1970, for a review of the literature on chemical cue utilization by reptiles). Accordingly, when a predatory strike occurs, chemosensory searching should be released and the rest of the predatory chain should unfold. Often a rattlesnake which has consistently refused food can be instigated to eat if it can be made to exhibit chemosensory searching consequent to striking a prey object even for defensive reasons. This strengthens our belief that strike-induced chemosensory searching is a modal action pattern and that the predatory sequence is a response chain in which execution of each element predisposes the snake to engage in the next element. Although strong sequential dependencies exist between some components of the response chain (Dullemeijer, 1961; Duvall et al., 1978), variations in the usual temporal ordering of components are known to occur and even to be characteristic of individual snakes. For example, some specimens will exhibit chemosensory searching and ingestion without first striking prey (Klauber, 1956; Patten and Banta, 1980). Accordingly, it seems most appropriate to regard rattlesnake predatory behavior as an open reaction chain as opposed to a closed or fixed program (Mayr, 1974).

Some rattlesnakes are especially defensive and exhibit ritualized threatening behaviors because of very slight movements of keepers or their equipment. Even if striking prey acts to induce chemosensory searching in such a snake, the animal's attentional priorities may override this effect. Defensive behaviors rather than chemosensory searching may occur, or, a mixture of both behaviors may emerge. The present experiment was designed to evaluate this possibility.

METHOD AND MATERIAL

Subjects were six specimens of *Crotalus durissus terrificus*. The animals were approximately three yr. old and had been in captivity for 2½ yrs. Three of these snakes were extremely defensive, exhibiting coiling, rattling, and head hiding upon being approached by experimenters. The other three animals showed such responses only upon strong provocation and usually exhibited investigatory behavior (Chiszar et al., 1976) when experimenters approached the cages (see also Armstrong and Murphy, 1979).

Each snake was observed in two conditions. In Condition A a mouse was suspended into the snake's cage for three s and held just out of striking range. Condition B was exactly like Condition A except the snake was allowed to strike the mouse at the end of three s. In both cases the mouse was removed at once, and immediately a perforated plastic box containing a different, envenomated, dead mouse was placed into the cage approximately 20 cm from the snake. This procedure has two advantages as compared to testing

snakes with the mouse used in the initial presentation: (1) Since in Condition A the snakes did not have an opportunity to strike, any envenomated mouse used in the subsequent test of chemosensory searching must be struck by a different snake. By using mice envenomated by different (but conspecific) snakes in all tests (including Condition B), we hold this factor constant, otherwise source of envenomation would be confounded with our two experimental conditions; (2) By having an envenomated mouse ready prior to all tests we are able to begin the chemosensory searching observations immediately after the three s mouse presentations. This eliminates any confounding delays that would be occasioned by waiting for mice to die in Condition B.

All tongue flicks emitted by the snakes were recorded for five min following introduction of the dead mouse. The two conditions were administered on successive days and snakes had been fasted for two mo prior to these tests.

RESULTS

Figure 1 presents mean number of tongue flicks emitted by the defensive and nondefensive snakes in each of the test conditions. It is obvious that striking induced chemosensory searching in both groups ($F = 38.21$, $df = 1/4$, $P < .01$).

The defensive snakes showed a much smaller chemosensory searching effect after striking than the nondefensive snakes; in fact, the linear and quadratic components of the strike and no-strike functions were significantly smaller in the former than in the latter animals ($F = 3.90$, $df = 2/16$, $P < .05$).

DISCUSSION

That striking induced chemosensory searching even in the defensive snakes is evidence of the reliability of this phenomenon. However, the reduced magnitude of the effect of striking in the defensive snakes required

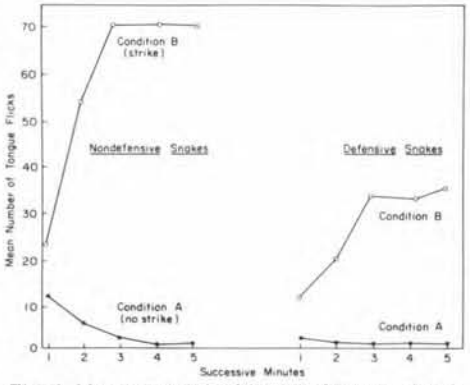
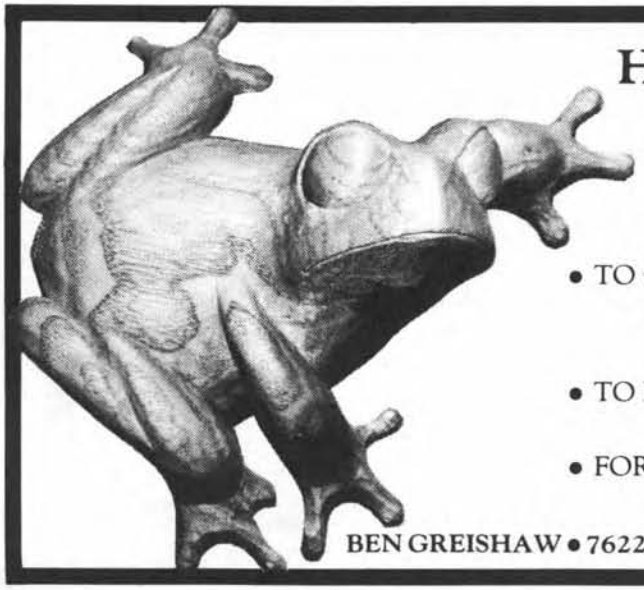


Fig. 1. Mean number of tongue flicks emitted by three nondefensive and three defensive specimens of *C. d. terrificus* during five successive minutes after seeing a mouse (Condition A) and after seeing and striking a mouse (Condition B).

explanation, assuming that the present finding based on small samples can be regarded as a characteristic difference between defensive and nondefensive rattlesnakes. Our view is that defensive snakes have lower thresholds for activation of ritualized threat responses and that the occurrence of these responses interferes with the simultaneous occurrence of predatory behavior, including the emission of high rates of tongue flicking. In support of this idea it should be said that after the tests described in this paper, all snakes were offered the mouse they had struck at the start of Condition B. The three nondefensive snakes accepted their prey immediately and all had finished swallowing within 10 min. The defensive snakes began to eat only after the experimenters left the room, and they finished swallowing after 40 min. Probably the latter snakes would not eat as long as a person was in the laboratory, indicating that (1) these snakes responded defensively to stimuli that were ignored by the nondefensive snakes, and (2) striking prey did not produce a complete shift in attention from threat-eliciting to feeding-related cues. The last point is especially interesting for three reasons. First, we had previously believed that striking prey was an unconditional releaser of chemosensory searching; this view must now be modified. Second, in our experience some defensive rattlesnakes have been switched completely into chemosensory searching by striking; these snakes would then swallow a dead mouse immediately upon encountering it, even if human observers remained nearby. Accordingly, it may be theoretically important to learn what distinguishes those defensive snakes that are induced to feed by striking a mouse from those that are not. Third, we believe it operationally useful to assume that when a rattlesnake strikes a mouse a search image (Croze, 1971; Dawkins, 1971, Tinbergen, 1960) is formed in the snake's central nervous system. The search image is conceptualized as a neural representation of an envenomated dead mouse, and its function is to provide the basis for the snake's ability to trail and locate the rodent carcass (Chiszar et al., in press). In essence, asserting the existence of a search image is tantamount to saying that the snake "knows what it is looking for." The search image is akin to a memory trace, and, as such, it is subject to decay over time. Our results indicate that the search image remains available for at least 30 min in most rattlesnakes, and considerably longer in some individuals (Scudder, in prep; Radcliffe and Chiszar, in prep). If we assume that allowing a snake to strike a mouse results in defensive reactions (because of the keeper's presence) and the activation of a predatory search image, we can hypothesize that the duration of defensive behavior will be a critical parameter. If the defensive reactions, which preclude most aspects of feeding behavior, outlast the search image, the snake may cause itself to lose the representation of its now dead prey. Since this representation appears to be a necessary condition for trailing and swallowing (Chiszar et al., 1977; Duvall et al., 1978), its loss may preclude ingestion. This may explain why some particularly defensive snakes never or rarely eat in captivity, even when they can be induced to strike a prey item.



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STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES (Second Edition)

By Joseph T. Collins, Roger Conant, James E. Huheey, James L. Knight, Eric M. Rundquist and Hobart M. Smith

Available in summer 1982. The first edition of this reference, issued in 1978 as SSAR **Herpetological Circular** No. 7, quickly became a standard reference for herpetologists, biologists, zoos, museums, conservation organizations, wildlife societies, book publishers, and Federal and state wildlife agencies. This second, revised edition is an up-date listing over 1300 common and scientific names for species and subspecies of North American (north of Mexico) salamanders, frogs and toads, crocodilians, turtles, lizards, and snakes. New features in this edition (not in the 1978 version) are an appendix of Hawaiian amphibians and reptiles, the inclusion of the names of describers for all genera, species and subspecies, and the addition of a table comparing the number of currently recognized subspecies with those listed in earlier publications. The SSAR Committee on Common and Scientific Names (shown above) considered over 50 proposed changes for this edition, the majority of which were adopted.

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General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1978. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

AMPHIBIA/REPTILIA. HEMOPARASITES.

During the MPM Kuehn-Amazon Expedition (Oct.-Dec. 1974) 102 amphibians and reptiles were surveyed for hemoparasites. Samples were obtained at four different locations in Amazonian Peru; near Centro Union (CU), Iquitos (I), Mishana (M) and Yanamono (Y) (see Dixon and Soini. 1975. Milwaukee Pub. Mus. Contrib. Biol. Geol. No. 4:1-58.) Because customs policies were in a political flux we were unable to utilize scientific materials shipped into Peru. The study was completed with whatever materials obtainable and the quality of the slides permitted a reliable decision only on positive blood smears.

Blood was obtained by heart puncture or a caudal or limb stab with a disposable scalpel. Blood smears were air-dried, fixed in methanol and stored for later examination. Because, there is so little information concerning the distribution of many amphibian and reptile parasites (Ayala. 1978. J. Protozool. 25(1):87-100.), especially from Amazonia (Guerrero and Ayala. 1977. Rev. Inst. Med. Trop. São Paulo 19(5):283-288.) we present the results of the survey (Table I).

Funding for the MPM-Kuehn Amazon Expedition was provided primarily by the James H. Kuehn Research Fund, with supplemental funding via Friends of the Museum and Max Allen's Zoological Gardens. Dr. James R. Dixon, Sherman and Marge Ketcham, Robert Henderson, Janice Mahlberg and Pekka Soini assisted in various ways. Dr. William Duellman identified the hylid frogs.

Table I. Blood parasites found in some amphibians and reptiles from Amazonian Peru.

Species (useable blood films)	Hemoparasites (no. infected)	Site
Amphibians		
Frogs		
Bufonidae		
Bufo marinus (3)	Hemogregarines (1)	M
Bufo typhonius (17)	Hemogregarines (3)	M
	Trypanosomes (2)	
Dendrobatidae		
Colostethus marchesianus (1)	Trypanosomes (1) (3 forms)	M
Hylidae		
Hyla lanciformis (4)	Trypanosomes (1)	M
Hyla marmorata (1)	*Dactylosoma* (1)	M
Osteocephalus taurinus (1)	Hemogregarines? (1)	M
Reptiles		
Lizards		
Gekkonidae		
Gonatodes humeralis (6)	*Plasmodium gonatodi* (1)	CU
Teiidae		
Ameiva ameiva (5)	*Plasmodium* sp. (3)	M
	Hemogregarines (1)	
	Microfilaria (1)	
Prionodactylus argulus (1)	*Pirhaemocyton* (Virus) (1)	Y
Snakes		
Colubridae		
Imantodes lentiferus (1)	Hemogregarine (1)	Y
Leptodeira annulata (1)	Hemogregarines (1)	Y
Crocodilians		
Alligatoridae		
Caiman crocodilus (2)	Hemogregarines (1)	Y

Submitted by **MAX A. NICKERSON** Head -Vertebrate Division Milwaukee Public Museum Milwaukee, Wisconsin 53233 and **STEVE AYALA** Sección de Parasitología Facultad de Medicina Universidad del Valle AA2188 Cali, Columbia. ●

GYMNOPHIONA

TYPHLONECTES COMPRESSICAUDUS (Aquatic Caecilian). **REPRODUCTION.** *Typhlonectes* is known to be viviparous, but little published information on captive reproduction is available. Breeding habits of *T. compressicaudus* have been described in detail (Murphy *et al.*, 1977, Copeia: 66-69), and a single young was produced at Cincinnati Zoo in 1970 (D. Jardine, pers. comm.) and died after approximately six weeks.

On 22 March 1981, the Oklahoma City Zoo obtained a female *T. compressicaudus*, which was housed in an aquarium with a male already in the collection. On 24 April 1981, the male died. No mating was observed during the brief interim they were together, and it is conceivable that the female arrived at the zoo in gravid condition. In late September, a few small protuberances were noticed along the flanks of the female, and during the evening of 2-3 October she gave birth to four young. These measured approximately 11, 12, 12, and 14 cm total length. The smallest retained the oviductal gill sac until midday, 4 October; the others shed this member shortly after parturition, prior to being discovered. All neonates were slate-black in colour, slightly lighter along the lateral grooves, and resembled thinner versions of the adult.

The young were transferred to an aquarium provided with undergravel filtration, several large, smooth rocks, and a layer of fine, coarse gravel. Water temperature ranged from 21.5-22° C. The first feeding of chopped earthworms was readily accepted; subsequently, they have taken whole young earthworms and tubifex worms. Each caecilian shed the entire skin six days after birth, and a second shedding followed by the 16th day.

The smallest specimen died in March 1982, and the other young were placed on public exhibit. They have since accepted young crickets, small snails and finely chopped horsemeat.

Prior to parturition, the female showed no unusual behavior and fed regularly on earthworms, snails and horsemeat. She escaped the week after giving birth and has since been assumed dead. While it is possible mating occurred at the zoo, it was not observed. Had the female arrived gravid, gestation of the young would have been at least six months.

Submitted by **ROBERT GEORGE SPRACKLAND,** 416 NW 94th Street, Oklahoma City, OK 73114, U.S.A. ●

CROCODILIA

ALLIGATOR SINENSIS (Chinese alligator). **REPRODUCTION/AGING.** A female *A. sinensis* was received 28 September 1937 by the National Zoological Park from the National Geographic-Smithsonian Institution Expedition to the East Indies. On 22 March 1976, she was sent to the Rockefeller Wildlife Refuge, Grand Chenier, Louisiana, for inclusion in a New York Zoological Park breeding program (Behler, J. 1977. Herp. Rev. 8(4):124-125). In August 1980, this female laid 21 eggs from which eight hatchlings were produced. This is the oldest, known-age crocodilian to successfully reproduce. The female is still alive in a breeding situation.

Submitted by **MICHAEL L. DAVENPORT,** Department of Herpetology, National Zoological Park, Washington, D.C. 20008 ●

CROCODYLUS CATAPHRACTUS (Slender-snouted crocodile). **REPRODUCTION/AGEING.** A "young adult" female *C. cataphractus* was received 7 August 1940 by the National Zoological Park from the Smithsonian-Firestone Expedition to Liberia. On 23 July 1980, she laid 18 eggs while on breeding loan to Metrozoo, Miami, Florida. Thirteen eggs were fertile; one egg hatched but the hatchling died within several days. The female is still alive in a breeding situation.

Though the literature is contradictory (Neil, W. T. 1971. The Last of the Ruling Reptiles.... pp. 1-486; Yadav, R. N. 1979. Int. Zoo. Yearb. 19:66-68; Yangprapakorn, U. *et al.* 1971. IUCN Publ. n.s. suppl. 32:98-101), the majority of authors and this note indicate that old crocodilians are capable of successful reproduction and should not be discounted from captive breeding programs.

This has been written through the cooperation of John Behler and Peter Brazaitis of the New York Zoological Park, Ted Joanen and Larry McNease of the Rockefeller Wildlife Refuge, and William Zeigler of Metrozoo.

Submitted by **MICHAEL L. DAVENPORT,** Department of Herpetology, National Zoological Park, Washington, D.C. 20008 ●

SAURIA

HOLBROOKIA MACULATA (Lesser Earless Lizard). **COLORATION.** A small sample of *Holbrookia maculata* was collected from slopes of the east shore of Parker Canyon Lake, Huachuca Mountains, Cochise County, Arizona on 6-8 June, 1972. The habitat is at an elevation of about 1560 m. The sample consists of two males and four females, one of the latter being essentially patternless (Figure 1). The dorsal color of this specimen (UCM 54206) is a uniform grayish-brown. There is a diffuse longitudinal stripe on each side, gray in color, which replaces the faint lateroventral bars exhibited by the other females. The specimen differs in color from representatives of *H. m. ruthveni,* the Bleached Earless Lizard, in retention of the usual intensity of pattern background pigmentation. The ventral color of all specimens is white.

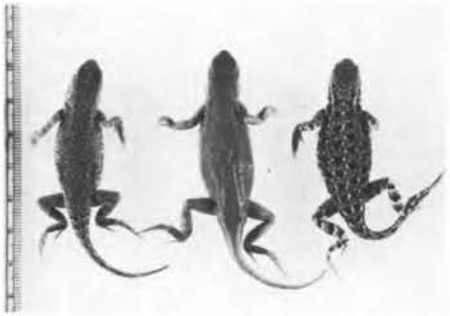


Fig. 1. Three female specimens of *Holbrookia maculata* from the vicinity of Parker Canyon Lake, Huachuca Mountains, Cochise County, Arizona illustrating representative color patterns present in the population (left, UCM 54210; center, UCM 54206; right, UCM 54207).

The correct subspecific identity is in doubt, although a short-tailed form is indicated. The tail/total length ratios for individuals with intact tails = males: 45 and 49%; females: 44, 45, and 48%. Smith's (1946, Handbook of lizards. Comstock., p. 115) key provides an identity of *H. m. approximans,* but the specimens lack the small, light dorsal spots that appear to characterize individuals of this subspecies. In addition, the specimens have supraocular-frontal scale contact, a character used by Smith and Taylor (1950, An annotated checklist and key to the reptiles of Mexico exclusive of the snakes. U.S. Nat. Mus. Bull. 199., p. 82) to distinguish *H. m. elegans* from *H. m. approximans.* Because *H. m. elegans* is not known to occur in the U.S., a positive allocation of the specimens to subspecies is not warranted.

I thank Dr. Hobart M. Smith for the photograph used in Figure 1. The sample has been deposited in the herpetological collection of the University of Colorado Museum (UCM 54206-54211).

Submitted by **HARRY L. TAYLOR,** Department of Biology, Regis College, Denver, Colorado 80221. ●

XANTUSIA RIVERSIANA (Island Night Lizard). **COLORATION.** *Xantusia riversiana* lives on only three islands off the coast of southern California (Santa Barbara, San Clemente and San Nicholas Islands). Bezy *et al.* (1980. pp. 565-583 *in:* The California Islands, Dennis M. Power, ed., Santa Barbara Mus. of Nat. Hist.) compared *X. riversiana* on all three islands with respect to electrophoretic differences, karyotypes, scalation, coloration, body size, clutch size, and variability. Color patterns in *X. riversiana* were described as highly variable including uniform, striped and mottled patterns. Bezy *et al.* noted that the mottled pattern occurs on all three islands while the striped pattern occurs on only San Clemente and San Nicholas Islands and the uniform pattern is present on only San Nicholas Island.

In the course of an ecological study on Santa Barbara Island, we have captured five lizards which had the striped pattern (Figure 1). These individuals represent 3.3% of the 154 lizards marked thus far. Perhaps this pattern was overlooked if, as suggested by Bezy *et al.,* the pattern is found only in local pockets.



Figure 1. Striped pattern of *Xantusia riversiana* on Santa Barbara Island.

Submitted by **GARY M. FELLERS** National Park Service 450 Golden Gate Ave. San Francisco, CA 94102 and **CHARLES A. DROST** Channel Islands National Park 1901 Spinnaker Dr. Ventura, CA 93001. ●

SERPENTES

AGKISTRODON PISCIVORUS (Cottonmouth). **HYBRIDIZATION.** In an account of hybridization within Reptilia, Porter (1973. Herpetology, W. B. Sanders Co., Philadelphia) noted that "compared to the Amphibia, reptiles seem to hybridize very infrequently." He then proceeded to summarize the reported instances of hybridization between reptiles (P. 441). Among them were several involving crotaline snakes, including an intergeneric cross. He cited no records of hybridization between species of *Agkistrodon,* however, nor have we found any. Following is a general account of such an instance.

On October 14, 1979, the junior author noted copulation involving a male copperhead, *Agkistrodon contortrix,* and a female cottonmouth, *A. piscivorus,* in his possession. The snakes were in copula for at least 45 min. The copperhead was collected in Tallapoosa Co., Alabama, and the cottonmouth in Collier Co., Florida, where the incident took place. They had been in captivity together for approximately 3 years.

The cottonmouth gave birth to 6 young during the first week of the following August (1980). Examination of the neonates, all of which seemed perfectly healthy and normal, revealed their obviously hybrid nature. Measurements were not taken, but all were within the usual size ranges of neonatal *Agkistrodon.*

Two of the snakes refused to eat and ultimately died. The remaining 4 took mice and remained active and healthy until June, 1981. In early August, 1981, two more died, after a lengthy period of repeatedly regurgitating their food. The junior author, and amateur, was unaware of the importance of preserving the dead snakes and discarded them. Of the remaining two, one was presented to a physician in Gainesville, Florida and the other to the senior author. The latter (Fig. 1) is presently (1 June 1982) active, feeding well, and in apparent good health in the Auburn University Museum.

The snake's dorsum has 23 scale rows at midbody and is intermediate in color pattern, although it resembles that of a cottonmouth somewhat more than that of a copperhead. The shape and color of the head and the pattern on the belly more closely resemble those of a copperhead. The presence or absence of a loreal and other descriptive details must await a more thorough examination of the animal than that to which are willing to subject it as this time.

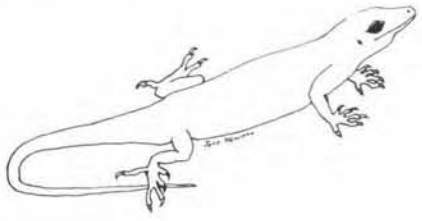


Figure 1. Hybrid between *Agkistrodon contortrix* (Tallapoosa Co., Alabama) and *A. piscivorus* (Collier Co., Florida) in the Auburn University Museum.



We thank Dr. J. L. Dobie, G. W. Folkerts and R. E. Mirarchi for their constructive criticism of the manuscript. Alabama Agricultural Experiment Station Journal No. 15-810094.

Submitted by **ROBERT H. MOUNT,** Department of Zoology-Entomology, School of Agricultural, Forestry, and Biological Sciences, Auburn University, Auburn University, AL 36849 and **JOHN CECIL,** 2714 Barrett Avenue, Naples, FL 33942. ●

DIADOPHIS PUNCTATUS EDWARDSI (Northern Ringneck Snake). **SIZE.** A large *Diadophis punctatus edwardsi* was caught by Robert Spalding, Jr. on 7 May 1982 as it crossed a U. S. Forestry Service road in Cherokee National Forest, Monroe Co., Tennessee. The snake is a female with a total length of 706 mm (568 mm SVL, 138 mm TL).

The record length for *D. p. edwardsi* is reported as 625 mm by Conant (1975. A field guide to reptiles and amphibians of eastern and central North America, Houghton Mifflin Co., Boston).

The snake is presently on loan to the Chattanooga Nature Center and is being maintained by John Muir, South Pittsburg, Tennessee.

Submitted by **JOHN R. FREEMAN,** Biology Department, University of Tennessee at Chattanooga, Chattanooga, TN 37402 and **CHARLOTTE C. FREEMAN,** Girls' Preparatory School, Chattanooga, TN 37405. ●

MASTICOPHIS LATERALIS (California Striped Racer). **FOOD.** On 22 April 1973 at ca. 1015 hours, a specimen of *Masticophis lateralis* was observed eating an adult *Gerrhonotus multicarinatus.* The snake and lizard were in an oak-shaded ravine 0.5 km west of Carbon Canyon, Orange County, California. The lizard was approximately one third swallowed when the snake, apparently disturbed by my presence, disgorged it. The lizard immediately ran for shelter beneath the dense undergrowth. The snake was captured and measured (total length = 98.2 cm, with a portion of its tail missing).

A second specimen of *M. lateralis* was observed in direct sunlight on 2 July 1977 at 0945 hours, eating a subadult *Sceloporus orcutti.* Once again the snake disgorged the lizard as I approached, and both escaped. The latter observation occurred in Idyllwild County Park, Riverside County, California. Though *M. lateralis* is known to prey upon lizards (Klauber, Bull. Zool. Soc. San Diego 8:1-93, 1931; Stebbins, Amphibians and Reptiles of Western North America, McGraw Hill Book Co., New York, 536 pp., 1954), these are the first observations of these two lizard species as prey.

Submitted by **JAMES W. CORNETT,** Natural Science Department, Palm Springs Desert Museum, P.O. Box 2288, Palm Springs, California 92263. ●

NAJA NAJA NAJA (Indian Cobra). **COLORATION.** Madras, So. India. While touring southern India in March, 1981, I had the fortunate experience of observing and photographing one of the rarest hood markings in cobras. An adult, *Naja naja naja* had been recently obtained by the Madras Snake Park, Madras, South India, and apparently was collected locally. Bob Larson (Hogle Zoo, Salt Lake City, Utah), at the time employed at the Snake Park, had noticed the unusual nature of the hood design and had isolated the specimen for further examination. The dorsal hood marking was similar to the description of Deraniyagala (1960, The Taxonomy of the Cobras of South Eastern Asia, Spol. Zeyl. Geol. Zool. Anthropol., 29:41-43) who described five types of dorsal hood markings in Asian cobras, and added an additional sixth type as follows: "An additional type of marking sometimes occurs between the back of the head and the main hood marking. This consists of a row of two to six white spots with dark margins *which might be connected* to form a transverse bar across the hood anterior to the two main ocelli of the spectacles marking. This is the color variety *polyocellata* Deraniyagala and such cobras only exist in Ceylon and Southern India." Plates III and IV in Deraniyagala's report illustrate various markings above the spectacle design in *Naja n. naja* specimens from Ceylon (Sri Lanka). He notes that approximately 20% of the Ceylon cobras exhibited markings in this hood region, which he terms a color variety *polyocellata* (not a subspecies). He further adds that this variety is rarer in Southern India than in Ceylon. Two small white spots in this hood region are also illustrated by Deoras (1971, The Story of Some Indian Poisonous Snakes. In: Venomous Animals and Their Venoms, Vol. II, Academic Press, N.Y., pp 41-63).





In this specimen, the white zig-zag design bordered by dark margins formed a twin-peak-like mountain scene, extending straight across the dorsal hood region approximately midway between the back of the head and the spectacle design (Figure 1a). The ventral view (Figure 1b) appeared normal, as did other body markings.

It is impossible to judge how common this hood design is in the region by quizzing the local Irula "snake catchers" or the local snake charmers ("magicians"). They show little interest in such matters and will often favor you with "what they think you want to hear." However, Romulus Whitaker, Director of the Madras Snake Park, is undoubtedly one of the most knowledgeable and experienced herpetologists in India. He has seen thousands of cobra skins in the markets, plus hundreds of live cobras from the region. He said this pattern was highly unusual and he had never noticed it before in his experience. He further noted, as did other Snake Park employees, that they had seen cobras with either black or white spots in this hood region, and this was fairly common.

Regardless of how unique this hood marking is, it represents one of the most ornate and attractive designs in cobra hood patterns. This information has been reported through the permission of the Madras Snake Park Trust, Deer Sanctuary, Guindy, Madras 600 022 India.

Submitted by **JAMES L. GLENN,** Hogle Zoological Gardens and Venom Research Laboratory, VA Medical Center, Salt Lake City, UT 84108. ●



VIRGINIA VALERIAE (Smooth Earth Snake). **SIZE.** On 13 April, 1982, an exceptionally large *Virginia valeriae elegans* was collected by Nicholas A. Laposha and Kenneth P. Bromeier in the Blue River valley, Kansas City, Jackson County, Missouri. The animal is a female with a total length of 393mm (342mm SVL, 51mm TL). The specimen has been deposited in the Bobby Witcher Memorial Collection (BWMC 01714) at Avila College, Kansas City.

The record length reported for the species by Conant (1975. A field guide to reptiles and amphibians of eastern and central North America, Houghton Mifflin Co., Boston) was 338mm. The previous record for Missouri was 285mm, reported by Anderson (1965. The reptiles of Missouri, Univ. Mo. Press, Columbia). Collins (1974. Amphibians and reptiles in Kansas, Univ. Ks. Mus. Nat. Hist. Publ. Educ. Ser. No. 1, Lawrence) reported in Kansas record of 327mm from Wyandotte County (immediately west of Jackson County, Missouri), and noted that that record apparently represented the maximum size for the species at that time. The specimen reported herein surpasses by 56mm the record reported by Conant and by 66mm that reported by Collins, thereby representing a new record length for the species.

Submitted by **NICHOLAS A. LAPOSHA,** Kansas City Zoo, Swope Park, Kansas City, Missouri 64132, and **ROBERT POWELL,** Avila College, 11901 Wornall Road, Kansas City, Missouri 64145. ●

TESTUDINES

GEOCHELONE ELEGANS (Indian Star Tortoise). **FECUNDITY.** Deraniyagala (1939, The Tetrapod Reptiles of Ceylon, Vol. 1) reported for *Geochelone elegans* in Sri Lanka that, "Three to six eggs are laid at a time and two or three batches appear to be laid annually, for specimens dissected after oviposition contain half developed eggs" (p.287). Jayakar and Spurway (1966, J. Bombay Nat. Hist. Soc. 63 (1):83-114) reported a clutch of seven eggs laid on 18 April 1964 in Bhubaneswar. Four additional eggs found later, were laid by the same female, but in a different nest. However these authors concluded, "It is not impossible that these 11 eggs were all laid on 18/iv/64 before midnight" (p.89).

A female *G. elegans* of unknown origin, in captivity since 20 April 1968, laid nine clutches during the period 5 June 1977 to 17 October 1980. The clutch sizes, in chronological order, were 5, 5, 6, 7, 5, 9, 10, 5, and 8 eggs. The clutch of 10 eggs was laid on 14 May 1980. The first eight clutches were the result of mating with the same male. All 52 eggs from those clutches were infertile. The last clutch (eight eggs) was the result of mating with one or more of a group of three males while the female *G. elegans* was on a breeding loan. Coakley (1981, J. NOAH 7 (1):1-6) reported three hatchlings from that clutch. Incubation periods were 111, 113, and 127 days. All three hatchlings were still alive at the time this paper was submitted (7 June 1982).

In the calendar years 1977 through 1980, three was the maximum number of clutches laid annually (1977, 1980) and 23 was the maximum number of eggs laid annually (1980). If the term, "annually", is taken to mean a 12 month period other than a calendar year, then four was the maximum number of clutches laid (5 June 1977 through 27 May 1978) and 23 was again the maximum number of eggs laid (same period).

Submitted by **JOHN P. WHELAN,** 173 Senator St., Brooklyn, New York 11220 and **JOHN COAKLEY,** 33 Indigo St., Mystic, Connecticut 06355. ●

TECHNIQUES

NEW METHODS FOR MEASURING AND TAGGING SNAKES

The need for an accurate and harmless technique for measuring the length of snakes is long-standing and reflected in the results of several studies including those of Fitch and Glading, 1947, Fitch, 1949, and Wharton, 1966. Such studies report fluctuations in recapture lengths and/or loss of body weight, indicating inaccuracy and injury to the snake, respectively. Concern has been expressed by workers that rough handling of the snakes was a major cause of the problem. These problems can be avoided by either of two alternative methods for measuring live snakes of any size, both tested in a field study of *Sistrurus miliarius* (Serpentes: Crotalidae) in south Florida (Hudnall, 1979).

Photographed Snake Measurement. The procedure is as follows: 1. The snake, a meter stick, and an appropriate identification card are photographed from directly above using slide film. 2. The slide is projected onto a piece of paper and the snake's outline is traced along with an increment of the meter stick for scale. 3. The snake's length is then obtained with a measuring wheel (a Germany brand device was used) commonly used in reading map mileages, and comparing it with the meter stick increment. If the snout-vent length is desired, a water base paint can be applied to the back above the vent before photographing.

Accuracy in this method was determined by photographing two *S. miliarius*, one six times and the other seven times, disturbing the snakes between each photograph to assess the effect of different body positions on the measured length; this work was done in a field enclosure. The photographed measurements (N = 13) differed from each other by 4.5-6.1% of the smallest photographed-measured length. These same photographed measurements were within 0.3-3.4% of direct measurements of the chilled snakes (method below).

The great advantages of this method for field studies include simple, portable equipment (camera, film, and ruler), and that it features universal applicability to all reptiles and amphibians in that the animals are not manipulated mechanically or physiologically. The time investment (excluding film development, ca. 15 minutes per snake) could be limiting for processing especially large numbers of snakes.

Chilled Snake Measurement. — The procedure is as follows: 1. The snake is placed in a jar with enough water to cover it, and the jar is placed in an ice-water mixture. 2. When the temperature of the jar approaches 5 C, either submerge the snake directly into the ice-water mixture or add ice to the jar to finish chilling it. 3. The snake can then be readily straightened out along a meter stick for measuring. 4. The snake is placed in a shaded area for a short period to allow gradual re-warming.

The time required for chilling will differ with the size of the snake to be measured. This technique was used on pigmy rattlesnakes *(Sistrurus miliarius)* in southern Florida. Their weights ranged from 17 to 70 grams, and it was found that 15-20 minutes at step 1, with an additional 3-5 minutes at step 2 was sufficient to immobilize them.

Possible inconsistency in this method was checked. Three *S. miliarius* and one *Agkistrodon piscivorus* were chilled five times each over a ten day period. They measured from 453 mm to 523 mm in length; the measurements differed by less than one per cent (0.65-0.96%) of their total length.

Of 22 recaptures of *S. miliarius* in a field marking study using this method, 63.6% gained and 36.4% lost weight over periods from 7 to 294 days. Further, six *S. miliarius* were chilled and measured in the lab; all ate readily the following day and did well during a seven month observation period. This indicates that the chilling process as employed was not harmful to these snakes. However, it is strongly recommended that different species be tested in the lab prior to using this method in the field; some species may succumb to the severe change in body temperature (see Heatwole *et al.*, 1969 and Lowe *et al.*, 1971).

Color-bead Tagging Method. — This method employs monofilament suture-line mounted on a surgical needle, available from surgical supply houses, to attach two or more colored glass beads to a snake's tail. The glass beads, commonly used in decorations on belts and handbags, can be obtained in a variety of colors from hobby stores.

The procedure is as follows: 1. A bead is threaded onto the line and a knot is tied in the end of it. 2. The needle is inserted into the snake's tail dorso-laterally and run along the backbone for at least 13 mm. 3. The slack is pulled through the tail so that the bead is snug against the skin. 4. The line is clipped far enough from the skin to allow room for tying another knot after a bead has been threaded onto it. The beads should be tied close to the skin to reduce snagging on brush while the snake is moving. The process requires three to four minutes per snake. Individual snakes are distinguished by the color sequence of the beads and the color of the line (Fig. 1).

In a long-term field project of *S. miliarius* in southern Florida (Hudnall, 1979) it was found that the bead tag had a tendency to pull free after several skin sheds, leaving a detectable scar. This was probably due to the small diameter of the tail which afforded little musculature to resist the pulling of the tag. This tag will last even longer on larger snakes.

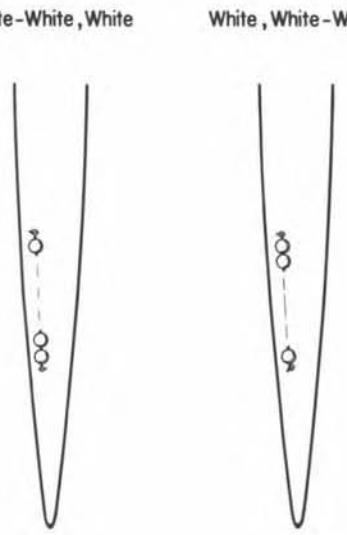


Figure 1. Diagrammatic dorsal view of snake tails tagged with three white beads in two arrangements; dashed line indicates subcutaneous position of monofilament suture-line.

The small size of the pigmy rattlesnake tail precluded successful use of the Buttoneer marking method (Pough, 1970). As Pough and others have noted, the Buttoneer method is applicable to snakes 250 mm or more in total length. The bead tagging method, unlike the Buttoneer and other tagging methods in the literature (see Ferner, 1979), is useful on snakes as small as 180 mm.

In situations where small snakes (< 250 mm) are tagged, a short-term tag is desired, and/or the need for remote identification presents itself, this method is satisfactory. With binoculars, individuals are easily identified at considerable distance. Application of the tag causes no apparent distress to the snake; of 50 tagged *S. miliarius*, 16 (=32%) were recaptured after periods of up to one year and none showed any signs of infection or impediment of movement at any time. This recapture success in a very brushy study area strongly suggests mortality was not increased with this tagging method.

ACKNOWLEDGMENTS

I thank my father, Jack L. Hudnall, for his open and enthusiastic exchange of ideas in the development and testing of these techniques, as well as his moral, financial, and technical support during this study. I especially thank Dr. Charles Lowe, University of Arizona, for kindly and critically reviewing this manuscript, and for providing moral and financial support throughout its preparation.

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BOOK REVIEWS

Biomechanics. An approach to vertebrate biology. by Carl Gans. 1974. J. B. Lippincott Company, New York. x + 261 pp. Available for $6.50 postpaid from: University of Michigan Press, P.O. Box 104, Ann Arbor, Michigan 48106.

This is an unusual book. Most herpetologists might overlook it and its relevance to amphibian and reptilian biology — its title obscures the wealth of herpetological information and the philosophy that Gans brings to the study of lower vertebrates. Herpetological literature is replete with extensive taxonomic, regional, and demographic tomes, and, with the exception of a few herpetology texts and Gans' "Biology of the Reptilia" (1969 *et seq.*), few books which adopt a different view of amphibians and reptiles have appeared in recent years.

"Biomechanics" is a five-chapter book about functional morphology which draws almost exclusively on amphibians and reptiles as examples for analysis. Its first chapter defines structures and adaptations, presents a model for analysis, and closes with a rationale for comparison which concludes that "actual observation rather than extrapolation, living specimens rather than preserved materials, manipulation rather than passive observation of the system, and comparison rather than conclusions from single forms represent optimal approaches to the study of biomechanics." The following four chapters deal with analytical approaches to diverse problems involving structure and adaptation.

Chapter 2 is an analysis of structure using dissection and observation of egg-eating snakes, with emphasis on the genus *Dasypeltis*. Chapter 3 is an investigation of locomotion without limbs and features the adaptations of snakes, concluding with a brief discussion of lateral undulation and its significance to the phylogeny of vertebrates. This third chapter is an illustration of analysis by limiting the question. Chapter 4 is a discussion of analysis by comparison using the burrowing habits of amphisbaenians as examples of structural adaptation. The final chapter is a description of analysis by quantification using as an example air breathing and vocalization in frogs, and featuring electromyographical analysis, an experimental technique that Gans has explored and utilized more extensively since this book appeared.

This book is cohesive and easily read with profit by herpetologists from zoos, museums, and universities, and particularly by the large numbers of herpetologists who maintain amphibians and reptiles as an avocation. Gans states that this book is "intensely personal," and he restricts amphibian and reptilian examples used in the book to those forms with which he has experimented personally. His intent to present examples of analyses in functional morphology, to offer samples of approaches to functional morphology and samples of philosophy from which the approaches derive has been achieved. In addition, he has admirably presented a little-used approach which herpetological systematists and physiologists might embrace in their future research.

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Synopsis of the Herpetofauna of Mexico, Volume VI. Guide to Mexican Turtles and Bibliographic Addendum III, by Hobart M. Smith and Rozella B. Smith. 1980, 1044 pages. $40.00. John Johnson Natural History Books, North Bennington, Vermont.

This book represents the sixth volume in the Smith's monumental series on the amphibians and reptiles of Mexico. The main text is totally devoted to turtles, but also included is a general literature addendum to the previous volumes.

The Preface explains the significance, objectives, and status of the entire series project; and the organization of the present volume is briefly outlined. The objectives of this volume being to provide as complete a survey of the present knowledge of the turtle fauna of Mexico as possible, in as practically usable a form as possible.

The Introduction summarizes the turtle fauna of Mexico, 60 species and subspecies, and compares it with that of the United States and Canada. This is followed by a brief description of some taxonomic problems relating to Mexican turtles, the sources of the data included, acknowledgements, a list of acronyms of the 70 scientific collections containing Mexican turtles, and explanations of the literature citations and map preparations.

A section entitled Systematic Accounts appears next and includes the synonomies, nomenclatural history, and definitions of the

higher taxonomy of Mexican turtles: Subclass Chelonomorpha, Order Testudines, Suborder Casichelydia, Infraorder Cryptodira, and Parvorder Eucryptodira. In this respect it is refreshing to find that the authors have used the modern classification proposed by Gaffney (1975). Adequate keys are then provided to the families, genera, and species. In some cases these keys were prepared by known experts on the taxon. Each superfamily, family, subfamily, tribe, subtribe, and genus is fully described and its synonomy, nomenclatural history and geographical range is given.

The accounts of each species include a fully referenced synonomy, a nomenclatural history, a discussion of its taxonomic status, and a listing of the pertinent literature involving the species. For each reference, an index number is listed which refers to a bibliographic entry in either the Addendum in this book or to one of the previous volumes of the series. The literature section is subdivided into such topics as popular books, ecology, zoo breeding, regional accounts, anatomy, physiology, parasitology, paleontology, and taxonomy. A well organized, detailed description is included for each species, and its general range and etymology are discussed. For those species with recognized subspecies, a key to the Mexican subspecies follows, and then each subspecies is described and discussed in detail in a similar format as that of the entire species. The range of each subspecies is given, and a list of Mexican localities is presented. Another feature of each subspecific account is its conservational status in which harmful practices or situations are discussed and suggested methods of protection given. Mexican range maps for each taxon are included near the end of the book, as also are drawings or black and white photographs of most.

A detailed Gazetteer gives, in alphabetical order, all Mexican localities from which turtles have been recorded. The quadrant and state in which the locality is found, and all of the species and subspecies of turtles recorded from it are also given. Finally, a cross-index to secondary localities of particular importance for reference to rivers, follows the main list of localities.

The Bibliographic Addendum III is a list of 767 titles pertinent to Mexican herpetology not included in the earlier volumes of the series. Many are pertinent to the turtles and are indexed and cited by entry number in the taxonomic accounts of the text. All entries in the Addendum bear distinctive numbers integrated with, but not duplicated by those of the preceding volumes.

The book ends with adequate indexes to the subject matter and scientific names.

The text is written in both an interesting and informative manner, with few spelling or typographical errors. The binding seems adequate, but the printing is small and somewhat light. The illustrations, many reprinted with permission from the works of others, are often of poor quality, too dark, or too small to adequately show the important features.

There are few errors in the taxon descriptions and keys. For instance, in the key to the subspecies of *Rhinoclemmys pulcherrima, rogerbarbouri* and *incisa* are separated on the basis of the extent of the dark plastral figure when, in reality, this is very similar and overlaps greatly.

The text is perhaps slanted too much toward taxonomy, but this is the Smiths' major interest. The use of two nomenclatural combinations may cause come confusion and consternation among chelonian systematists — *Trionyx spiniferus asper* and *Caretta caretta tarapacana*. The former is usually considered a full species, while the eastern Pacific loggerheads are more commonly known as *Caretta c. gigas* and the name *tarapacana* is unfamiliar to most herpetologists. In each case, the authors have documented their reasons for the use of these names.

The Major criticism of this book, however, is one which is inherent to the series as a whole. The reader needs either to own or have readily available the other volumes of the series in order to find all of the numerically listed references. On an individual basis this becomes expensive; however, the libraries of most universities and museums now subscribe to the series, and it is more locally available than before.

Despite these few problems, the book is an excellent source of information on Mexican turtles, and is a necessary reference for all who plan to study the Mexican herpetofauna. Much more data is to be found between its covers than could be adequately described in the short space of this review. It is a highly recommended volume for all herpetologists and biological libraries.

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George Mason University

South African Frogs, by Passmore, N. I. and V. C. Carruthers. 1979. Witwatersrand University Press, Johannesburg. xviii + 270pp., ill. + Voices of South African Frogs.

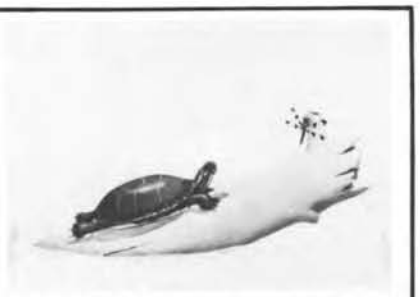
This publication represents not only a beautiful book, worthy of the coffee table trade, but also one useful to the more scientifically inclined herpetologist. As suggested in Foreword by Prof. Paterson, it should certainly stimulate interest in South African frogs and help motivate studies on a relatively poorly-known segment of the fauna.

There are 10 short introductory chapters dealing with frogs and frog biology, including an important discussion on frog sounds. Considerable weight is placed on frog vocalizations as being an important component of specific mate recognition systems. Sonagrams accompany each species description and a 7-inch two-sided 33.3 record is included as a supplement. The reader is urged to study the sonagrams in conjunction with listening to the record.

Eighty-four species comprise the anuran fauna of South Africa and each is illustrated by a color photograph of superb artistry, a distribution map, a sonogram, plus a number of black and white photographs illustrating the salient morphological features that distinguish any given species from its nearest relatives. Color variation, which is considerable in many of the species, is emphasized by showing several selections from the range of colors and patterns. Subspecies are treated in a reasonable fashion, shown in color plates, but described in more detail in an appendix. One feature that is puzzling to me — each species has a black and white photo purporting to represent life size. If these dimensions are accurate, then the frog fauna of South Africa must be composed of midgets. I know that *Xenopus* and *Pyxicephalus* grow larger than the illustrations depict — do the others? Unfortunately, tadpoles are neither illustrated nor described in any significant way so only metamorphosed individuals can be truly identified. A selected bibliography, an index, and a glossary of sorts complete the text.

This is an excellent book both for its contents and for its printing.

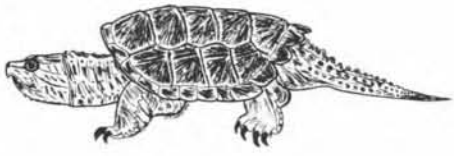
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Turtles: Perspectives and Research. Edited by Marion Harless and Henry Morlock. 1979. John Wiley & Sons, New York. 695 p.

Like its subject, this book is at once ponderous and graceful. The chapters mix much original material with analyses of the literature (through the early 1970s). The opening chapter on taxonomy and distribution (P. C. H. Pritchard) is concise and readable.

A practical manual of methods is next: capture, marking (M. V. Plummer); telemetry (W. K. Legler); life history techniques (T. E. Graham); photographic analysis of behavior (C. C. Carpenter); lab maintenance (H. W. Campbell, S. D. Busack); anesthesia, surgery (J. H. Maxwell). The material is clear but occasionally oversimplified. For example, I have found some turtles *(Chelydra, Terrapene)* more difficult to sex than implied on p. 82-83. Potential impacts of study techniques need more attention (*e.g.*, radioactive tags, anesthetics, pesticides for parasitic arthropods, confinement in small cages). Suppliers' addresses are given in one chapter and would have been useful in others.

The section on vital functions covers: cardiovascular system (C. G. Jackson); respiration (D. C. Jackson); brain (A. S. Powers, A. J. Reiner); thermoregulation (V. H. Hutchison); feeding, drinking, excretion (I. Y. Mahmoud, J. Klicka). I enjoyed most the elucidation of unique breathing and buoyancy control mechanisms. Some chapters need more graphics.

Selected senses are the subjects of: eyes and color sensitivity (A. M. Granda); smell and taste (T. R. Scott); olfactory behavior (M. L. Manton). "There is no concrete evidence that olfaction is critical in any of the life functions of turtles" (p. 289), but how do some species feed and orient in very turbid waters?

Reproductive cycles and adaptations (E. O. Moll) and the embryo and its egg (M. A. Ewert) make up the section on reproduction and development. Ewert has assembled data on egg and hatchling measurements, eggshell characteristics, egg constituents, incubation periods, and 29 good black-and-white photos of terata into a fascinating and perceptive mini-book.

A section on behavior includes: (D. W. Ehrenfeld); locomotion (W. F. Walker); learning (H. Morlock); social behavior (M. Harless); emotional reactivity (I. M. Spiegel); rhythms (E. V. Gourley). Ehrenfeld analyzes activities from landfall to re-entry into the water, with a final stimulating discussion of orientation. Harless includes intriguing observations on *Clemmys insculpta* in an outdoor pen. Spiegel treats the effects of drugs, cerebral lesions, and various stimuli on *Chrysemys picta* behavior in experimental apparatus, with little evident awareness of wild behavior. However, the use of excretory sodium and potassium levels in cage water as indicators of emotional status is a very promising technique.

The book concludes with discussions of population ecology of sea (H. R. Bustard), land (W. Auffenberg, J. B. Iverson), and freshwater turtles (R. B. Bury). Sea turtle "farming" is proposed as a cottage industry to give Third World consumers a stake in resource stewardship, and *Gopherus polyphemus* populations are related to vegetation variation in space and time.

This book should stimulate lab and field workers to collaborate in testing and amplifying proposed techniques and hypotheses. There is much to be learned, with a minimum of potentially behavior-distorting or inhumane drugs, surgery and hardware necessary. Biologists could: choose research projects with clear application to conservation problems, and use these problems to approach "pure science" questions; and obtain their experimental animals from captive-bred or reared stocks, or collect them from the wild while observing behavior and monitoring population size.

Most of the authors do not provide recommendations to implement the editors' desire for conservation of wild populations. Bury concludes that "information on the population ecology of freshwater turtles is wholly inadequate for conservation and management of these resources". Lack of comparative natural history data as basic as nest chamber dimensions is mentioned several times (here is work for careful amateurs and students). Graham warns that field studies are often halted by land development projects; but are parks and sanctuaries always safe from dumps, impoundments, parking lots?

Some potentially misleading errors are: "Atland" for Altland (p. 60); "mm/sec" for frames/sec (99); "miasis" for myiasis (124); "*Chrysemys picta*" for *Pseudemys scripta* (214); "Friar" for Frair (226, 234); "concostracod" for conchostracan or ostracod (232); "orinithine" for ornithine (240); "Risely" for Risley (390); "rigor" for vigor (392); "*typhinurium*" for *typhimurium* (399); "external" for internal (402); "*Malaclemmys*" for *Malaclemys* (516); "arribidas" for arribadas (525); and "Tonier" for Toner (572). The photos are switched on p. 329-330. Fig. 1a (437) shows right lateral and ventral (not "dorsal") views. *Chelydra* matures at 200 mm carapace (not plastron) length, equivalent to 145 mm plastron length (578). Some abbreviations in the figures on p. 196-201 suffer from reduction. In my copy, p. 321-328 are badly wrinkled.

More integration among chapters, and addition of non-technical abstracts would improve a 2nd edition. I would like to see a photo of a wild turtle rather than a specimen on the dust jacket. And the publisher should consider selling paperbound separates of the sections to people who can't spend $45 for the whole book.

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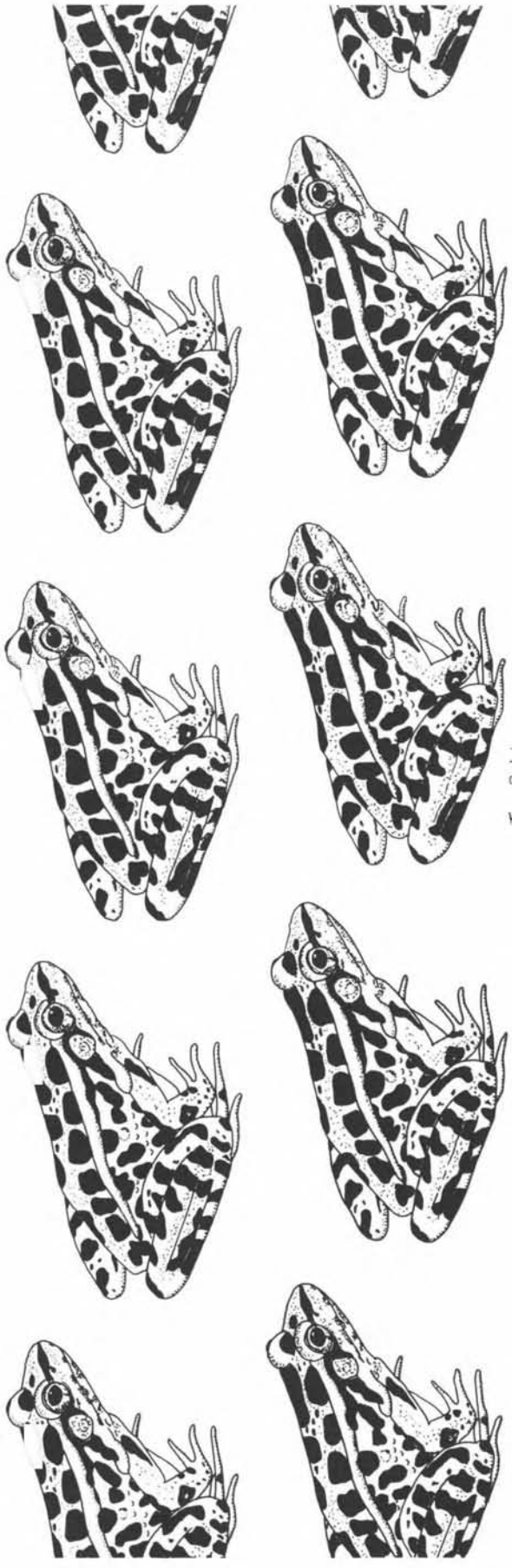
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A WATERDOG BY ANY OTHER NAME IS NOT SO NEAT

The In-Fisherman, a "journal of freshwater fishing" that claims to have a large influence on the angling community, recently carried an article by its editor extolling the virtues of "waterdogs" as bait (Stange, D. 1982. The In-Fisherman 42:78-80, 81, 84, 81). The term "waterdog" is used in reference to gilled aquatic salamander larvae, in particular to tiger salamanders, *Ambystoma tigrinum.* In addition to this feature article, salamanders are promoted elsewhere in the same issue (pp. 50, 72, 181, 182, and the cover illustration, captioned "The waterdog breakthrough"). Although the use of salamanders as bait is nothing new, and although most herpetologists would probably be happy to find more than an academic interest in an object of their study, there are a number of disturbing elements about the current trend as described by *The Jn-Fisherman.*

First, indiscriminate use of the term "waterdog" (and "mudpuppy" on p. 79) will only increase the frequent confusion of ambystomid larvae with *Necturus,* especially when this use is propagated by an author who claims to have been a former high school biology teacher. To add to this confusion, illustrations of "waterdogs" on pp. 181, 182, and the cover depict four toes on each hind foot; five toes are clearly visible in the photographs on pp. 78-80.

Of far greater concern, however, are advertisements on pp. 141 and 144 offering "waterdogs" for sale, including an offer to ship the larvae anywhere in the U.S. or Canada except Saskatchewan. According to the feature article by Stange, these tiger salamanders have been selectively bred to produce a stock which is easy to maintain in the larval stage. There are many cases of bait species (*e.g.,* minnows and crayfish) becoming established outside their native ranges through release by well-meaning anglers who did not wish to kill their extra bait or by individuals who wished to establish their own naturally-breeding supply. Not only does this obfuscate original distribution patterns and frustrate zoogeographers, but it may have a negative impact on native species or conspecific stocks. The exotic crayfish *Orconectes rusticus,* for example, has replaced native crayfish in some northern Wisconsin lakes and has a serious impact on aquatic macrophyte beds (Lorman, J. G. 1980. Ecology of the crayfish *Orconectes rusticus* in northern Wisconsin. Ph.D. thesis, Univ. Wisconsin, Madison). *Ambystoma tigrinum* has already become established in several areas through bait release (Smith and Kohler. 1978. Trans. Kansas Acad. Sci. 80:1-24); commercial traffic can only aggravate the situation, as will the use of special hooks that do not injure the larvae to which they are attached and which thereby promote their survival (p. 72 of *The In-Fisherman*). The potential for genetic swamping of local stocks by commercially supplied salamanders is of particular concern in light of recent speculation that *Ambystoma tigrinum* may constitute a multi-species complex (Collins *et al.* 1980. Copeia 1980:938-941). Herpetologists should be aware of the possibilities and should support any state laws which limit the transportation, use, or release of exotic baits.

Anonymous

EDITOR'S NOTE: Several examples of such *Ambystoma* have been kept at K.U. as lab pets. They were on their way to being released in a local pond when I intercepted them. They were easy to maintain and eventually metamorphosed into what externally appears intermediate between *A. t. tigrinum* and *A. t. mavortium.* I do not know the supplier of stocks sold in Lawrence. **G.R.P.** ●

LETTER

LEGISLATIVE CHANGES NEEDED TO ENSURE SPECIES SURVIVAL

The recent "Snakescam" operation undertaken by the U.S. Fish and Wildlife Service has been the center of much controversy. The operation has brought the problems of wildlife protection laws into sharp focus. The abuse of civil rights which reportedly occurred cannot and should not be tolerated. Heretofore elusive effects of wildlife laws, regulations, and enforcement modes have emerged as very real and direct threats; not only to rare animals but also to the people who work with protected species. These laws discourage, rather than promote, activities such as captive propagation that are beneficial to wildlife. Research and breeding of protected species, especially by private parties, is effectively being legislated out of existence. Thus, we are being forced either to take action against the very department created to protect wildlife, or face systematic elimination of captive breeding, research, and our attendant civil rights. New legislation needs to be introduced; legislation which will encourage and assist activities beneficial to wildlife. Action towards this end can be on an individual and a group level.

Individual Action:

The "Snakescam" operation should be used to capture public attention. It is necessary to expose the violations of our civil rights and the harassment, coercion, and threats purportedly made by federal personnel. The fact that defendants are apparently being forced to prove their innocence, rather than being presumed innocent until proven guilty, is something that threatens the constitutional fabric of this country.

Concerned individuals must voice their opinions to their representatives! Some of us have already done this and the results are encouraging. Fish and Wildlife actions are being questioned in many areas. Demands for explanations have been issued by Senators and Congressmen. The more people who express themselves the more pressure will be brought to bear. Of especial value will be the testimony of those directly involved in the "Snakescam," as they can document unethical and illegal methods used. Too many persons are not making themselves heard for fear of further harassments. No changes will be made by sticking our heads in the sand! Unless we speak up now it will be nearly impossible to continue captive breeding, and the future of wildlife research will be jeopardized. The abuse of civil rights could set a precedent which will threaten other areas of scientific inquiry. Opinions need to be expressed to those who can make changes —our Senators, Congressmen, and the media.

Group Action:

There are four areas the various zoological societies across the country should address.

I. A committee is needed to draw up proposed amendments to the laws we are concerned with. These are the Endangered Species Act, the Lacey Act, the Migratory Bird Treaty, and the Convention on International Trade in Endangered Species (CITES). These amendments should stipulate that there be *no* restrictions on the sale, trade, transport, importation, exportation, or possession of any *captive born* wildlife. Protected animals now in captivity in the United States should be granted a general amnesty. This is necessary because proof of legal origin is often impossible for animals acquired prior to their protection, as well as animals collected from areas where they are not protected. A general amnesty would remove the necessity for proving legal origins for animals already in captivity. It would stimulate persons with animals of undetermined origins to bring these animals into breeding situations. An attitude of encouraging and assisting captive breeding and other activities beneficial to wildlife should be an underlying basis of wildlife laws. They should not be just a negative set of restrictions and prohibitions. They should take an actively positive approach by promoting captive breeding, as well as animal product farms that benefit wildlife by providing legal sources for animal products.

The October 1982 reauthorization of the Endangered Species Act is an ideal time to introduce an amendment. A means of changing the other laws should be formed. This effort will require a legal team, and it may be desirable to work in cooperation with a national wildlife organization. The need for these amendments must be brought to the attention of our legislators. Individuals and wildlife organizations need to express their concern for making these changes to their representatives.

II. Zoological societies should issue demands for action to their representatives. The opinion of a society representing many people carries weight in political considerations. Zoological societies should use this power to the best advantage.

III. Individuals and zoological societies should approach other wildlife organizations. These groups cannot help but be concerned over the destruction of research and wildlife that has occurred, as well as the problems of captive propagation. The situation we are facing should be brought to the attention of these groups.

Traditionally, most wildlife organizations have supported prohibitions on live trade.

These laws have been portrayed as essential for wildlife protection. However, it can be documented that many of these laws and regulations pose a threat to captive wildlife. Regulations that apply to captive wildlife are compelling zoos, researchers, and private individuals *not* to breed rare and endangered animals in their collections. Further, the attitudes and enforcement activities of the Fish and Wildlife Service have created an unprecedented paranoia among zoological personnel throughout the United States! The inability to obtain permits to move offspring or acquire mates for lone animals can be documented, as well as unreasonably long waiting periods for permits. In this time of rapid habitat loss, more and more species are becoming dependent on captive propagation for their very survival. Yet, our laws consist mainly of a negative set of restrictions and prohibitions that discourage the breeding of rare animals.

IV. Foreign zoos and wildlife concerns should also be approached. They can put pressure on the United States to allow free trade in captive born wildlife for breeding purposes. Many zoos have been frustrated by an inability to obtain mates for rare animals from overseas. This frustration works both ways.

SUMMARY

This note is a plan of action extracted from a lengthy proposal illustrating the problems with current wildlife laws. The restrictions which make captive breeding of rare and endangered species nearly impossible are discussed. The recent "Snakescam" operation undertaken by the U.S. Fish and Wildlife Service exemplifies this dilemma. Laws and regulations now in effect are basically a set of restrictions and prohibitions, which discourage, rather than promote, activities such as captive breeding which are beneficial to wildlife. Wildlife agencies should promote, aid, and cooperate with public and private efforts to propagate rare species. Encouragement should be given to animal product farms, which relieve pressure on wild populations by providing a legal source for superior quality products. Rewriting laws to achieve this would have many benefits for wildlife.

A plan of action for implementing this ideal includes:

I. Amendments to the Endangered Species Act, Lacey Act, Migratory Bird Treaty, and CITES Treaty. These amendments should include:
   - A) No restrictions on the sale, trade, transport, importation, exportation, or possession of any captive born wildlife.
   - B) A general amnesty for animals now in captivity.
   - C) Requirements for wildlife agencies to encourage and assist captive and semi-captive breeding programs, public and private.
   - D) Provisions to ensure the employment of teams of expert personnel (public and private) when establishing regulations on trade in live fauna, and all other policies regarding wildlife.
   - E) Incentives for animal farms which will provide legal sources for animal products, take pressure off wild populations, and make it uneconomical for poachers and illegal suppliers to operate.

II. Concerned individuals should express their opinions to their representatives.

III. Zoological societies should issue demands for action to their representatives.

IV. The problems with current wildlife laws should be brought to the attention of national wildlife organizations and foreign concerns. These groups should be requested to express their concerns to our legislators and to aid in revising laws and regulations.

V. Our legislators should be convinced of the need to change wildlife laws. Zoological societies, wildlife groups, and concerned individuals should work with our legislators to introduce amendments to these laws.

The inequities of the "Snakescam" operation are currently being investigated and documented by the author. The full version of this proposal, detailing problems with current wildlife laws and the benefits of revision, is being reworked and documented for publication. Anyone interested in learning more about this situation or wishing to contribute ideas should contact the author at the address below. Any and all comments are welcome.

GARY CASPER
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April 30, 1982 ●

Herpetological Circulars Seeks Manuscripts

As of 1983, I will be taking over the editorship of **Herpetological Circulars** from the capable hands of Joseph Collins. I hope to continue the outstanding style and success of previous issues of this publication. To that effect, I would like to solicit appropriate manuscripts from prospective authors. These manuscripts should be of intermediate length (20 to 100 pages, typed, double spaced) on subjects of general interest to herpetologists. Past topics have varied from animal husbandry to historical reviews of herpetology. If you have such a manuscript or ideas for one that might be appropriate, please contact me.

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ABSENCE OF *STAPHYLOCOCCUS AUREUS* IN THE ORAL CAVITIES OF CAPTIVE HARMLESS SNAKES

Recently a case of wound infection following the bite of a harmless snake was related to me by a physician. This infection could easily have been caused by bacteria present on the person's skin or by later contamination of the bite wound. However, bacteria from the snake's oral cavity could also have caused the infection and thus it seemed meaningful to investigate their occurrence.

A preliminary study to determine the common morphologic types of oral bacteria (which would grow at human body temperature) present in harmless snakes was first conducted. Three captive snakes were sampled — eastern king snake *(Lampropeltis getulus getulus)*, black rat snake *(Elaphe obsoleta obsoleta)*, eastern garter snake *(Thamnophis sirtalis sirtalis)*. The oral cavity of each was sampled with a sterile cotton swab. Two blood agar plates for each sample were then streaked and incubated aerobically at 37° C for 24 hr. Colonies of the various cultural types were subcultured in tryptic soy broth and incubated as before. Gram stains of each culture were examined. Gram negative bacilli (40 cultures), Gram positive staphylococci (20 cultures), and Gram negative diplococci (5 cultures) were observed.

Since *Staphylococcus aureus* is sometimes implicated in wound infections (Bauer, *et al.*, 1974) and has been isolated from the oral cavities of venomous snakes (Williams, *et al.*, 1934; Parrish, *et al.*, 1956), I chose to determine if the staphylococcus type seen in the preliminary study was *Staphylococcus aureus*. Thirty-four captive snakes representing ten species were thus sampled. The species and number of each sampled are as follows: eastern garter snake *(T. s. sirtalis)*, 21; northern ribbon snake (T. sauritus septentrionalis), 3; northern brown snake *(Storeria dekayi dekayi)*, 2; northern water snake *(Nerodia sipedon sipedon)*, 2; eastern king snake *(L. g. getulus)*, 1; eastern hognose snake *(Heterodon platyrhinos)*, 1; sonoran gopher snake *(Pituophis melanoleucus affinis)*, 1; corn snake *(E. guttata guttata)*, 1; boa constrictor *(Boa constrictor)*, 1; indian python *(Python molurus)*, 1. Each was sampled as before. A m-staphylococcus broth tube (for enrichment) and a mannitol salt agar streak plate (for differentiation) were employed for isolation (Benson, 1979). Colonies showing a yellow halo and staphylococcus morphology (five from each positive plate) were subcultured on brain heart infusion agar.

Staphylococci were isolated from ten of the snakes sampled — one indian python, one boa constrictor, one northern water snake, two northern brown snakes, and five eastern garter snakes. The determinations employed and results for these isolates are as follows: morphology — Gram positive staphylococci; growth on mannitol salt agar plate — two mm diameter shiny raised entire colonies show-

ing mannitol fermentation; growth on brain heart infusion agar plate — white to tan colonies after five days at 25° C; growth on blood agar plate — white to tan yellow colonies but no hemolysis even after refrigeration; growth on nutrient agar slant (15% NaC1) — growth within six days; growth in nutrient broth and tryptone phosphate broth tubes — turbid; growth in phenol red mannitol broth tube — slow fermentation in 24 hr.; growth in fluid thioglycollate medium tube — aerobic; DNAase test — varied; coagulase test — negative; catalase test — positive; VP test — negative; novobiocin sensitivity — negative (Bauer, *et al.*, 1974; Benson, 1979). Various positive and negative control strains including a coagulase positive *Staphylococcus aureus* culture were utilized in each determination.

Since these strains did not produce coagulase, hemolyze blood cells, grow anerobically in fluid thioglycollate medium, produce golden pigment, or rapidly ferment mannitol in tube culture they appear not to be *Staphylococcus aureus* but rather to represent relatively non pathogenic species of staphylococci or micrococci (Kloos and Schleifer, 1975; Buchanan and Gibbons, 1974). However the presence of a variety of Gram positive and Gram negative bacteria in the oral cavities (Williams, *et al.*, 1934; Parrish, *et al.*, 1956) and alimentary tracts (Mergenhagen, 1956) of snakes suggests the possibility of infection following a bite. Contamination of a bite wound with saliva and/or feces from the snake could cause this infection.



ACKNOWLEDGMENTS

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INTERSEXUALITY IN A LOGGERHEAD SEA TURTLE, *CARETTA CARETTA*.

The term intersex refers to any specimen which exhibits both male and female characteristics (Miller and Limpus, in press). Forbes (1965) reviewed the widely variable degree of intersexuality that can occur in turtles. Pieau (1975) identified varying degrees of intersexuality at the histological level in embryos of *Emys orbicularis* and *Testuda graeca* even when incubated at constant temperature. However, Bull (1980) expressed the opinion that intersex phenotypes are rare among turtle hatchlings in laboratory and field studies except in a few temperature-shift experiments and he also concluded that intersex phenotypes are rare in natural populations of turtles. Histological examination of gonads of hatchlings *Caretta caretta* and *Chelonia mydas* from natural and laboratory incubation studies by the authors have shown that animals with intersex gonads occur at birth. Because the occurrence of interest specimens is relevant to studies of temperature dependent sex determination, we present the following observations.

C. Caretta, Tag no. X2621, was captured three times in three years in the Lagoon of Wistari Reef about 2 km west from Heron Island (23°27'S, 151°57'E) southern Great Barrier Reef, Queensland Australia. When first captured, 12 May 1976, X2621 had a curved carapace length of 88 cm. It was tentatively classed as a sub-adult male because its tail, although longer than that of a nesting

STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES (Second Edition)

By Joseph T. Collins, Roger Conant, James E. Huheey, James L. Knight, Eric M. Rundquist and Hobart M. Smith

Available in summer 1982. The first edition of this reference, issued in 1978 as SSAR **Herpetological Circular** No. 7, quickly became a standard reference for herpetologists, biologists, zoos, museums, conservation organizations, wildlife societies, book publishers, and Federal and state wildlife agencies. This second, revised edition is an up-date listing over 1300 common and scientific names for species and subspecies of North American (north of Mexico) salamanders, frogs and toads, crocodilians, turtles, lizards, and snakes. New features in this edition (not in the 1978 version) are an appendix of Hawaiian amphibians and reptiles, the inclusion of the names of describers for all genera, species and subspecies, and the addition of a table comparing the number of currently recognized subspecies with those listed in earlier publications. The SSAR Committee on Common and Scientific Names (shown above) considered over 50 proposed changes for this edition, the majority of which were adopted.

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female, was much shorter than those of adult males, which have tails that extend more than 20 cm beyond the carapace. On 9 June 1979, X2621 was recaptured and again classed as a sub-adult male because of its intermediate tail length. The animal was recaptured 29 May 1979; it had increased 1.5 cm in curved carapace length, weighed 80 kg and its tail extended 11 cm beyond the carapace. The front flipper claws were not strongly recurved. Upon being dissected, each gonad resembled a normal testis in colour and size; the epididymus was distinct. Beside each testis was what appeared to be a well formed although narrow paramesonephric duct supported by a mesentry. However, each duct degenerated posteriorly and did not enter the cloaca as a normally developed oviduct would.

Histological examination of the right testis showed advanced spermatogensis within typically structured seminiferous tubules. The investing tunica albuginea showed no abnormal development; the epithelium was squamous. Examination of the structure of the duct revealed a large lumen lined by a squamosal epithelium supported by a thick matrix of muscle and connective tissue. The general structure resembled that of oviducts from mature *C. caretta* except that in normal oviducts the epithelium is columnar.

Two other male *Caretta* from this feeding ground have been dissected. An adult male (curved carapace length = 91.5 cm) displayed the normal external secondary sexual characters of large recurved front flipper claws and very large tail. The second was an immature male (curved carapace length = 80.5 cm) with non recurved claws and a tail not extending beyond the carapace. Both of these latter males lacked paramesonephric ducts.

Although the carapace growth rate (0.5 cm/yr) for X2621 is within the range of sexually differentiating male *Caretta* in the study area (Limpus, unpublished data), the relative slowness in the differentiation of the tail of this maturing turtle contrasts with the more rapid tail development of other presumed maturing male *Caretta* of similar size under observation in the same area (Table 1). There is a distinct possibility that the retention of the well developed paramesonephric ducts was related to the reduced development of the secondary sexual characters of X2621.

Table 1. Growth data from three maturing male *Caretta caretta* inhabiting feeding grounds on reefs adjacent to Heron Island in the southern Great Barrier Reef. (Asterisk (*) denotes captures at which the turtle was classed as a possible female, based on tail length.)

Tag No.	Date	Curved carapace length (cm)	Curved carapace average growth rate (cm/yr)	Tail length beyond carapace (cm)	Tail length average growth rate (cm/yr)
10376	14.07.74*	85.0		2.5	
	31.10.74*	85.0		3.5	
	15.11.76*	86.0	0.8	5.0	1.8
	11.11.78	88.0		8.0	
	02.02.80	89.5		12.5	
X573	02.10.74*	89.0		-ve	
	21.05.77*	89.5	0.5	3.5	1.6
	16.05.80	91.5		9.0	
X2045	04.02.78	89.5	0.7	4.5	4.7
	26.05.80	91.0		15.0	

There are additional "subadult male" *Caretta* in the study area with carapace size and tail length similar to that of X2621 which have shown no major change in tail length over several years. It is possible that there are abnormalities in their gonads and associated ducts.

With sea turtles, insemination is dependent on the male mounting the carapace of the female and having a tail long enough to facilitate intromission. We do not know at present whether or not a turtle such as X2621 would eventually develop a normal adult tail or whether it would be capable of reproducing if its tail did not differentiate further.

There is a need for accurate assessment of the frequency of intersexuality within sea turtle populations and not just within successfully breeding animals. Also there is a need to determine what effect intersexuality has on the reproductive potential of the individual turtle.

ACKNOWLEDGMENTS

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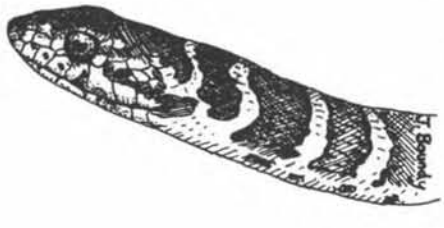
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IMMOBILITY IN *SOOGLOSSUS GARDINERI* (ANURA: SOOGLOSSIDAE)

While there are numerous anecdotal references to immobility in frogs, there are little quantitative data available and few adequate descriptions of behavior prior to immobility or postures associated with it. I have previously provided references on immobility (Dodd, 1976) and reviewed the importance of immobility as an anti-predator mechanism, especially to small frogs (Dodd, 1977). No published literature records anti-predator mechanisms of sooglossids, a group considered transitional between "Archaic" and "Advanced" frogs, thus of evolutionary importance (Nussbaum, 1980; Lynch, 1973). Current studies on the sooglossids involve various aspects of their evolution, morphology, genetics, and ecological requirements; no observations of potential anti-predator mechanisms have been recorded (R. Nussbaum, pers. commun.).

Observations of immobility in *Sooglossus gardineri* were recorded May 10, 1980, between 0930 and 1220 h, on the southwest facing slope (elevation approximately 600 m) of Morne Seychellois, Island of Mahé, Seychelles. Air temperature was 24.4 degrees C and substrate temperature 26.6 degrees C; the weather was overcast with the sun occasionally breaking through the clouds. A heavy downpour terminated the observations. The frogs were discovered by turning small rocks and other debris next to a small stream. All times were recorded with a stopwatch to the nearest .5 s and an arbitrary maximum limit of 180 s was imposed. Postures and behavior of frogs were noted.

The behavior of six adult *S. gardineri* (9-13 mm, $\bar{x}$ = 11.1) were recorded; a seventh frog, obtained from the core of a fern frond, fell into a deep ravine and was lost for several minutes before found. Five of these frogs showed immobility (1 frog = 82 s; 4 frogs = 180 s) while the sixth began hopping immediately and continued to move approximately 1 m before capture. Two of the frogs hopped once before remaining motionless; one hopped twice. If a frog remained motionless 180 s, the frog was touched lightly or the substrate next to it was distrubed, as by running a stick next to the animal. In none of the four cases did the frog then move. No postures such as crouching (Dodd, 1977) or limb folding (Dodd and Cupp, 1978) were noted. The frogs remained exactly as uncovered.

The habitat where *S. gardineri* is found, forest floor under and between debris and rocks, is deeply shaded even on sunny days. This species is brown dorsally and black laterally, ventrally, and on the limbs. As a result, an individual is extremely difficult to see when uncovered (Fig. 1). The animal shaken from the fern frond was found motionless in the ravine only after several minutes of close search on hands and knees. By remaining motionless, the cryptic coloration would probably have allowed it to escape detection

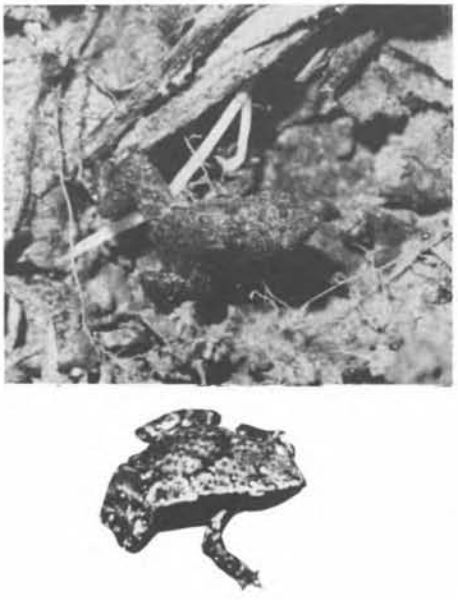


Fig. 1. Immobile *Sooglossus gardineri*. Cryptic coloration coupled with immobility makes the frog difficult to detect in natural habitat.

by a natural predator relying on sight or hearing for detecting prey.

Of importance to understanding the effectiveness of immobility as an anti-predator mechanism to this frog is knowledge about its predators. Unfortunately, there is only an unconfirmed record of caecilians as predators; R. Nussbaum (pers. commun.) believes this record invalid. He also has never found this frog in the stomachs of the sympatric small colubrid *Lycognathophis seychellensis*. It is probable, however, that skinks *(Mabuya seychellensis)* or birds might be predators. This needs to be investigated further.

Immobility coupled with cryptic coloration provides an important means of predator avoidance. A detailed quantitative study of predator avoidance in this species, and for that matter most species of frogs, is long overdue.

ACKNOWLEDGMENTS

I thank Ron Nussbaum for providing information on potential predators based on his extensive research on Seychelles frogs. I also thank Lindsay Andre Chong-Seng, Conservation Officer, Seychelles, for accompanying me in the field.

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PUBLIC PERCEPTIONS OF VENOMOUS SNAKES: RESULTS OF AN INTERPRETIVE SLIDE PROGRAM IN MISSOURI

Many wildlife species evoke emotional responses from the public, but few seem to trigger such predictably fearful and negative reactions as venomous or "poisonous" snakes. Though it may be too much to ever expect most members of the public to "like" venomous snakes, educational programs on snakes might help balance the public's view of these animals and promote herpetology-oriented conservation.

A slide program entitled, "Missouri's Venomous Snakes" has been produced by the Missouri Department of Conservation (Johnson, 1980). This 15-minute program features high quality 35 mm photographs and recorded narrative pertaining to Missouri's five species of venomous snakes, and is designed to educate and entertain viewers. Initial showings were at the 1980 Missouri State Fair; ironic, perhaps, in that some displays of reptiles at carnivals and sideshows have done little more than generate snake-related fiction and fear. Viewers of these first showings were asked to participate in a post-program survey to determine their enjoyment of the presentation, as well as their perceptions of venomous snakes before and after the showing. Reiterating, participants gave their pre-program and post-program views of venomous snakes at one time — the conclusion of the presentation. The questionnaire was a self-administered form, seven items in length, and designed to allow even young viewers to respond (Figure 1). Questionnaires were completed by 723 viewers. This group is not purported to represent the "general" public. The following percentages are adjusted for missing values.

Sexes were evenly represented in the group, with males (367) slightly outnumbering females (341). Age was well distributed, also: 21% (143) were 15 years old or younger, 30% (208) were 16-30, 36% (249) were 31-50, and 13% (88) were 51 or older.

Fully 73% (515) of the respondents indicated they had seen or thought they had seen venomous snakes in the wild. One wonders how many of these sightings actually were of venomous snakes, and how many ended with snakes being killed.

When asked to indicate if their pre-program views of venomous snakes were "negative," "neutral," or "positive," 51% (361) said "negative." One-third (235) held neutral views, and 15% (108) had positive views before the show. Negative views were held by 65% (211) of the females compared to only 39% (134) of the males. Youngsters were least likely of all age groups to have negative views: 35% (50) of the respondents 15 or younger checked "negative," compared to 53% (111) of those 16-30, 61% (153) of those 31-50, and 42% (37) of those 51 or older.

Nearly all viewers enjoyed the slide show, with only 2% (11) saying "not enjoyable." Indeed, 64% (455) called the presentation "very enjoyable." Interesting, too, is that 77% (544) said the show was as enjoyable as most other things they had done at the fair — a compliment to the program in view of the wide range of activities available at the Missouri State Fair.

When asked to recall 2 selected points of fact from the presentation, 80% (573) remembered how many kinds (5) of venomous snakes are in Missouri, and 71% (514) recalled that "copperhead" *(Agkistrodon contortrix phaeogaster)* is the most common species in the state.

The slide program apparently had a positive effect on respondents' perceptions, or at least momentary moods, in that only 32% (219) classified their views of venomous snakes as "negative" compared to 51% prior to the show. In fact, 38% (133) of the 347 viewers who felt negatively prior to the presentation changed their views following the program to "neutral" (101) or "positive" (32). The percentage of females changing views from "negative" (37%) about equalled the percentage of males switching views (39%). Overall, 24% (85) of the males viewed venomous snakes negatively after the program, as did 41% (133) of the females, representing decreases in "negative" responses of about 15 percentage points in both groups. Across age groups, decreases in the percentages responding "negative" were substantial. Only 18% (25) of those 15 or younger held a negative view of venomous snakes following the program, as did 31% (64) of those 16-30, 40% (96) of those 31-50, and 32% (27) of those 51 or older.

Missouri Department of Conservation

MISSOURI'S VENOMOUS SNAKES

1. Did you find this show: ( ) very enjoyable ( ) somewhat enjoyable ( ) not enjoyable

2. Compared to most other things you've done at the fair, was seeing this show: ( ) more enjoyable ( ) as enjoyable ( ) less enjoyable

3. How many kinds of venomous snakes are in Missouri? ____ OR ( ) DON'T REMEMBER

4. Which is the most common? ( ) cottonmouth ( ) copperhead ( ) rattlesnake ( ) DON'T REMEMBER

5. Please show (✓) your view of venomous snakes,

	Negative	Neutral	Positive
a. BEFORE the show	( )	( )	( )
AND			
b. AFTER the show	( )	( )	( )

6. Have you ever seen, or think you've seen a venomous snake in the wild? ( ) YES ( ) NO

7. Age ____ And you are ( ) Female ( ) Male

It is safe to conclude that viewers enjoyed the slide program, and that the presentation had a positive effect on some viewers' perceptions of venomous snakes. More and more, biologists and natural resource managers are recognizing that wildlife conservation stems from effective communication with people as much as application of biological techniques. An interpretive presentation like "Missouri's Venomous Snakes" which entertains viewers while fostering understanding and tolerance of the subject thus represents a useful tool in wildlife conservation.

The slide program, "Missouri's Venomous Snakes" (80 slides and cassette tape), can be purchased from the Missouri Department of Conservation. Contact: Film Library, Missouri Department of Conservation, Box 180, Jefferson City, MO 65102.

REFERENCE

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MEETINGS

APPLICATION OF GENETICS TO THE MANAGEMENT OF WILD PLANT AND ANIMAL POPULATIONS

An international symposium and workshop to be held 9-13 August 1982 at the Washington, D.C. Hyatt Regency Hotel.
Co-chairpersons (*=contact for more information):

* Christine Schonewald-Cox
Natural Sciences Division
National Park Service - 494
Department of the Interior
Washington, D.C. 20240

Steven M. Chambers
Office of Endangered Species
U.S. Fish and Wildlife Service
Department of the Interior
Washington, D.C. 20240

The purpose of this symposium and workshop is to transfer new knowledge and technology to the field of biological resources management with the intent of improving the long-term success and fiscal efficiency of biological resources management programs. Its intent is to short-cut the decades normally required for such information to filter from academic circles to the remote field locations where biological resources management actually takes place.

This symposium and workshop will provide perspectives on the potential contribution of genetics to the management of biological resources. It will specifically address problems associated with the management of wild animal and plant populations, primarily in the temperate zone, as protected areas progressively become more isolated. The isolation of these protected areas, due to changes in peripheral land use and human activities that interfere with historical patterns of movement and migrations between populations, will also be addressed. Other topics to be discussed will include species declines, extinctions, the founding of new populations, the merging of separated populations, and the maintenance of the natural diversity of populations and taxonomic units. The symposium and workshops will identify gaps in our knowledge, and will develop recommendations for interim management practices that could be implemented immediately, as well as for future study to mitigate adverse conditions and trends known to be occurring or anticipated in protected areas. Finally, the symposium will explore possibilities for multidisciplinary, multiinstitutional and multinational approaches to solving the problem of biological resources management in a world vastly different from the one in which many of the protected species evolved.

The symposium and workshop will last 5 days and will consist of an intense schedule of morning talks and of afternoon workshops lasting from 8:00 AM to 6:00 PM. Each day will be devoted to one topic. The workshops will discuss and summarize the limitations and advantages of diagnostic methods for recognizing problems and subjects for additional research, including the testing of the hypotheses in the field.

Daily topics are:

1) The isolation of populations;
2) The extinction of populations;
3) The founding of new populations;
4) The merging of naturally disconnected populations;
5) Preserving the natural diversity of populations and taxonomic units. ●

TAMAULIPAN BIOTIC PROVINCE

Announcing an International Symposium on the Tamaulipan Biotic Province. The Symposium will include all ecological aspects of the biome: vegetation, invertebrates, vertebrates, ecological structure and function, biological resources (use and effects), and management. It will include aspects of applied science and conservation. The meeting will be held at La Quinta Royale Motor Inn, Corpus Christi, Texas, on October 28, 29, 30, 1982. Those interested in contributing papers should submit an abstract by 1 August 1982; abstracts for invited papers must be received by 1 September 1982. For information on either, contact Gene W. Blacklock, Curator, Welder Wildlife Foundation, P.O. Drawer 1400, Sinton, Texas, 78387 or David Riskind, Head, Resource Management Section, Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas, 78744. For information on registration contact Jimmie R. Picquet, Director, John E. Conner Museum, Texas A&I University, P.O. Box 2172, Kingsville, Texas, 78363. ●

CONSERVATION/ LEGISLATION

NEW YORK REVISES STATE LIST OF ENDANGERED AND THREATENED SPECIES

New York State's Endangered Species Unit has recently revised its state list of endangered species. Two new categories are also identified — *threatened* species, which are legally protected, and *special concern* species, which are unofficially listed. During list revision, candidate species were rated according to 23 biological/ecological parameters. These ratings were then used in conjunction with various expert opinions to put species into one of three categories, if appropriate.

The species of reptiles and amphibians which are currently listed by New York are:

Endangered (six species):	
tiger salamander	*Ambystoma tigrinum*
bog turtle	*Clemmys muhlenbergi*
leatherback sea turtle	*Dermochelys coriacea*
hawksbill sea turtle	*Eretmochelys imbricata*
Atlantic ridley sea turtle	*Lepidochelys kempii*
massasauga	*Sistrurus catenatus*
Threatened (six species):	
cricket frog	*Acris crepitans*
mud turtle	*Kinosternon subrubrum*
Blanding's turtle	*Emydoidea blandingi*
loggerhead sea turtle	*Caretta caretta*
green sea turtle	*Chelonia mydas*
timber rattlesnake	*Crotalus horridus*
Special Concern (ten species):	
southern leopard frog	*Rana sphenocephala*
hellbender	*Cryptobranchus alleganiensis*
Jefferson salamander	*Ambystoma jeffersonianum*
blue-spotted salamander	*Ambystoma laterale*
spotted salamander	*Ambystoma maculatum*
spotted turtle	*Clemmys guttata*
wood turtle	*Clemmys insculpta*
diamondback terrapin	*Malaclemys terrapin*
worm snake	*Carphophis amoenus*
eastern hognose snake	*Heterodon platyrhinos*

Anyone planning or contemplating work with any listed species should contact the Endangered Species Unit at the address listed below. A permit and prior approval is required for work with any endangered or threatened species.

The Unit is also soliciting information on the status, distribution, threats to or natural history of any of the species listed. Any information gained will aid in the protection and management of our state's herpetofauna.

The Endangered Species Unit would also like to officially thank those SSAR members who provided assistance and comments during species ratings and list formation. Input from professional herpetologists has allowed the formulation of a list most representative of the status of New York's reptiles and amphibians.

For further information please contact: Patricia Riexinger, Reptile and Amphibian Specialist, Endangered Species Unit, NYS Dept. Environmental Conservation, Wildlife Resources Center, Delmar, NY 12054-9767●



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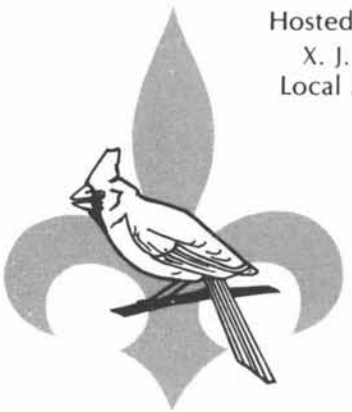
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MISCONCEPTIONS ABOUT THE ENDANGERED HOUSTON TOAD *(Bufo houstonensis)*

A discussion at the Nov. 1980 meeting of the Houston Toad Recovery Team focused on three widespread misconceptions about *Bufo houstonensis* which have been disseminated in a number of publications and unpublished reports. One misconception concerns the importance of enlarged postorbital cranial crests as a diagnostic character of *B. houstonensis*. A number of specimens from Harris County, Texas and some specimens from Bastrop County, Texas do have thickened postorbitals. However, this can hardly be considered excessive enlargement and many specimens have postorbitals of moderate size. Furthermore, specimens of *Bufo woodhousei* having enlarged postorbitals have also been uncovered from localities in Chambers, Hardin, and Jefferson counties, Texas and Beauregard Parish, Louisiana. Thus, the structure of the postorbital cranial crests is variable and often cannot be used alone to identify *B. houstonensis*.

Another misconception is the assumption that pine trees occur at all localities where *B. houstonensis* has been found. A great abundance of natural loblolly pine *(Pinus taeda)* characterizes the locality in Bastrop County, Texas and pines are found at or near some other localities for *B. houstonensis*. However, the pine stand at Lake Woodrow (Burleson County, Texas) was planted by man in 1959 (Thomas, 1977). Also, the habitats at the Skyscraper Shadows/East Haven locality and Fairbanks locality (both in Harris County, Texas) were prairie without pines before being developed for housing (W. McClure, pers. comm.). A common characteristic of all known localities for *B. houstonensis* is friable sandy soil (Brown, 1971; Kennedy, 1962) which, coincidentally, is conducive to pine growth. It thus seems probable that the toads are reliant upon the substrate but not the presence of pine trees.

The last misconception is the emphasis often placed on the importance of natural hybridization as a cause of the trend toward extinction. There is actually little evidence that natural hybridization has had such an effect. Only 20 confirmed natural hybrids (16 *B. houstonensis* X *B. valliceps*, 4 *B. houstonensis* X *B. woodhousei*) have been located (Brown, 1971). The majority of these hybrids were found at one location (Barking Dog Pond, Bastrop County, Texas), and all of these hybrids were found in only two years (1965,1966). There is no evidence of widespread natural hybridization, backcrossing, or introgression. Brown (1971) only indicated the *potential* of natural hybridization to contribute to the trend toward extinction. The most important causes of the decline of *B. houstonensis* are probably destruction/modification of habitats and climatic changes.

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TECHNIQUES

A PHYSIOLOGICAL (RINGER'S) SOLUTION FOR ANOLINE LIZARDS

During the last two decades there has been a tremendous increase in research concerning reptilian physiology. Many of these studies have utilized mammalian or avian physiological solutions modified for cold-blooded animals (e.g. Munsick's solution: Munsick et al., 1960; Tyrode's solution: Hoar and Hickman, 1975). A review of the major sources containing formulae for physiological solutions reveals a lack of preparations designed for use with specific reptilian genera (Humason, 1972; Hoar and Hickman, 1975; McDonald, 1976). One of the reptilian species extensively studied is the lizard *Anolis carolinensis*. To my knowledge, there are no physiological solutions designed for this species based on its reported blood chemistry.

Recently, our laboratory had a need for a physiological solution specific for anoline lizards. This solution was designed using the plasma ion concentrations reported for *A. carolinensis* (Dessauer, 1952, 1970; Hutton and Ortman, 1957). The compounds and their amounts used to make one liter of anoline physiological solution are given in Table 1. The osmotic concentration of this solution, as measured with an osmometer, is 360.9 mOs/liter. The pH of anoline plasma at 32° C is 7.26 (Dessauer, 1970) and is similar to that measured for this solution (pH at 32° C = 7.2).

This anoline Ringer's solution has been used in physiological studies dealing with *in vitro* oviductal contraction (Guillette and Jones, unpublished) and *in vitro* ovulation in *A. carolinensis* (Jones and Guillette, unpublished). Survival of tissues in the above studies (performed at 32° C) using the anoline Ringer's solution was 4 times greater than in Munsick's Solution. Additionally, anoline Ringer's has been used with other reptilian species, notably in studies concerning *in vitro* oviduct contraction in *Sceloporus jarrovi* (Guillette, unpublished), physiology of the parietal eye in *Iguana iguana* (Jenison and Nolte, 1980), and red blood cell morphology and culture in *Cnemidophorus lemniscatus* (Serena, 1980). As observed in these studies, anoline physiological solution is useful in different types of experiments (especially *in vitro* studies) and can be used successfully with lizards other than *A. carolinensis*.

TABLE 1: DATA FOR ANOLINE PHYSIOLOGICAL SOLUTION

Compound	Amount used[a] (grams)	mM/L
$MgSO_4 + 7H_2O$	0.27	1.1
$NaHCO_3$	1.30	15.4
$NaH_2PO_4 + 1H_2O$	0.36	2.6
$CaCl_2$	0.32	2.9
KCl	0.34	4.6
NaCl	8.11	139.0
Glucose	1.72	10.5

[a]The amounts of each compound shown in this column are placed in a 1 liter volumetric flask. Flask is then brought to volume using distilled water.

LITERATURE CITED

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Information on other regional herpetological societies throughout the world is needed to complete and up-date this list. Please send all regional society address changes, corrections, and additions to: John C. Murphy, 201 Peerless Dr., Plainfield, IL 60544 USA.

Editor's Note: This is John Murphy's final contribution as Regional Societies Section Editor. My thanks to John for his efforts as section editor, and my welcome to Jan Perry to that role. Please send all correspondence to her (see inside front cover). ●

THE KANSAS HERPETOLOGICAL SOCIETY

The Kansas Herpetological Society is a non-profit organization composed of professional and amateur herpetologists and naturalists. Founded in May of 1974, the Society is dedicated to promoting the science of herpetology through education, by encouraging scientific endeavor, and by working for the conservation of wildlife in general and of Kansas reptiles and amphibians in particular. Consisting of approximately 165 members, the Society maintains a strong tradition of field work and community interaction. Field trips to poorly known and biologically interesting areas of the state are normally held twice in the spring and once in the fall. Regular meetings are held periodically throughout the year, usually with at least one meeting being held at the University of Kansas Natural History Museum in Lawrence and one at the Sedgwick County Zoo in Wichita. The annual meeting is held in November at the hometown of the current president. Meetings always include a number of interesting talks of semi-technical or travelogue nature and are free and open to the public. Since its inception in 1974, the Society has been responsible for the addition of 525 new county or maximum size records as well as the addition of an amphibian species to the state herpetofaunal list.

The Society currently issues its *Newletter* quarterly to all members and publishes a variety of articles. The *Newsletter* is edited by Hank Guarisco with assistance from Ray Lorraine. Under the editorship of Guarisco, the *Newsletter* has increased in size to approximately 25 pages and includes news of the Society's activities, natural history notes, notes concerning endangered or threatened forms, articles on husbandry, requests for information, and non-live animal advertisements of interest to herpetologists. In addition, the *Newsletter* periodically reprints articles of interest to concerned citizens from other conservation oriented organizations. The November 1981 *Newsletter* represents issue #46. Persons are encouraged to submit manuscripts, pen and ink drawings, or interesting photographs and should send them directly to the Editor, K.H.S. Newsletter, c/o Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. The Society also exchanges newsletters with other regional conservation organizations and any society wishing to set up a reciprocal agreement should contact the Editor.

The K.H.S. maintains three standing committees. Two of these (the Membership and Program Committees) are concerned with the internal affairs of the Society while the Legislation/Conservation committee regularly reviews pertinent changes in local or national legislation. The Society also maintains liaison representatives with the Kansas Association of Biology Teachers, the Kansas Academy of Science, the Oklahoma Academy of Science, and the Kansas Chapter of the Wildlife Society. Governance of the Society is by an Executive Board consisting of five officers (elected by the membership) and the Editor. The financial condition of the Society is healthy and is due in large part to the dedicated efforts of the officers and the committee chairpersons. Because of this, the Society has been able to maintain a remarkably economical $4.00 membership fee.

In 1980 the Society applied for and received a $200.00 Regional Society Grant-in-Herpetology from the Society for the Study of Amphibians and Reptiles for the publication and distribution of a brochure concerning the six species of reptiles and amphibians determined by state legislature to be threatened or endangered within the state. Additional monies are forthcoming from local agencies and the K.H.S. anticipates the publication of a textual brochure with six color photographs and distribution maps early in 1982. ●

DUTCH SNAKE SOCIETY (NEDERLANDSE DOELGROEP SLANGEN)

The society, established in 1980, publishes *Litteratura Serpentium* on a bi-monthly basis (6 issues annually), totaling *ca.* 500 pages per volume; photos may be color or b/w, and articles are accompanied by English summaries. Membership is open to anyone interested in snakes. DSS officers are:

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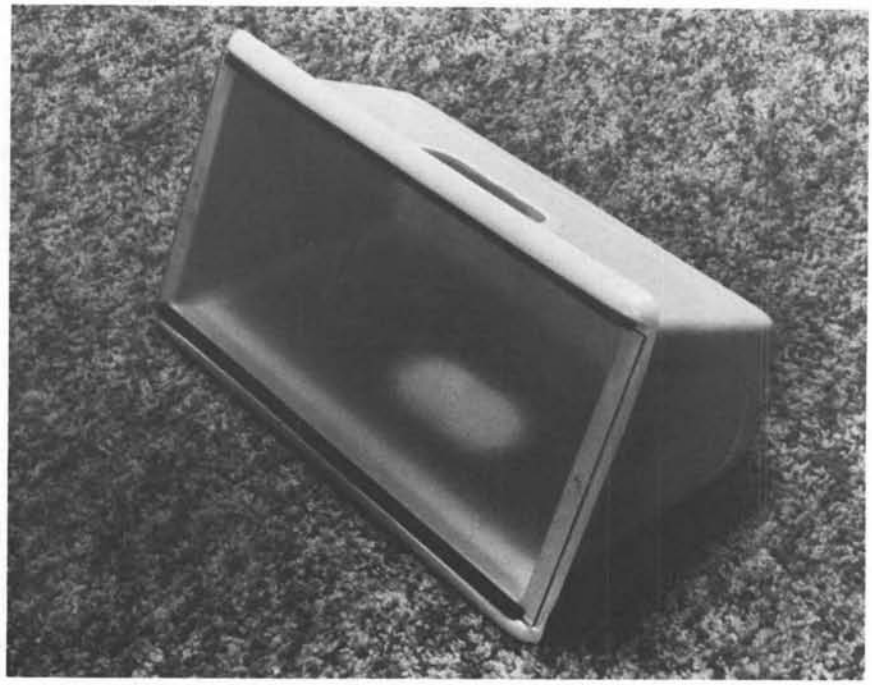
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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Houston Zoological Gardens, Houston, Texas 77001.

REPRODUCTION IN CAPTIVE BLACK PINE SNAKES *PITUOPHIS MELANOLEUCUS LODINGI*

The Black Pine Snake *Pituophis melanoleucus lodingi*, a melanistic subspecies of a widely distributed North American genus, is restricted to the longleaf pine belt of southwestern Alabama, southern Mississippi, and southeastern Louisiana (Conant, 1975). Its limited habitat has been severely damaged due to logging and agricultural activities prevalent in this region (Wright and Wright, 1957). This snake is now listed as an endangered species in the state of Mississippi (Cliburn, 1980). *P. melanoleucus lodingi* has rarely reproduced in captivity and information on reproduction is scarce in the literature. Bowler (1979) mentioned that the subspecies had reproduced successfully at the Philadelphia Zoo. There appears to be no description of newly hatched individuals. The purpose of this paper is to report details of reproduction in captive *P. melanoleucus lodingi* and to describe the hatchlings.

On 29 May 1979, a male *P. melanoleucus lodingi* (1701 mm total length) was received. A female (*A*, 1676 mm total length) was obtained on 21 June 1979. On 19 March 1980, a second female (*B*, 1346 mm total length) was added. All snakes were collected in Mobile County, Alabama, and were jet-black dorsally and ventrally, with light brown caudals and mahogany brown labials. The only distinctive difference in coloration among these snakes was the presence and extent of the white gular patch, which was dissimilar in all individuals.

Specimens were housed individually in 113 liter aquaria in a room illuminated with two 40 watt fluorescent tubes and two 200 watt incandescent bulbs. The photoperiod was similar to that described by Wagner (1979), ranging from 7 h of light in December to 19 h in June and July. Temperature was allowed to fluctuate to match environmental conditions. Summer temperatures usually ranged between 25-32 C. From 1 November through 1 March the daily temperature ranged between 9-18 C. These sharp daily fluctuations did not appear to have any deleterious effects on the snakes. Humidity averaged 60% in summer and 40% during winter months.

Specimens were fed from 15 March through 15 October. They were not offered food during four months when they were artificially hibernated. They were offered initially live and dead laboratory mice and rats, on which they fed sporadically. In June 1980, they were switched to a diet of live chicks and began to feed regularly.

The male and female *A* were first introduced to each other in early March 1980, along with an additional pair from another collection. They were all placed in a large cage with floor dimensions of 1.5 X 2 m. No reproductive activity was noted and the snakes were separated the latter part of May.

On 1 April 1981, the original pair was again introduced. No breeding activity was observed. On 15 April 1981, female *B* was introduced. For several days, during the first few hours of light, the male was observed pursuing female *B* around the cage. Occasionally he crawled over her and bit her neck. He attempted intromission without success. On 21 April 1981 at 0930 h female *B* was observed to have a prolapsed cloaca, and the male was crawling off of her. On the substrate, below the vent of the female was a drop of fluid which, upon microscopic examination, proved to contain spermatozoa. The prolapsed condition of the cloaca of female *B* corrected itself by 0945 h. No further activity was observed and the snakes were separated on 1 May 1981.

Female *B* began refusing food on 7 May 1981, and her girth soon increased noticeably. On 20 May 1981 ecdysis occurred. On 29 May 1981 at 1300 h, oviposition began and was completed by 1700 h. Seven cream white eggs were laid. Six were adherent and no attempt was made to separate them. The single non-adherent egg measured 88 X 40 mm. The other eggs were not measured. All eggs were incubated in an 11 liter plastic box on a medium composed of 255 g of coarse vermiculite and an equal amount (by volume) of water (Tryon, 1975). The box was sealed tightly with the exception of small holes drilled in the sides for air flow. Temperature inside the box was maintained between 24-31 C but was allowed to drop as much at 6 C at night. Incubation took 65-68 days.

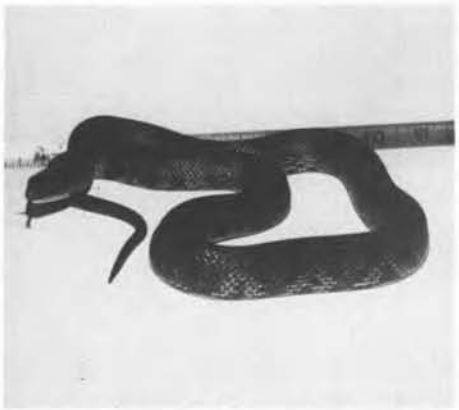


Figure 1. Juvenile *Pituophis melanoleucus lodingi* one month after hatching. Photo by Diane Hall.

The seven hatchlings ranged from 481-533 mm ($\bar{x}$=516 mm) in total length. They differed considerably from the adults in color and pattern. The posterior 75% of the body was distinctly patterned, consisting of black blotches five to seven scales wide. Between these blotches were narrower black blotches one to two scales wide. Most of these blotches extended onto the edge of the ventral scales. This pattern was on a dark brown ground color. Anteriorly, the pattern became more obscure as the ground color darkened. The anterior 25% of the body was completely jet-black, with no trace of pattern. Labials were dark brown to light gray, varying in each individual. The iris was yellow posteriorly and black anteriorly. As with adult *P. melanoleucus lodingi*, the white gular patch was the most variable feature, and was used as a convenient means of identifying each snake. Ventral ground color varied from tan to pink, with differing amounts of black blotching and suffusion.

Ecdysis occurred seven to ten days after hatching. All hatchlings fed readily on live or dead newly weaned mice.

ACKNOWLEDGMENTS

I thank Dr. James S. Jacob for critically reviewing the manuscript, and Dr. Michael Douglass, D.V.M., for providing invaluable assistance. I am especially grateful to my wife Ann, for the encouragement she unfailingly gave.

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REPRODUCTION IN CAPTIVE URACOAN RATTLESNAKES, *CROTALUS VEGRANDIS*

The Uracoan rattlesnake, *Crotalus vegrandis*, is confined to savannahs and alluvial plains in the Venezuelan states of Monagas and Anzoategui (Lancini, 1966). There is little published information concerning reproduction in this species. Lancini (1966) found three to four embryos in each of five females captured in December and Murphy, *et al.* (1979) reported dates of birth and weights and lengths of young in four litters of 3-6 young each from wild-bred females. From 1970-1980 six litters were born at the Houston Zoological Gardens (HZG), Texas, all but one the result of captive breeding.

In the summer of 1970, a male and two females were captured in the wild and arrived at the HZG on 9 July 1970. These specimens and subsequent offspring were either exhibited or kept in various sized aquaria. The exhibits (80 X 90 X 140 cm) were glass-fronted and contained a substrate of gravel, large rocks and plastic plants. Light was provided by four 20 watt Vita-lite tubes (Durotest Corp.). Temperature averaged 28° C and the relative humidity was *ca.* 75 percent. The aquaria had paper substrates and hide boxes. Temperature averaged 28° C with a relative humidity of *ca.* 75 percent. Water was available *ad libitum* and adults were fed adult mice every 14-21 days. All specimens were maintained under a 14L:10D photoperiod throughout the year. Specimens were occasionally separated and reintroduced in attempts to induce reproduction. From October through April, a 250 watt sun lamp (Westinghouse Electric Corp.) was placed about one meter above the substrate to provide extra heat and ultraviolet radiation. From May through September, the adults were sprayed with water several times a week to simulate a wet season. Specimens were weighed on a triple-beam balance and lengths were obtained using the squeeze box technique (Quinn and Jones, 1974).

Misting often stimulated the males to begin reproductive behavior, as did introducing a male from one cage into another. Courtship was observed throughout the year (eight of 12 months) but occured most frequently in June and July. Copulation was observed in October 1975 and on 16 September 1980. The 16 September occurrence lasted at least five hours, after which observation was discontinued.

Table 1. Birth dates, number of young, lengths and weights of young *C. vegrandis*.

Date	Number of young	Total length (mm) $\bar{x}$ (range)	Tail length (mm) $\bar{x}$ (range)	Weight (g) $\bar{x}$ (range)
9 July 1970	3	—	—	—
8 June 1976	2	—	—	—
12 May 1978	3	265(250-277)	22(21-24)	13.2(12.0-14.0)
2 May 1979	6	262(230-280)	—	15.1(11.5-16.5)
25 April 1979	8	248(225-265)	—	12.9(11.9-14.4)
30 April 1980	8	265(254-275)	25(20-27)	13.2(11.6-14.3)

The five births that were a consequence of captive breeding occurred during a six week period from 25 April to 8 June. Data from wild-bred females indicate that births in the wild may occur somewhat later. A female captured in the wild during the summer of 1970 gave birth on 9 July 1970 at the HZG. Murphy, *et al.* (1979) reported on four wild-bred females that were collected between 6-8 June and gave birth on 21, 24, 29 June and 9 July.

Birth dates, number of young per litter, weights and lengths of young are given in Table 1. The number of young resulting from captive-bred births varied from 2-8 ($\bar{x}$=5.4). Data on 10 wild-bred females from this study, Lancini (1966) and Murphy, *et al.* (1979) vary from 3-6 ($\bar{x}$=3.6).

The total length of all young measured in this study was 225-280 mm ($\bar{x}$=259 mm). Murphy, *et al.* (1979) reported a total length of 230-279 mm ($\bar{x}$=254 mm) for three full-term wild-bred litters.

According to Klauber (1972), male *C. vegrandis* have 25-31 ($\bar{x}$=27.0) subcaudal scutes and females have 18-25 ($\bar{x}$=21.0). There

is no published information on sexual dimorphism in tail length for this species. The litter of eight young born 30 April 1980 were measured one day after birth and later probed to determine sex; the subcaudals were counted. Tail length-total length ratios were also determined for two adult males and one adult female. Tail length, expressed as a percentage of total length was 9.9-10.6 ($\bar{x}$=10.2) for newborn males (N=5) and 7.8-8.7 ($\bar{x}$=8.1) for newborn females (N=3). The percentages for two adult males were 11.4 and 13.0. The figures for the adult female was 8.1. Subcaudal counts for males (N=9) were 29-32 ($\bar{x}$=30.2) and 22-26 ($\bar{x}$=24.2) for females (N=5). This increases the range of variation for both sexes by one.

The largest adult reported by Klauber (1972) and Lancini (1966) was 684 mm in total length. A male and female presently living at the HZG measured 854 and 761 mm respectively on 26 May 1980.

All young shed for the first time 2-24 hr after birth.

ACKNOWLEDGMENTS

We thank the staff of the Department of Herpetology, Houston Zoological Gardens for their assistance. Specimens will be placed in the University of Texas at Arlington Collection of Vertebrates upon their deaths.

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EFFECTS OF HANDLING ON REPTILE EGG HATCHING

There is little agreement among reptile breeders as to methods of incubating eggs, with nearly everyone having his own unique method. Disagreement can be found in almost any element of egg incubation, from type of substrate to temperature. One area of interest concerns the handling of eggs during incubation. Workers such as Frye (1973), and Tryon (1975) state that reptile eggs should not be handled, or at least not turned, during incubation. On the other hand, Pawley (1962) handled *Natrix natrix* eggs daily and found little effect on hatching success. Kauffeld (1969) rotated an adhered clutch of 11 *Pituophis* eggs and 9 subsequently hatched. Riches (1976) stated that turtle and crocodilian eggs should not be handled, but that handling had little effect on snake eggs. Yet Drajeske (1974) found that turning the eggs of *Chrysemys* and *Terrapene* did not adversely affect hatching. Recent reports by Bustard (1972) and Limpus *et al.* (1979) indicated that handling reduced hatching success in sea turtle eggs. Pooley (1971) stated that the eggs of crocodilians should not be handled.

Except for Limpus *et al.* (1979), controlled experiments and quantified results are largely lacking in the cited work. In this paper, the effect of handling on hatching success in two snakes *(Elaphe guttata* and *Python molurus),* a lizard *(Eublepharis macularius)* and a tortoise *(Geochelone carbonaria)* is experimentally tested and discussed.

MATERIALS AND METHODS

The eggs used in the experiments were from clutches laid by animals in breeding groups at the National Zoo during 1977, '78, '79. Whenever possible, an effort was made to use eggs from a single clutch for both control and experimental groups.

The basic incubator set-up was similar for all eggs. They were incubated in slate-bottomed, 10 gallon aquaria with glass tops. Eggs were placed in the aquaria in two evenly-spaced, parallel rows. Heat was provided by 120 watt heat tapes placed lengthwise under the tanks. Temperature could be regulated by thin wooden staves under the aquaria, thus raising or lowering them from the heat source. Temperatures of all aquaria were taken daily. The aquaria were in a windowless room maintained at an air temperature of approximately 24° C.

Each *Elaphe* egg was placed in a pint jar containing a layer of pea gravel into which water was poured; this was covered with a layer of damp sand within which the egg was half buried. Each jar had a plastic lid with a hole in it. The jars with the eggs were then placed on the bottom of the aquarium. Incubation temperature was maintained at an average of 29° C (21-32° C).

The python eggs were placed on top of potting soil in plastic cups. The containers were put in the incubator on 80 mm deep pea gravel and water was poured into the pea gravel. No water was added to the potting soil, but adequate moisture was available from the atmosphere. The temperature was maintained at an average of 32° C (30-34° C).

The gecko eggs were incubated in a two-to-one mixture of potting soil and sand in a plastic cup. The mixture was initially dampened and additional water was added during incubation if the substrate dried. The cups were placed on a pea gravel/water substrate. Temperature was maintained at an average of 28° C (27-29° C).

The tortoise eggs were incubated in the same way as the gecko eggs but the incubation temperature averaged 27° C (26-28° C).

Eggs and jars for each experiment were individually marked and three groups of eggs established: one unhandled, and two groups that were handled weekly. One handled group was rotated twice along its long axis (end-for-end) and twice along its short axis, leaving the eggs with the same side up each week. The other group was rotated one half turn more on its long axis so that the opposite side was up each week. Handling continued until hatching.

Hatching success in two control groups was inexplicably poor and not representative of normal hatching success for *Python molurus* and *Geochelone carbonaria* at the National Zoological Park (Table 1). Data more typical for unhandled eggs of these species were obtained from clutches incubated in the same way as the experimental groups and these are included in Table 1 for comparative purposes.

In *E. guttata, E. macularius,* and *G. carbonaria* the unhandled (reliable data for *P. molurus* and *G. carbonaria*) and experimental groups did not differ significantly in number of eggs hatched, but in *P. molurus* a significant difference between unhandled and experimentals exists (X^2, $P < 0.05$). The experimental groups were similar in hatching success in *E. macularius* and *E. guttata* but significantly different in *P. molurus* and *G. carbonaria* with those turned right side up having lower success than those turned upside down (X^2, $P < 0.05$).

To determine if handling affected hatchling survival, the animals were followed through one month. Survival was nearly 100% in the handled snakes and lizards, with only one *E. guttata* dying in the first month. In the handled tortoises hatchling survival was much worse with five dying within one month. Three of these were from the turned/inverted group and two from the turned/uninverted group. This 74% survival in hatchlings from handled eggs is significantly different from the 100% survival in the 18 unhandled tortoises (X^2, $P < 0.05$). Animals were examined for abnormalties upon hatching and during their first month. All animals appeared normal except for two tortoises. One hatchling that was in the handled/inverted group had an abnormal saddle-shaped shell, but it has survived to date. Another from an unhandled egg hatched with one eye and has also survived.

It is felt that the results differ in reliability. The high hatching success for all groups in *E. guttata* and *E. macularius* promote confidence in these results. The relatively low hatching success (compared to typical) in *P. molurus* and the overall low success in *G. carbonaria* reduce confidence in these results and more data should be collected for definitive con-

Table I. Hatching success for unhandled and two treatments of handled *Elaphe guttata, Python molurus, Eublepharis macularius* and *Geochelone carbonaria* eggs.

Species and Treatment	No. of Eggs	No. Hatched	% Hatched
Elaphe guttata			
Unhandled control	18	18	100
Turned: same side up	18	17	94
Turned: opposite side up	18	17	94
Python molurus			
Unhandled control	10	0	0
Unhandled*	22	16	74
Turned: same side up	10	4	40
Turned: opposite side up	10	6	60
Eublepharis macularius			
Unhandled control	8	7	88
Turned: same side up	8	8	100
Turned: opposite side up	8	7	88
Geochelone carbonaria			
Unhandled control	5	1	20
Unhandled*	39	17	44
Turned: same side up	16	6	37
Turned: opposite side up	23	13	56

*Data for typical unhandled eggs incubated in the same way as the control group.

clusions. In any case, some tentative conclusions can be made from this study and some earlier work.

It appears that handling snake eggs, especially colubrids, does not adversely affect hatching success (Pawley, 1962; Kauffeld, 1969). Whether this is true of the boids and other snake families remains to be determined but, at the National Zoological Park, many snake eggs are handled during incubation. Eggs are frequently candled and examined with no apparent effect on hatching success. Lizard eggs are also commonly handled at the NZP with no adverse effect on hatching. The routine handling is carefully done and the eggs are not inverted.

Work with turtle and tortoise eggs indicates that handling may be detrimental. Limpus *et al.* (1979) demonstrated that *Caretta caretta* eggs show a significant decrease in hatching if inverted between 12 hours and 14 days after laying. Bustard (1972) reported a decrease in hatching of more than 23% in green turtle eggs moved to a hatchery. Although there was no significant decrease in hatching in handled tortoise eggs in the present study, the death of five hatchlings from handled eggs before a month indicates that caution should be exercised in the handling of the eggs of chelonians.

Limpus *et al.* (1979) identified a critical period when eggs should not be handled. Pooley (1971) also states that it may be deleterious to move crocodilian eggs late in the incubation period. A critical period may exist for other reptile eggs, but this could not be determined in the present work.

The final position of turned eggs may affect hatchling survival. For two species in the present study, those turned rightside up had significantly lower hatching success than those turned upside down. The limited literature is contradictory on this point, but for sea turtles it is the process of rotating the eggs that is damaging and not the final position (Limpus *et al.*, 1979).

More information is necessary to determine conclusively if handling reptile eggs is detrimental to hatching and hatchling survival. However, it appears that lizard and snake eggs can be handled without a deleterious effect on hatching success.

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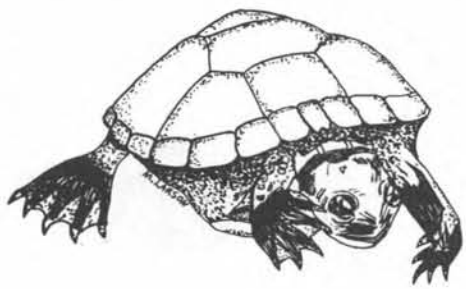
SEA TURTLE IDENTIFICATION POSTER NOW AVAILABLE

The Sea Turtle Rescue Fund of the Center for Environmental Education (CEE), together with the National Marine Fisheries Service (NMFS), have announced the availability of the Sea Turtle Identification Poster, which was jointly developed by the non-profit organization and the federal agency. Seven of the eight species of sea turtles are protected under the Endangered Species Act, which Congress is currently considering for reauthorization. Sea turtle populations have declined around the world due to the destruction of nesting beaches, hunting for commercial trade in their by-products and incidental drowning in fishing nets.

The poster breaks new ground in recognizing the Pacific green turtle *(Chelonia agassizi)* as a separate species. Previously this species had been included as part of the green sea turtle species *(Chelonia mydas).* The poster notes that *Chelonia agassizi* is widely, but not universally, accepted as a separate species.

Printed on a water-resistant surface, the 24 X 36-inch, full-color poster depicts each of the eight species in their natural habitats. Artist Marvin Bennett, under the technical supervision of Dr. Peter C. H. Pritchard, has faithfully rendered each species to allow a sea turtle observer the means of identifying an encountered animal.

Single copies may be obtained free of charge from the NMFS Washington and regional offices or by writing: Charles A. Oravetz, National Marine Fisheries Service, Southeast Region, 9450 Koger Blvd., St. Petersburg, Fla. 33702, telephone (813) 893-3366 or (813) 893-3720. Other materials regarding sea turtles may be obtained by writing: Michael Weber, Sea Turtle Rescue Fund, Center for Environmental Education, 624 9th St., N.W., Washington, D.C. 20001, telephone (202) 737-3600. ●



MALNATE BACK TO ANSP

The Department of Vertebrate Biology welcomes Mr. Edmond V. Malnate, who has retired from The Ullman Organization in Philadelphia in order to devote his time and energy to further studies of the "natricine" snakes, especially those of southeast Asia. A first priority will be completion of his revision (with Garth Underwood) of New Guinean snakes of the genus *Styporhynchus*. He will also continue searches for typical material in the Academy's collections, and will continue to answer queries from colleagues. A newly available herpetological office at the Academy of Natural Sciences will provide a base for these activities. ●

REPTILIAN EMBRYOLOGICAL MATERIAL SOUGHT

Dr. Frank Billett of the University of Southampton and I are in the process of preparing an introduction to the forthcoming volume of the BIOLOGY OF THE REPTILIA dealing with reptilian embryology. It seems appropriate at this time to include a listing of reptilian embryological material available in various institutions. Some such series have been deposited in museums, but many more remain in university collections. We should be most grateful for any advice that can be provided regarding its provenance. When responding, please advise a) the name of the species, b) the age (or size), c) has the material been published on, when, and by whom, d) how many sets, including number of slides are involved. The source of the information will obviously be acknowledged.

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AUTHORS SOLICITED FOR SALIENTA ACCOUNTS IN *CAAR*

A number of species in the anuran fauna of the United States have had no authors assigned, or the assignments have been relinquished by their prospective authors. If you would care to volunteer to write the *Catalogue* account for one or more of the species listed below, please contact the undersigned. Accounts available are: *Bufo americanus, B. boreas, B. cognatus, B. debilis, B. exsul, B. microscaphus, B. punctatus; Hyla chrysoscelis, H. cinerea, H. crucifer, H. eximia, H. regilla, H. versicolor; Hypopachus variolosus; Pseudacris clarki, P. nigrita; Rana berlandieri, R. catesbeiana, R. onca, R. pipiens, R. utricularia (sphenocephala); Syrrhophus cystignathoides, S. guttilatus, S. marnocki.* A number of accounts on the generic level are open, too. Richard G. Zweifel, Salientia Editor, Catalogue of American Amphibians and Reptiles, Department of Herpetology, American Museum of Natural History, New York, NY 10024. ●

LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Longevity, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1978. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

ANURA

PSEUDACRIS ORNATA (Ornate Chorus Frog). **REPRODUCTION.** *Pseudacris ornata* has been reported to lay egg masses containing 10-100 eggs (Martof, et al., 1980, Amphibians and Reptiles of the Carolinas and Virginia, U. of NC Press, Chapel Hill); an egg mass containing 25 eggs was reported in Alabama (Brown, 1956, The Frogs and Toads of Alabama, Ph.D. diss., U. of AL, Tuscaloosa). No additional information is available regarding number of eggs in egg masses, number of yolked ovarian follicles, or number of oviducal eggs in this common southeastern hylid.

Pseudacris ornata egg masses were collected in a semi-permanent sandhills pond in Marion Co., GA, in the Fall Line Hills physiographic region, on 28 January, 1980. Most egg masses (15 of 23) contained 20-40 eggs; mean egg number per egg mass was 40.50 ($n = 23$; $SE_{\bar{x}} = 9.81$; range = 21-106). Egg masses were attached to submerged grass and sedge stems in shallow water areas open to full sunlight.

Gravid *Pseudacris ornata* were collected in drift fence can traps around the same pond during the period 25 November, 1979-24 February, 1980. Yolked ovarian follicles and oviducal eggs were counted in each female. One frog (SVL = 35.0 mm), collected on 28 January, contained 434 yolked ovarian follicles and 150 oviducal eggs; another (SVL = 34.0 mm), collected on 24 February, contained 487 yolked ovarian follicles and 77 oviducal eggs. Other females in the sample contained yolked ovarian follicles but lacked oviducal eggs. These 20 females ranged in SVL from 30.0-37.0 mm ($\bar{x} = 33.70 \pm 0.76$) and contained 214-848 yolked ovarian follicles ($\bar{x} = 443.05 \pm 77.52$). Number of yolked ovarian follicles in gravid *P. ornata* showed a weak positive correlation with SVL ($r^2 = 0.45$). The female *P. ornata* herein reported were deposited in the Savannah Science Museum herpetological collection.

Submitted by **CHARLES W. SEYLE, JR.**, Research Associate, Savannah Science Museum, 4405 Paulsen Street, Savannah, GA, 31405, and **STANLEY E. TRAUTH,** Dept. of Biology, University of South Florida, Tampa, FL, 33620. ●

RANA PIPIENS (Leopard frog). **PREDATION.** During a recent study of the trophic ecology of largemouth bass, *Micropterus salmoides*, in Lake Rebecca, Hennepin County, Minnesota (Cochran and Adelman, Env. Biol. Fishes, in press), evidence for a seasonal pulse of predation upon leopard frogs was obtained. Young-of-the-year frogs were first observed along the shoreline of the lake on 20 Jul 1978. Since reproductive activity was not noted during the spring, and no tadpoles were ever collected during seining, electrofishing, or fish stomach sampling, it is likely that these frogs had dispersed from a reproductive site elsewhere. This would be consistent with Merrell's (1977, Occas. Pap., Bell Mus. Nat. Hist., No. 15) generalization that young leopard frogs disperse to the shores of large permanent water bodies from breeding sites in temporary ponds without fish. Although they were observed in the immediate vicinity of the shoreline for the rest of the season, frogs were found in only 2 of 404 bass sampled on 8 dates from 17 May-29 Aug 1978. However on 21 Sept, frogs were found in 4 of 84 stomachs, whereas on 5 Oct, 11 frogs were found in 10 of 52 stomachs.

Predation on leopard frogs by bass in early autumn was probably enhanced by increased availability of frogs due to two factors: (1) a die-off of aquatic macrophytes around the edge of the lake, noted in progress as early as 21 Sept, may have in effect removed a "buffer strip" that served to minimize contact between bass and frogs earlier in the season (frogs were found in five bass stomachs that also contained fragments of reeds or other vegetation), and (2) the frogs appeared to spend more time in the water with the onset of cooler weather, as was also noted by Merrell (*ibid.*). A sample of frogs collected on 5 Oct from 1200-1230 were all captured in approximately 15 cm of water with air and water temperatures at 12 C and 14 C respectively. That frogs overwintered in the lake was indicated by the observation of large numbers of dead individuals on the bottom in shallow water after a severe winterkill in March 1979.

The addition of frogs to the diet of bass in early autumn occurred during the midst of a period of high bass growth rates when alternate prey were abundant. Moreover, anglers were observed successfully using leopard frogs as bait as early in the season as late July, supporting the conclusion that low predation rates by bass on frogs at that time were due to low availability of frogs and not to the presence of more highly preferred prey.

Twelve frogs collected on 5 Oct had a mean snout-vent length of 46 mm (range: 40-56 mm), whereas 6 relatively intact frogs found

in stomachs had a mean snout-vent length of 60 mm (range: 48-73 mm). The range in total length of bass that contained frogs was 206-473 mm. One bass that contained a frog on 21 Sept contained 2 frogs when recaptured on 5 Oct.

Submitted by **PHILIP A. COCHRAN,** Department of Entomology, Fisheries, and Wildlife, University of Minnesota, St. Paul, Minnesota. Present address: Laboratory of Limnology, University of Wisconsin, Madison, Wisconsin 53706. ●

CAUDATA

PHAEOGNATHUS HUBRICHTI (Red Hills Salamander). **REPRODUCTION.** Within ten years of the discovery and description of *Phaeognathus hubrichti,* the Red Hills Salamander (Highton, 1961, Copeia:65-68), it became clear that it's range was tiny (Schwaner and Mount, 1970, Copeia:571-573) and that the species was in danger of extirpation through habitat destruction (Jordan and Mount, 1975, J. Herpetol. 9:211-215). The species is now listed as "threatened" by the U. S. Fish and Wildlife Service (Federal Register, January 17, 1979, part II, page 3650), the first amphibian in the United States to be so listed (Andres et al., 1976, Ann. Rept., U. S. Fish & Wildl. Serv., 221 p. At least one commercial owner of *P. hubrichti* habitat has agreed to manage it in a manner that will ensure its integrity (Andres et al., 1976).

Despite the need to reserve or manage habitat for this species and to monitor population density, information on demography and reproductive ecology is scarce. Data on oocyte sizes indicate that egg laying may continue to the end of summer, but that most eggs are laid in the spring months (Brandon, 1965, Copeia:67-71; Schwaner and Mount, 1970). Clutches of *P. hubrichti* eggs have not been reported from nature but the size of the largest oocytes (6-7 mm in diameter, Brandon, 1965) and their number suggest the absence of an aquatic larval stage.

In this note are recorded the first instance of egg deposition in this species, in captivity, and a description of the laid eggs.

On 1 July 1976 a female (115 mm snout-vent length), which had been in captivity in the Cincinnati Zoo nearly six years at 7° C (winter) to 18° C (summer) in a 27 X 40 X 9-cm plastic box on damp paper towels, deposited a clutch of 16 eggs. Previous estimates of clutch size based on oocyte complements were 8 and 9 for females 105 and 109 mm in snout-vent length, respectively (Brandon 1965). Until earlier in 1976 the female had been kept essentially in darkness and fed earthworms and crickets weekly. Early in 1976 the room in which salamanders were maintained was equipped with fluorescent lighting regulated to match Cincinnati photoperiod. Thereafter, females of several other species of plethodontid salamanders (*Ensatina eschscholtzii, Plethodon nettingi,* and *P. jordani*) that had been kept for years without reproductive activity also began to deposit eggs.

The eggs of *P. hubrichti* were attached in a cluster, from a common stalk, to the underside of an arched piece of cork bark from which they hung pendulously. The pigmentless eggs were 7-7.2 mm in diameter and were attached to the bark or to other eggs by their outer envelopes. Diameters of eggs plus envelopes were about 8.5 mm. The female was not observed to brood and none of the eggs developed; all were preserved at the first sign of deterioration.

Submitted by **RONALD A. BRANDON** and **EDWARD J. MARUSKA,** Department of Zoology, Southern Illinois University at Carbondale, Carbondale, Illinois 62901; and Cincinnati Zoo, 3400 Vine Street, Cincinnati, Ohio 45220. ●

SAURIA

CNEMIDOPHORUS UNIPARENS (Desert Grassland Whiptail). **BEHAVIOR.** Schall and Pianka (1980, Am. Nat. 115:551-566.) proposed an "escape tactic diversity" hypothesis wherein they described and quantified various escape tactics and the occurrence of tail autotomy in five *Cnemidophorus* species. A species not included in their study was the Desert Grassland Whiptail. I observed a predator-prey interaction between a Sonora Whipsnake, *Masticophis bilineatus,* and a *C. uniparens* in Sawmill Canyon, Pima Co., Arizona, in Upper Sonoran desert grassland. The following is an account of the incident.

On 8/10/81, at 1130 h, I saw the snake actively pursuing the lizard. Both were traveling at a high rate of speed across rocky, open ground for a distance of at least 6 m (I did not see the initial chase), until the lizard attempted to escape into a rock pile of a campfire site. The snake followed the lizard into the rock pile and managed to catch it by the base of the tail. The lizard lost its tail and ran out of the rock pile, stopping in a clearing about 5 m away. When I attempted to photograph the tail-less lizard, it ran back to the rock pile, whereupon the snake immediately captured it, this time across the chest region. The lizard was eventually swallowed.

This field observation documents a naturally occurring incident of tail autotomy in *C. uniparens.*

Submitted by **KATHLEEN GROSCHUPF,** Dept. of Biology, Virginia Polytechnic Institute and State University, Blacksburg, Virginia 24061. ●

EUMECES FASCIATUS (Five-lined Skink). **MORPHOLOGY.** A bifid tailed *Eumeces fasciatus* (Fig. 1) was captured by George Steward on 23 March 1981 at the base of a rotting stump near Steward's home in Clarksville, Tenn. It was presented to me, alive, on the following day, whereupon it was refrigerated for a few days before being sacrificed, preserved and deposited in the APSU Museum of Zoology (APMZ No. 3312).

The specimen is an adult male measuring 164 mm total length (SV 72 mm, tail 92 mm). The bifurcation is 78 mm posterior to the cloacal opening and appears to have resulted from a dorsal outgrowth of an original, unbranched tail.

Bifid and even trifid tailed individuals of several lizard species have been reported previously (Smith, 1946, Handbook of Lizards, p. 392; Banta, 1963. Turtox News 41:207; Crouch, 1969, Wildlife in Australia 6:101; Goin and Goin, 1971. Introduction to Herpetology, p. 281; and Clark, 1973, HISS News-Journal 1:158). However, this appears to be the first report of such an anomaly in *E. fasciatus.*

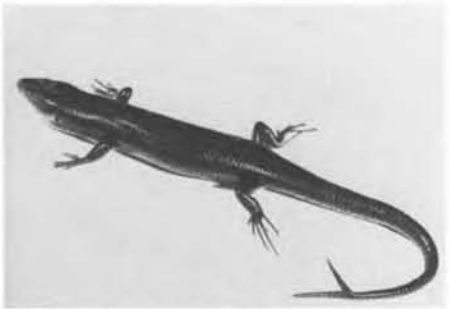


Figure 1. A bifid tailed adult male *Eumeces fasciatus.*

Submitted by **A. FLOYD SCOTT,** Department of Biology, Austin Peay State University, Clarksville, Tennessee 37040. ●

EUMECES FASCIATUS (Five-Lined Skink). **MORTALITY.** An adult female *Eumeces fasciatus* was found dead in a decayed log adjacent to an abandoned beaver pond on the Oconee National Forest, Greene County, Georgia, an apparent victim of an accidental entrapment. The skink was apparently traversing the interior of the decaying log by using the tunnels of some species of wood boring beetle. The skink was stuck in a small hole on the surface of the log, presumably while attempting to exit the tunnel system. The skink managed to squeeze through the small hole as far as the rear legs, which were apparently too wide for the hole. The skink apparently did not try to back up; the rear legs were thoroughly lodged in the hole. The skink probably died as an indirect result of overexposure. When found, the specimen was still limp with no external signs of predation.

Submitted by **ROBERT L. LOCHMILLER,** Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843. ●

SERPENTES

ELAPHE GUTTATA EMORYI (Great Plains Rat Snake). **FOOD.** Rat snakes (genus *Elaphe*) are known to feed on a variety of food items (Wright and Wright, 1957. Handbook of Snakes of the U.S. and Canada). However, snakes are rarely reported as being consumed. Yellow rat snakes, *E. obsoleta quadrivittata,* are known to include snakes in their diet (Wright and Wright, ibid.) and cannibalism has been noted in a group of captive-hatched juvenile corn snakes, *E. g. guttata* (Hillis, 1974. Bull. Maryland Herpetol. Soc. 10(1):31-32). An additional incidence of ophiophagy in *E. guttata* is noted here.

In September 1979, the New York Zoologi-



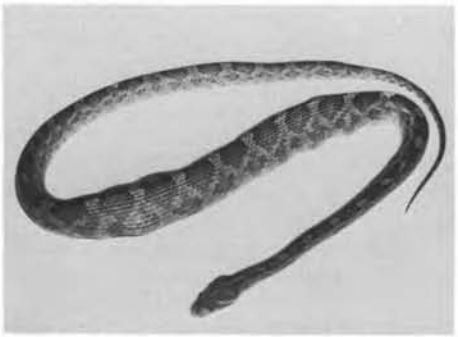


Fig. 1. Adult Great Plains Rat Snake after consuming an adult Texas Garter Snake.

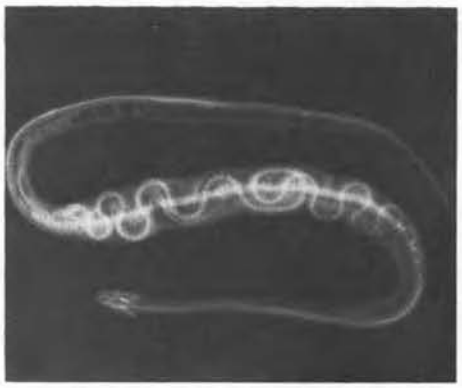


Fig. 2. Radiograph of Great Plains Rat Snake showing the ingested Texas Garter Snake.

cal Park received a shipment of Great Plains rat snakes, *E. guttata emoryi* and Texas garter snakes, *Thamnophis sirtalis annectens*. The snakes were separated into groups of three and four and soaked overnight in plastic barrels (66 cm height, 55 cm diameter). The water depth was 3 cm.

The next morning it was observed (Fig. 1) that a female *E. guttata emoryi* (weight 174 g, snout-vent 85 cm, total length 103 cm) had consumed a female *Thamnophis sirtalis annectens* (weight 94 g, snout-vent 60 cm, total length 77 cm). A radiograph determined that the garter snake had been ingested head first (Fig. 2).

The Department of Animal Health at the New York Zoological Park took the radiograph. Thanks are also extended to Bruce Foster for supplying the photograph.

Submitted by **HUGH K. McCRYSTAL,** Department of Herpetology, New York Zoological Park, Bronx, New York 10460 (present address: Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843.

ELAPHE OBSOLETA (Black Rat Snake). **AUTOPHAGY.** Several cases of ingestion of tails by lizards that have recently autotomized them (autophagy) have been reported; it has been suggested that consumption of an autotomized tail is energetically economical (Vitt, *et al.*, 1978. Ecology 58:326-337, and references therein.). Autophagy is rare in lizards but would be unexpected in snakes since few snakes readily autotomize their tails.



Figure 1. Result of an unusual incident of autophagy in *Elaphe obsoleta*.

On 4 December 1981, a juvenile *Elaphe obsoleta obsoleta* (approx. 300 mm total length) was found by one of us (DE) under a bush at Matoaca Elementary School, Matoaca, Chesterfield Co., Virginia. Discovery of a snake that morning (0845 EST) was unusual since it was raining and cold (4.5°C). The snake was placed in a quart jar for viewing by students. It was cold and, consequently, moved slowly. The jar was placed atop a radiator heater until it was warm to the touch (about 2 min.), then placed on an adjacent windowsill. As it was warming, the snake bit a portion of its tail, about 2cm from the tip. It did not release its grasp but continued to engulf the tail and eventually most of its body. Consumption took about 2 hours and resulted in a circle 4cm in diameter (Fig. 1).

Upon its arrival at the University of Richmond, approximately 5 hours later, the snake was dead. Necropsy revealed that passage of the body continued through the pyloric sphincter and into the small intestine. Consumption behavior resulted in two complete revolutions within the outer circle. The tail was bent about 1.5cm below the anal plate and it circled anteriorly for one-half the circumference of the outer circle. Digestion had not started when the snake died. We suspect death was caused by the snake's inability to inflate its lungs because of pressure from the "meal." The specimen is deposited in the National Museum of Natural History (USNM 225101).

We believe some role in triggering this unusual behavior was played by the sudden exposure of the cold snake to the warm (possibly hot) temperature. One of us (CAP) observed an instance of self-biting (on the tail) by a *Nerodia septemvittata* when immersed in an ice bath. Such sudden and drastic changes in temperature could alter normal neurological and behavioral patterns and result in bizarre behaviors such as described above. Whether snakes exposed to sudden temperature changes in nature exhibit abnormal behavior awaits further observations and/or experimentation. Perhaps a similar unusual behavior observed in the Colonial period led to the hoop snake myth.

ACKNOWLEDGMENTS

Chip Young and Shane Neave helped in the initial phase of this observation.

Submitted by **JOSEPH C. MITCHELL,** Department of Biology, University of Richmond, Richmond, Virginia 23173, **CHRISTOPHER A. PAGUE,** Lafayette Zoological Park, 3500 Granby St., Norfolk, Virginia 23504 and **DAVID L. EARLY,** Matoaca Elementary School, Matoaca, Virginia 23803.

LEPTODEIRA ANNULATA ASHMEADII (n.c.n.). **ENVENOMATION.** *Leptodeira annulata ashmeadii* is a small rear-fanged colubrid snake that is very common in lowland forests and savannas in Venezuela. It is a snake that is generally regarded as being harmless. I have, during seven years of field work captured and handled numerous specimens of this subspecies without accident.

During 1976, I was attempting to demonstrate the rear fangs of a small (± 30 cm) specimen to two veterinary surgeons, when the snake managed to bite the middle joint of the middle finger of my left hand. Since I did not wish to damage the snake's mouth by pulling it away, nor did I expect to be envenomated, I placed my hand on the floor in order to let the snake free itself. This resulted in the snake chewing on my finger for about 10 seconds. During this time, a very slight pricking sensation was felt at the site. The finger began to swell after 5 minutes, and within one hour was so swollen that it could not be bent. The swelling extended to the wrist within 8 hours. I measured my temperature several times during the first 2 hours and it remained normal. There were no other symptoms apart from a very slight pain to the touch at the site of the bite. I did not seek medical aid because the nearest specialist was 100 miles away. I applied no medication whatsoever, even though I had polyvalent anti-serum (horse anti-*Bothrops, Lachesis, Crotalus*), anti-coral (rabbit anti-*Micrurus*) and a variety of antihistamines available. The swelling went down after three days.

Submitted by **STEFAN GORZULA,** Departamento de Medicina Experimental, I.V.I.C., Apartado 1827, Caracas, Venezuela. Present address: CVG/EDELCA, Departamento de Ecología, Apartado 28, Puerto Ordaz, Estado Bolívar, Venezuela.

MICRURUS FULVIUS TENERE (Texas coral snake). **REPRODUCTION.** An adult pair of *Micrurus fulvius tenere* was donated to the Houston Zoological Gardens (HZG) in late April 1981. Both specimens were collected in Harris County, Texas shortly prior to the donation dates. The pair was placed together for breeding purposes on 12 May 1981. Copulation was recorded shortly after introduction, and the pair was maintained separately thereafter.

A clutch of eight elongate, non-adherent eggs was laid 18 June 1981, 37 days after observed copulation. A small box of damp sphagnum moss was available for nesting purposes but was not utilized. Egg-length ranged from 33-44 mm ($\bar{x}$=36.3mm), egg-diameter from 11-13 mm ($\bar{x}$=11.6 mm), and egg weight from 2.9-4.5 g ($\bar{x}$=3.5 g). Total

clutch weight (28.3 g) was 88 percent of the female's post-ovipositional weight (32.0 g). The eggs were incubated in a vermiculite medium (Tryon, B. W. 1975. Bull. New York Herp. Soc. 11:33-37) and maintained between 25-32° C.

Two eggs slit longitudinally on 5 August 1981. By the morning of 6 August, 49 days after egg deposition, all eight hatchlings had emerged. Sex ratio was five males and three females as determined by total length/tail length ratios. Total length of the eight hatchlings varied from 196-210 mm ($\bar{x}$= 205.2 mm) and weight varied from 2.9-3.3 g ($\bar{x}$=3.1 g). Adults and neonates were released shortly after the hatching date.

A second female was collected between Bryan and Caldwell in Brazos County, Texas shortly prior to its donation to Texas Cooperative Wildlife Collection (TCWC: LA 8101) on 19 April 1981. The specimen was maintained in a 19 liter aquarium with pine bark substrate. Small snakes (*Leptotyphlops, Nerodia* and *Virginia*), lizards (*Anolis*) and hylid frogs were offered as food but all were ignored.

On 10 July 1981, the specimen laid nine eggs. Egg-length ranged from 30-35 mm ($\bar{x}$= 32.1 mm), egg diameter from 14-19 mm ($\bar{x}$= 15.3 mm) and egg-weight from 1.7-3.1 g ($\bar{x}$=2.4 g). Though all appeared dehydrated upon discovery, all were incubated by the above technique at 22-27° C. By 13 July, seven eggs appeared discolored and were determined to be infertile. On 10 September at 0800 h, one neonate had slit the egg and had its head protruding. By 1700 h, the second fertile egg had pipped. Both neonates (TCWC: LA8117-8) had emerged by 0800 h, 11 September after 62 days incubation. Total lengths were 234mm and 238mm ($\bar{x}$=236 mm) and weights were 3.4 g and 3.6 g ($\bar{x}$=3.51 g). The adult female consumed two *Ophiodrys* and one *Nerodia* before being released with the two hatchlings in mid-September 1981.

Reproduction in *M. f. tenere* was summarized by Quinn (1979. Copeia 1979(3):453-463). The HZG account herein is noteworthy as it represents a probable captive-breeding of this form. Though Quinn found sperm in the oviducts of females from October through May, the TCWC female reported herein must have retained viable sperm past May in order to produce fertile eggs in July, 83 days after the date of acquisition. The difference of 12 days in egg incubation time was probably due to the slightly higher temperature range utilized at HZG.

Submitted by **BERN W. TRYON,** Department of Herpetology, Houston Zoological Gardens, P.O. Box 1562, Houston, Texas 77001 and **HUGH K. McCRYSTAL,** Department of Wildlife and Fisheries Sciences, Texas A&M University, College Station, Texas 77843. ●

REGINA GRAHAMI (Graham's Crayfish Snake). **COLORATION.** According to the reviews of Hensley (Hensley, M., 1959, Mich. State Univ. Biol. Ser., 1 [4]) and Dyrkacz (Dyrkacz, S., 1981, SSAR Herp. Circ. 11) no instances of albinism in this species has been reported in the literature. On 1 July 1961 I collected a complete albino of this species 1.6 km N of Ganado, Jackson Co., Texas at 6:15 PM AOR. It was an adult ♀, having a S-V length of 524 mm and a tail length of 98 mm. After 20 years of preservation, the eyes are clear with the pupils slightly darkened and the scales slightly yellowed. It is presently in the private collection (EAL 250) of the author.

Submitted by **ERNEST A. LINER,** 310 Malibou Blvd., Houma, Louisiana 70360-2598. ●

THAMNOPHIS PROXIMUS (Western Ribbon Snake). **REPRODUCTION.** A gravid female was collected 2 miles south of Columbia, Boone County, Missouri, on 26 April 1981, by Joe Blum. After being maintained in captivity under natural conditions of light and temperature, the snake gave birth to a litter of five young on 25 June 1981. The female measured 784 mm (TL) and 572 mm (SV) at the time of parturition. The litter is notable for its small size; the previously reported minimum litter size for the species was four (Carpenter. 1958. Herpetologica 14:113-115), but average litter size is twelve (Fitch. 1970. Univ. Kansas Mus. Nat. Hist. Misc. Publ. No. 52). Also noteworthy is the early date of birth. The previously reported record in the United States was 4 July (cited by Wright and Wright. 1957. Handbook of Snakes of the United States and Canada, Vol. II. Cornell Univ. Press). The sizes of the neonates are also exceptional. Total lengths of the young in this litter at the time of birth were (SV lengths in parentheses): 256 (184), 275 (184), 282 (205), 283 (207), 298 (214) mm. The largest previously reported total length was 280 mm (cited by Behler and King. 1979. The Audubon Society Field Guide to North American Reptiles and Amphibians. Alfred A. Knopf, Inc.). The snake and young are currently being kept and exhibited at Avila College, Kansas City, Missouri. Upon their death they will be deposited in the Bobby Witcher Memorial Collection at Avila College.

Submitted by **ROBERT POWELL,** Avila College, Department of Natural Sciences, 11901 Wornall Road, Kansas City, Missouri 64145. ●

TESTUDINES

EMYDOIDEA BLANDINGI (Blanding's Turtle). **REPRODUCTION.** Graham and Doyle (1979. Journal of Herpetology, 13(1): 125-127.) referred to a clutch of 17 eggs they observed deposited by a captive specimen as the largest reported.

I observed a 22.9 cm *E. blandingi* deposit 19 eggs in captivity between 10 and 18 July 1980. The turtle was obtained from a motorist who had captured it several days earlier on a roadside in Trempeleau County, Wisconsin. The number of eggs deposited ranged from 0-5 eggs per day. $\bar{x}$ egg length: 38.6 mm (range: 38.1-39.0 mm). $\bar{x}$ egg diameter: 19.2 mm (range: 17.7-22.0 mm).

After laying was completed, the specimen was released in the Central Wisconsin Conservation Area. The eggs were incubated at 21-23° C, buried 10 cm deep in slightly moistened sand. After 100 days of incubation, no development was noted and the eggs were opened. All but two of the eggs were infertile. The two embryos were poorly developed.

I wish to thank James Harding and Dr. Max Nickerson for their assistance in obtaining background information for this manuscript.

Submitted by **KEVIN N. BREWSTER.** Rt. 1, Three Lakes, WI 54562. ●

GOPHERUS POLYPHEMUS (Gopher Tortoise). **BURROW ASSOCIATES.** Landers and Speake (in press, Management needs of sandhill reptiles in southern Georgia, Publ. Proc. Southeastern Assoc. Game and Fish Comm.) summarized vertebrate inquilines occurring in gopher tortoise burrows and included new records for some forms, *e.g. Sistrurus miliarius barbouri.* During an extensive series of tortoise burrow excavations (N = 218) on the Kings Bay Naval Submarine Support Base, Camden County, Georgia, the following snakes were encountered within abandoned gopher tortoise burrows. These snakes were deposited in the herpetological collection at the Savannah Science Museum, to which the specimen numbers refer.

Micrurus fulvius fulvius. Two female snakes were found in tortoise burrows on 19 February 1981. SSM 9564 (720 mm SVL) occurred under leaves in the sunlit entrance of a partially collapsed burrow. SSM 9565 (740 mm SVL) was removed from a small root tunnel leading away from the collapsed lower portion of an excavated burrow; it was about 3 m from the burrow entrance.

Sistrurus miliarius barbouri. We captured two female snakes within the entrances to small tortoise burrows. SSM 9502 (384 mm SVL) was found on 20 February 1981; SSM 9503 (297 mm SVL), on 24 February 1981.

These records are the first documented occurrences of *Micrurus fulvius fulvius* in gopher tortoise burrows and the second reports for *Sistrurus miliarius barbouri* there. It is likely that these snakes were overwintering in the tortoise burrows and, thus, are at least transient members of the gopher tortoise burrow community.

Submitted by **CHARLES W. SEYLE, JR.,** Research Associate, and **GERALD K. WILLIAMSON,** Research Director, Savannah Science Museum, 4405 Paulsen Street, Savannah, GA 31405. ●

TERRAPENE C. CAROLINA (Eastern Box Turtle). **REPRODUCTION.** Most literature records list seven or eight eggs as the upper limit of a single clutch of eggs from *Terrapene carolina carolina (c.f.,* Ernst and Barbour, 1972, Turtles of the United States); there is one brief note by Zieller (1969. Int. Turtle & Tortoise Soc. J. 3(6):6-9, 30, 31.) of a captive depositing eleven eggs in June 1960.

On 15 June 1980 at approximately 7:00 P.M. a large *T. c. carolina* was located at Wilton, Fairfield County Connecticut in the early stages of nest construction along the tracks of the Penn Central Railroad Company. The first egg was deposited at 9:06 P.M. and a total of eleven eggs were deposited by 9:15 P.M.; nesting was typical for the species. The dimensions and weights of the eggs were

recorded within one-half hour after deposition. The length of the eggs ranged from 24.5 - 37.5 mm ($\bar{x}$ = 33.0, S.D. = 3.525, δ = 12.423), the width of the eggs ranged from 21.5 - 22.5 mm ($\bar{x}$ = 22.3, S.D. = .410, δ = .168) and the weight of the eggs ranged from 8.2 - 10.3 grams ($\bar{x}$ = 9.7, S. D. = .618, δ = .382). A plaster cast was made of the nesting excavation; the throat measures 80 X 70 X 35 mm and the actual egg chamber measures 110 X 90 X 55 mm. Following are the dimensions (straight-line) and the weight of the specimen after nesting.

Carapace (mm)	Plastron (mm)	Height (mm)	Weight (g)
159 X 124	159 X 98	79	746.3

The eggs were moved to an artificial incubator and hatched 18 August 1980; one egg failed to hatch and upon examination of the egg proved to be a near term embryo which apparently died after making the initial break in the egg shell. This specimen is now in the preserved collection of the American Museum of Natural History (AMNH 119636).

The adult *T. c. carolina* was marked and released where found 48 hours after egg deposition and was not recovered during the 1981 nesting season. I suggest the upper limit of eggs for a single clutch from *T. c. carolina* be placed at eleven eggs.

Submitted by **JAMES L. WARNER,** 7 Gaylord Drive, Wilton, CT 06897. Present address: Dept. of Biological & Environmental Science, Western Connecticut State College, Danbury, Connecticut 06810. ●

TRIONYX FEROX (Florida Softshell). **SIZE.** This paper presents data on four exceptionally large Florida Softshell turtles that exceed previously published records. All specimens were females. Collection data and measurements are given.

COLLECTION DATA

Turtle 1

Found by Tim Williams and Marvin Brown on State Road 13A north of State Road 207, St. Johns County, Florida, June 30, 1979, 4:30 p.m. (new moon). Donated to St. Augustine Alligator Farm.

Turtle 2

Found by Dennis Magee near St. Johns River, Jacksonville, Florida, Duval County, July 1, 1979. Donated to Jacksonville Zoological Park in care of Ralph Williams, Reptile Supervisor.

Turtle 3

Found by Scott Glasscock on land at the Deseret Ranch, East Hwy 192, near St. Johns River marsh, Osceola County, May 15, 1979. Delivered to Gatorland Zoo, Kissimmee, Florida.

Turtle 4 (see figure below)

Found by John Black near St. Johns River marsh and east of Blue Cypress Lake, Indian River County, crawling on dry land, 4:00 p.m., August 26, 1979. This specimen old, scarred with most of tail missing. Donated to St. Augustine Alligator Farm. I, in turn, delivered to Florida State Museum, Gainesville.



Fig. 1. Photo of RA 4

MEASUREMENTS

Measurements were made with flexible U.S.A. steel tape following curve of carapace, plastron, and then converted to metric. The live turtles were placed on top of eight inch concrete blocks and held by an assistant while measuring. Turtle 4 was measured September 1, 1979, and added to the manuscript. It was measured again September 12th and weight loss of 4 pounds noted and height measurement of ½ inch. This turtle was also measured by square, straight line method, as described by Roger Conant. Turtle 3, the largest, on exhibit at Gatorland Zoo, was measured while in the turtle exhibit pen and weighed by Zoo personnel.

Table 1. Measurements (mm) following shell curve, with straight line measures for RA4 parenthetically.

Number	RA 1	RA 2
Carapace length	603	568
Carapace width	454	456
Plastron length	438	—
Height	114	—
Weight (Kg)	13.72	14.06
Number	**RA 3**	**RA 4**
Carapace length	673	630 (580)
Carapace width	530	482 (410)
Plastron length	469	450 (450)
Height	193	171 (171)
Weight (Kg)	29.48	21.77

Special thanks are expressed to St. Augustine Alligator Farm for Research facilities and travel expenses.

Submitted by **E. ROSS ALLEN,** St. Augustine Alligator Farm, P.O. Drawer E, St. Augustine, FL 32084. ●

NEW DEVELOPMENTS IN HERPETOLOGY AT THE MUSEUM OF COMPARATIVE ZOOLOGY, HARVARD UNIVERSITY

The Department of Herpetology, Museum of Comparative Zoology, is now able, thanks to the National Science Foundation, to offer small sums for travel and per diem to visiting scientists able and willing to revise genera and families in its collections. To advertise this opportunity and because it is our feeling that the MCZ collections have in the past been under-utilized, we here provide a description of the current range and strengths of the collections and of the present plans and research thrust of the Department.

Ever since its founding by Louis Agassiz in 1859, the Department has attempted to be synoptic. Although Agassiz's goal of "typical specimens" from everywhere has never been quite achieved, every curator since Agassiz has endeavored, by international contacts and exchanges, to obtain as broad a coverage of the world's faunas as possible and, *in addition*, has emphasized acquisition of extensive collections from special areas, the latter including large, well-documented series of certain taxa. These efforts over the more than 120-year history of the collections have resulted in an extraordinary research and educational tool that is also an exceptional historical record.

The accessioning policy of the MCZ collection has been, and will continue to be under the new curator, to attempt to concentrate on the two objectives stated above, i.e., 1) to achieve a comprehensive synoptic coverage through an active exchange program and purchase of private collections; and 2) to develop large series of taxonomic groups or of geographical areas.

In regard to the first goal, we are interested in exchanges at the national and international level and lists of our holdings are available for this purpose. We welcome inquiries from other institutions and individuals. In regard to the second goal, each successive curator has had his own areas of special interest and attention: Garman and Barbour, the West Indies; Loveridge, Africa; Williams, the genus *Anolis*, the West Indies and South America. In addition, huge collections from Bougainville and New Guinea were received during Williams' tenure.

The collection now contains about 600,000 specimens in alcohol, more than 2,000 of which are primary types. There are 7,000 skeletons, 20,000 chromosome slides and smaller embryological slide collections. The Herpetology library is enormous, the result of donations by Louis and Alexander Agassiz, Garman, Barbour, Loveridge and E. E. Williams: there are 24 file cabinets of reprints and about 200 shelf feet of books. The coverage of the



herpetological literature is outstanding. Many of the books are old, irreplaceable classics.

The Department is presently undergoing a series of small renovations thanks to combined NSF and MCZ support. The most important is the organization of a skeletal preparation and storage facility. The area, equipped with most wet laboratory facilities (e.g. hood, chemical benches, distilled water, etc.), will allow for the expansion and adequate curation of our already valuable skeletal collection. We hope that these new facilities will further promote the usage of the collection as a research tool.

During his curatorship (he retired from that office in July, 1980), E. E. Williams, while not at all discouraging the collection of amphibians, emphasized reptiles, especially lizards, and in his own and most students' work particularly the genus *Anolis* and its close relatives. (This has resulted in what is unquestionably the best collection of *Anolis* in the world.) Research under Williams' auspices was wide-ranging, from systematics and anatomy to ecology, karyology, and electrophoresis. Biogeography, especially of the West Indies, was a major concern.

Williams continues active work. He and his present and former students continue with their interest in karyotypes and electrophoresis. SEM studies with Jane Peterson have recently flowered. Studies with the latter and Richard Etheridge now extend to the "anoloid" southern South American iguanids that appear to be a sister group or groups to the anolines.

Under the new curator, a change in emphasis is expected. Pere Alberch's group of interest is the amphibians and his research technique comparative and experimental embryology. His incorporation into the MCZ teaching staff has been coupled with the addition, to the Herpetology Department facilities, of a modern laboratory to do histological and embryological work, including live animal facilities. Most of the work in Alberch's laboratory concerns salamanders and it is expected that this will freshen and enlarge the salamander collection, probably the weakest area in the MCZ collection. With the exception of very large collections of *Plethodon cinereus,* made by Williams and students, the salamander collection has remained too snyoptic, with few large series. In spite of its central focus on urodeles, projects involving anurans and snakes are currently being carried out in Alberch's laboratory. Alberch welcomes prospective graduate students interested in any herpetological group as long as the conceptual approach is related to development, evolutionary morphology and systematics.

There are defects we are endeavoring to correct. Until seven years ago there was no geographic file at all. Even now requests for lists of our specimens from specific areas cannot be honored without hardship and expense. Currently, a major effort has been undertaken to complete our geographic file by the end of the 1982 summer. We do maintain species files and routinely xerox our cards on request.

The staff of the Department consists of only one curator and (with the aid of NSF) two curatorial associates. In addition, one or two curatorial assistants are also employed. E. E. Williams continues to assist when he is in residence. The Curatorial Associates are José P. O. Rosado and James L. Knight. Knight, currently interested in the systematics and ecology of some groups of neotropical colubrid snakes, is in charge of the library and of the non-traditional collections. Rosado is the Collections Manager and is in charge of cataloguing, loans, and most aspects related to the maintenance of the main alcoholic collection.

Loan policies are liberal, but visits are encouraged. All requests should be addressed to Dr. Pere Alberch. ●

BOOK REVIEWS

THE NATURAL HISTORY OF MEXICAN RATTLESNAKES. Barry L. Armstrong and James B. Murphy. Special Publication No. 5, Univ. Kansas Museum of Natural History, 88 pp., Dec. 14, 1979. $6.00.

The authors of this book attempt to synthesize the facts of natural history of Mexican Rattlesnakes, based primarily on their own experiences and maintenance of most of the Mexican rattlesnake taxa in captivity. Only three species of their compendium *(C. Stejnegeri, C. catalinensis* and *C. tortugensis)* were not adequately discussed. The first species because it is extremely rare and the latter two because they are island forms and the authors were unable to obtain data on them first hand. I am a little surprised that the authors did not let it be known that they lacked information on the two island forms. There are a number of herpetologists, myself included, who have visited the islands, collected the two species and have substantial field notes on habitat, densities and some on behavior. Nothing was noted for the species, *C. lannomi,* perhaps nothing is known.

The book is remarkably free of errors, I spotted only one typographical error, and the format and layout of the photographs is relatively good. Perhaps only one or two of the 14 habitat photographs could have been improved by the printer. The cover color photographs of the four subspecies of *C. willardi* are exquisite. Photographs of *C. atrox, C. cerastes, C. mitchelli, C. ruber, C. tigris,* and *C. viridis* are not included, the obvious reason being that these are fairly common United States forms and nearly every snake book has photographs of them. However there is no reason why photographs of *C. catalinensis* and *C. tortugensis* were not included, nor those of *C. basiliscus* and *Sistrurus ravus.* I would have preferred to have seen a photograph of the two subspecies of *C. durissus* on a natural background rather than an unpainted piece of plywood.

I was also surprised to see that only the authors collecting localities were recorded as being important for documentation of their field data. I am sure most herpetologists would assume that their stated data were valid without listing the exact localities from where their specimens were taken. In retrospect, it would have been better to have given "up-to-date" distribution maps of the various taxa than to cite the few records to validate their field experience. Their "general description of the region" is so general that nothing is described but citations on where to find descriptions.

Perhaps another point of contention is the detailed "blow by blow" account of breeding behavior in *C. atrox* and *C. pusillus,* while the remainder of the species are somewhat lumped into a standard format summary. If the authors had data on 23 other taxa (so indicated, p. 74), especially the relatively rare island form, *C. catalinensis,* why weren't the data utilized? Only three of 10 lines devoted to the discussion of *C. catalinensis* were utilized to describe its breeding and courtship behavior.

I am relatively sure that there are considerable amounts of natural history data on such common rattlesnakes as *C. atrox, C. cerastes, C. ruber, C. scutulatus, C. mitchelli, C. lepidus,* and *C. viridis* that were not utilized by the authors. Their discussion seems to revolve around only those populations of the above species that occur in Mexico. I have never known a rattlesnake to observe a political boundary, and perhaps in this type of synopsis where one hopes to see a summary of all of the known natural history of a species living in the Sonora or Chihuahua Desert, or the Sierra Madre Occidental, we should not recognize that boundary either. The authors duely cited many authors whose contributions to the study of rattlesnake ecology are extremely important, but failed to utilize much of the data available for a comprehensive account, apparently relying on their own contributions more than their predecessors. Perhaps, as the preface indicates, this was their primary goal. There may have been serious monetary restraints placed on the authors by the editor and publisher of this book and the faults outlined above may have been unavoidable from the authors' view point.

Some positive attributes of the book are the photographs, and the $6.00 price tag. In addition, the knowledge that the authors have concerning rattlesnakes isn't lost to the reader. The data presented are worth having for any student of rattlesnake biology, and I recommend that this book be placed among other herpetological literature as a useful compendium on the natural history of Mexican rattlesnakes.

JAMES R. DIXON
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LES BATRACIENS DE MADAGASCAR. Jean Guibé. 1978. Bonner Zoologische Monographien No. 11:1-144 pp, 1-82 pls. (Zoologisches Forschungsinstitut und Museum Alexander Koenig, Adenauerallee 150-164, 5300 Bonn, West Germany; price 35 DM).

The island of Madagascar has a rich and highly endemic herpetofauna, which has been studied extensively over the past three decades, principally by French herpetologists. Les Batraciens de Madagascar is the culmination of Jean Guibé's investigations on the frogs of the island.

A brief introduction contains an outline of the ecophysiographic regions of Madagascar — two regions and six subregions. The rest of the book is a systematic treatment of the anuran fauna, which consists of three families, 24 genera, and 128 species, plus nine specific names that are unassigned. Keys to the genera and species are included in each familial and generic account. Each genus is diagnosed, and each species account contains a synonymy, diagnosis, and brief statement of geographic distribution. Some accounts contain comments on nomenclature and/or individual or geographic variation. Most of the diagnoses include statements about the osteology of the species.

The book is well illustrated; 364 good pen and ink drawings are grouped on 82 plates. Of these figures, 70 are of frogs, 162 are of hands and feet, and 133 are of osteological characters. The book is printed on high-quality paper (16.5 X 24 cm) and has a good paper binding.

No new taxa are named, but Guibé does make some generic changes. He does not recognize *Boophis* as distinct from *Rhacophorus*, and he elevates the subgenus *Aglyptodactylus* (of *Mantidactylus*) to generic status. He treats *Platyhyla* as a synonym of *Platypelis*.

Eighteen of the 24 genera and all but three of the species are endemic to Madagascar. Of the nonendemic genera, *Rana* is represented by an introduced species *(R. tigrina)*, three genera *(Ptychadena, Tomopterna,* and *Hyperolius)* are shared with Africa, and two genera *(Rhacophorus* and *Microhyla)* are widespread in the Oriental Region.

Guibé's alpha taxonomic treatment of the Madagascaran frogs provides a good foundation for subsequent studies on the evolution and biogeography of the anuran faunas. Such syntheses are needed for an adequate understanding of the evolutionary relationships within the ranoid and microhyloid frogs.

WILLIAM E. DUELLMAN
Museum of Natural History and
Department of Systematics and Ecology
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Geographic Distribution

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles** , Collins, Huheey, Knight and Smith, 1978), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Joseph T. Collins, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

CAUDATA

AMBYSTOMA CINGULATUM (Flatwoods Salamander). USA: ALABAMA: Houston Co: 4.45 air km S of Gordon; sec. 25, T.2N., R.29E. 26 October 1981. T. R. Jones and J. C. Godwin. Verified by T. R. Jones and J. C. Godwin, Auburn University (AUM 30282-30283). An adult male and female were collected from beneath separate logs in a dry, shallow gum pond basin following moderately heavy rains. The female contained mature ova and deposited an undetermined number of fertile eggs the following day. Larval *A. cingulatum* were collected at this site by T. Lamb and D. Botts on 4 March 1978. These specimens verify the presence of *A. cingulatum* in southeastern Alabama (Mount, R. H. 1975. The Reptiles and Amphibians of Alabama. Alabama Agric. Exper. Sta., Auburn, AL) and as far as we know, the adults are the first adult *A. cingulatum* that have been collected in Alabama since 1910 (USNM 42861, 57389-91). G. Zug kindly supplied the data for the National Museum specimens.

Submitted by **THOMAS R. JONES,** Alabama Cooperative Wildlife Research Unit, Auburn University, Alabama 36849, **JAMES C. GODWIN,** Department of Zoology-Entomology, Auburn University, Alabama 36849 and **TRIP LAMB,** Department of Zoology, University of Georgia, Athens, Georgia, 30602. ●

CHIROPTEROTRITON PRISCA. MEXICO: NUEVO LEON: 10.4 km N Santa Lucia (by road) at Puerto de Pena Nevada, 2743 m, Pena Nevada Mtn., 20 July 1979, EAL 4672 (31 specimens); 10.4 km N Santa Lucia (by road) at Puerto de Pena Nevada, 2743 m, Pena Nevada Mtn., 21 July 1979, Ernest A. Liner, Richard M. Johnson and Allan H. Chaney, EAL 4676 (3 specimens); 19.6 km NE San Antonio de Pena Nevada, Puerto de Pena Nevada, 2743 m, 6 August 1980, EAL 4773 (11 specimens); 18.6 km SW Zaragoza at La Encantada, 2843 m, 6 August 1980, EAL 4775 (3 specimens); 17.7 km SW Zaragoza at La Encantada, 2835 m, 6 August 1980, Ernest A. Liner, EAL 4781 (5 specimens); verified by Ernest A. Liner. These records extend the range approximately 120-130 km SW of the type locality, Cerro Potosi, Nuevo Leon, and are the most southern localities to date.

Submitted by **ALLAN H. CHANEY,** 1208 W. Richard, Kingsville, Texas 78363, **ERNEST A. LINER,** 310 Malibou Blvd., Houma, Louisiana 70360 and **RICHARD M. JOHNSON,** 4170 Lantern Lane, Mobile, Alabama 36609. ●

PSEUDOEURYCEA GALEANAE. MEXICO: NUEVO LEON: 19.6 km NE San Antonio de Pena Nevada, Puerto de Pena Nevada, 2743 m, 16 July 1980, EAL 4746 (2 specimens); 17.8 km SW Zaragoza at La Encantada, 2835 m, 17 July 1980, Ernest A. Liner and Richard M. Johnson, EAL 4747 (1 specimen); 18.6 km SW Zaragoza at La Encantada, 2835 m, 6 August 1980, EAL 4776 (1 specimen); 17.7 km SW Zaragoza at La Encantada, 2835 m, 6 August 1980, Ernest A. Liner, EAL 4782 (5 specimens); verified by Ernest A. Liner. These records extend the range of this species approximately 70-100 km SE of the previously known southern range in Nuevo Leon.

Submitted by **RICHARD M. JOHNSON,** 4170 Lantern Lane, Mobile, Alabama 36609, **ERNEST A. LINER,** 310 Malibou Blvd., Houma, Louisiana 70360 and **ALLAN H. CHANEY,** 1208 W. Richard, Kingsville, Texas 78363. ●

ANURA

RANA BOYLI (Foothill Yellow-legged Frog). USA: CALIFORNIA: Shasta Co: Pit River at the mouth of Deep Creek, T36N, R6E, Sec. 22, NE Corner. 20 June 1981. M. R. Jennings. Verified by S. D. Busack, University of California, Berkeley. Museum of Vertebrate Zoology, U. C. Berkeley (MVZ 158969). Extends known range 19 km up the Pit River drainage into northeastern Shasta County (Zweifel, 1955, Univ. Calif. Publ. Zool. 54(4):207-292, and Zweifel, 1968, *Rana boylii,* Cat. Amer. Amphib. Rept., 71.1-71.2). Specimen collected is one of two adults observed that morning.

Submitted by **MARK R. JENNINGS,** California Department of Fish and Game, P.O. Box 607, Red Bluff, California 96080. Present address: School of Renewable Natural Resources, 210 Biological Sciences East Building, The University of Arizona, Tucson, Arizona 85721. ●

RANA GRYLIO (Pig Frog). USA: GEORGIA: Glynn Co: Jekyll Island, Golf Clubhouse pond on Captain Wylly Road. 12 October 1979. E. Kiviat. American Museum of Natural History 108379.

Not reported on Jekyll Island by Sandifer et al. (1980. Ecological Characterization of the Sea Island Coastal Region of South Carolina and Georgia, Vol. III. Biological Features of the Characterization Area. US Fish Wildl., Serv., Wash. DC. FWS/OBS-79/42 p. 130) or Schwab and Shelton (1981. Bull. Chicago Herpetol. Soc. 16(3):67-69), though known from nearby Cumberland and Sapelo Islands.

Submitted by **ERIK KIVIAT,** Hudsonia, Bard College, Annandale, New York 12504. ●

SCAPHIOPUS HOLBROOKI HOLBROOKI (Eastern Spadefoot). USA: GEORGIA: Glynn Co: Jekyll Island, 3 localities on S end. 7 and 9

October 1979. E. Kiviat. American Museum of Natural History 108367-108369.

Not reported on Jekyll Island by Sandifer *et al.* (1980. Ecological Characterization of the Sea Island Coastal Region of South Carolina and Georgia, Vol. III. Biological Features of the Characterization Area. US Fish Wildl. Serv., Wash. DC. FWS/OBS-79/42 p. 130) or Schwab and Shelton (1981. Bull. Chicago Herpetol. Soc. 16(3):67-69), though known from nearby Little Cumberland and Sapelo Islands.

Submitted by **ERIK KIVIAT,** Hudsonia, Bard College, Annandale, New York 12504. ●

TESTUDINES

CLEMMYS MUHLENBERGI (Bog Turtle) USA: SOUTH CAROLINA: Greenville Co: 2.5 km W Marietta. 23 August 1980. C. E. Putnam, Jr. Verified by D. W. Herman (Atlanta Zoological Park). Clemson University (CU 37-272). One juvenile found basking on a grass clump at 1430 hr; air temperature 25° C. The site is a woodland bog with a canopy of yellow poplar *(Liriodendron tulipifera)* and red maple *(Acer rubrum).* First record for the state and extends the range at least 20 km S from the southern boundary of Transylvania County, North Carolina, where the turtle is known from several localities (Nemuras, K. 1974. Wildl. North Carolina, 38(2):13-15.

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Atlanta Zoological Park, 800 Cherokee Avenue SE, Atlanta, Georgia 30315 and **CARL E. PUTNAM, JR.,** Rt. 5, Box 37D, Anderson, South Carolina 29621. ●

EMYDOIDEA BLANDINGI (Blanding's Turtle). USA: NEW YORK: Jefferson Co: Millsite Lake, Town of Theresa. 3 July 1981. R. J. Gawlik. American Museum of Natural History (AMNH 120619). Verified by M. W. Klemens. This report extends the species' northern New York range approximately 10 km to the SE of its reported occurrence at Goose Bay Marsh on the St. Lawrence River (Petokas and Alexander, 1978, SSAR Herp. Review 9(3):107) and more clearly defines its range in the St. Lawrence River lowland as described by Petokas and Alexander (1981, New York Fish and Game J. 28(1):119-120). Millsite Lake is deep and cold with steep, rocky shorelines having little aquatic vegetation, and thus does not appear to be suitable Blanding's turtle habitat. We suspect that this individual wandered from its more usual habitat such as the ponds and marshes found in the general area of capture.

Submitted by **PETER J. PETOKAS,** U. S. Fish and Wildlife Service, 100 Grange Place, Room 202, Cortland, New York 13045 and **RANDY J. GAWLIK,** Department of Biological Sciences, State University of New York, Cortland, New York 13045. ●

SAURIA

CNEMIDOPHORUS SEXLINEATUS SEXLINEATUS (Six-lined Racerunner). USA: GEORGIA: Glynn Co: Jekyll Island, 1 km S of eastern terminus of Fortson Parkway. 10 October 1979. E. Kiviat. American Museum of Natural History 120073.

Under concrete fragment in low herbs back of ocean beach. Not reported on Jekyll Island by Sandifer et al. (1980. Ecological Characterization of the Sea Island Coastal Region of South Carolina and Georgia, Vol. III. Biological Features of the Characterization Area. US Fish Wildl. Serv., Wash. DC. FWS/OBS-79/42 p. 131) or Schwab and Shelton (1981. Bull. Chicago Herpetol. Soc. 16(3):67-69), though known from nearby Little Cumberland and Sapelo Islands.

Submitted by **ERIK KIVIAT,** Hudsonia, Bard College, Annandale, New York 12504. ●

EREMIAS CF. NEUMANNI Tornier (Neumann's Sand-Lizard) AFRICA: TANZANIA: Coast Region, Kisarawe District, Edge of Pugu Forest Reserve, on grounds of Pugu kaolin works, app. 23 km SW Dar es Salaam. 9 January 1971. In short grass on kaolin sand. K. M. Howell, D. M. Pearson. Minaki Secondary School, 23 km SW Dar es Salaam, 10 October 1978. K. M. Howell, Michael O'Meara, Tessa van der Willigen. Specimens identified by Dr. E. N. Arnold, British Museum (Natural History) and catalogued as BMNH 1975.993 and 1978.1331, respectively. These two specimens are the first records of *E. neumanni*-like animals south of Ngatana, Tana River, Kenya (Loveridge, 1957, Bull. Mus. Comp. Zool. 117(2):233).

Submitted by **K. M. HOWELL,** Department of Zoology, P.O. Box 35064, University of Dar es Salaam, Dar es Salaam, Tanzania. ●

EUMECES INEXPECTATUS (Southeastern Five-lined Skink). USA: GEORGIA: Glynn Co: Jekyll Island, pond between Amphitheater and Golf Clubhouse, S of Captain Wylly Road. 12 October 1979. E. Kiviat. American Museum of Natural History 120072.

Under old rubber doormat at wooded edge of pond. Not reported on Jekyll Island by Sandifer et al. (1980. Ecological Characterization of the Sea Island Coastal Region of South Carolina and Georgia, Vol. III. Biological Features of the Characterization Area. US Fish Wildl. Serv., Wash. DC. FWS/OBS-79/42 p. 131) or Schwab and Shelton (1981. Bull. Chicago Herpetol. Soc. 16(3):67-69), though known from nearby Cumberland and Sapelo Islands.

Submitted by **ERIK KIVIAT,** Hudsonia, Bard College, Annandale, New York 12504. ●

HEMIDACTYLUS TURCICUS (Mediterranean Gecko). USA: ALABAMA: Jefferson Co: railyard in city limits of Birmingham (T17S, R3W, Sec. 27, N½). 7 October 1981. G. Bosworth. Identified by K. R. Marion. University of Alabama at Birmingham Vertebrate Museum (VM-UAB 0368). First record for county and north Alabama. The locality is *ca.* 230 km NW of an isolated breeding colony near a motel in Eufaula, Barbour County (Mount, R. H. 1975. The Reptiles and Amphibians of Alabama, Auburn University Press) and ca. 150 km NW of the only other reported locality in the state, an apparent small breeding population on the Auburn University Campus, Lee County (R. H. Mount, pers. comm.). The specimen was captured under a railroad tie and was evidently introduced by rail from points south. The railyard regularly receives freight shipments from Pensacola, Florida. Several "small lizards" were also seen by workers in the immediate area in the weeks preceding the capture of this specimen, an adult.

Submitted by **KEN R. MARION** and **GREG BOSWORTH,** Biology Department, University of Alabama in Birmingham, University Station, Birmingham, Alabama 35294. ●

SCELOPORUS COUCHI (Couch's Spiny Lizard). MEXICO: NUEVO LEON: Picachos Mts., 9.8 km SW Cerralvo and 10.1 km W on Rancho El Milagro, 11 July 1977, Ernest A. Liner and Allan H. Chaney, EAL 4299 (7 specimens); 9.8 km SW Cerralvo and 10 km W on Rancho El Milagro, Picachos Mts., 15 August 1978, EAL 4560 (4 specimens); 9.8 km SW Cerralvo and 13.3 km W on Rancho El Milagro, Picachos Mts., 15 August 1978, EAL 4564 (1 specimen); 9.8 km SW Cerralvo and 16.7 km W on Rancho El Milagro, Picachos Mts., 16 August 1978, Ernest A. Liner, Richard M. Johnson and Allan H. Chaney, EAL 4569 (4 specimens); verified by Ernest A. Liner. These specimens extend the range eastward approximately 60 km from the nearest known range in the vicinity of Sabinas Hidalgo.

Submitted by **RICHARD M. JOHNSON,** 4170 Lantern Lane, Mobile, Alabama 36609, **ERNEST A. LINER,** 310 Malibou Blvd., Houma, Louisiana 70360 and **ALLAN H. CHANEY,** 1208 W. Richard, Kingsville, Texas 78363. ●

SCELOPORUS POINSETTI POINSETTI (Crevice Spiny Lizard). MEXICO: NUEVO LEON: Picachos Mts., 9.8 km WW Cerralvo and 11.9 km W on Rancho El Milagro, 10 July 1977, EAL 4296 (1 specimen); Picachos Mts., 9.8 km SW Cerralvo and 11.9 km W on Rancho El Milagro, 11 July 1977, EAL 4297 (5 specimens); Picachos Mts., 9.8 km SW Cerralvo and 10.1 km W on Rancho El Milagro, 11 July 1977, Ernest A. Liner and Allan H. Chaney, EAL 4301 (1 specimen); 9.8 km SW Cerralvo and 13.3 km W on Rancho El Milagro, Picachos Mts., 15 August 1978, EAL 4565 (1 specimen); 9.8 km SW Cerralvo and 16.7 km W on Rancho El Milagro, Picachos Mts., 16 August 1978, Ernest A. Liner, Richard M. Johnson and Allan H. Chaney, EAL 4572 (1 specimen); verified by Ernest A. Liner. These records extend the range approximately 60 km east from the previously known range.

Submitted by **ALLAN H. CHANEY,** 1208 W. Richard, Kingsville, Texas 78363, **ERNEST A. LINER,** 310 Malibou Blvd., Houma, Louisiana 70360 and **RICHARD M. JOHNSON,** 4170 Lantern Lane, Mobile, Alabama 36609. ●

SERPENTES

ELAPHE SUBOCULARIS (Trans-Pecos Rat Snake). MEXICO: NUEVO LEON: 35.4 km SW Bustamante, 610 m, 26 July 1979, (fig. 1); 28.3 km W Bustamante, 610 m, 28 July 1981, (fig.



Fig. 1. *Elaphe subocularis.* 35.4 km SW Bustamante, Nuevo Leon, Mexico.

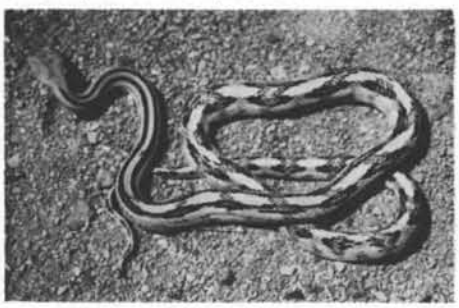


Fig. 2. *Elaphe subocularis.* 28.3 km W Bustamante, Nuevo Leon, Mexico.

2); Ernest A. Liner, Richard M. Johnson and Allan H. Chaney. According to the latest review of this species (Worthington, Richard D., 1980, Cat. American Amph. Rept., 268) these two specimens were collected some distance to the east of the range as depicted and are the most northern localities in Nuevo Leon. They were collected at an archeological site called "Chiqihuitillos" and were photographed and released at the site of capture due to their protected status in the United States. A photograph of each specimen is presented in lieu of a catalogue number for verification.

Submitted by **ERNEST A. LINER,** 310 Malibou Blvd., Houma, Louisiana 70360, **ALLAN H. CHANEY,** 1208 W. Richard, Kingsville, Texas 78363 and **RICHARD M. JOHNSON,** 4170 Lantern Lane, Mobile, Alabama 36609. ●

OPHEODRYS AESTIVUS (Rough Green Snake). USA: GEORGIA: Glynn Co: Jekyll Island, South River View Drive 0.7 km S of Fortson Parkway. 10 October 1979. E. Kiviat. American Museum of Natural History 120075.

Dead on road near a brackish pond. Not reported on Jekyll Island by Sandifer *et al.* (1980. Ecological Characterization of the Sea Island Coastal Region of South Carolina and Georgia, Vol. III. Biological Features of the Characterization Area. US Fish Wildl. Serv., Wash. DC. FWS/OBS-79/42 p. 132) or Schwab and Shelton (1981. Bull. Chicago Herpetol. Soc. 16(3):67-69), though known from nearby Little Cumberland and Sapelo Islands.

Submitted by **ERIK KIVIAT,** Hudsonia, Bard College, Annandale, New York 12504. ●

SISTRURUS MILIARIUS MILIARIUS (Carolina Pigmy Rattlesnake) USA: GEORGIA: Douglas Co: Sweetwater Creek State Park, 8 km S Lithia Springs. 14 July 1981. Bret Baker. Verified by D. W. Herman (Atlanta Zoological Park). Univ. Ga. Mus. Nat. Hist. (UGA-MNH 15575). Adult male collected at 1450 hr approximately 15 m from creek. First record for county and extends range at least 30 km in northwest Georgia (Conant, 1975. A Field Guide to the Amphibians and Reptiles of Eastern and Central North America. Houghton Mifflin Co., Boston).

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Atlanta Zoological Park, 800 Cherokee Avenue SE, Atlanta, Georgia 30315 and **BRET BAKER,** Sweetwater Creek State Park, Rt. 1, Mt. Vernon Rd., Lithia Springs, Georgia 30057. ●

SISTRURUS MILIARIUS MILIARIUS (Carolina Pigmy Rattlesnake) USA: GEORGIA: Fulton Co: Ga. Rt. 70, 5.2 km S intersection Ga. Rt. 166. 23 August 1979. Charles Pearson. Verified by D. W. Herman. Atlanta Zoological Park (AZP 210). Male (Fig. 1) collected at 1830 hr during light rain; air and road temperatures 26° C and 23.8° C respectively. First record for county and extends range into northwest Georgia by at least 15 km (Conant,

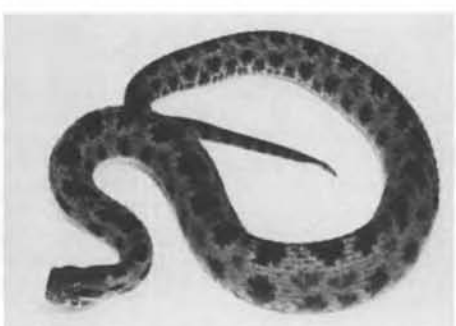


Fig. 1. An adult male Carolina pigmy rattlesnake (AZP 210) from Fulton County, Georgia.

1975. A Field Guide to the Amphibians and Reptiles of Eastern and Central North America. Houghton Mifflin Co., Boston).

Submitted by **DENNIS W. HERMAN,** Department of Herpetology, Atlanta Zoological Park, 800 Cherokee Avenue SE., Atlanta, Georgia 30315. ●

TANTILLA RUBRA RUBRA (Red Blackhead Snake). MEXICO: NUEVO LEON: 9.8 km SW Cerralvo and 16.7 km W on Rancho El Milagro, Picachos Mts., 457 m, 16 August 1978, Ernest A. Liner, Richard M. Johnson and Allan H. Chaney, EAL 4566 (1 specimen); verified by Ernest A. Liner. This specimen extends the range northeast approximately 90 km from its nearest previously known range of Horsetail Falls and Chipinque, Monterrey in Nuevo Leon.

Submitted by **ERNEST A. LINER,** 310 Malibou Blvd., Houma, Louisiana 70360, **RICHARD M. JOHNSON,** 4170 Lantern Lane, Mobile, Alabama 36609 and **ALLAN H. CHANEY,** 1208 W. Richard, Kingsville, Texas 78363. ●

THAMNOPHIS SAURITUS SEPTENTRIONALIS (Northern Ribbon Snake). USA: INDIANA: Putnam County: Warren Township: East half of the NE quarter of section 16: 1.3 km due south of the Deer Creek bridge on U.S. 40 in Putnamville, Indiana. 11 October 1981. Collected by Jon Hendrix. Verified by James List, Ball State University, Muncie, Indiana, and by Sherman A. Minton, Jr., Indiana University School of Medicine, Indianapolis, Indiana. County record for Putnam County, Indiana, filling a gap near the southeastern limit of the range of the subspecies in the state. Photographs and specimen data are in the herpetology collections of the Department of Biology, Ball State University, (BSU # 821).

Submitted by **J. R. HENDRIX** and **JAMES LIST,** Department of Biology, Ball State University, Muncie, Indiana 47306. ●

AMPHIBIAN AND REPTILE DISTRIBUTION IN COLORADO: CORRECTIONS OF ERRONEOUS RECORDS

SCAPHIOPUS INTERMONTANUS (Great Basin Spadefoot). USA: COLORADO: Moffat Co: Dinosaur Nat. Monument, Castle Park. 25 June 1949. A. H. Fehlman. Identified by G. Hammerson, verified by H. M. Smith. Univ. Colorado Mus., Boulder (UCM 5237, 97 specimens). Erroneously reported as *Bufo w. woodhousei* by Maslin (1959, Univ. Colorado Stud., Ser, Biol. No. 6, p. 14). Metamorphosing and recently metamorphosed specimens differ from *B. woodhousei* of same stages (1) by possessing: a well-developed, hard metatarsal spade; oral papillae encircling the mouth parts; a vertical pupil; and more extensive interdigital webbing; and (2) by lacking: pronounced tibial tuberculation; a well-developed parotid gland; and an outer metatarsal tubercle. First record for county. Extends known range 154 km N. in extreme western Colorado (Smith, Maslin & Brown 1965, Univ. Colorado Stud., Ser. Biol. No. 15, p. 13).

SCAPHIOPUS MULTIPLICATUS (New Mexico Spadefoot). USA: COLORADO: San Miguel Co: Vicin. Gypsum Gap. 9 June 1964. D. Johnson. Identified by G. Hammerson, verified by H. M. Smith. UCM 32286-32287. Erroneously reported as *S. intermontanus* by Secoy and Brown (1968, Southwest. Nat. 13:106). Both specimens have flat frontoparietals and an extensive frontoparietal fontanelle (*cf.* Zweifel 1956, Am. Mus. Novit. No. 1762, pp. 35-37, Fig. 23). Negates major southward range extension for *S. intermontanus* in Colorado. First record for county.

PHRYNOSOMA CORNUTUM (Texas Horned Lizard). USA: COLORADO: Bent Co: John Martin Reservoir, N. shore, 9.7 km W dam. 16 May 1959. A. B. Wolfson. Identified by G. Hammerson, verified by H. M. Smith. UCM 32238. Erroneously reported as *P. douglassi brevirostre* by Secoy and Brown (*loc. cit.*). Negates only *P. douglassi* record for county.

SCELOPORUS GRACIOSUS GRACIOSUS (Northern Sagebrush Lizard). USA: COLORADO: Pitkin Co: 1.6 km NE Snowmass, Wheatley Gulch. 17 June 1965. H. G. Rodeck. Identified by G. Hammerson, verified by H. M. Smith. UCM 32689. Erroneously reported as *S. undulatus elongatus* by Secoy and Brown (*loc. cit.*). Negates only *S. undulatus* record for county.

THAMNOPHIS ELEGANS VAGRANS (Wandering Garter Snake). USA: COLORADO: Las Animas Co: 37 km E Model, Purgatoire R. 22 June 1963. R. & J. Holland. UCM 31769. 8.0 km W, 40.2 km S Fowler. 14 May 1959. R. Strickland. UCM 31785. Fremont Co: 8.0 km E Florence. 23 August 1964. D. Post. UCM 31784. Otero Co: 35.4 km S Fowler. 15 May 1959. R. Strickland. UCM 31786. Identified by H. M. Smith & T. P. Maslin, verified by G. Hammerson. Erroneously reported as *T. sirtalis parietalis* by Secoy and Brown (*loc. cit.*). Negates reported major range extension out of S. Platte R. drainage.

Submitted by **GEOFFREY A. HAMMERSON,** Department of Environmental, Population & Organismic Biology, University of Colorado, Boulder, Colorado, 80309. ●

HERPETOLOGICAL RECORDS FROM WEST-CENTRAL ARIZONA

In a continuing effort to determine the distribution and ecology of wildlife species in western Arizona, the USDI Bureau of Land Management inventoried reptiles and amphibians on 2.3 million acres of federal, state, and private lands in Yavapai, Maricopa, Yuma, and Mohave counties.

The following herpetological records were determined to be range extensions. Voucher specimens from each separate locality have been placed in the Phoenix District herpetological museum unless otherwise noted. BLM numbers corresponding to records listed in this paper, were assigned to all specimens observed or collected, and can be found in the district's central file records catalog. Vegetative associations listed are based on compilations of Brown, *et al.* (1979).

ANURA

Rana catesbeiana — Arizona: Yuma Co: Centennial Wash, 7 km NW Gladden T7N, R11W, SW, Sec. 26, mesquite-salt cedar woodland in large perennial reservoir, *ca.* 2,010 ft., 18 September 1979 and 29 March 1980 (BLM #4345, 4812-4813). Extends range 95 km N and 100 km E of that illustrated by Stebbins (1966) along the Gila and Colorado Rivers, respectively. This population may be contingent with those along the Gila River during extended wet periods.

Bufo alvarius — Arizona: Yuma Co: Santa Maria River, 9 km NE Alamo Dam, T11N, R12W, NE, Sec. 18, cottonwood-willow riparian, *ca.* 1,280 ft., 13 September 1979, (BLM #4463). Fills in distributional gap between localities reported by Stebbins (1966) along the Colorado River and that of Hahn and May (1972) 42 km to the east. Not collected. Two additional records at Centennial Wash, 7 km NW Gladden, T7N, R11W, SW, Sec. 26, *ca.* 2,010 ft., mesquite-salt cedar woodland, 13 August 1979 (BLM #4333 and 4347).

SAURIA

Eumeces gilberti arizonensis — Arizona: Yuma Co: Harquahala Mountains, 21 km SW Aguila, T5N, R10W, NE, Sec. 6, *ca.* 5,020 ft., open chaparral, 23 August 1979, (BLM #4122). Extends range 50 km W of that reported by Stebbins (1966) near Wickenburg, Arizona. Additional records from Harcuvar Mountains, 23 km NW Aguila, Arizona, T8N, R11W, SE, Sec. 2, *ca.* 5,040 ft., open chaparral, 29 August 1979.

Xantusia vigilis vigilis — Arizona: Maricopa Co: Harquahala Mountains, 21 km SW Aguila, T5N, R10W, NW, Sec. 5, *ca.* 4,880 ft., open chaparral, 30 April 1980, (BLM #5047). Extends range 70 km NE of that reported by Stebbins (1966) in the Kofa Mountains and 105 km S of that reported by Jones, *et al* (1980) in the Wikieup, Arizona vicinity.

SERPENTES

Diadophis punctatus regalis — Arizona: Maricopa County: Harquahala Mountains, 21 km SW Aguila, T5N, R10W, SW, Sec. 31, *ca.* 4,860 ft., open chaparral, 4 October 1979, (BLM #4135) and the Harcuvar Mountains, 23 km NW Aguila, T8N, R11W, SE, Sec. 2, *ca.* 5,050 ft., open chaparral, 11 September 1979 (BLM 4153). Extends distribution 80 km W and 100 km S of that illustrated by Stebbins (1966).

Masticophis taeniatus — Arizona: Yuma Co: Harquahala Mountains, 22 km SW Aguila, T6N, R10W, SW, Sec. 31, *ca.* 5,600 ft., open chaparral, 5 September 1979 (BLM #4131). Additional record from Harquahala Mountains, 21 km SW Aguila, T6N, R10W, NW, Sec. 31, *ca.* 5,480 ft., open chaparral, 27 April 1980 (BLM #4874). One additional record from Harcuvar Mountains, 23 km NW Aguila, T8N, R11W, SE, Sec. 2, *ca.* 5,050 ft., open chaparral, 22 August 1979 (BLM #4147). Extends record 70 km W of that illustrated by Stebbins (1966) near the Prescott National Forest.

Tantilla planiceps atriceps — Arizona: Yuma Co: Harquahala Mountains, 21 km SW Aguila, T6N, R10W, SW, Sec. 31, *ca.* 5,600 ft., open chaparral, 13 and 23 May 1980 (BLM #5235 and 5237, respectively).

Two additional records from Arizona: Yuma Co: Harcuvar Mountains, 23 km NW Aguila, T8N, R11W, SE, Sec. 2, *ca.* 5,050 ft., open chaparral, 8 and 21 May 1980 (BLM #5272 and 5275, respectively). Extends range 55 km SW of Date Creek reported by Hahn and May (1972).

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CENTROLENELLA FLEISCHMANNI (BOETTGER): NEW TO THE ANURAN FAUNA OF EL SALVADOR

The frog *Centrolenella fleischmanni* (Boettger) occurs from Guerrero and Veracruz, Mexico south through Central America to Surinam and Ecuador (Duellman, 1977). Starrett and Savage (1973) included El Salvador in the distributional range for this species, although, they did not mention any specimens from that country. On the night of 1 December 1979 Victor Hellebuyck collected an individual of *C. fleischmanni* from under a leaf of a bush along a fast-moving stream at Cantón Monte Negro, 14 km W Matapán, Departamento de Santa Ana, 1686 m. The site of Capture falls within the Subtropical Humid Forest formation of Holdridge (1975). The most common trees at Cantón Monte Negro are *Liquidambar styraciflua, Quercus hondurensis, Q. pendularis,* and *Pinus oocarpa.* This locality is located on the south slopes of the Cordillera de Alotepeque-Metapán in northwestern El Salvador.

The Salvadoran specimen (MHNES 30-859) is a male with a snout-vent of 24.9 mm and agrees in every respect with the descriptions given by Taylor (1952) and Lynch and Duellman (1973). This is the first known record for *C. fleischmanni* and the anuran family Centrolenidae for El Salvador.

I thank René M. Jaime and Victor Hellebuyck of the Museo de Historia Natural de El Salvador (MHNES) for allowing me to examine the live frog and for providing me with access to the museum collections.

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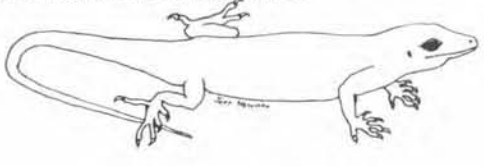
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> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted **must** be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white, 8 X 10, glossy prints, and should be accompanied by a descriptive caption and exposure data. The name and address of the contributor should be taped or penciled on the back of each print. Please DO NOT send photographs before corresponding with the editors about them. Return of the unsolicited photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

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ANNUAL DUES 1982

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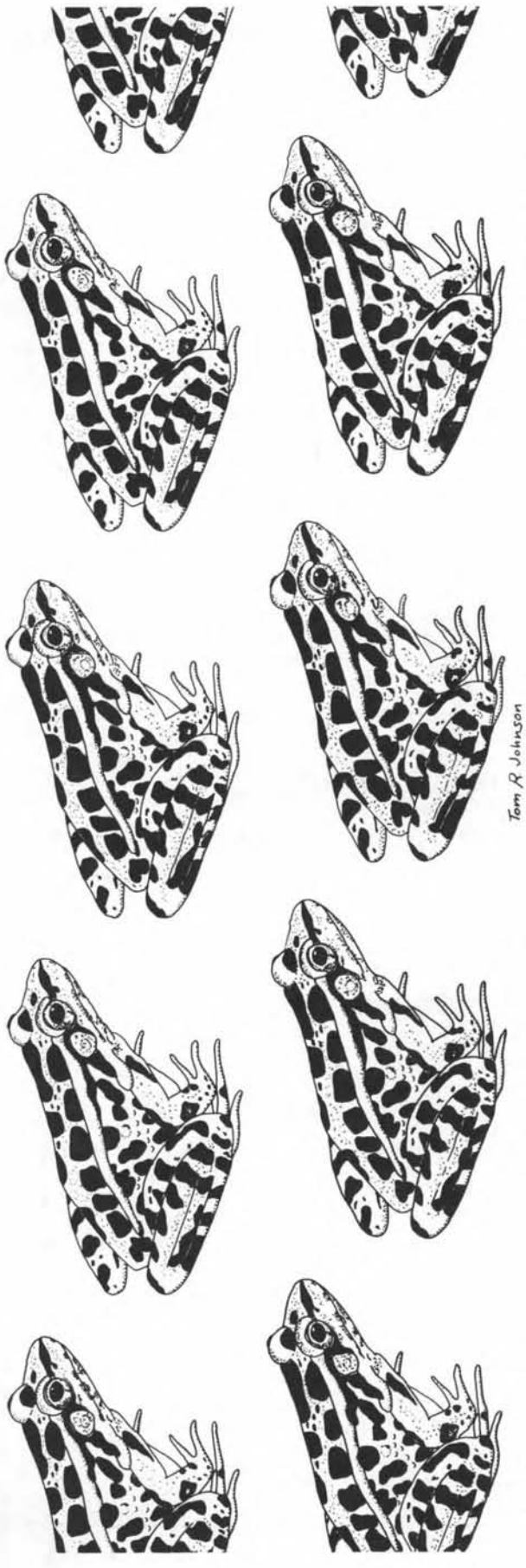
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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

A MESSAGE TO THE MEMBERSHIP

This is a special year for our Society. Twenty-five years ago the society was founded as The Ohio Herpetological Society by two young amateurs and, despite this modest beginning, SSAR has grown to become the largest professional herpetological society. It sponsors innovative annual meetings of interest to a broad spectrum of persons interested in amphibian and reptile biology; supports many scientific, educational and conservation activities in herpetology; and issues six series of publications, one of the most ambitious programs of any scientific society.

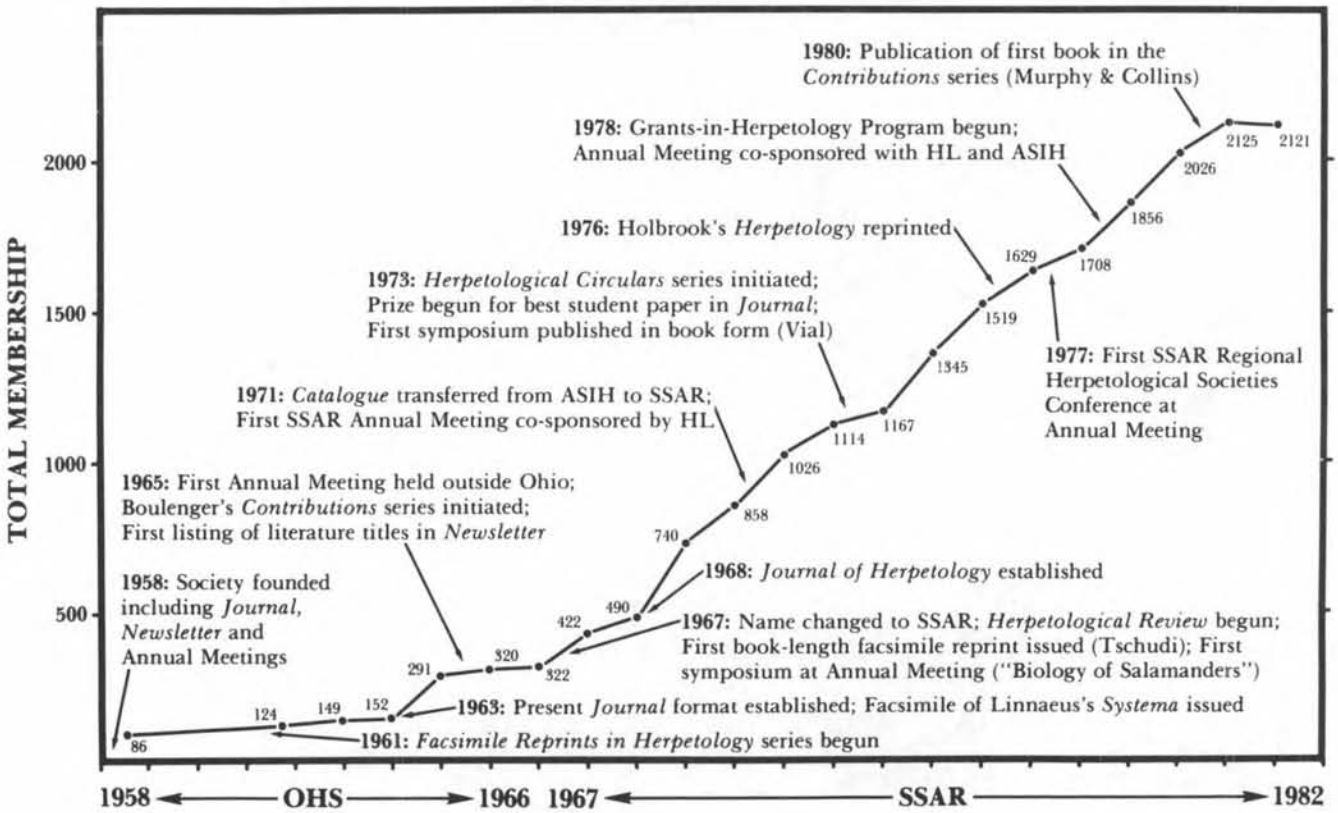
SSAR has been successful in recognizing and responding to the changing and expanding needs of the herpetological community, sponsoring activities of interest not only to the professional herpetologist, but also to serious amateurs, zoo and aquarium personnel, veterinarians and to those interested in conservation. This is a tribute to the foresight of the many persons who have served the society in various leadership capacities as officers, editors, and committee members, but also to the enormous support given by the membership. A detailed history of SSAR is now being prepared by N. Bayard Green for publication, but the primary milestones are noted in the figure below.

At the Annual Meeting in August several activities will serve to mark this anniversary, including a special symposium and a commemorative poster by the noted wildlife artist David M. Dennis. Detailed information about the meeting is given elsewhere (see p. 3 in this issue). The meeting will also provide us with an occasion to honor the many hardworking officers and editors—past and present—whose dedication and imagination have ensured the success of SSAR.

To continue this progress, however, the society must attract the best possible new leadership when positions become vacant. The Nominating Committee makes every effort to identify persons willing to serve but, inevitably, some potential candidates are not known. Thus, the society encourages all persons to state their interest by letter to the SSAR President, Kraig Adler. Such persons may wish to attend the Board of Directors' meeting, this year to be held on Sunday, August 1, beginning at 10:00 AM; incidentally, Board meetings have always been open to the general membership.

In 1983 the society will meet, jointly with the Herpetologists' League, in Salt Lake City, Utah (August 7-12). The Meeting Sites Committee is presently considering invitations for 1984 and beyond. Persons interested in developing a proposal from their institution are invited first to write to the committee chair, Lynne Houck (Department of Biology, University of Chicago, 1103 East 57th Street, Chicago, Illinois 60637).

IMPORTANT EVENTS IN THE HISTORY OF THE SOCIETY



SSAR SILVER ANNIVERSARY
and
Herpetologists' League Meeting
Raleigh, North Carolina
August 1-6, 1982
First Call For Papers

Please return completed form and abstract, by *5 June 1982*, to: Ray E. Ashton, Jr., N. C. State Museum of Natural History, P.O. Box 27647, Raleigh, NC 27611.

Please *type* the following:

Author(s) (last names first); **underline** speaker:_____

_____

Institution(s): _____

_____

Speaker's address: _____

_____ Phone:_____

Speakers will receive instructions and equipment request forms from session chairman. Wayne VanDevender, Chairman of Paper Sessions; Sandy Echternacht, Chairman of Poster Sessions.

Check appropriate item:

_____Contributed paper

_____Student paper (students *only;* will be considered for HL prize)

_____Poster session (submit abstract; HL will present cash prize for best poster presentation)

_____By title only (abstract will be printed if submitted)

Type an ABSTRACT within the following space and do not exceed the margins. Use new ribbon and elite type to facilitate direct offset reproduction. Underline scientific names *only*. Follow this format: *first line*, author(s); *second line*, institution(s); *third line*, TITLE; *rest*, abstract.

SSAR 25th ANNIVERSARY MEETING

The 25th annual meeting (Silver Anniversary) of the Society for the Study of Amphibians and Reptiles will be held in conjunction with the 30th annual meeting of the Herpetologists' League, at Meredith College, Raleigh, North Carolina, 1-6 August 1982. The meeting is hosted by the North Carolina State Museum of Natural History.

Herpetological collections and research have a long tradition at NCSM. The museum came into official existence on 20 February 1879, and in December 1880 the Brimley brothers — H. H. and C. S. — arrived in Raleigh from England. They were ardent naturalists, and in 1884 began publishing papers on the state's fauna. H. H. Brimley became the museum's first curator (later director) in April 1895, and C. S. entered the employ of the Entomology Division of the N. C. Department of Agriculture in December 1919. One of C. S.'s main interests was herpetology, and among his many publications were descriptions of several new amphibians and reptiles, including the endemic aquatic salamander, *Necturus lewisi*. He also wrote the first comprehensive accounts of the local herpetozoa, assembled and published by Carolina Biological Supply Company. The museum's second director, Harry T. Davis, co-authored with C. S. Brimley a booklet on poisonous snakes of eastern North America. John B. Funderburg, fourth and current director, has published papers on the amphibians and reptiles of Florida, Virginia, and North Carolina.

In the Department of Lower Vertebrates, Chief Curator William M. Palmer has contributed papers on the North Carolina herpetofauna, including the booklet *Poisonous Snakes of North Carolina* (1974), and was a co-author of *Amphibians and Reptiles of the Carolinas and Virginia* (1980). He is currently working with the taxonomy of *Ophisaurus*, and has completed most species accounts for a book on North Carolina reptiles to be published by the museum. Alvin L. Braswell, Curator of Lower Vertebrates, has also published a number of papers, and is studying the taxonomy of an undescribed *Eurycea*, and of the lizard *Bachia* on the island of Tobago. He is engaged also in studies of local populations of *Hemidactylium, Ambystoma talpoideum, Rana areolata, Eumeces anthracinus,* and *Elaphe obsoleta*, and is working with Palmer on the state herpetological publications. In addition, Braswell directed field survey activities of a two-year, federally funded study of *Necturus lewisi*. Ray Ashton is principal investigator in this project, the results of which are now being prepared for publication as a special issue of the museum's journal, *Brimleyana*. Ashton, the museum's Director of Education, has published in herpetology, and continues studies as time allows. Windward Press recently published *Handbook of the Amphibians and Reptiles of Florida. Part I, The Snakes,* written by Ray and his wife, Pat. David S. Lee, Curator of Ornithology and Mammalogy, has published on the herpetofauna of Maryland and Florida, and John E. Cooper, Director of Research and Collections, has published on those of Maryland and Cuba, and on the cave-associated herpetozoa of Virginia, West Virginia, Alabama, and Georgia.

Program Summary

Sunday, 1 August
- Registration
- SSAR Board of Directors meeting (10:00 AM)
- HL council meeting
- Regional Society social, hosted by North Carolina Herpetological Society

Monday, 2 August
- Plenary session
- HL Distinguished Herpetologist Lecture — Thomas Uzzell, "In Praise of Common, Widespread Frogs".
- Regional Society program — "Collecting in Exotic Places"
- Contributed Paper sessions
- Social and auction

Tuesday, 3 August
- SSAR Symposium: "Molecular and Genomic Evolution of Amphibians and Reptiles," organized by David B. Wake
- Zoo Liaison program — "Meet the Grant Providers"
- Contributed Paper sessions
- "Pig Pickin'" banquet

Wednesday, 4 August
- SSAR Symposium continued, and evening open Panel Discussion
- Contributed Paper sessions
- Workshop on photographing herps
- IUCNNR Tortoise Council meeting
- Poster session — HL contest (authors available for discussion)
- Slide shows — "Herpers Past and Present" and others — David Dennis

Thursday, 5 August
- Paper session review
- Invited author question-and-answer session; Herndon G. Dowling, Chairman
- Contributed Paper sessions
- Gopher Tortoise Council, informal gathering

Friday, 6 August
- FIELD TRIP, North Carolina Sandhills

Saturday and Sunday, 7-8 August
- Conference on Plethodontid Salamanders at Highlands Biological Station. Contact Lynne Houck, Department of Biology, University of Chicago, 1103 East 57th Street, Chicago, Illinois 60634.

SSAR Symposium Topics and Speakers — David B. Wake, Coordinator

Genetic inference from electrophoretic phenotypes of proteins, an introduction — Herbert C. Dessauer, Louisiana State University Medical Center

Is the newt metapopulation model general? — Douglas E. Gill, University of Maryland

Genetic recombination in zones of secondary intergradation in amphibians and reptiles — David L. Jameson, University of Houston

The clonal nature of the *Ambystoma jeffersonianum* complex — James P. Bogart, University of Guelph (Canada)

Gene flow and population differentiation in *Ascaphus truei* — Charles H. Daugherty, University of Illinois

Genic differentiation and its correlates in the *Desmognathus ochrophaeus* and *fuscus* complexes — Stephen G. Tilley, Smith College

The correlation between reproductive isolation and genetic differentiation in eastern large *Plethodon* — Richard Highton, University of Maryland

Natural hybridization between *Bombina bombina* and *B. variegata* (Anura: Discoglossidae): a comparative study of hybrid zone structure in southern Poland and western Yugoslavia — Jacek M. Szymura, Jagellonian University (Poland)

Hybridization between subspecies of *Ensatina* — Kay P. Yanev, University of California

The recognition and relationships of species in a highly paedomorphic lineage: a biochemical study of the Mexican ambystomatid salamanders — H. Bradley Shaffer, University of Chicago

Hybridization between cryptic species of two-lined salamanders — Sheldon Guttman, Miami University

Species with extreme amounts of genetic differentiation: the species problem in *Rhyacotriton* and *Pseudoeurycea* — David B. Wake, University of California

Molecular phylogenies: frameworks for addressing major evolutionary questions — Linda R. Maxson, University of Illinois

Opportunities and limitations of microcomplement fixation techniques — Thomas Uzzell, Academy of Natural Sciences, Philadelphia

Molecular genetics and systematics of the Crocodilia — Llewellyn D. Densmore, Louisiana State University Medical Center

The neotropical colubrid snake fauna: lineage components and biogeography — John E. Cadle, University of California

Biochemical characters and the reconstruction of turtle phylogenies: relationships among batagurine genera — J. W. Sites, Jr., Texas A & M University

Patterns of karyotypic evolution in reptiles —John W. Bickham, Texas A & M University

(Title to be chosen) — Herbert C. Macgregor, University of Leicester (United Kingdom)

Mitochondrial DNA sequence analysis and reptilian systematics: applications in the lizard genus *Cnemidophorus* — Wesley M. Brown, University of Michigan

Genomic composition of reptiles: evolutionary perspectives — Ettore Olmo, University of Naples (Italy)

The significance of sex chromosomes in the evolution of salamander genomes — Stanley K. Sessions, University of California

Chromosome banding analysis in elapid snakes and its phylogenetic implications — Greg Mengden, Australian National University, Canberra City (Australia)

Open panel discussion: research opportunities and prospects. David B. Wake, moderator

Special Activities

Herpetological art, crafts, books, and para-.phernalia: show and sale

Live display of North Carolina amphibians and reptiles, with photo facilities

Special social activities

Special tours of state museums, historic sites, and other points of interest in the Triangle area

Special audio-visual presentations

Commemorative limited-edition print by David Dennis will be given to all registrants

Special commemorative limited-edition T-shirts will be on sale (send order with registration)

General Information

Pre-registration package including final call-for-papers, housing reservations, and fee schedule will be sent in April. Members of both SSAR and HL will automatically receive this information. Others may request the information by writing to the local committee chairperson.

Housing will be in air-conditioned dormitories, and only linen (no blankets) will be provided. Special rates have been arranged at a local motel for those who prefer these accommodations.

Air travel should be to Raleigh-Durham (RDU) airport. Transportation from the airport will be provided for those who pre-arrange it by returning the appropriate form in the registration package.

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A BRITTLE BUCKET CAUTION

Readers of John Legler's paean to plastic buckets (1981, Herp. Review 12(1):9-10) are cautioned that he has used them for only 5 years, and that after 5 to 9 years opaque white Saturn buckets used to store fish and reptiles at the National Museum of Natural Sciences, Ottawa, have shown a disturbing tendency to become brittle and to crack either spontaneously or when they are opened. About 1% of a population of 500 buckets in the ichthyology collection cracks spontaneously each year, and a similar or higher rate obtains in the herpetology collection. A bucket is dangerously brittle when pieces of the rings around the top of the bucket can be snapped off by hand. Buckets from some shipments are more prone to brittleness than others, but all seem to become more brittle with age. For much of this time our collections were subjected to continuous light from fluorescent lamps, and this may have embrittled the plastic.

We should not be able to explore the use of these buckets as specimen containers further, because the Ottawa Fire Marshal, at least, will not approve the storage of inflammable liquids (in our institution 45-50% isopropyl alcohol) in plastic containers, but we suggest that if they are to be used for this purpose shipments of buckets which sound brittle when they are tapped should be rejected, and that the buckets not be stacked, over-filled, or exposed to intense or prolonged light.

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The first Herpetological Conference of the Socialist Countries was held in Budapest, Hungary, 25-29 August 1981. The meeting included most of the leading herpetologists from Eastern Europe and the Soviet Union and also a few colleagues from Western countries invited by the Organizing Committee, chaired by Oliver Gy. Dely. Although relatively small by comparison to herpetological meetings elsewhere, the well organized conference was not only pleasant but exceedingly important in providing the first significant occasion for contacts between several herpetologists in Eastern Europe and Russia with their counterparts in the West, contacts that will hopefully prove useful in the sharing of scientific information and also in planning future herpetological meetings such as a proposed International Congress of Herpetology. The next Conference of the Socialist Countries is tentatively scheduled for Dresden, East Germany, in 1984 (Günther Peters, organizer).

Several dozen papers covering a broad range of biological topics were presented at the Budapest meeting, as listed below; where papers were co-authored, the presenter is indicated (*). These papers will be published shortly as a volume of *Vertebrata Hungarica*, obtainable from Zoological Department, Hungarian Natural History Museum, H-1088 Budapest, Baross u. 13, Hungary.

Adler, K. (USA): Sensory aspects of amphibian orientation.

Alekperov, A. M. (USSR): Present status of rare and threatened herpetofauna in Azerbaidzhan.

***Ananjeva, N. B.** (USSR) and N. L. Orlov (USSR): The trophic behavior of snakes of the Henophidia and Caenophidia groups.

***Berger, L.** (Poland), T. Uzzell (USA) and H. Hotz (Switzerland): Systematic status of the two southern forms within the *Rana esculenta* complex.

Böhme, W. (West Germany): The problem of the hierarchy of within-species classifications.

***Brushko, Z. K.** (USSR) and R. A. Kubykin (USSR): Horsfield's tortoise (*Agrionemys horsfieldi* Gray, 1844) and its rational utilization in Kazakhstan.

Ckhikvadze, V. M. (USSR): On the finding of fossil Cryptobranchidae in the USSR and Mongolia.

Darevsky, I. S. (USSR): Unisexuality in the Reptilia: results and projects.

Darevsky, I. S. (USSR) and *L. A. Kupriyanova (USSR): Rare males in the parthenogenetic species *Lacerta armeniaca* Méhely.

Dely, O. Gy. (Hungary): Morphological variation in the Balkan wall lizard (*Lacerta taurica* Pallas).

***Dely, O. Gy.** (Hungary) and G. Stohl (Hungary): Head shields and phylogenetic relationships in the Lacertidae.

Engelmann, W.-E. (East Germany): Serological studies on taxonomy of the genera *Lacerta* and *Gallotia*.

Freytag, G. E. (East Germany): Concerning *Pachytriton brevipes* Sauvage.

***Gans, C.** (USA) and G. C. Gorniak (USA): Muscle architecture of frog tongues; a neglected characteristic.

Garanin, W. I. (USSR): Urbanization and the herpetofauna.

Gasc, J. P. (France): The mechanism of crawling in *Amphisbaena alba* (Amphisbaenidae, Squamata).

Günther, R. (East Germany): Results of experimental crosses between waterfrogs from Europe and Central Asia.

Hodrová, M. (Czechoslovakia): The genus *Pliobatrachus* from Czechoslovakia.

Itämies, I. (Finland): On the food of *Rana arvalis* Nilss. in central Finland (presented by G. Kramer).

Jurcsák, T. (Romania): New findings of Sauria from the Mesozoic of Romania (presented by A. Embey-Isztin).

Korsós, Z. (Hungary): Field observations on two lizard populations (*Lacerta agilis* L. and *L. viridis* Laur.).

Kramer, E. (Switzerland): Systematic questions on the European snake fauna.

Langerwerf, B. A. W. A. (Netherlands): Reproduction of several Asiatic *Agama*- species in terraria.

***Lukina, G. P.** (USSR) and T. F. Krawtschenko (USSR): Ecological aspects of the desert runner lizard *(Eremias)* in the northern Caucasus.

Moody, S. M. (USA): Phylogenetic origins and relationships of the terrestrial genera *Agama, Phrynocephalus* and *Uromastyx* within the family Agamidae.

Peters, G. (East Germany): Phylogenetic problems of Lepidosaurian systematics.

Roček, Zb. (Czechoslovakia): A new view on the basic phylogeny of frogs.

Rustamov, A. K. (USSR) and *S. Shammakov (USSR): Biotopic distribution and the numbers of reptile species in the flat lands of Turkmenistan.

Sharpilo, V. P. (USSR): An historical look at the origin of the Palearctic helminth fauna of reptiles.

***Špinar, Zd.** (Czechoslovakia) and L. P. Tatarinov (USSR): A new frog from the Upper Cretaceous of Gobi; its significance for the systematics, phylogeny and paleobiogeography of Anura.

Szczerbak, N. N. (USSR): Characteristic features of the herpetogeographic organization of the Palearctic province.

Szymura, J. M. (Poland): Hybrid zones between *Bombina bombina* (L.) and *B. variegata* (L.) in Europe.

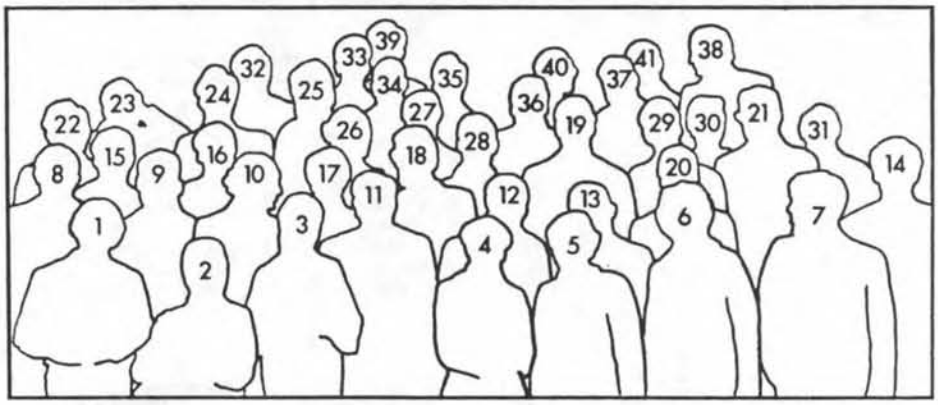
Tatarinov, L. P. (USSR): The significance of paleontology for herpetology.

Vancea, Şt. (Romania), J. E. Fuhn (Romania) and M. Borcea (Romania): Morphological investigations of *Vipera berus* populations from the central highlands of Moldavia, East Carpathia and Transylvania (presented by E. Kramer).

Besides the technical sessions there was a one day field trip to Lake Balaton during which the group visited the famous Biological Institute (Tihany) and the University of Agriculture (Keszthely).

KRAIG ADLER
Cornell University

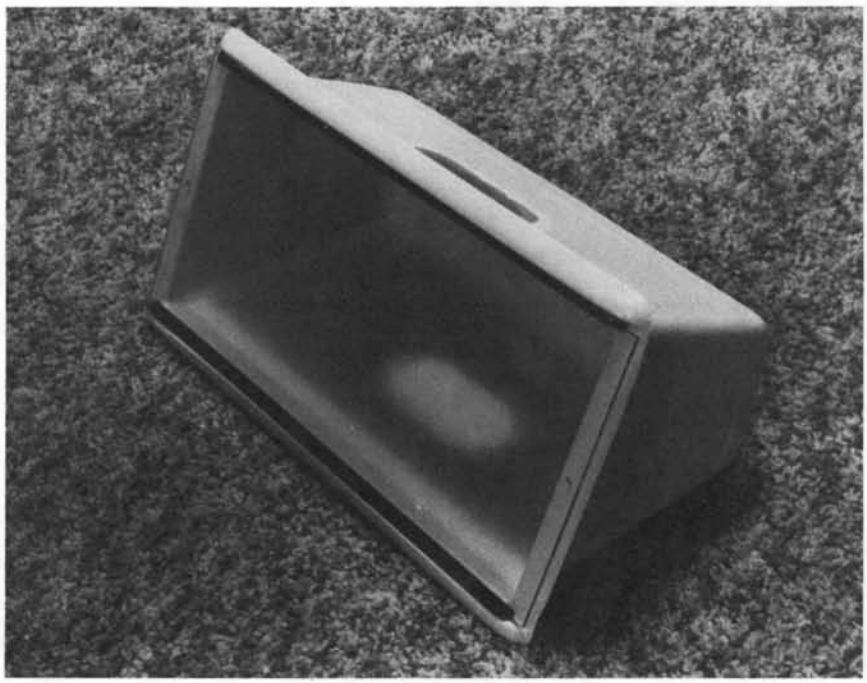




Identifications: 1. J. M. Szymura (Poland); 2. Mrs. Gasc (France); 3. N. B. Ananjeva (USSR); 4. L. A. Kupriyanova (USSR); 5. G. P. Lukina (USSR); 6. Z. K. Brushko (USSR); 7. W. Böhme (West Germany); 8. Zd. Špinar (Czechoslovakia); 9. C. Gans (USA); 10. I. S. Darevsky (USSR); 11. A. M. Alekperov (USSR); 12. L. P. Tatarinov (USSR); 13. L. Berger (Poland); 14. K. Adler (USA); 15. V. P. Sharpilo (USSR); 16. J. P. Gasc (France); 17. Mrs. Peters; 18. G. Peters (East Germany); 19. M. Janisch (Hungary); 20. S. M. Shammakov (USSR); 21. V. M. Makeev (USSR); 22. Zb. Roček (Czechoslovakia); 23. N. N. Szczerbak (USSR); 24. J. Eiselt (Austria); 25. Ch. J. Klaver (Netherlands); 26. M. Hodrová (Czechoslovakia); 27. W.-E. Engelmann (East Germany); 28. G. Holló (Hungary); 29. M. Fischer (Hungary); 30. Mrs. Freytag; 31. G. E. Freytag (East Germany); 32. S. M. Moody (USA); 33. Z. Korsós (Hungary); 34. R. Günther (East Germany); 35. Mrs. Dely (Hungary); 36. M. Környei (Hungary); 37. E. Kramer (Switzerland); 38. K. Klemmer (West Germany); 39. G. Erdélyi (Hungary); 40. O. Gy. Dely (Hungary); 41. A. Taborski (Poland).

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REPRODUCTION AND FEEDING IN *Eridiphas slevini* (SERPENTES: COLUBRIDAE)

Since its discovery in 1921 by Joseph Slevin, *Eridiphas slevini* Leviton and Tanner (1960), has remained one of the rarest snakes known to occur on the Baja California peninsula. It is presently represented in collections by about 20 specimens. Aside from its general distribution and apparent differentiation into an insular subspecies (Ottley and Tanner, 1978), little is known of its biology. This note presents the first record of its reproduction.

On 24 July, 1979, a gravid *Eridiphas slevini* (KU 185647; Fig. 1) was collected from a date palm *(Phoenix dactylifera)* grove ± 1 km N of San Ignacio, Baja California Sur, México. The specimen was coiled inside the moist center of a decaying, prostrate palm trunk. The ground around the trunk was covered by small pools of standing water. Several *Hyla regilla* and an adult *Pituophis melanoleucus* were also found at this site.

On 26 August, the snake was placed in a 25 gal terrarium having 8-10 cm of coarse sand on the bottom with bark strips and rocks providing cover. Two eggs were found beneath a piece of bark on 9 October (average measurements: medial width = 10.0 mm; length = 52 mm; weight = 3.6 gms). The female weighed 26 gms after egg laying. The eggs were thin-shelled and leathery in texture with a distinct kidney shape. Both eggs had a diffuse pink medial area with slightly tapering, cream-colored ends. The eggs were incubated in a 1 gal glass container to which a layer of moist vermiculite had been added in the manner described by Campbell (1972). The eggs were checked daily during incubation and the container was opened periodically when condensation became excessive. Air temperature fluctuated between 20° C (68° F) and 29° C (84° F) during incubation. No measurable changes in egg dimensions occurred during incubation.

On 5 November the air temperature dropped to 15° C (58° F) for several hours, and on 7 November the eggs were wrinkled. Dark spots appeared on the eggs a few days later. On 11 November, 64 days after deposition, the eggs were presumed dead and were opened. Both eggs contained a well developed embryo with considerable yolk. Morphological characteristics of the embryos and adult female are within the range given by Ottley and Tanner (1978), for their specimens from San Ignacio (Table 1). Head and body scales of the embryos were well developed, although pigmentation was minimal and pattern development was completely absent. Pigmentation was limited to a single, diffuse lateral stripe involving the 3rd and 4th scale rows and the 4th and 5th scale rows of the female and male embryo, respectively. The skin was translucent. Cranial ossification was not complete; the brain of both embryos being exposed dorsally. The hemipenes were everted in the male and umbilical slits were present in both embryos.

The extreme elongation of the eggs of *Eridiphas* prompts comparison with other closely related genera. Leviton and Tanner (1960), stated that *Eridiphas*, on the basis of "intermediate" morphological characteristics, represented a relict of an early ancestral stock from which *Hypsiglena* and *Leptodeira* subsequently diverged. A comparison of clutch size and egg dimensions of *Hypsiglena, Leptodeira*, and *Eridiphas* is presented in Table 2. The length of *Eridiphas* eggs is striking, especially when compared with other closely related colubrids. The relationship that exists between clutch size and egg dimensions may partially explain this, but whether this is due to genetic or more proximal influences on these reproductive parameters, must await further records of reproduction in this species.

The *Eridiphas* refused food items such as juvenile *Mus musculus* and *Eumeces fasciatus* prior to laying. An adult *Phyllorhynchus decurtatus* and *Chilomeniscus cinctus* which shared the terrarium with the *Eridiphas* were not disturbed. Food items, prey size, and feeding dates were: *Coluber constrictor erythrogaster* (T.L. = 15 cm; 13 Sept.), *Tropidoclonion lineatum lineatum* (T.L. = 10 cm; 25 Sept.), and *Thamnophis sirtalis parietalis* (T.L. = 13 cm and 12 cm; 10 Oct. and 30 Oct., respectively).

In each instance, feeding behavior was similar. The *Eridiphas* sensed the presence of potential prey by rapid tongue flicking. It would move from its retreat and apparently through the use of visual and chemosensory cues, proceed to follow the prey. It was sensitive to slight movements of the prey during this pursuit phase. When within a few centimeters of the head of the prey, the *Eridiphas* struck, usually seizing it behind the head. On several occasions, the strike missed the prey. Upon making a capture, the *Eridiphas* worked the head of the prey to the back of the mouth and retained it there for several minutes before swallowing. Possibly, envenomation occurred during this interval. Constriction of the prey never occurred, although the *Eridiphas* often dragged the prey about the terrarium by its head, using objects such as rocks and bark to gain a purchase on the prey prior to swallowing.

We wish to thank Jonathan A. Campbell, Dr. William E. Duellman, Dr. Henry S. Fitch, and Nancy L. Zuschlag for critically reading the manuscript and offering helpful comments. We also thank Ken Stockton for assistance in the field and Hank Guarisco, Animal Caretaker, University of Kansas, for providing food items and caring for the snakes. Scientific collecting permits for México were issued to JRO by the Dirección General de la Fauna Silvestre.

TABLE 1. Morphological characteristics of the embryos and an adult female *Eridiphas s. slevini*.

character	KU 185648	KU 185649	KU 185647
sex	embryonic female	embryonic male	adult female
egg weight prior to opening (gms)	2.2	2.0	—
embryo weight (gms)	0.50	0.45	—
SVL (mm)	78	88	372
tail length (mm)	17*	20	75
ventrals	188	187	195
subcaudals	38*	65	58
scale rows at midbody	23	22	23
supralabials	7-7	7-7	8-8
infralabials	10-10	10-10	10-10
dorsal blotches	—	—	62

*tail tip missing



Figure 1. Gravid female *Eridiphas slevini slevini* (KU 185647), collected 1 km N of San Ignacio, Baja California Sur, México. (Photograph courtesy of Joseph T. Collins).

TABLE 2. Reproductive data on *Eridiphas*, *Hypsiglena*, and *Leptodeira*.

species	locality	female SVL (mm)	clutch size	x egg length (mm)	x egg width (mm)	x egg weight (gms)	source
Eridiphas slevini slevini	Baja Calif.	372	2	52.0	10.0	3.6	this paper
Hypsiglena torquata texana	Kansas	—	4	25.0	10.0	1.8	Wright and Wright, 1957
H. t. texana	Oklahoma	387	6	24.7	10.8	1.75	Hibbard, 1937
H. t. ochrorhyncha	Sonora, Mex.	568	9	26.5*	—	1.77*	Ottley, unpub. data
Leptodeira maculata	W. Mexico	960	6-12	24.9	11.6	—	Duellman, 1958
L. septentrionalis polysticta	" "	640	5	28.0	13.0	2.7	" "
L. punctata	" "	565	6	22.3	10.5	1.8	" "

* sample size = 3

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PARASITIC NEMATODES, *Kalicephalus willeyi*, IN A SRI LANKAN BLIND SNAKE, *Typhlops mirus*

Worm snakes of the family Typhlopidae are poorly-known ecologically, partly because their small sizes and fossorial habits usually preclude collection of large series, and partly because identification of specimens is notoriously difficult. In reviews of snake diseases, neither Reichenbach-Klinke and Elkan (1965) nor Page (1966) mentioned blind snakes.

In February 1978, the senior author received several live typhlopids from Sri Lanka. One female snake, collected 17 January 1978 at Illukumbura, Kandy, Marrichikadda, orally expelled three nematode worms when preserved on 2 March. We identified this snake as *Typhlops mirus* Jan, since it agreed with Taylor's (1947, 1950) accounts of this uncommon species in having: a subocular; eye not apparent; 18 longitudinal scale rows around body; transverse scale rows 337 on body and 15 on tail; no terminal spine; ventral 3 scale rows light-colored, with portions of two adjacent lateral rows on each side light but becoming dark dorsally, and all of dorsum very dark brown (in life); total length (after preservation) 140 mm, tail 5 mm.

The nematodes were fixed and then cleared in lacto-phenol. We identified these worms as *Kalicephalus willeyi* von Linstow (Diaphanocephalidae) from Schad's (1962) diagnosis of this species in having: face flat; esophageal bulb wider and set off from esophageal neck; males almost invariably absent (our three specimens are females).

This is the first record of a nematode from *Typhlops mirus*, a snake which is endemic to Sri Lanka, and a new host record for *Kalicephalus willeyi*. Yamaguti (1961) and Schad (1962) reported *K. willeyi* from a variety of Oriental boid, colubrid, viperid, and elapid snakes, and from the typhlopid *Ramphotyphlops braminus* (Daudin) (formerly placed in the genera *Typhlops* or *Typhlina*).

The snake specimen is preserved in the senior author's collection (RSF 3676), and the nematodes have been deposited in the National Parasite Collection (U. S. Natl. Mus. Helminth Coll. No. 75513).

ACKNOWLEDGMENTS

We thank: W. L. E. de Alwis, B. Fernando, and J. Samarakoon for providing the snake; D. E. Hahn for confirming the identity of the snake; J. R. Lichtenfels for accessioning the worms; and L. E. Brown, D. E. Hahn, and H. W. Huizinga for critically reading the manuscript.

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AMPHIBIANS OF THE ZOOLOGICAL REFERENCE COLLECTION, NATIONAL UNIVERSITY OF SINGAPORE

The Zoological Reference Collection of the National University of Singapore has been maintained by the Department of Zoology since 1972 when it was taken over from the National Museum (formerly Raffles Museum) of Singapore.

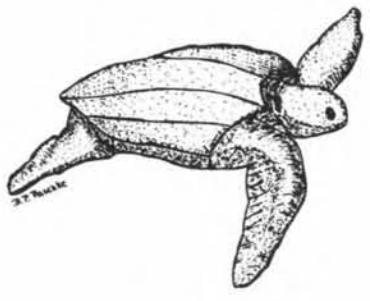
The amphibian collection contains over 1200 specimens belonging to 21 genera. Three paratypes are represented in the collection and they are *Amolops kinabaluensis* Inger 1966, *Rana nitida* Smedley 1931 and *Rana tweediei* Smith 1935. The majority of the collection originated from the Southeast Asian region and were obtained between 1890 and 1981. The species within the collection are fairly representative of the amphibians of this region. A list of species is available upon request.

At present, the collection is housed temporarily at the campus of the Nanyang Technological Institute. A permanent site within the new campus of the National University of Singapore has been identified and will be ready late next year. The collection is being expanded through mutual exchange and as soon as it is located within the new building, a more aggressive improvement programme can be embarked upon.

Researchers are most welcome to examine the collection should they be in Singapore at any time. Inquiries regarding the collection should be sent to Mrs. Yang Chang Man whose address appears below.

We would like to thank Dr. H. K. Voris and Dr. R. F. Inger of the Field Museum of Natural History, Chicago, for their time spent on examining some of the specimens and their invaluable comments on the collection.

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TAIL WAVING AS A DIVERSIONARY TACTIC IN *Anolis carolinensis*

Ballinger (1973) hypothesized that the tail of the iguanid lizard *Anolis carolinensis* functions as a balancing organ, and he presented experimental evidence to support his hypothesis. Here, we suggest a possible cofunction for the tail of *A. carolinensis*.

Over the past three years, we have seen hundreds of anoles stalked by saurophagous snakes (primarily arboreal species). Although tree snakes in general, and attenuate-snouted species (*e.g. Oxybelis*) in particular, rarely miss seizing their prey on the first strike (Henderson and Binder, in prep.), we have witnessed some unsuccessful strikes. Many saurophagous snakes are diurnal, movement-oriented predators that seemingly lose visual contact with a lizard that remains motionless. On a number of occasions, we have observed anoles, that were apparently aware that a potential predator was near, become motionless except for waving their tails back and forth. The tail was raised above the ground and then switched and undulated back and forth, sometimes hitting the ground. On several occasions, this tail movement provided the necessary stimulus for the snake to regain visual contact and make a successful strike at the lizard's body, but in other instances the waving tail acted as a diversion. In those cases, a snake would strike at the waving tail and the lizard would run from the snake, usually with its tail still intact. Since the lizards were confined, it was only a matter of time before the snakes located them again, but in nature the missed strike would probably have given the anoles time to seek a protective shelter.

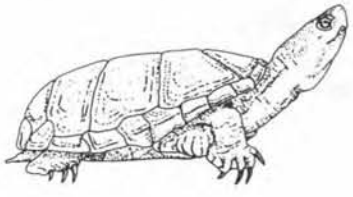
Perhaps the reason Ballinger (1973) found so few *A. carolinensis* with regenerated tails was because such anoles lack their diversionary organ, and so are more susceptible to predation.

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THE FIRST RECORD OF *Rana Sylvatica* FROM THE SOUTHERN ROCKY MOUNTAINS AND OTHER EARLY COLLECTIONS OF ARTHUR E. BEARDSLEY

In 1946, Maslin collected 17 specimens of *Rana sylvatica* in north-central Colorado (Maslin 1947). In 1947, Baxter reported *R. sylvatica* from southern Wyoming. Although these were the first records for the disjunct *R. sylvatica* population in the southern Rocky Mountains, an unreported specimen was taken nearly 50 years earlier.

The University of Northern Colorado (UNC) in Greeley formerly housed an early important collection of Colorado amphibians and reptiles. Unfortunately, this collection apparently was destroyed in a fire. However, a register of specimens bearing the title "Museum Register 3, Colorado State Normal School" (an old name for UNC) still exists in good condition. In the register is listed a *Rana cantabrigensis* (= *R. sylvatica*) collected by A. E. Beardsley near Chambers Lake on 26 August 1898. Chambers Lake is in north-central Colorado and has been the site of many *R. sylvatica* collections since 1950.

Many specimens collected by Beardsley throughout Colorado are listed in the museum register. Most were recorded by Ellis and Henderson (1913) but *R. cantabrigensis* was not included. Perhaps the accuracy of its data was doubted, but today there is no reason for doubt; *R. sylvatica* can still be found in that vicinity. Beardsley was primarily an invertebrate zoologist, and perhaps for that reason failed to publish the record or to convince others of its validity.

Many of Beardsley's amphibian and reptile discoveries in Colorado took many years to be confirmed by additional specimens. The second specimen of *Bufo debilis* was found 81 years after Beardsley's first listing. The second specimens of *Sonora episcopa* and *Diadophis punctatus* came 75 and *ca.* 50 years after the first ones. Thus, several doubtful records of Beardsley's early collections have since been validated.

Corroboration of the accuracy of Beardsley's early amphibian and reptile listings from Colorado is most pertinent to his as yet unconfirmed disjunct records (see Stebbins's 1966 maps) of *Storeria* (1883) and *Hyla arenicolor* (1886) from Las Animas Co., Colo. (Ellis and Henderson 1913). Beardsley's excellent reliability for other species strongly suggests that these species too at least formerly inhabited southeastern Colorado. Intensive field work is needed to clarify their status.

I thank Dr. James Fitzgerald for making the museum register available to me and Dr. Hobart M. Smith for his helpful comments on the manuscript.

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NOTES ON REPRODUCTION IN *Clemmys marmorata*

From June 30 to July 24, 1978, four female Western pond turtles *(Clemmys marmorata)* were captured between 7 and 11 a.m. on the land while apparently attempting to find suitable nesting sites along the Umpqua River near Roeburg, Douglas County, Oregon.

They varied in carapace length from 16.0 to 17.1 cm. Each was injected with oxytocin (into the oviduct) to induce egg laying. Clutch sizes were 4, 7, 9 and 9 eggs. These clutch sizes are within the range of 3-11 eggs reported by Ernst and Barbour (1972). One egg broke. Of the remaining 28 eggs, 10 were incubated on saturated vermiculite and 18 on a screen over a water bath heated to 30° C. Air temperature during incubation varied between 25° and 30° C.

None of the eggs on the vermiculite hatched and only two showed any development. Of the 18 on the screen, 13 hatched and only 2 showed no development. Hatching time was 73-80 days.

Many of the hard shelled eggs on the saturated vermiculite split open early in development. Apparently they absorbed more water than they could contain (Plummer, 1976).

Since the summers along the Umpqua River near Roseburg are hot and dry it makes sense that the eggs of *Clemmys marmorata* would evolve to absorb all the water they could. Hence, in a wet environment, they can literally explode from excess internal pressure (Claessen, 1980). This is in contrast to eggs of *Kinosternon subrubrum* and *Sternotherus odoratus* which were also incubated on saturated vermiculite and developed normally. These eggs, from species living in areas with higher summer rainfall, do not tend to absorb as much water (Lynn and von Brand, 1945).

It was also noted that the hatchlings (from 2.5-2.9 cm in carapace length) did not leave the egg if the temperature exceeded 27° C. But, once moved to a cooler environment, they broke free of the egg within 2-3 hrs. This

may be adaptive since a hatchling exposed to the drying heat of the summer sun would quickly dehydrate and die. Since eggs of *Clemmys marmorata* are frequently laid far from the water (Storer, 1930) such a mechanism could have great survival value.

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TOLEDO COLLECTION NOW AT AMERICAN MUSEUM

Through the courtesy of the Board of Directors of the Toledo Zoological Society and its Executive Director, William V. A. Dennler, the collection of approximately 3,000 preserved amphibians and reptiles, formerly housed at the Toledo Museum of Health and Natural History (TMS), was recently transferred to the Department of Herpetology at the American Museum of Natural History (AMNH) in New York City. It will be available for study as soon as it is catalogued and cross-indexed at the latter institution, with which I have been a Research Associate since 1948.

Because of serious staff limitations, the Toledo Zoo was forced to adopt a restricted policy. No specimens could be borrowed, although herpetologists were permitted to examine them on site. The material was kept permanently in a dark, windowless basement room, which effectively prevented serious fading. Attrition, chiefly a result of deterioration of rubber jar rings used on the storage bottles, was minimal. A number of specimens, which a few years ago were lent to Toledo University and some of the city's high schools as teaching aids, were retrieved by Dennler before the transfer was made to New York. In general, the collection is in excellent condition despite the fact it had been largely untouched for 46 years. It was curated in part during 1977 by Gregory O. Vigle (Herp. Rev., 9(2):48-49) through the cooperation of Philip C. Skeldon, Executive Director Emeritus.

The material was assembled from 1929 to 1935 while I was associated with the Toledo Zoo. The bulk of it is from Ohio localities, and it served in large part as the basis for the text and distribution maps in the "Reptiles of Ohio" (Amer. Midland Nat., 1938). Through the kindness of my superiors, I was permitted, during spring and early summer weekends and occasionally in autumn, to take an extra day, in addition to my one day off each week, in order to go afield. My companions and I shared the expenses, which were largely for gasoline (then under 25 cents a gallon) and meals (with care one could get by on a dollar a day!). My "Chevy" provided transportation. Personnel varied from trip to trip and, although I am indebted to everyone who helped, there were four who participated most frequently and therefore made the largest contributions to the driving, hiking, climbing, and rock turning. They were, David D. Delzell, Barney Gardner, Malcolm K. Murphy, and Homer Percival. Repeatedly we visited all parts of Ohio and accumulated a varied collection that would be impossible to duplicate today. Destruction of habitats, pollution, and other factors have taken their toll.

For making the transfer possible, I thank the officials at the Toledo Zoo and Thomas D. Nicholson, Director, and Charles W. Myers, Chairman of the Department of Herpetology, respectively, of the American Museum of Natural History. Also, I am grateful to Richard G. Zweifel, Curator, and George W. Foley, supervisor of the collection in New York, who drove to Toledo and returned with a truck load of specimens.

Inasmuch as there no longer is a collection in Toledo, TMS should be deleted from the list of museum "acronymys" (Herp. Rev., 11(4):93-102).

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POSITIONS

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The Department of Biology invites applications at the Assistant Professor, or more senior, level. The position is funded for the academic year 1982-83. We anticipate that it will be made permanent. Teaching will include a one-quarter course on the biology of reptiles and amphibians, participation in a team-taught lower division course, and the offering of an advanced course or seminar.

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A COMPARISON OF THE SOCIAL BEHAVIOR OF *Urosaurus auriculatus* AND *U. clarionensis* ON THE REVILLAGIGEDO ISLANDS, MEXICO

The Islas Revillagigedo consist of a group of four volcanic, oceanic islands located between 350-650 km southwest of the tip of Baja California, Mexico. The islands, in order of increasing size, are Roca Partida, San Benedicto, Clarion, and Socorro. The herpetofauna consists of sea turtles (*Chelonia mydas* which breeds on Socorro and Clarion, and one record of breeding of *Caretta caretta* on Clarion), an endemic species of snake (*Masticophis anthonyi* on Clarion) and two endemic lizards (*Urosaurus auriculatus* on Socorro and *U. clarionensis* on Clarion Island. In 1955, I published on the general natural history of these reptiles based on a trip in 1953 (Brattstrom, 1955). I have since been on the Revillagigedo Islands several times, largely associated with studies on the repopulation of Barcena Volcano, 1952, on San Benedicto Island (Brattstrom, 1963).

I have collected additional information on these reptiles on the several trips (including specimens, skeletons, and live animals for chromosome studies all of which are in the Los Angeles County Natural History Museum or Calif. State University, Fullerton collections). I here report on the differences in the social behavior of the two species of *Urosaurus*.

Urosaurus auriculatus

The adult male Socorro Island lizard is, when warm, a brilliant bright blue lizard. The females are smaller than the males and not as blue. The lizard occurs at all elevations on the island, from beaches and lava flows at sea level to near the top of Mt. Evermann at 1130 m. It is a very wary lizard as its only predator is the Socorro Red-tailed Hawk. While the lizard occurs sparcely on rocky slopes and cliffs and near the edges of barren lava flows, it is much more abundant in the heavily vegetated arroyos on the south side of the island and in the heavy *Ficus, Prunus,* and *Guitardia* forests of the northern wetter slopes of the island. Inactive individuals can be found under logs, bark of dead trees, rocks, and coral rubble. Juveniles appear to be most common in open and marginal areas while juveniles and adults are found together in forested areas. The young are the most wary and the adult males the least.

The lizards seem to have a loose hierarchy and they seem to forage by wandering about thru the forested area. In one 6 x 6 m plot, for example, a series of logs occurred beneath a bunch of vine covered *Guitardia* shrubs. Portions of two logs were in full sun while the rest were in shade or semi-shade. As lizards crawled into the sunny spot, they would stop and bask. Within an hour I collected 14 lizards from these two spots on those two logs. It

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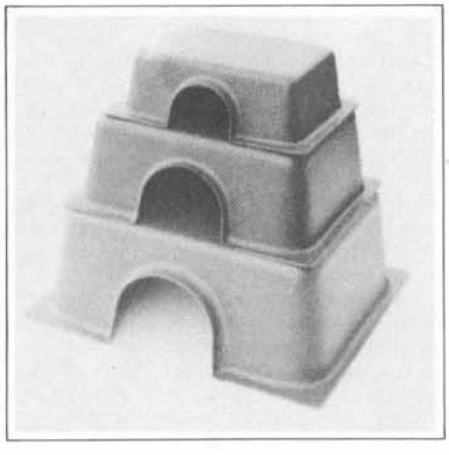
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seemed that the lizards were just wandering thru the area, when one passed on (or was caught), another would enter the area. In another site, a 5 m tall fig tree at Academy Bay, I collected from this one tree and the dead branches at its base, two large males, two large females, and many small juveniles. I returned to the same tree an hour later and collected about the same number of lizards. The impression was that the lizards were just passing thru. They would explore the tree and branches searching for food, then move on. On two occasions, I saw a large male make an assertion display. I saw no chases or other displays. Hence there seemed to be no exclusions or fighting, suggesting a passive hierarchy based more or less on size and sex.

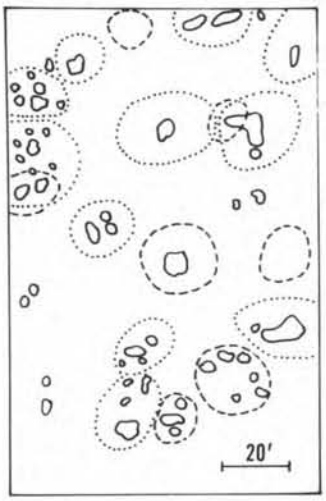
Urosaurus clarionensis

The males of this lizard found only on Clarion Island are bright green when warm. The females are smaller than the males and are brown above with some green on the sides; juveniles are mostly all brown. Clarion is the oldest of the four islands and instead of heavy lava flows has a cinder cone base with a large number of well rounded lava boulders strewn about. The vegetation consists of fairly low grasses and *Opuntia* cactus occurring over most of the island and some shrubs to 3 m high on some of the higher (335 m) parts of the island. The lizards are found at all elevations. Juveniles only are found on and about coral rubble on the upper beaches. Juveniles and adults are found elsewhere on the islands. The lizards are not at all wary and are very conspicuous as they bask on top of exposed boulders. The only predator on this lizard is the Clarion Island Racer. Perched on top of boulders, the lizards apparently can easily see approaching racers.

These lizards are clearly territorial, defending by short quick push up displays and chases. In March 1953, I observed lizards in a large (26.8 x 44.2 m) study plot on the south side of the island (Brattstrom, 1955). The entire plot, with its low vegetation and large boulders could be seen from any vantage point outside the plot. I walked around and thru the plot for two hours until I was convinced I had located every lizard (indeed almost all of the lizards could be seen at any one time from certain places). In March of 1953, 11 males and 6 females were observed on the plot. On November 9, 1971, I sampled the same plot and counted 9 males and 7 females (Fig. 1). So, while the two counts were 18 years apart, the numbers of lizards on the plot were essentially the same (16 in 1971, 17 in 1953). This would suggest that the population levels on Clarion are fairly stable.

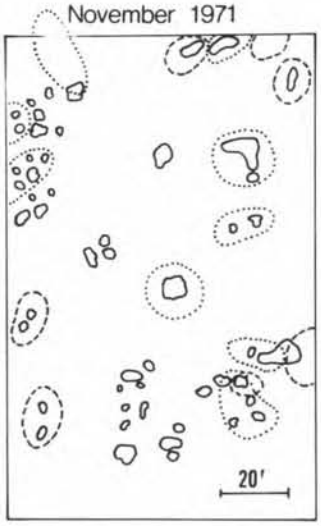
The lizards observed were territorial, with males having mutually exclusive territories and females having either exclusive territories or those which overlapped or were closely adjacent to that of males (Fig. 1). A territorial system is probably facilitated by the more or less evenly distributed large boulders found about the island. In one situation, however, the topography seemed to have induced or allowed a hierarchy to form. At the east end of the southern beach (Sulphur Bay) a large rock (3 x 9 m and 6 m high) had on and about its base, 3 large adult males, 2 adult females, and several juveniles. Maybe the size of this rock and its many cracks and crevices allowed for more lizards to occur on it. Maybe a hierarchy did not occur and the territories were too subtle for me to observe.

March 1953



---- Male
..... Female
—— Rocks

November 1971



Summary

It would thus appear that because of abundance of two major resources, food and dense vegetation, plus the need to escape from the Red-tailed Hawk, a hierarchical social behavior has developed on Socorro Island. The wide distribution of one resource (rocks) and perhaps a more limited food supply requires that a territorial social system predominate on Clarion Island. This in turn allows for vantage sites from which to escape the predacious racer. The territorial system may allow for a fairly stable and fairly equally distributed population. The hierarchical system would allow for a larger population of lizards to occur in areas of Socorro Island where food is more abundant.

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TWO PLATYHELMINTHS FROM *Caudiverbera caudiverbera* (ANURA; LEPTODACTYLIDAE) IN SOUTHERN CHILE

Caudiverbera caudiverbera is an aquatic frog which ranges in Chile between Coquimbo Province and Llanquihue Province (Cei, 1962).

There are few data about parasites of this frog; previously only the tapeworm *Ophiotaenia noei* (Proteocephalidae) (Noé and Lira, 1946) and the trematode of the urine bladder *Gorgoderina valdiviensis* (Gorgoderidae) (Puga, 1979) have been reported.

New parasitological observations of *C. caudiverbera* are presented here, which are based on 36 adult frogs of both sexes collected in Valdivia city (Southern Chile). These data are compared with the observations presented by Noé and Lira (1946), to frogs collected in Santiago Province (Central Chile).

Of the 36 frogs examined, 21 (58.3%) were infected with *O. noei* and 3 (8.3%) with *G. valdiviensis*. In Table 1, the percentages of both parasites infecting males and females of *C. caudiverbera* are presented. Only the females were parasitized with the fluke *G. valdiviensis*.

TABLE 1. Platyhelminthe infection in 36 specimens of *Caudiverbera caudiverbera* from Southern Chile.

	Host sexes					
Platyhelminthes	Males (N=19)		Females (N=17)		Total (N=36)	
	Infected		Infected		Infected	
O. noei	10	52.6%	11	64.7%	21	58.3%
G. valdiviensis	0	0	3	17.6%	3	8.3%

TABLE 2. Monthly variation in *O. noei* and *G. valdiviensis* infection in *Caudiverbera caudiverbera* from Southern Chile.

	Number of frogs				
		with *O. noei*		with *G. valdiviensis*	
	examined	N°	%	N°	%
July	1	1	100	0	0
August	2	2	100	2	100
September	8	7	87.5	0	0
November	12	2	16.6	1	8.33
December	13	8	61.5	0	0

The highest degree of parasitism was observed in a female (13 cm snout-vent) contained 14 tapeworms, and a male (9 cm snout-vent) containing 9 specimens of *O. noei*. The mean tapeworm content observed was 4.5 (range: 1-4). One female of *C. caudiverbera* held 7 flukes.

Table 2 shows the monthly variation of *O. noei* and *G. valdiviensis* in *C. caudiverbera*. *G. valdiviensis* was not reported by Noé and Lira (1946) in the urine bladder of this frog; however, in different parts of Santiago Province (San Antonio, and Santiago Department) they found that 38 (50%) of 75 examined frogs were parasitized by *O. noei*. The degree of parasitism found in Southern Chile was 58.3%.

ACKNOWLEDGMENTS

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AMPHIBIANS AND REPTILES IN THE UNIVERSITY OF MIAMI REFERENCE COLLECTION

Catalogued specimens of amphibians and reptiles in the reference collection of the University of Miami (UMRC) presently number 7,654, representing 50 families, 206 genera, and 512 species (Table 1). The bulk of the collection consists of specimens obtained by J. A. Weber during the 1920's - 1940's and donated to the University of Miami in 1947. In the summer of 1952, L. N. Bell and Albert Schwartz merged the Weber collection with the small reference collection of the University.

Three-quarters of the specimens (75.9%) are from the eastern United States. Especially well represented are the genera *Desmognathus, Notophthalmus, Plethodon, Scaphiopus, Bufo, Acris, Hyla, Rana, Anolis, Nerodia,* and *Thamnophis.* The balance of the collection consists of specimens from Mexico, Central and South America (12.7%); the Western United States (7.2%); the Caribbean (2.8%); and the Old World (1.3%).

Although small, the collection may be of interest to the herpetological community because a number of species common to the eastern United States are represented by large series, and because the collection contains several species that are uncommon in collections (*e.g., Andrias japonicus, Alytes obstetricans* with eggs, *Hemiphractus probocidius*). In addition, the collection is of historical importance in that it contains samples of several introduced species (*e.g., Anolis distichus, A. sagrei, Osteopilus septentrionalis*) that were collected early in the process of colonizing southern Florida. Finally, the collection contains the holotype and a paratype of *Coluber constrictor haasti* Bell, and five paratypes of *Leiocephalus carinatus hodsoni* Schmidt.

Some of the older material is badly formalin-burned, but most specimens are well preserved, and nearly all bear locality data. All are stored in 70% ethanol except tadpoles, which are stored in 10% buffered formalin. The specimens are cross referenced taxonomically, but no geographic file exists.

A listing of specimens, complete as of 13 March 1981, is available upon request.

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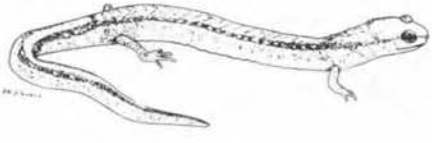
Table 1. Taxonomic break-down of amphibians and reptiles in the University of Miami reference collection.

	Families	Genera	Species	Specimens
CAUDATA	8	27	61	2,662
ANURA	14	39	159	3,026
TESTUDINES	5	10	17	72
CROCODILIA	2	2	2	6
SQUAMATA				
Sauria	11	54	144	1,152
Amphisbaenia	1	1	1	4
Serpentes	9	73	128	732
TOTAL	50	206	512	7,654

Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Houston Zoological Gardens, Houston, Texas 77001.



CAPTIVE REPRODUCTION OF THE CHILDREN'S PYTHON, *Liasis childreni.*

INTRODUCTION

L. childreni is a small python indigenous to Australia. It is commonly found in savannah areas characterized by extreme day/night temperature fluctuations of 1-30 C (M. Moyle: pers. comm.). Various observations of successful breeding have been recorded for *L. childreni.* Ross (1973) reported two clutches of eggs from breeding during a period of shortened photocycle and variable day/night temperatures. In a compiled report, Ross (1978) indicated temperatures of breeding as low as 21.1 C during the months of April-August. R. Cauble (pers. comm.) reported breeding at 26.7-29.4 C and an egg incubation time of 45 days. The results of this study follow a somewhat similar pattern.

A description of the prerequisite conditions to breeding of thermocycle, relative humidity, nutrition and photoperiod are included. Specific notes on breeding behavior, oviposition, artificial incubation and hatchlings are also included.

MATERIALS AND METHODS

Two adult *L. childreni* were acquired from a private keeper in May 1978. Collection data are unknown. The *L. childreni* were probed (Laszlo: 1975) and proved to be a sexual pair.

The male weighed 476 g and measured 1041 mm in total length. The female's weight was recorded at 402 g and total length was 990 mm.

The specimens were housed separately in 35 liter aquaria. Newspaper was used as substrate. A piece of cork bark was placed in each cage to provide a hiding place. The gravid female was moved to a large fiberglass cage (914 x 457 x 302 mm) with basking and thermal gradient facilities to allow her to seek optimum conditions for embryonic development.

The snakes were maintained in a room where the average temperature was 28 C day and 24 C night. During August and September the day/night temperatures were more variable at 30 C/18 C. The nightly lows were achieved by blowing cooler outside air into the room through a window by fan. Temperature was stabilized after these months at 28-24 C.

Room humidity was relatively constant year round at 40-50 percent. A room humidifier runs during the dry winter months to maintain the desired level. Cage mistings were not utilized. A 101 ml water bowl was present at all times. This provided both drinking water and a source for cage humidity. Relative humidity and temperature were measured with a Bendix model 594 Hygrothermograph.

Both *L. childreni* were fed at 7-10 day intervals. The female was fed larger meals in an attempt to increase her weight for breeding. The male was kept comparatively thin. No vitamin supplements were used.

Cage lights were not utilized. Twenty watt fluorescent Vita-lite tubes from adjacent cages ran from 0600-1800 h. Two high-intensity, 40 watt Vita-lite tubes ran on the ceiling from 1000-1600 h.

The pair were separated whenever breeding activity subsided for more than 48 h. Forty-eight to 72 h later the male was reintroduced to the female's cage and copulation occurred within 24 h on most occasions. Twenty-five separate instances of breeding were noted from 25 October to February 1979.

The eggs were incubated in a still air incubator at 31 C, with 100 percent relative humidity. The incubator was a wooden unit covered with styrofoam. Non-automatic heat tape was stapled to the inside bottom and was plugged into a wafer-type incubator thermostat mounted at egg level. The egg box was a covered plastic shoe box which contained potting soil. A minimum-maximum thermometer was set in the egg box to check for possible variances in temperature. The box maintained a constant temperature in relation to the incubator itself, which varies during the heating and cooling process of thermostat operation. An aluminum pan was set on the heat tape and filled with pea gravel. Water was added to the pan to provide humidity. The pan also served to disperse heat of the heat tape evenly throughout the incubator and reduce the possibility of hot spots. The eggs were placed on top of the potting soil for easy viewing during the daily checks.

The neonates were individually housed in plastic shoe boxes. Paper towel substrate was used. The cage was placed over a single length of heat tape. A 50 ml water bowl was placed over the tape, inside the cage. The resultant environment for the hatchlings was warm and humid.

RESULTS

The male was introduced to the female's cage 24 October 1978. Copulation was noted the next day at 0915 h and continued until 1800 h. Courtship was never observed. The male was always positioned next to the female with his tail under hers, with both tails resting on the cage floor. They maintained this position without motion until separation occurred, 1-9 h later. The lowest temperature at which copulation occurred was 20 C and the highest was 26.7 C ($\bar{x}$ = 22.8 C). Relative humidity ranged from 40-50 percent ($\bar{x}$ = 44.48 percent).

The female appeared gravid in mid-January 1979. She first refused food on 16 December 1978. She was observed coiled upside down (ventrals up) on 14 January. She spent all of her time under a heat lamp in a nest box containing damp potting soil. The temperature at this location was 30 C day and 27 C night. She was frequently observed in the ventrals up position while in the box.

The female began to exhibit behavior that indicated she was ready for oviposition on 14 April, 1979 at 1000 h. The tail was in the center of her coils. She was contracting anterior to the vent. Her tail raised and she deposited the first egg at 1030 h. A total of 10 adherent eggs were deposited by 1445 h. The eggs measured from 36-48 mm ($\bar{x}$ = 39.9 mm) in length and weighed 13.7-17.7 g ($\bar{x}$ = 15.09 g). She had a post-ovipositional weight of 325.6 g.

Two eggs containing developing embryos discolored on 25 and 28 April for unknown reasons and subsequently failed to hatch or develop further. The first egg was slit on 1 June. Six hatchlings had emerged by 4 June. The two remaining eggs were opened on 5 June and contained dead, full term embryos. The live and dead specimens appeared normal in color, pattern and morphology in relation to other *L. childreni* observed by the author in other collections. Weight ranged from 7.3-9.5 g ($\bar{x}$ = 8.63 g) and total length ranged from 232-256 mm ($\bar{x}$ = 245 mm).

Ecdysis occurred on 12 and 13 June. All snakes accepted first meals of newborn mice by 21 June. Mean weight doubled by the 40th day after hatching from $\bar{x}$ = 8.63 to 18.35 g. The mean weight was 88.7 g at nine months of age.

DISCUSSION

Ross (1978) reported temperatures of 21.1-30.0 C in Australian and 25.0-29.4 C in North American collections during breeding periods. R. Cauble (pers. comm.) reported an annual temperature range of 26.7-29.4 C for his *L. childreni* in a breeding project. Results of this study were 20.0-26.7 C with a mean of 22.8 C for similar behavior patterns. The low temperatures previous to breeding are probably significant for the inducement of copulation. Previous to breeding activity the *L. childreni* were experiencing 30-18 C day/night fluctuations. This may have represented a winter period. Breeding then took place during the apparent spring (warming) cycle.

Copulation occurred in October (1 time), November (4), December (6), January (9) and February (5) in this study. Ross (1973) reported breeding from September through February and Ross (1978) reported breeding from April through August. R. Cauble (pers. comm.) reported no observed breeding activity although oviposition reflected a northern hemisphere fall breeding.

The unusual positioning of the female is characteristic of many pythons when gravid (personal observations). Ross (1973), Boos (in Ross 1973) and R. Cauble (pers. comm.) noted similar dorsal inversions of gravid *L. childreni*. The author has witnessed similar behavior in *Python molurus* ssp. at this facility. Conversely, a gravid *L. albertisii* exhibited no inversions here.

Ross (1973) reported 18 April and Ross (1978) reported February, March, April (3), May, June (2), October, November (2) and December as dates of oviposition. R. Cauble (pers. comm.) recently reported a clutch on 3 January, 1979.

Incubation time is somewhat variable in the literature. This report indicates 49-53 days ($\bar{x}$ = 52) at 31 C. Ross (1973) reported 66-67 days at 27.2-31.7 C and R. Cauble (pers. comm.) indicated 45 days at approximately 29.4 C. These variations are probably due to the differences in incubation temperature. In both reports the incubation temperatures were varied and the true average temperature was not readily ascertainable.

It appears that the breeding season of *L. childreni* is highly variable in captivity. It is probable that captive behavior is the result of cycling into existing conditions possibly unknown to the keeper. A preliminary hypothesis is set forth from this report; a mild winter period of lower night temperatures, followed by a comparatively stable warmer period, will result in mating behavior. These environmental conditions may be important in gonadal development and conditioning; leading to successful reproductive functions.

The controls have been repeated for the 1980 breeding season with similar results in relation to observed breeding at the date of this writing.

ACKNOWLEDGMENTS

I would like to thank Dan Chiras and Dale Marcellini for review of the original copy. I am also grateful to Tracy Miller for offspring growth data.

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COURTSHIP AND COPULATORY BEHAVIOR OF CAPTIVE EASTERN HOGNOSE SNAKES, *Heterodon platyrhinos.*

Reproductive behavior of the eastern hognose snake, *Heterodon platyrhinos*, has been sparsely documented with details of oviposition, egg size and incubation, and hatching size. Edgren (1955) and Platt (1969) detailed the natural history, but did not discuss the courtship and copulatory behavior of these snakes. Reported here are observations of the courtship and copulatory behavior of a captive pair of *H. platyrhinos*.

METHODS AND MATERIALS

The male (550 mm SVL) was collected in Gloucester County, New Jersey on 30 July 1973. He was maintained in a 38 liter aquarium and was fed a diet of toads, frogs, and mice. The female (580 mm SVL) was taken on 26 April 1977 from the above locality and was maintained in the same aquarium with the male until 16 September 1978. She was removed to a cage (305 x 203 x 101 mm), after laying a clutch of ten eggs to prevent any further breeding. She was returned to the male's aquarium on 15 January 1979 for mating observations and removed after copulation occurred. She produced one clutch of fifteen eggs on 3 March 1979 and a second clutch of sixteen eggs on 4 September 1979.

OBSERVATIONS

The observations reported below occurred at various times during the fall of 1977. Although no copulation was observed during this period it probably occurred because the female produced a clutch of ten eggs ($\bar{x}$ = 6.7g; 35.5 x 18.1 mm) on 14 September 1978.

The male approached the female about three quarters of the way down her body and contacted her side with his rostrum. After contact, he advanced anteriorly along her laterally, nudging her with his rostrum as he moved. When he reached her neck, his body was parallel with that of the female. He continued to nudge her with his rostrum, looped his tail over hers and attempted to push a loop of his tail underneath. The undulations of the tail moved anteriorly until his entire body was undulating against the female's body. The female usually remained still but occasionally advanced. During most observations, the female moved away shortly before the male's tail search and copulatory attempt, but in one instance he was observed forcing his tail under hers, and the undulations of his body became more rapid causing the female to move quickly away.

The female laid a single yellow egg (4.2g; 37.9 x 15.6 mm) in the water dish on 14 September 1978 and the remaining nine eggs (4.0-8.7g; 27.8-40.5g x 14.8-20.1 mm) on 16 September 1978. The female was removed after egg laying and readily accepted food the following day. The eggs were opened on 15 December 1978 and found to be undeveloped.

On 15 January 1979, the female was returned to the male's aquarium for the below reported observation.

The male approached about three quarters of the way down the body of the female on the right side making tongue-flicks at a rate of about one per second. After contact with his rostrum, he moved anteriorly along the female's dorsum with his head pressed against her body. He made short tongue-flicks at a rate of about two - three per second and sudden jerking movements described as forward-jerking in rat snakes by Gillingham (1979). During his advance, the female occasionally moved forward with the male partially draped over her body. The male began to undulate his tail over the tail of the female and shortly thereafter these undulations moved anteriorly in waves described as caudocephalic waves in rat snakes by Gillingham (1979). He then forced a loop of his tail under the female's tail and began to rapidly move it back and forth.

Intromission was accomplished with the left hemipenis. The male was lying alongside the female with his head pressed against the back of her neck. The female periodically moved forward; the male's body moved apart from hers during coitus. Copulation lasted about five hours, after which the female was removed.

On 27 February 1979 she laid one yellow egg (5.7g; 33.0 x 18.6 mm), two white eggs (10.0, 8.3 g; 43.8 x 20.4 mm, 34.3 x 20.5 mm) were laid on 1 March 1979, and the remaining twelve eggs (4.0-9.2 g; 30.7-40.3 x 15.7-21.8 mm) were laid on 3 March 1979. The eggs began hatching on 13 May 1979 and averaged 75 days incubation (72-78 days) for seven eggs. Five other eggs failed to hatch but contained fully developed snakes. Hatchlings weighed 3.6-8.2 g (av. 5.3 g) and measured 126-157 nn SVL ($\bar{x}$ = 143 mm). After shedding the natal skin, the hatchlings were offered dead *Hyla crucifer*.

On 4 September 1979, without having been in contact with the male since 15 January 1979 the female laid 16 eggs (3.5-10.1g; 25.2-44.5 x 16.4-24.Omm). Eight eggs were discarded on 20 September 1979, four eggs hatched on 4 November 1979, two eggs were discarded on 10 November 1979, and the remaining two eggs were opened on 21 November 1979 and found to contain deformed snakes; one of them was dorsally bifurcated.

DISCUSSION

The courtship behavior of *H. platyrhinos* resembles the courtship of rat snakes as described in Gillingham (1979). The courtship can be broken down into several phases: 1) dorsal advance movement, 2) tail searching and copulatory attempt, and 3) coitis. The male did not chase the female, possibly because of the small confines of the cage or the female's receptiveness to the male. The male did not bite the female during copulation as in many other colubrid snakes but positioned his head along the dorsal surface of the female just behind the head.

There were differences between the first group of observations and the single observation. During the dorsal advance of the first set

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of observations the male advanced along the side of the female, nudging her with his rostrum, possibly to stimulate reproductive behavior from the female. He did not exhibit forward jerking, which was noted in the later sequence. The male's approach during the early observations and his failure to elicit reproductive behavior from the female, may have been due to the female's sexual immaturity, small size, or age. Platt (1969) found that the western hognose, *H. nasicus*, with SVL of less than 360mm were immature and that of those 360-400mm SVL, seventy-five percent were immature. Since *H. platyrhinos* averaged slightly larger than *H. nasicus* (Platt 1969), it is believed that the female may not have given off the proper chemical stimuli to elicit proper courtship behavior from the male.

ACKNOWLEDGMENTS

I am grateful to John D. Groves for his help in the preparation of the manuscript. I thank my wife, Nancy, for her care and understanding during the study.

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LIFE HISTORY NOTES

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General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1978. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

ANURA

RANA CATESBEIANA (Bullfrog). **FOOD.** A bullfrog *(Rana catesbeiana)* was gigged by a frog hunter at approximately 10:30 p.m. on 11 July 1978 on the north bank of the Mississinewa River at the northwest corner of Botany Glen in Grant County, Indiana. Botany Glen is a natural area owned by Marion College and is described in Lindsey *et al.* (1969. Natural Areas in Indiana and Their Preservation. Purdue Univ., Lafayette, Ind. 594 p.)

The wing of a bat was observed protruding from the mouth of the bullfrog. The bat was dead but had apparently been ingested very recently. It was an adult female Big Brown Bat *(Eptesicus fuscus)* bearing band number BAT9-77182. It was banded as an adult on 5 August 1972 in a nursery colony of Big Brown Bats located in the attic of a two-story brick home in Gas City 2.3 mi (3.7 km) NW of Botany Glen. It was recaptured in the same colony on 11 September 1973.

The ingestion of bats by bullfrogs may be uncommon since a search of the literature revealed but two reports. Lee (1969. Notes on the Feeding behavior of cave-dwelling bullfrogs. Herpetologica 25:211-212) found the Southeastern Myotis *(Myotis austroriparius)* in the diet of bullfrogs in an Alabama cave. Korschgen and Baskett (1963. Foods of impoundment and stream-dwelling bullfrogs in Missouri. Herpetologica 19:89-99) found two Red Bats *(Lasiurus borealis)* in the stomachs of bullfrogs collected at a Missouri impoundment.

Submitted by **RALPH D. KIRKPATRICK,** Department of Biology, Ball State University, Muncie, IN 47306 ●

SERPENTES

AGKISTRODON CONTORTRIX PICTIGASTER (Trans-Pecos Copperhead). **NEONATES.** USA. Texas, Presidio County. Numerous accounts of the offspring of *A. contortrix* have been given in the literature (see Fitch, H. 1960. Univ. Kansas Mus. Nat. Hist. Publ. 13(4):85-288.); however, none has appeared for the subspecies *A. c. pictigaster.* On 16 August 1980, a brood of four (3 ♂, 1 ♀) offspring resulting from a captive mating was produced. Within 24 h after parturition, lengths and masses were obtained to the nearest millimeter and 0.1 g, respectively. S-V lengths: 200-210 mm ($\bar{x}$=205 ±4.08 mm); tail lengths: 41-47 mm ($\bar{x}$=44.5 ±2.52 mm); masses: 13.7-14.1 g ($\bar{x}$=13.9 ±0.03 g). Ecdysis occurred 9 days after parturition for all specimens, and subsequently color notes were taken. The neonates differ in coloration from the holotype (Gloyd, H. K. and R. Conant. 1943. Bull. Chicago Acad. Sci. 7(2):147-170.) in the following: (1) the dorsal crossbands are dark brown stippled lightly with tan; (2) the dorsal ground color is dark tan; (3) the venters are uniformly darker; (4) dark brown spots (usually paired) occur laterally on the dorsal crossbands principally in the caudal two-thirds of the body; and (5) the distal one-half of the tails are dull white (one dull yellow).

Submitted by **GORDON W. SCHUETT** and **FRED KRAUS,** Department of Biology, University of Toledo, Toledo, Ohio 43606, and Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109. ●

CROTALUS VIRIDIS CONCOLOR (Midget Faded Rattlesnake). **COLORATION.** USA. Wyoming, Sweetwater County. On 5 May 1979, James L. Glenn secured a specimen having extensive fusion of the dorsal blotches (only 6 anterior dorsal blotches are complete). There is no fusion of the tail blotches. Another Sweetwater *concolor,* captive born on 20 August 1979 to a wild-bred female (normal pattern) collected 5 May 1979, has some fused posterior dorsal blotches. On 25 September 1979, GWS secured from the same locality two additional *concolor* (A and B) with some fused dorsal blotches. Crotalines with fused dorsal blotches have been previously reported (Gloyd, H. K. 1958. Bull. Chicago Acad. Sci. 10(2); Nickerson, M. A. and C. E. Mays. 1973. Wasmann J Biol. 26(1):125-131.) but the occurrence of four aberrant *concolor* within an area of *ca.* 100 m^2 is unusual. Specimen A: a male (Fig. 1); total length of 414 mm; S-V length of 380 mm; dorsal color is tan with flecks of dark brown and gray; dorsal blotches are dark tan and well-defined, bordered by dark brown and outlined by white. A series of dorsolateral and lateral blotches are tan and dark brown, respectively. Five dorsal areas exhibit fused blotches; the greatest amount of fusion is directly behind the head (the first blotch is not fused) and extends posteriorly 55 mm. At mid-body there are two separate fusions (45 mm and 15 mm in length), and posteriorly two more (50 mm and 25 mm in length). Some



Fig. 1. Male *C. v. concolor.*



Fig. 2. Female *C. v. concolor.*

dorsolateral and some lateral blotches are fused. There is no fusion of the tail blotches. The venter is cream with dark brown concentrated along the lateral edges. Specimen B: a female (Fig. 2); total length of 499 mm; S-V length of 471 mm. This specimen is similar to the male except that: (1) fusion of the dorsal blotches occurs largely in one region with the largest amount located 80 mm behind the head (*ca.* 55 mm in length); at mid-body there is a two-blotch fusion, and (2) there is no fusion of the dorsolateral or lateral blotches. The scale counts of both specimens are typical for the subspecies. Gloyd (*op. cit.*) noted typical scale counts in crotalines he examined that had fused dorsal blotches. The specimens are being kept alive to determine whether they will produce offspring with pattern aberrations; however, similar aberrations in other snake taxa are known to result from suboptimal temperatures during embryogenesis (see Vinegar, A. 1974. Herpetologica 30:72-74 and references therein). We wish to thank L. Porras, L. D. Wilson, and J. L Glenn for their helpful comments on the manuscript. L. Porras kindly supplied one of the specimens.

Submitted by **GORDON W. SCHUETT** and **FRED KRAUS,** Department of Biology, University of Toledo, Toledo, Ohio 43606, and Museum of Zoology, University of Michigan, Ann Arbor, Michigan 48109. ●

EPICRATES SUBFLAVUS (Jamaican Boa). **FOOD.** A 2.0 m, 3.6 kg female(?) Jamaican boa was captured by W. Robinson on 24 July 1980 at White Horses, St. Thomas Parish, Jamaica, and taken to Hope Zoo, where it is now on exhibit. Four fecal samples contained the remains of a large mongoose, *Herpestes auropunctatus,* an adult rat, *Rattus cf. rattus,* boa teeth, and finely masticated pieces of beetles, ants, and grass. The insects and grass probably had been eaten by the mammals. It is possible that the mammals were taken as carrion, and it is possible that the rat was eaten by the mongoose, which was in turn eaten by the boa. The introduced mongoose has ravaged Jamaica's herpetofauna in general and *Epicrates subflavus* in particular. We are pleased to report that the tables may sometimes be turned.

Submitted by **JAMES R. BAIN,** Florida State Museum, Gainesville, Florida 32611 (present address: 1004 Hazel Way, Flagstaff, Arizona 86001) and **LARRY HURST,** Hope Zoo, Royal Botanical Gardens, Kingston 6, Jamaica (present address: U.S. Peace Corps, 9 Musgrave Avenue, Kingston 10, Jamaica). ●

LAMPROPELTIS GETULUS HOLBROOKI (Speckled Kingsnake). **FOOD.** On 11 February 1978 I introduced a 96 cm (S-T) speckled kingsnake *(L. g. holbrooki)* into a cage with a breeding pair of *L. g. yumensis,* each measuring about 137 cm (S-T). The three snakes were compatible, so were left together.

From 4 April through 27 April 1978, copulatory behavior between male and female *L. g. yumensis* was observed. Since the smaller *L. g. holbrooki* was not disrupting reproductive behavior between the other two snakes, it was left in the same cage.

On 11 June 1978, I discovered four eggs in the kingsnake cage. Since previous clutches from the female *L. g. yumensis* numbered 9, 16, 9, and 15 eggs, I thought it strange that only four eggs were laid this year. Later in the day when I removed the kingsnakes, I noticed great distention of the belly of the *L. g. holbrooki.* The shape of five engulfed eggs was easily detected on the ventral surface of this snake.

While Conant (1975. A field guide to reptiles and amphibians, Houghton Mifflin Co., Boston) mentions that kingsnakes eat turtle eggs, Porter (1972. Herpetology, W. B. Saunders Co., Philadelphia), Schmidt and Inger (1957. Living reptiles of the world. Doubleday and Co., Garden City), and others say nothing about kingsnakes eating snake eggs. During the three years the *L. g. yumensis* were kept together, they never ate eggs from any of their clutches.

Submitted by **ROBERT E. LEWKE,** Allied Health Division, District One Technical Institute, 620 W. Clairemont Avenue, Eau Claire, WI 54701. ●

LAMPROPELTIS TRIANGULUM (Milk Snake). **COLORATION.** Leucistic, aberrant eastern milk snake, *Lampropeltis triangulum triangulum* caught by Mark Lucas in August, 1980. This snake was found on the grounds of the Soldiers Home Hospital beside the Wabash River, located about three miles east of



Lafayette, Indiana. Because of the extreme pattern anomaly there was some question as to the identity of this snake but it feeds readily on pink mice, is a powerful constrictor and keys to an eastern milk snake. This area is about 50 miles north of the ranges of both *Lampropeltis t. syspila* and *L. calligaster.* The snake is being maintained in the collection of Ernie Wagner.

Submitted by **ERNIE WAGNER,** Curator of Reptiles, Woodland Park Zoo, Seattle, Wash. ●

TANTILLA RUBRA CUCULLATA (Blackhood Snake). **SIZE.** On 11 June 1980 an exceptionally large *Tantilla rubra cucullata* was found DOR by Lorna Trumbower on State Hwy. 118 near the intersection of Park Road 3, Jeff Davis Co., Texas. The specimen (UF 50785) is a male with a total length of 654 mm (502 mm SVL, 152 mm TL).

The record lengths for *T. r. cucullata* and *T. r. diabola* were reported by Conant (1975. A field guide to reptiles and amphibians of eastern and central North America, Houghton Mifflin Co., Boston) as 438 mm and 552 mm, respectively. However, *T. r. diabola* was later synonymized with *T. r. cucullata* by Degenhardt, Brown, and Easterla (1976. The taxonomic status of *Tantilla cucullata* and *Tantilla diabola.* Texas J. Sci., 27(1):225-234). The specimen reported herein surpasses the reported record length for *T. r. cucullata* (=*diabola*) by 102 mm. This also represents a new record length for the species (L. D. Wilson, pers. comm.).

There are only three species of *Tantilla* which have been reported to approach or barely exceed 600 mm in total length. *Tantilla annulata* was reported to measure 590 mm by Dunn and Bailey (1939. Snakes from the uplands of the Canal Zone and of Darien. Bull. Mus. Comp. Zool., 86(1):1-22). *Tantilla moesta* is reported to measure 592 mm by Wilson (In press. A review of the colubrid snakes of the genus *Tantilla* of Central America. Milwaukee Public Mus. Contr. Biol. Geol.). *Tantilla semicincta* has been reported to measure 600 mm by Wilson (1976. Variation in the South American colubrid snake *Tantilla* (Duméril, Bibron, and Duméril) with

comments on pattern dimorphism) although a specimen with an incomplete tail would probably have exceeded this length. Therefore, the record length for the genus *Tantilla* is now held by the *T. r. cucullata* herein reported.

Submitted by **LOUIS PORRAS,** 12120 S.W. 180th Street, Miami, Florida 33177. ●

SAURIA

CNEMIDOPHORUS SEXLINEATUS (Six-lined Racerunner). **CANNIBALISM.** Cannibalism in captivity has been reported in members of several families of lizards including Iguanidae, Scincidae, and Varanidae. This paper is the first report of cannibalism in a teiid species.

On April 20, 1979, an adult male *Cnemidophorus sexlineatus* weighing 9.6 g was captured in Chambers County, Alabama. The lizard was individually bagged and returned to the laboratory. Subsequent dissection of its digestive tract revealed an intact juvenile racerunner in its stomach. The juvenile, probably a hatchling from the previous summer, measured 27 mm SVL. The juvenile had been swallowed head first and showed little evidence of digestion, indicating it had been consumed just prior to the adult's capture.

Fox (1975, Cannibalism in natural populations. Ann. Rev. Ecol. System., 6:87-106) reported that cannibalism is not an aberrant behavior limited to a few taxa; rather, he suggested that is is normal behavior in healthy populations of fish, anurans, birds, mammals, and numerous invertebrates. He indicated that cannibalism might serve to eliminate competition before resources become limited. Furthermore, Fox suggested that population density as well as availability of alternative food may influence the intensity of this behavior. This was the only lizard which positively exhibited cannibalism of the 338 racerunners we collected in a study on hibernation. This male was collected during early spring soon after emergence from hibernation. During this time insect prey items are relatively scarce, a situation which may intensify cannibalistic behavior.

Submitted by **KAY ETHERIDGE** and **LAWRENCE C. WIT,** Department of Zoology-Entomology, Auburn University, Alabama 36849. ●

PHRYNOSOMA CORONATUM JAMESI (Coast Horned Lizard). **LONGEVITY.** Captured 15 April 1973, 31 Mi. west of San Ignacio, Baja Del Sur. "DOR, Hit but not dead." (Adult) Died accidentally 27 or 28 July 1981. The specimen was donated to LACM. Previous recorded longevities for *Phrynosoma* cluster around one year.

Thanks are expressed to Mario Luis Cossio Gabucio for Scientific Collecting Permit #219.1.

Submitted by **THOMAS PORTER,** 7812 Yarmouth Ave., Reseda, CA 91335. ●

TESTUDINES

CHRYSEMYS PICTA (Painted Turtle). **COLORATION.** An unusual color morph of this species, tentatively designated "erythroxanthic," was collected in Livingston County, Michigan, in August 1980. The carapace has a symmetrical pattern of orange whorls outlined in black, on an olive-green background, with an orange, black-bordered, dorso-medial stripe. Head and soft parts are pale yellow. Legs and feet have a single dark lateral stripe, while the top of the head has a gray and olive figure bordered in black. The area between eye and nostrils has finer black streaking. Eye is white with a black pupil, and lacks the transverse stripe of normal specimens. Plastron is immaculate pale yellow. (See photo).





Ewert (1979. The embryo and its egg: development and natural history. In: Turtles: Perspectives and Research. Harless and Morlock, eds. Wiley and Sons, Inc., NY. 695 pp.) discusses variations in turtle pigmentation. The suggested causes include environmental extremes during egg incubation, and genetic factors. Aside from pigmentation, the present specimen is morphologically normal. It is presently being maintained alive at Cranbrook Institute of Science, Bloomfield Hills, MI, and will be deposited there upon death.

Submitted by **JAMES H. HARDING,** Cranbrook Institute of Science, Box 801, Bloomfield Hills, MI 48013, and **KATHERINE LATINEN,** 275 E. Lewiston, Ferndale, MI 48220. ●

BOOK REVIEWS

ROCK LIZARDS OF THE CAUCASUS, by I. S. Darevskii. v, 276 pages, soft covers. Publ. by Indian National Scientific Documentation Centre, New Delhi, "1978" (first copies received in US April 1979). Available from US Department of Commerce, National Technical Information Service, Springfield, Virginia 22161 (Publ. TT 70-53086). Price $11.00.

In 1967 Ulya Darevsky published his important review of the rock lizards (genus *Lacerta*, subgenus *Archeolacerta*) of the Caucasus, the Crimea, Turkey and northern Iran. This monograph ("Skal'naye Yashcheritsa Kavkaza," Izdatel'stvo 'Nauka,' Leningrad, 214 pages plus errata, color plates I-II, photos 1-35) covers the systematics, geographic variation, ecology and phylogeny of the eight species in this group, including both bisexual and parthenogenetic forms. Darevsky's book is of broad interest to ecologists and evolutionary biologists because he deals at length with the problems of species criteria and taxonomic rank of parthenogenetic populations, the significance of hybridization between bisexual and parthenogenetic forms and the evolution of parthenogenesis. Herpetologists are especially interested in these issues because of the existence of all-female species of lizards (representatives in at least six families), salamanders *(Ambystoma)* and, apparently, some primitive snakes *(Typhlops)*. But for those who do not read Russian, the only other recent review had been that published by Darevsky in 1966 in the *Journal of The Ohio Herpetological Society*.

The need for a more comprehensive review in English has not been met through this translation of Darevsky's book by the Scientific Documentation Centre. Insofar as I have been able to check, the translation has been done accurately and the English version has also benefited from the scientific editorship of George Zug. The manufacture of the book, however, is poor. Several signatures of pages have already fallen out of my copy. There are numerous typographic errors and many crude attempts to correct others. The photos have been reproduced very badly; the line drawings look as if they were reprinted from xerox copies and have lost much detail when compared to the original. Despite these defects,

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this translation provides for the first time in English a detailed review of the subject yet this is now badly out of date as Darevsky and his colleagues have made important new studies in the last 15 years that are not covered at all in this translation.

KRAIG ADLER
Cornell University

SOUTH AFRICAN FROGS by N. I. Passmore and V. C. Carruthers, 1979. Witwatersrand University Press, Johannesburg, xxiii + 270 pp., cloth bound including an LP record of calls. Available from Witwatersrand University Press, 1 Jan Smuts Avenue, Johannesburg 2001, South Africe for R22.00 plus R2.00 for postage and packing.

This book makes a magnificent addition to the older treatments of the South African herpetofauna contained in Rose (1962), Wager (1965) and Poynton (1964). **South African Frogs** is the result of a continuing and fruitful collaboration between Neville Passmore, of the Department of Zoology, University of Witwatersrand, and Vincent Carruthers, whose fine photography places this book very high on the list of illustrated guides to any animal group published to date.

The book is designed as a field guide to the adults of the 84 anuran species (in 23 genera) recognised to date in South Africa, although its large size (21.5cm x 27.5cm) and glossy finish would discourage me from using it under true "field" conditions. In common with other recently published field guides to frogs (for example Barker and Grigg, (1977), for Australia), the authors exclude several undescribed species and subspecies. At the risk of treading on some taxonomists' toes, I rather regret this. The useful life of the guide could be extended, and more rapid resolution of taxonomic and distributional problems achieved if such forms were included, and identified at least to genus and/or species group. Menzies (1975) **Handbook of Common New Guinea Frogs** does not flinch from presenting such unresolved taxonomic problems.

The first sections of the book deal generally with species and sub-species; frog sounds; mating; spawn; development and tadpoles; colour, temperature, water and the skin; feeding and a field key to the genera. Some of the content of these early sections departs refreshingly from the usual fare of other treatments.

For example, male advertisement calls are interpreted functionally as part of a co-adapted 'specific male recognition system' (SMRS). 'Isolating mechanisms', which traditionally serve to reduce mis-matings between species, are thus only an effect, rather than the raison d'être of the specificity of intraspecific signal-receiver systems. This re-interpretation of the concept of 'isolating mechanisms' will lead to useful new insights into such topics as speciation by reinforcement, coexistence in complex communities and the evolution of signalling systems.

In the section on frog sounds, the mechanisms of call production, functions of calls and interpretation of sonagrams are briefly but usefully treated. I am uncertain why the term "mating call" is adhered to, rather than Wells's (1977) more useful term "advertisement call", particularly as the authors acknowledge more functions than mate attraction alone.

Ecological consequences of species-specific call structure variation and calling site selection in mixed-species choruses are also discussed. The remaining early sections of the book treat other aspects of frog biology in a general, but useful way.

A highlight of the book is a photographic key to the genera. The excellent half tone photographs of the key make each choice absolutely clear, avoiding the usual problems of written keys, with which one often struggles in a conflict of interpretation. The photographs, in addition to clearly illustrating the key's choices, also give the user a rapid appreciation of the whole appearance of the animal to be keyed out, in visual contract to the possible alternatives. Key characters are also arrowed, in a similar fashion to the Peterson system, further reducing the possibility of ambiguity. Species determinations are achieved by comparison among the systematic accounts within each genus.

A map of localities cited follows the key, although the map does not contain the names of larger political divisions (*e.g.* Transvaal, Natal) which are frequently mentioned in the text.

The majority of the text (pp. 42-255) consists of systematic accounts, in which each species is defined. The systematic accounts are arranged by genus, and the individual species' treatments are preceded by a diagnosis of the genus, and short notes on sexual dimorphism, eggs, tadpoles and distribution.

The notes on eggs and tadpoles are generally insufficient for positive identification, even to genus. This is hardly a harsh criticism — even treatments of well-worked faunas, such as North America (Conant, 1975) do not often provide keys to eggs and larvae. A key to eggs and larvae, possibly only to genus, would strengthen this book in its (hopefully) future editions.

The species' accounts contain scientific and common names, with limited synonymy; a superb colour photograph (sometimes more than one), usually on a natural background, a distribution map, a sonagram of the male advertisement call, notes on habitat, a life-size half tone photograph and diagnostic half tone photographs of the ventral surface, foot, thigh and/or hand. Again, the Peterson system is used to indicate diagnostic features. One slightly annoying omission is the lack of higher taxonomic, for example, familial, classification. This would assist the user when comparing the composition of the South African anuran fauna with those elsewhere. The broad distributions of species occurring more widely than South Africa alone are generally not mentioned.

The systematic section is followed by an Appendix containing characters used to differentiate recognised subspecies, a glossary of technical terms, a selected bibliography and an adequate index. Accompanying the book is a recording of all available calls, narrated by Carruthers. The recordings are of excellent standard, and are presented in the same order as the species' appearance in the text, so that visual and aural comparison is simple.

I have very few negative comments. Typographical errors are few. I discovered only two: on page 233 "comparatively" is mis-spelt, and on page 267 the citation of van Dijk, *Zool. Afr.* **6:**119-132, is undated. Errors of fact are also rare. One which caught my eye (page 129) is the statement that the genus *Rana* does not occur in the Australian region. One species does occur on the northern tip of Cape York Peninsula (Cogger, 1979).

Considerable use is made of Afrikaans terms such as kloof, fynbos and vlei without sufficient definition, at least for non-South African users. There is also some loose use of comparative statements, such as "large eggs", rather than a more explicit, and useful, quotation of an ovum diameter.

The layout of the book is very attractive, and easy to read, but the text could have been considerably compressed. Compression of the text might have permitted the production of a smaller book, although a reduction in the quality of the photographs seems a likely consequence.

The only obvious omissions are brief sections on field observation and collection techniques (the book is intended for amateurs, as well as scientists), and a treatment of photographic methods. Information on this topic is readily available elsewhere, however.

Passmore and Carruthers's book is a fine contribution to the herpetological literature of the world, and sets exacting standards for the authors of future field guides. **South African Frogs** is certain to provide a great impetus to studies of the ecology, speciation and behaviour of this incompletely-known fauna.

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ROBERT B. HUMPHRIES
Australian National Museum

RARE AND ENDANGERED BIOTA OF FLORIDA: VOLUME THREE: AMPHIBIANS AND REPTILES edited by Roy W. McDiarmid. 1978. University Presses of Florida, Gainesville. xxii + 79 pp, cloth bound. $5.50.

This text represents the third in a four volume series on the rare and endangered biota of Florida. Other volumes have covered mammals, birds, and fish, respectively. Sponsored jointly by the Florida Audubon Society and the Florida Defenders of the Environment, each volume is designed as a concise compendium of biological information on the status and distribution of the endangered or threatened members of each major verebrate group within Florida. Considering the greatly increased public awareness for the plight of endangered species, and the fact that so many of these forms are found in Florida, it is not surprising that this series has been initiated. What is surprising is that the sponsoring agencies have been able to enlist the aid of so many scientists, researchers, and state and local officials to produce this timely and valuable volume.

The volume on amphibians and reptiles begins with a relatively long introductory section, providing a list of the species considered, a detailed description of the major terrestrial and wetland habitats utilized by herps within the state, and a tabular listing of all 45 endangered or threatened forms, as they occur in each habitat and county in Florida. Following the introduction comes the main bulk of the text, a series of 1-2 p. individual species accounts, each prepared by a different author., Each account consists of a detailed morphological description, as well as notes on range, habitat, life history, special characteristics and a list of selected references. A finely detailed map, showing the species' range both within Florida, and in North America, is also provided. These accounts are clearly not intended to be a complete description of the species' biology; rather they provide a concise introduction to what is currently known concerning each species within Florida. The amount of information varies widely with the author, but all accounts are adequate for the purposes of this volume.

I found relatively little to criticize about this text. The only serious problem concerns the rationale behind some of the classifications used, which were not always clear to the reader. For example, it is difficult to understand why the eastern indigo snake *(Drymarchon corais couperi)* is classified here as a "species of special concern", considering that the Federal government only recently (1978) classified it as threatened, and that the author of the account (p. 69) states that "currently the indigo snake is considered threatened and legally protected by the state of Florida". There are similar questions about the classification of a few other species, most notably the American alligator *(Alligator mississippiensis)*. Although there may be a sound biological basis for these classifications, the reasons behind them should be made clearer to the reader, especially those not familiar with Florida's herpetofauna.

Considering the number of authors involved, inconsistencies and typographical errors were uncommon, and did not significantly detract from the text. A few are mentioned here for the sake of completeness. On pp. 7 and 61, the selected references are not in order. For the sake of taxonomic consistency, *Pseudobranchus striatus* (p. 17) should be placed under Order Urodela, as are the other salamanders in the text, rather than under Caudata. On p. 24, the legend for the map insert is partially illegible. Papers cited as "in preparation" should not be placed in the selected references, or given a date of publication, as they are on pp. 7 and 61. On p. 33, the title is missing from the reference Jackson and Jackson (1968).

Despite some minor difficulties, the state of Florida has produced a handsome and valuable reference text, which will be useful to anyone working with endangered or threatened amphibians and reptiles, or to anyone interested in the herpetofauna of Florida. Conservation officials from other states would be well-advised to use this entire series as a model for their own endangered species publications. Finally, the price of this text ($5.50) makes it a good buy in these days of inflated prices.

RICHARD A. SEIGEL
Museum of Natural History
University of Kansas

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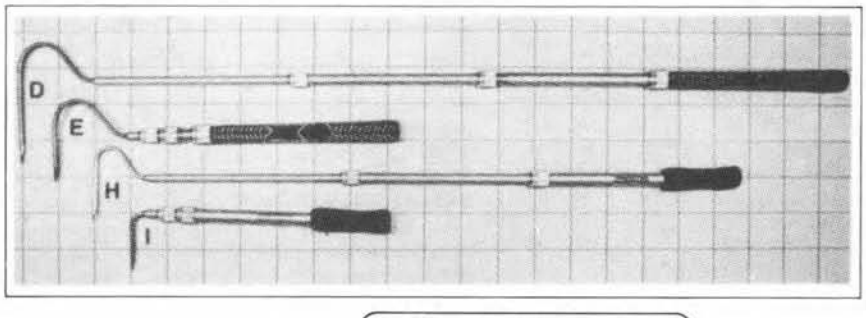
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By Joseph T. Collins, Roger Conant, James E. Huheey, James L. Knight, Eric M. Rundquist and Hobart M. Smith

Available in summer 1982. The first edition of this reference, issued in 1978 as SSAR **Herpetological Circular** No. 7, quickly became a standard reference for herpetologists, biologists, zoos, museums, conservation organizations, wildlife societies, book publishers, and Federal and state wildlife agencies. This second, revised edition is an up-date listing over 1300 common and scientific names for species and subspecies of North American (north of Mexico) salamanders, frogs and toads, crocodilians, turtles, lizards, and snakes. New features in this edition (not in the 1978 version) are an appendix of Hawaiian amphibians and reptiles, the inclusion of the names of describers for all genera, species and subspecies, and the addition of a table comparing the number of currently recognized subspecies with those listed in earlier publications. The SSAR Committee on Common and Scientific Names (shown above) considered over 50 proposed changes for this edition, the majority of which were adopted.

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***Herpetological Circulars are no longer distributed free to SSAR members; individuals desiring copies of this and future numbers should place their orders as per the above instructions.**

MELBOURNE HERPETOLOGICAL SYMPOSIUM PROCEEDINGS

This volume summarizing the 1980 symposium, is now available. The meeting, held at the Royal Melbourne Zoological Gardens, attracted 110 persons; 35 papers were presented. The volume's 199 pages are peculiarly broken into 9 macrodivisions which show more than a little overlap and hence are of questionable value. Hence, one finds a paper on farm management of *Chelonia mydas* under ***TURTLES AND TORTOISES*** rather than ***MANAGEMENT AND CONSERVATION,*** and several other inconsistencies. But, ignoring that, the volume is a fine treatise on the Australian herpetofauna as a whole and a valuable reference for anyone involved with captive propagation of reptiles. The additional papers on biogeography, physiology, taxonomy and natural history make this a well balanced volume suitable for use as a readings-in-herpetology text with an emphasis on Australia. For information on availability of the volume, write:

Chris Banks
The Royal Melbourne Zoological Gardens
P.O. Box 74 Parkville
Victoria 3052
AUSTRALIA

GRP ●

NEWSNOTES

PSEUDACRIS TRISERIATA BREEDING DATES SOUGHT

I am gathering data for a summary of breeding dates of *Pseudacris triseriata* throughout its range, hoping to relate the mean and variance of breeding dates to climatic variables, and would very much appreciate copies of obscurely published data about breeding of this species or lists of observations of breeding, giving the locality, date, and evidence of breeding (amplecant pairs or eggs). Any data received will, of course, be fully acknowledged.

FREDERICK W. SCHUELER
Herpetology Section
National Museum of Natural Sciences
National Museums of Canada
Ottawa, Ontario K1A 0M8 ●

SALAMANDRIDS NEEDED

Frederick J. Prohaska (9901 W. Hampton #4, Milwaukee, WI 53225, phone (414) 438-1774) would like to obtain specimens of *Triturus alpestris, T. cristatus, T. marmoratus, Paramesotriton deloustali* and *Salamandra salamandra* for hybridization experiments. He is willing to pay or trade for them if that would stimulate responses. ●

VENOMOUS ANIMAL SOCIETY FORMED

The Venomous Animal Society of Canada has recently formed and has subsequently released the first issue of their Journal (No. 1: June 1981).

The goal of the V.A.S.C. is "to provide a vehicle for the exchange of information and ideas to those members of the zoological community with an interest in venomous animals." Membership is open to persons with an interest in venomous animals in general, and is not restricted to reptiles and amphibians alone.

Membership fees are $10.00 Canadian/year and it is anticipated that three or four issues of the Journal will be published per year.

Interested persons may write to:

Scott Allen
11 Knightsbridge Road, #1010
Bramalea, Ontario
L6T 3X4 Canada ●

ANNUAL MEETING SITES

The SSAR and Herpetologists' League are considering annual meeting sites for 1984 and beyond. Sites are selected with attention to accessibility, facilities for meeting rooms and housing, and relatively low costs for housing and meals. Persons interested in hosting the SSAR/HL annual August meetings should contact Lynne Houck [Department of Biology, University of Chicago, 1103 East 57th Street, Chicago, IL 60637; (312) 753-2803] for more information. ●

ENDANGERED SPECIES DATA SOUGHT

Rom Whitaker, Chairman of the Species Survival Commission-Snake Group, is requesting up-to-date information on snake species for the Red Data Book of the International Union for the Conservation of Nature (I.U.C.N.). More specifically, Whitaker is requesting the following:

1) What snake species in your area do you consider endangered or under heavy pressure?
2) Suggested action/study (e.g., status survey, etc.).
3) Names and addresses of people who could contribute information and be involved with follow-up work.

For more information, write Romulus Whitaker, SSC Snake Group, Madras Snake Park, Madras 600 022, South India. ●

HR REVIEWERS

Thanks are expressed to the following persons who have reviewed articles for **HR:**

Peter Brazaitis	Edward Maruska
R. Bruce Bury	Robert Mount
Jonathan Campbell	N. Mrosovsky
John Frost	Martin J. Rosenberg
Carl Gans	John W. Wright

●

AMPHIBIAN SPECIES SURVIVAL PLAN

The American Association of Zoological Parks and Aquariums is assembling a list of Amphibians to be included in its species survival plan. Criteria that should be considered for species selection is the availability of specimens to insure good genetic make up for captive management and the need for conservation efforts based upon population status in the wild. Suggestions for species to be included on this list should be forwarded to: Frederick L. Paine, Curator of Birds and Reptiles, Buffalo Zoo, Delaware Park, Buffalo, NY, 14214. ●

FIRST INTERNATIONAL COLLOQUIUM ON PATHOLOGY OF REPTILES AND AMPHIBIANS

SEPT. 29 - OCT. 2, 1982 - ANGERS (FRANCE)

This Colloquium will be held at the University of ANGERS. Every aspect of pathology will be examined: microbial and viral infections, parasitism, tumors, malformations, physiopathologic diseases, hybrid lethality, etc. Sessions will start with synthethis reports; communications will be done in the form of brief statements. Table meetings could be organized in relation with the various aspects of pathology according to the different proposals.

This Colloquium is co-organized by:

C. VAGO
Membre de l'Institut
Professeur à l'Université des
Sciences et Techniques du Languedoc
Laboratoire de Pathologie comparée
Place Eugène Bataillon
34060 MONTPELLIER Cedex
France
and
G. MATZ
Professeur à l'Université d'Angers
Laboratoire de Biologie animale
2, Boulevard Lavoisier
49045 ANGERS Cedex
France ●

Pre-register via letter to G. Matz. The registration form, call for papers and program will be sent in March '82.

Geographic Distribution

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles** , Collins, Huheey, Knight and Smith, 1978), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Joseph T. Collins, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

CAUDATA

AMBYSTOMA TALPOIDEUM (Mole Salamander). USA: VIRGINIA: Campbell Co: 15.7 km ENE Gladys. 14 April 1981. Lenny Jones. Verified by R. N. Bader and J. C. Mitchell. Nat. Mus. Nat. Hist. (USNM 221845). Charlotte Co: South Isle Plantation, 10.4 km SSW Phenix. 20 March 1981. Dale Belcher and Robert N. Bader. Verified by J. C. Mitchell. Collected as larva and metamorphosed in captivity. (USNM 221846). 10.4 km SSW Phenix. 18 April 1981. Joseph C. Mitchell and Robert N. Bader. (USNM 221847, larva). 10.4 km SSW Phenix, 21 April 1981. Robert N. Bader and Ben Greishaw. (USNM 221848, larvae). These records extend the range of this species northward in eastern North America and establish its presence in Virginia (Conant, R. 1975. A Field Guide to the Amphibians and Reptiles of Eastern North America, Houghton Mifflin Co., Boston; Martof, B. S., et al. 1980. Amphibians and Reptiles of the Carolinas and Virginia, Univ. North Carolina Press, Chapel Hill). These localities lie 155 km (Charlotte County) and 163 km (Campbell County) northeast of a single known population in southeastern Surry County, North Carolina (Alvin Braswell, pers. conn.).

Submitted by **ROBERT N. BADER,** Route 2, Box 78, Brookneal, Virginia 24528 and **JOSEPH C. MITCHELL,** Department of Biology, University of Richmond, Richmond, Virginia 23173. ●

HEMIDACTYLIUM SCUTATUM (Four-toed Salamander). USA: VERMONT: Chittenden Co: Shelburne Pond, 8 km E Shelburne; 5 November 1968; University of Vermont Museum of Zoology (AM-5410) and Williston Bog, 1.8 km S Williston; 1 May 1960; University of Vermont Museum of Zoology (AM-5408). Verified by C. A. Woods. This report provides more precise locality information than is presently available for the range of *Hemidactylium* in Northern Vermont. These two localities are approximately 50 km north of the range indicated in Vermont by Neill (1963, Cat. American Amphib. Rept., 2:1-2).

Submitted by **C. WILLIAM KILPATRICK,** Department of Zoology, University of Ver-

mont, Burlington, Vermont 05405, and **CHARLES A. WOODS,** Department of Natural Sciences, Florida State Museum, Gainesville, Florida 32611. ●

ANURA

ACRIS CREPITANS BLANCHARDI (Blanchard's Cricket Frog). USA: TEXAS: Young County: 8 km NE of Eliasville on FM 701 in Clear Fork of Brazo's River. 14 June 1981. C. T. McAllister. Verified by L. C. Fitzpatrick. North Texas State University Herpetological Collection (NTSUHC #A-43). First record for the county and virtually fills distributional hiatus of central and eastern Texas, except for adjacent Clay and Stephens counties (Raun and Gehlbach, 1972. Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No. 2). Additional *A. c. blanchardi* were photographed and released along with smypatric *Rana blairi=Rana pipiens* complex (see Hillis, D. M. 1981, Copeia 1981:312-319) and *Rana catesbeiana.*

Submitted by **CHRIS T. MCALLISTER** and **MICHAEL C. WOOTEN,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203. ●

HYLA SMARAGDINA. Mexico: Jalisco: 21 km WSW Ameca, 20 July 1971, University of Texas at El Paso (UTEP 6971, adult); Jalisco, 10 km SW Autlan, 15 July 1966 (UTEP 8038-48, adults); Jalisco, 26 km SW Autlan, 20 July 1972 (UTEP 8053, larvae, N = 49); Mexico, 2-3 km S Nuevo Santo Tomas, 18 July 1968 (UTEP 8448, larva, N = 1); Nayarit, 16 km N Compostela, 13-14 July 1970 (UTEP 6990-92, adults); Nayarit, 15 km WSW Compostela, 14 July 1970 (UTEP 8035-36, adults); Puebla, 13 km SE Izucar de Matamoras, 19 July 1968 (UTEP 7758-63, adults; UTEP 7764, larvae, N = 22). All collected and identified by author. These localities provide additional records of occurrence in Nayarit, and are the first for the states of Jalisco, Mexico, and Puebla (Duellman, Hylid Frogs of Middle America, 1970: 414, fig. 210; 712).

Submitted by **ROBERT G. WEBB,** Laboratory for Environmental Biology, University of Texas at El Paso, El Paso, Texas 79968. ●

TESTUDINES

CARETTA CARETTA GIGAS (Pacific Loggerhead). USA: WASHINGTON: 17 February 1981. Fort Canby State Park, Ilwaco (Lat. 46.18 N., Long. 124.03 W.). Stranded on beach. Near death, body temperature 8-10 degrees C. Turtle transported to The Seattle Aquarium and placed under care of veterinarian. As aquarium water temperature gradually increased to 15 degrees C., the turtle began to swim. Health stabilized at The Seattle Aquarium (John Nightingale, Curator, pers. comm.). In cooperation with National Marine Fisheries Service specimen transferred to Sea World, San Diego, California to continue rehabilitation. Specimen tagged and released in open ocean off San Diego on 30 June 1981 (William Dickensen, NMFS, pers. comm.). This is the first *Caretta* record for the state of Washington, considerably north of "Southern California" (Stebbins, 1966, A Field Guide to Western Amphibians and Reptiles, Houghton-Mifflin Co., Boston.)

Submitted by **ROBERT PARKER HODGE,** 181 Raft Island, Gig Harbor, Washington 98335. ●

CHRYSEMYS CONCINNA (River Cooter). USA: TEXAS: Van Zandt Co: Fruitvale. Collected on Hwy 80. 4 April 1981. S. Myers and C. Whitfill. Verified by J. P. Karges. University of Texas at Arlington (UTACV-R-10322). This specimen appears to be an intergrade between the subspecies *texana* and *hieroglyphica. C. concinna* and *C. floridana* have been used interchangeably in the literature. Many East Texas populations are three-way intergrades among the ssp. *texana, hoyi,* and *mobilensis* (A. F. Carr, pers. comm.). This record helps fill the gap in the North Sabine River drainage hiatus (Raun and Gehlbach, 1972, Dallas Mus. Nat. Hist. Bull., 2:1-61).

Submitted by **STEVEN MYERS,** 4115 Douglas Ave., Dallas, Texas 75219. ●

CLEMMYS INSCULPTA (Wood Turtle). USA: NEW YORK: Suffolk Co: Islip, crossing Southern State Parkway, 2 km west of Islip exit. 5 July 1981. Identified by Robert Price. A single adult male was observed. No specimen was taken due to endangered and protected status. Neither Conant (1975, A field guide to reptiles and amphibians of eastern and central North America, Houghton Mifflin Co.) nor Ernst and Barbour (1972, Turtles of the United States, Univ. Press of Kentucky) include Long Island in the range of this species. *Clemmys insculpta* is known to occur some 55 km to the north (across Long Island Sound) in Connecticut, and some 100 km to the west in suburbs of New York City. Although the western part of Long Island (Kings, Queens, and Nassau counties) contains little woodland habitat suitable for this species, it is reasonable to assume relict populations existing in undeveloped areas of eastern Long Island.

Submitted by **ROBERT PRICE,** 1450 Blue Spruce Lane, Wantagh, New York, 11793. ●

GRAPTEMYS PULCHRA (Alabama Map Turtle). USA: Georgia: Whitfield County: Conasauga River (Coosa drainage) at Mitchell Bridge, 10.9 km ENE Dalton. 12 November 1978. J. L. Harris. Verified by C. J. McCoy. One juvenile (sex undetermined) taken from river. Skeleton only (UGAMNH 15018). First record for state and extends range approximately 110 km east of previously recorded locality (Mount, 1975. The reptiles and amphibians of Alabama. Auburn Printing Co., Auburn).

Submitted by **JOHN L. HARRIS,** Arkansas Department of Highways and Transportation, P.O. Box 2261, Little Rock, Arkansas 72205; **JOSHUA LAERM** and **LAURIE J. VITT,** Museum of Natural History, University of Georgia, Athens, Georgia, 30602. ●

STERNOTHERUS ODORATUS (Stinkpot). USA: NEW YORK: Jefferson Co: Millsite Lake, Town of Theresa. 6 June 1981. R. J. Gawlik. American Museum of Natural History (AMNH 120618). Verified by M. W. Klemens. Additional specimens were captured at Millsite Lake on 27 June 1981 (1) and 12 August 1981 (2) and later released at the lake unharmed. A specimen collected at Millsite Lake on 11 July 1970 (collector unknown) is stored in the collection of the Rice Creek Biological Field Station of the State University of New York at Oswego (RCBFS 60). This report extends the species' northern New York range approximately 10 km to the SE of its reported occurrence at Goose Bay Marsh on the St. Lawrence River (Petokas and Alexander, 1979, SSAR Herp. Review 10(4):118). Millsite Lake is one of a series of lakes (the Indian River Lakes) that empty into the St. Lawrence River along the same drainage and we speculate that the stinkpot will eventually be found to inhabit all of those lakes.

Submitted by **PETER J. PETOKAS,** Department of Biological Sciences, State University of New York, Binghamton, New York 13901 and **RANDY J. GAWLIK,** Department of Biological Sciences, State University of New York, Cortland, New York 13045. ●

TERRAPENE CAROLINA CAROLINA (Eastern Box Turtle). USA: MASSACHUSETTS: Dukes Co: Naushon Island, 12.9 km SW of Woods Hole, Barnstable County. Adult male found 14 July 1981 by Joseph A. DePari and John Kemp. Verified by Terry E. Graham of Worcester State College. Harvard University, Museum of Comparative Zoology, Herpetology Slide Collection 772-777. First verified specimen from the Elizabeth Island chain, town of Gosnold, filling a gap in the range between the Massachusetts mainland to the north and the island of Martha's Vineyard to the south. The author also observed a nesting female *Terrapene carolina carolina* on Naushon Island on 15 June 1980 which was not collected or photographed. (Lazell, 1976, This Broken Archipelago, Cape Cod and the Islands, Amphibians and Reptiles, Publ. Quadrangle/The New York Times Book Co., 262 pp.)

Submitted by **JOSEPH A. DEPARI,** Worcester State College, Department of Biology, 486 Chandler Street, Worcester, Massachusetts 01602. ●

TERREPENE CAROLINA CAROLINA (Eastern Box Turtle). USA: PENNSYLVANIA: Indiana Co: 1.6 km NW of Smithport. 5 September 1981. Jeffrey E. Lovich. George Mason University (GMU 756). This locaiity record extends the distribution some 80 km north of that suggested for west-central Pennsylvania (Adler, 1969. The influence of prehistoric man on the distribution of the box turtle. Annals of Carnegie Museum, 41(9):263-280). Another specimen has been collected in the county at the Indiana University of Pennsylvania Cooperative Farm (Dr. Arthur Hulse, person. comm.).

Submitted by **JEFFREY E. LOVICH,** George Mason University, 4400 University Drive, Fairfax, Virginia 22030 ●

SAURIA

CNEMIDOPHORUS SEXLINEATUS SEXLINEATUS (Six-lined Racerunner). USA: MARYLAND: Allegany Co: 8.2 km E of Oldtown, along Chesapeake & Ohio Canal. September 19, 1980. E. L. Thompson and J. Griffith. Verified by E. L. Thompson. Appalachian Environmental Laboratory (AEL-90). In Maryland, predominantly a coastal plain species which has extended its range westward through the piedmont and onto the valley and ridge via the Potomac River valley. This record represents a westward extension of 5 km from a previous Allegany County locality (Harris, 1975. Bulletin Maryland Herpetological Society. 11(3)). At this time, a substantial distributional gap exists along the Potomac River valley between Allegany County populations and coastal plain populations.

Submitted by **EDWARD L. THOMPSON,** Maryland Wildlife Administration, Route 2, Box 520, Frostburg, Maryland 21532. ●

HEMIDACTYLUS GARNOTI (Indo-Pacific gecko). USA: FLORIDA: Monroe Co: Dry Tortugas: Garden Key: 16 September 1981. Todd M. Steiner. Verified by Peter Meylan, Florida State Museum. (FSM 51-255). This is the first record for this species from the Dry Tortugas. Collected under permit from National Park Service, Everglades National Park.

Submitted by **TODD M. STEINER** and **LYNETTE T. McLAMB,** South Florida Research Center, Everglades National Park, P.O. Box 279, Homestead, Florida 33030. ●

SERPENTES

CROTALUS BASILISCUS OAXACUS (Oaxacan Rattlesnake). MEXICO: OAXACA: northern outskirts of Tlaxiaco, LOR, about 1971. Native collector, presented by Alan Downs. Head and anterior neck only. Identified by H. M. Smith. Head width 36 mm, depth 22 mm. Has four scales in the internasal-prefrontal area, part of the anterior median dark blotch, and no longitudinal dark lines on head or neck, all distinguishing the specimen from *C. durissus culminatus*, the only other large rattlesnake occurring in the area (Klauber, 1972, Rattlesnakes, 1:32-35, 132, figs. 2:2, 2:4, 2:14, 2:20). Univ. Colorado Mus. 54088. About 75 air km west of nearest other records (Armstrong and Murphy, 1979, Univ. Kansas Mus. Nat. Hist. Spec. Publ. 5:8) for El Tejocote, Rio Colorado near El Tecote, and 35.5 km NW (San Francisco) Telixtlahuaca. Only other records in Oaxaca are for the types (Gloyd, 1948, Nat. Hist. Misc. 17:1-4), from Oaxaca (city) and (San Pablo) Yaganiza, east of Armstrong and Murphy's localities. The Tlaxiaco record is of special interest in documenting occurrence of the subspecies westward from central Oaxaca in the Sierra Madre del Sur, lending credibility to the generally neglected record, originally by Hoge in 1966 (Mems. Inst. Butantan, 32 [for 1965]: 136) for the "Chilpancingo region," Guerrero. Hoge and Romano (1971, Bücherl and Buckley, Venomous animals, 2:261, fig. 6) reiterated the Guerrero citation, but failed to map it. No other synopsis has noted the purported occurrence of the subspecies in Guerrero, except for Smith and Smith (1976, Synopsis Herpetofauna Mexico, 3:S-F-17). Presumably the subspecies ranges throughout the Sierra Madre del Sur in suitable habitats, as many other taxa do (e.g., *Sceloporus mucronatus omiltemanus*), and is not limited to central Oaxaca as frequently assumed. Certainly *C. b. oaxacus* ranges at least into western Oaxaca. Extension of its range in Guerrero requires confirmation since *C. d. culminatus* is the large rattlesnake recorded for the Chilpancingo region (Klauber, 1952, Bull. Zool. Soc. San Diego, 26:67). However, habitats preferred by both species do exist in that region (as well as in Oaxaca), and it would not be expected that Hoge could confuse two species so markedly distinct.

Submitted by **JOHN C. SPENGLER** and **HOBART M. SMITH,** Department of E.P.O. Biology; **DAVID CHISZAR,** Department of Psychology, University of Colorado, Boulder, Colorado, 80309; and **GUSTAVO CASAS-ANDREU,** Instituto de Biología, UNAM, Apdo. Postal 70-153, México, D.F. 04510, México. ●

ELAPHE GUTTATA GUTTATA (Corn Snake). USA: MARYLAND: Allegany Co: 8.3 km E of Oldtown, along Chesapeake & Ohio Canal. May 25, 1981. E. L. Thompson and J. Dimpsey. Verified by E. L. Thompson. Appalachian Environmental Laboratory (AEL-91). This record represents a westward range extension of 20 km in Allegany County. The corn snake is more commonly found on Maryland's coastal plain. Populations located in Allegany County, which lies within the valley and ridge physiographic province, appear to be isolated from coastal plain populations (Harris, 1975. Bulletin Maryland Herpetological Society. 11(3)).

Submitted by **EDWARD L. THOMPSON,** Maryland Wildlife Administration, Route 2, Box 520, Frostburg, Maryland 21532. ●

ELAPHE OBSOLETA OBSOLETA (Black Rat Snake). USA: VERMONT: Addison Co: 6.5 km S Monkton. June 1978. Gordon R. Nielsen. Verified by C. William Kilpatrick. Museum of Zoology, University of Vermont No. 6411. First record for county and fills in gap in poorly known portion of the range between southeastern Ontario (Pope, 1946. *Snakes of the Northeastern United States.* N. Y. Zool. Soc.) and Frankland County, Massachusetts (Lazell, 1979. Herp. Review 10:60). Extends range approximately 35 km N to new northern limit in state (Conant, 1974. *A Field Guide to Reptiles and Amphibians of Eastern and Central North America*, Houghton-Mifflin Co., Boston).

Submitted by **C. WILLIAM KILPATRICK,** Department of Zoology, University of Vermont, Burlington, Vermont 05405, and **MICHAEL A. ROMANO,** Department of Zoology, Miami University, Oxford, Ohio 45056 ●

MASTICOPHIS TAENIATUS (Striped Whipsnake). USA: ARIZONA: Yuma Co: Kofa Mountains, Kofa National Wildlife Refuge, Kofa Queen Canyon, 650-900 m. 4 April 1978 and 31 May 1981. R. P. Reynolds and M. A. Williamson, respectively. Two adults taken. Verified by M. A. Williamson and N. J. Scott, Jr. Deposited in United States National Museum (USNM 221844, 221843). Individuals taken in dry rocky, desert canyon. Commonest plant associates in order from greatest cover to least: *Simmondsia chinensis, Cercidium microphyllum, Larrea tridentata, Encelia farinosa,* and *Acacia greggi*. Vegetative cover about 25% in the wash community. Extends range approximately 190 km SW of Horsethief, Yavapai County (Fowlie, 1965, The Snakes of Arizona, Azul Quinta Press, Fallbrook, California). These are the first records of this species in Arizona south of the central plateau and the locality approaches the northwestern limit of the similar *M. bilineatus* in the Ajo Mountains, 200 km SE.

Submitted by **MICHAEL A. WILLIAMSON,** 7401 Central NE, Albuquerque, New Mexico 87108 and **NORMAN J. SCOTT, JR.,** Denver Wildlife Research Center, U.S. Fish and Wildlife Service, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131. ●



TROPIDOCLONION LINEATUM (Lined Snake). USA: NEW MEXICO: Bernalillo Co: 6.5 km ESE Sandia Park, T11NR6E Sec. 28, 2200 m. 13 June 1981. Veronica and Carmen Williamson. One juvenile. Deposited in United States National Museum (USNM 221842). Juniper grassland. Verified by M. A. Williamson and N. J. Scott, Jr. This locality extends the range of the northeastern New Mexican populations 85 km SW (Conant, 1975, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston) and decreases the gap between these populations and the isolated populations in the Capitan Mountains 200 km to the southeast.

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MUSEUM AND LITERATURE RECORDS FOR THE RAINBOW SNAKE *(FARANCIA ERYTROGRAMMA* PALISOT DE BEAUVOIS)

In analyses of herpetofaunal distributions, particularly at the state level, locality records are often referenced by county. Geographic range extensions frequently refer to the Catalogue of American Amphibians and Reptiles. However, one must usually obtain exact locality information from the author for accurate measurements of distances between localities. To help alleviate this problem for *Farancia erytrogramma* (Mitchell, in press), the following known county records are presented. Museum records are listed first and are followed by literature records.

Farancia erytrogramma erytrogramma (Rainbow Snake). USA: ALABAMA: Baldwin, Chilton, Covington, Escambia, Henry, Limestone, Mobile, Shelby and Tuscaloosa. FLORIDA: Alachua, Clay, Duval, Columbia, Escambia, Franklin, Jackson, Jefferson, Leon, Liberty, Marion, Pinellas, Putnam, St. John, Santa Rosa, Wakulla, Washington; Walton (Neill, 1958). GEORGIA: Bibb, Bleckly, Bryon, Burke, Chatam, Dougher, Emanuel, Glynn, Liberty, Long, McIntosh, Richmond, Wayne; Wilcox (Gordon, 1957). LOUISIANA: East Baton Rouge, St. Tammy, Washington. MISSISSIPPI: Clarke, Harrison, Hancock, Jackson, Copiah, Forest, Lowndes, Oktibbeha; Pearl River and Stone (Cliburn, 1959, 1965). NORTH CAROLINA: Beaufort, Brunswick, Carteret, Chowan, Craven, Currick, Cumberland, Columbus, Dare, Duplin, Hyde, Jones, Moore, Pitt, Tyrrell; Camden and Paskotank (Brothers, 1965), Lenoir (Yarrow, 1882), New Hanover (Myers, 1924). SOUTH CAROLINA: Aiken, Barnwell, Beaufort, Berkeley, Bamberg, Charleston, Chesterfield, Colleton, Dorchester, Georgetown, Hampton, Horry, Jasper, Lexington, Lee, Orangeburg, Sumpter; Richmond (Corrington, 1929; Sanders, 1966). VIRGINIA: James City, King and Queen, New Kent, Southampton, Virginia Beach, York, Hanover and Surry (F. J. Tobey, Jr., pers. comm).

Farancia erytrogramma seminola (South Florida Rainbow Snake). USA: FLORIDA: Glades.

ACKNOWLEDGMENTS

I thank the following people and their institutions for providing locality records and/or literature references: J. R. Bailey (Duke University), G. R. Brooks (College of William and Mary), S. Busack and R. Crombie (U.S. National Museum of Natural History), J. T. Collins (Museum of Natural History, University of Kansas), N. H. Douglas (Northeast Louisiana University), H. A. Dundee (Tulane University), B. J. Freeman (University of Georgia), P. G. Haneline (Museum of Comparative Zoology, Harvard University), T. Hardaway (University of Southwestern Louisiana), H. S. Harris (Natural History Society of Maryland), D. F. Hoffmeister (University of Illinois), A. G. Kluge (Museum of Zoology, University of Michigan), T. C. Lewis (Florida State University), D. W. Linzey (University of South Alabama), E. V. Malnate (Academy of Natural Sciences, Philadelphia), H. Marx (Field Museum of Natural History, Chicago), C. J. McCoy (Carnegie Museum, Pittsburgh), P. Meylan (Florida State Museum, University of Florida), R. H. Mount (Auburn University), C. A. Pague (personal communication), W. M. Palmer (North Carolina State Museum of Natural History), D. A. Rossman (Museum of Zoology, Louisiana State University), A. E. Sanders (Charleston Museum), O. W. Thornton (Texas A&M University), F. J. Tobey, Jr. (Virginia Herpetological Society), C. H. Wharton (Georgia State University), G. K. Williamson (Savannah Science Museum), D. C. Whitman (Cornell University), R. G. Zweifel (American Museum of Natural History).

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A POPULATION OF *Tupinambis* FROM NORTHERN PATAGONIA, SOUTH OF THE RIO NEGRO, ARGENTINA

The geographical distribution of *Tupinambis rufescens* (Gunther) and taxonomic relationships between this southernmost tegu and *Tupinambis teguixin* (Linnaeus) are still in need of revision in their area of sympatry. According to Presch (1973), *T. rufescens* ranges from about 22° to 38° 40' South latitude in western and central Argentina where it is a characteristic Chacoan element, mostly in the arid, depauperate southern Chacoan province, the Creosote bush scrub or Monte. Although the Monte vegetation is distributed over extensive areas of north-eastern Patagonia in Rio Negro and Chubut provinces, *T. rufescens* has not been reported from south of the Río Colorado. In February 1980 a population of *T. rufescens* was discovered in the Gran Bajo del Gualicho depression, 60 km South of the Rio Negro at about 40° 30' S, 65° 30' W. Soil in the Gran Bajo del Gualicho reflects a typical salt desert environment, at elevations of ~10 120 m. A characteristic xerophytic Monte vegetation is dominated by *Larrea nitida, L. divaricata* and *L. cuneifolia, Condalia, Cercidium, Prosopis strombulifera, Chuquiraga erinacea* and *Atriplex.* Reptiles found in association with *Tupinambis* included *Liolaemus darwini,* snakes of the genera *Philodryas* and *Leimadophis,* and the tortoise, *Geochelone donosobarrosi.*

This southernmost Patagonian *Tupinambis* inhabits sandy soils, forages into scrub in midday, and takes shelter in ravines. Probably it is a distributional relic of a milder interglacial period. Its survival may have been dependent upon moderate Pleistocene climates in the Gran Bajo del Gualicho.

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Presch W. 1973. A review of the tegus, lizard genus *Tupinambis* (Sauria: Teiidae) from South America. Copeia, 4:740-746.

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TEXAS AMPHIBIANS AND REPTILES: SOME NEW DISTRIBUTIONAL RECORDS, PART IV

INTRODUCTION

This fourth serial report of new Texas distributional records includes only snakes; each record is substantiated with specimens in the University of Texas at Arlington Collection of Vertebrates (UTACV). These records supplement the range maps presented in Raun and Gehlbach (1972). I have used the nomenclature of Collins, *et al.* (1978) except for following Frost and Van Devender (1979) on the status of *Sonora semiannulata*. The abbreviations "US", "TX.", and "FM" refer to highway designations for national highways, state highways, and farm- (or ranch-) to-market roads, respectively. I verified the identifications, and I thank W. F. Pyburn and J. L Darling for access to the UTACV.

SERPENTES

Leptotyphlops d. dulcis (Plains Blind Snake): SAN SABA Co. 4.7 km S, 1.6 km E Bend. 10 April 1976. J. L. Darling. UTACV-R-7890-7891. WILLIAMSON Co. Georgetown Country Club. 22 May 1969. H. W. Greene. UTACV-1599.

Coluber constrictor flaviventris (Eastern Yellowbelly Racer): BRAZORIA Co. Lake Jackson. 24 May 1963. R. D. Burkett. UTACV-R-2296.

Elaphe guttata emoryi (Great Plains Rat Snake): COLEMAN Co. 16 km SE Santa Anna on FM 1176. 31 August 1974. G. G. Riddle & J. H. Riddle. UTACV-R-5064. FOARD Co. *ca.* 8 km N Crowell on TX.6. 13 October 1979. J. P. Karges, *et al.* UTACV-R-9295. HASKELL Co. 6.9 km W Rule on US 380. 27 April 1974. S. Wylie & L. Wylie. UTACV-R-2903. LUBBOCK Co. no precise locality. May 1973. L. A. Mitchell. UTACV-R-5535. SHACKLEFORD Co. 10.6 km N Albany on US 293. 2 August 1964. J. R. Glidewell. UTACV-R-2057.

Elaphe obsoleta lindheimeri (Texas Rat Snake): JONES Co. Stamford on TX.6. 27 April 1974. S. Wylie & L. Wylie. UTACV-R-2906.

Elaphe subocularis (Trans-Pecos Rat Snake): CROCKETT Co. 32 km (airline) S Ozona on TX. 163. 12 June 1968. J. E. Joy. UTACV-R-8665.

Heterodon nasicus (Western Hognose Snake): SCURRY Co. 59 km (by road) SE Post. 19 July 1964. J. R. Glidewell. UTACV-R-2092.

Heterodon platyrhinos (Eastern Hognose Snake): HOUSTON Co. 13.9 km SW Ratcliff. 31 March 1968. J. R. Glidewell & K. Barnes. UTACV-R-1425. KIMBLE Co. 54.8 km NE Rocksprings. 19 May 1973. R. W. Van Devender & J. R. Glidewell. UTACV-R-2700.

Lampropeltis getulus splendida (Desert Kingsnake): POTTER Co. Amarillo. September 1966. T. Hacker & J. R. Glidewell. UTACV-R-354.

Lampropeltis triangulum annulata (Mexican Milk Snake): JIM WELLS Co. 1.6 km S Premont. 18 August 1965. J. E. Joy. UTACV-R-8678.

Masticophis flagellum (Coachwhip): GARZA Co. 9.3 km E Post on US 380. 27 April 1974. S. Wylie & L. Wylie. UTACV-R-2892. RUNNELS Co. 7.1 km W Talpa on US 67. 16 May 1979. J. P. Karges, *et al.* UTACV-R-9182. SAN AUGUSTINE Co. 4.8 km N Broaddus on FM 1277. 20 May 1972. L. Rogers. UTACV-R-2547.

Masticophis taeniatus (Striped Whipsnake): COLEMAN Co. 0.4 km N Santa Anna. 28 July 1973. G. G. Riddle. UTACV-R-2620. FRIO Co. Dilley. 24 August 1964. W. F. Pyburn. UTACV-R-293.

Nerodia cyclopion (Green Water Snake): BRAZORIA Co. 8 km W Angleton. 21 August 1962. R. D. Burkett. UTACV-R-2214-2217.

Nerodia erythrogaster (Plainbelly Water Snake): SMITH Co. 8.8 km NE Lindale. 22 August 1962. H. W. Greene. UTACV-R-1374.

Nerodia fasciata confluens (Broad-banded Water Snake): ANGELINA Co. 3.2 km NW Broaddus. 10 May 1968. U.T.A. Nat. Hist. Class. UTACV-R-1455. HENDERSON Co. Waldrip's Lake, near Murchison. 31 August 1969. K. Barnes. UTACV-R-1584.

Nerodia rhombifera (Diamondback Water Snake): FOARD Co. *ca.* 8 km N Crowell on TX.6. 13 October 1979. J. P. Karges, *et al.* UTACV-R-9294. STEPHENS Co. NE part of county, no precise locality. 25 August 1951. W. E. Huffman. UTACV-R-1868.

Opheodrys aestivus (Rough Green Snake): KIMBLE Co. 1.6 km W Junction on US 377. 18 June 1977. D. B. Heckard. UTACV-R-6684.

Pituophis melanoleucus (Gopher Snake): COKE Co. 3.2 km W Robert Lee on TX.158. 16 May 1979. J. P. Karges, *et al.* UTACV-R-9027. COLLIN Co. 6.4 km SW McKinney on TX.121. 1 June 1975. J. L. Darling. UTACV-R-5242. COMANCHE Co. 28.4 km S Dublin on US 377. 16 May 1979. J. P. Karges, *et al.* UTACV-R-9026. JACK Co. 5.6 km SE Bryson. 6 May 1979. J. A. Campbell & L. S. Ford. UTACV-R-8719. LAMPASAS Co. 7.7 km SE Adamsville. 13 October 1974. J. R. Glidewell, *et al.* UTACV-R-5074. SAN SABA Co. 28.2 km W Lampasas at Colorado River, near Bend. 11 October 1974. U.T.A. Nat. Hist. Class. UTACV-R-5569.

Regina grahami (Graham's Crayfish Snake): CHAMBERS Co. Central part of county, no precise locality. 5 September 1953. W. E. Huffman. UTACV-R-127.

Rhinocheilus lecontei tessellatus (Texas Longnose Snake): POTTER Co. 11.3 km NE Bushland. 21 July 1963. J. R. Glidewell. UTACV-R-2107.

Salvadora deserticola (Big Bend Patchnose Snake): HUDSPETH Co. *ca.* 8 km WSW Hot Wells. 20 April 1974. S. R. Wylie. UTACV-R-5096.

Salvadora grahamiae lineata (Texas Patchnose Snake): ZAPATA Co. 9.7 km N San Ygnacio on US 83. No date given. H. W. Greene. UTACV-R-1512.

Sonora semiannulata (Ground Snake): HUDSPETH Co. Eagle Spring, 7.6 km WSW Hot Wells. 23 July 1976. J. R. Glidewell, *et al.* UTACV-R-8587. KINNEY Co. 37.1 km (airline) SW Brackettville. 12 April 1976. J. L. Darling. UTACV-R-7905. LLANO Co. 27.3 km S Llano. 26 December 1965. R. W. Van Devender. UTACV-R-50.

Storeria dekayi texana (Texas Brown Snake): SAN SABA Co. 4.8 km S, 2.7 km E Bend. 10 April 1976. J. L. Darling. UTACV-R-7885.

Tantilla gracilis (Flathead Snake): JIM WELLS Co. 2.4 km W Ben Bolt. April 1966. J. E. Joy. UTACV-R-8577.

Thamnophis cyrtopsis ocellata (Eastern Blackneck Garter Snake): WILLIAMSON Co. 11.3 km SW Georgetown. 7 April 1963. R. D. Burkett. UTACV-R-2329.

Thamnophis proximus (Western Ribbon Snake): YOUNG Co. Possum Kingdom Reservoir. 3 September 1950. W. E. Huffman. UTACV-R-1843.

Thamnophis sirtalis (Common Garter Snake): WHEELER Co. 26.6 km NW Shamrock. 11 April 1970. P. Ruff. UTACV-R-1899.

Virginia striatula (Rough Earth Snake): HOUSTON Co. 9.2 km N Ratcliff. 29 April 1966. U.T.A. Nat. Hist. Class. UTACV-R-1215. SAN SABA Co. 28.2 km W Lampasas at Colorado River, near Bend. 11 October 1974. U.T.A. Nat. Hist. Class. UTACV-R-5580.

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CURRENT LITERATURE

As of March, 1978, approximately 87 researchers are scanning 450 journals. Titles are published four times per year. Searchers are encouraged to submit titles for inclusion at three month intervals to assure approximately equal listings in HR.

Anyone publishing in a journal that is not widely distributed is invited to submit a complete citation or send a reprint to insure that the reference is published in Current Literature. Complete citations to obscure references are also welcome. Senior author addresses that are submitted will be included. Addresses following citations are those of first authors unless otherwise noted. Citations should be sent to

Joseph Dinardo
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Current Literature has been cited by readers as a highly valued section of **HR.** If this is true, I'm baffled over the lack of response Joe Dinardo has gotten in his appeals for scanners. Response to his appeals in HR 12(3):74 were nil, and the current status is that he has **generated** half of each section himself in addition to preparing the section for publication. Two other major contributors are Joe Ideker (Edinburg, TX) and Heinz Wermuth (Germany). Without these three, Current Literature would be about as current as news of the Battle of Verdun. So, those of you who profess to value this section highly should give some quick thought to signing up as scanners. Yes, this will take some work, but ostensibly you scan some literature anyway — why not get a greater return on your time? In response to the obvious reply, to the effect that the present return on zero time is great, I offer this: It's totally inequitable to have these three persons pulling the whole load, and I have lots of manuscripts to run, so unless Joe gets some help, I'm planning to dump the section and save many people a lot of work. Titles for this month could not reach me in time, and will appear in June. I had planned to run a sample format card in this issue, but rather than do that and urge people to contribute willy-nilly to this section I decided instead to urge you to write to Joe and volunteer some time, and then to heed his directions carefully. Citation cards prepared illegibly and/or improperly cause nearly as much work as would an original search for that citation. So please, some consideration and help **if** you truly value this section.

GRP ●

COLOR PLATES OF FIJI CRESTED IGUANA AVAILABLE

A few dozen additional sets of the 2 color plates of Fiji iguanas (see **Journal of Herpetology** volume 15, number 3, July 1981) are available for purchase. Each plate has been signed personally by the artist, David M. Dennis; the plates measure 7 X 10 inches and would be quite suitable for framing.

Sets of 2 plates are available for a minimum donation of $15 postpaid by sending your check made out to "SSAR" to Henri C. Seibert, Department of Zoology, Ohio University, Athens, Ohio 45701. Donations in excess of the minimum are solicited as we are several hundred dollars short of the actual cost of printing the plates for the **Journal.**

NOTE: All persons who earlier donated to the Iguana color plate fund were sent complimentary copies in November 1981. Please notify us if these were not received. ●

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AUSTRALASIAN AFFILIATION OF HERPETOLOGICAL SOCIETIES

The Affiliation started on an informal basis in 1974 and was formally established in 1977. Its objectives are to promote the scientific study of amphibians and reptiles and their conservation, to publish the journal *Herpetofauna*, to encourage liaison between the member societies through conventions, publications and field work, and to represent the interests of its member societies at the Regional level.



It is a non-profit co-operative organisation with the prime executive purpose of pooling the publishing resources of member herpetological societies in the Australasian Region. Five societies belong to the Affiliation (one in New Zealand and four in Australia) and another is considering joining. The Affiliation has a complimentary role and function to the Australian Society of Herpetologists in the Region.

PUBLICATIONS

Herpetofauna is published twice yearly and contains original papers and notes on any aspect of Australasian herpetology. Herpetological Notes, Regional News, and occasional book reviews are features of the journal. Member societies bulk subscribe to *Herpetofauna* on behalf of their members. Overseas and Australasian herpetologists who do not belong to one of the affiliated societies are invited to subscribe direct to the Affiliation. An Australasian herpetologists manual (of accumulated loose leaf design) on husbandry, study techniques, breeding, ailments etc. is in preparation.



MEETINGS

Conventions are held for society delegates and visitors about every two years in a field location, or hosted by a member society in its home city. Three productive and successful conventions have been held to date. The last was held in conjunction with the Melbourne Zoo Herpetological Symposium in May 1980. The fourth Convention will be in New Zealand in October, 1981. Societies from adjoining states also hold joint field work meetings.

INVITATION

Overseas and Australasian herpetologists who do not recieve *Herpetofauna* are invited to subscribe (use form below). Back issues are available. Readers of Herpetological Review who subscribe will receive their first copy free with six to follow.



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HERPETOLOGICAL REVIEW EDITORIAL POLICY

The following statement-of-purpose appeared in the Introduction to the first issue of **Herpetological Review** in 1967 (Corson Hirschfeld, Editor):

> "**Herpetological Review** incorporates the Ohio Herpetological Society Newsletter. Its primary function, as the name states, will be to review herpetology, past and present, in terms of the individuals, institutions, literature and other components of the field. Perhaps equally important, the **Review** will provide a unique means of communication among persons interested in amphibians and reptiles. We believe it will be of interest to all persons in herpetology and we hope all members will find it informative and entertaining."

Herpetological Review still remains true to that purpose. We will continue to publish semi- and non-technical articles (original research should be submitted to the **Journal of Herpetology**—see inside front cover for address), book reviews, institutional and regional society news, research requests of SSAR members, letters from readers directed to the field of herpetology, illustrations, and photographs. Manuscripts submitted **must** be typed, double-spaced, on 8½ X 11 paper, and should be sent in duplicate. Unpublished photographs of an unusual nature or of uncommon amphibians and reptiles may also be submitted. Submissions should be black-and-white, 8 X 10, glossy prints, and should be accompanied by a descriptive caption and exposure data. The name and address of the contributor should be taped or penciled on the back of each print. Please DO NOT send photographs before corresponding with the editors about them. Return of the unsolicited photographs cannot be guaranteed unless adequate return postage is provided. Unused photographs which the editors have requested to examine will be returned at our cost.

Reprints of contributions cannot be supplied. Contributors may reproduce up to 200 copies of pages containing their own articles for private distribution only. No reproduction for sale purposes is permitted. **Herpetological Review** will accept commercial advertising (except live animal ads). Rates and copy information are available from the editor.

GRP

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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (four issues per year), **Herpetological Review** (four issues per year), **Herpetological Circulars**, and several **Facsimile Reprints in Herpetology**. Members may purchase other Society publications at reduced rates.

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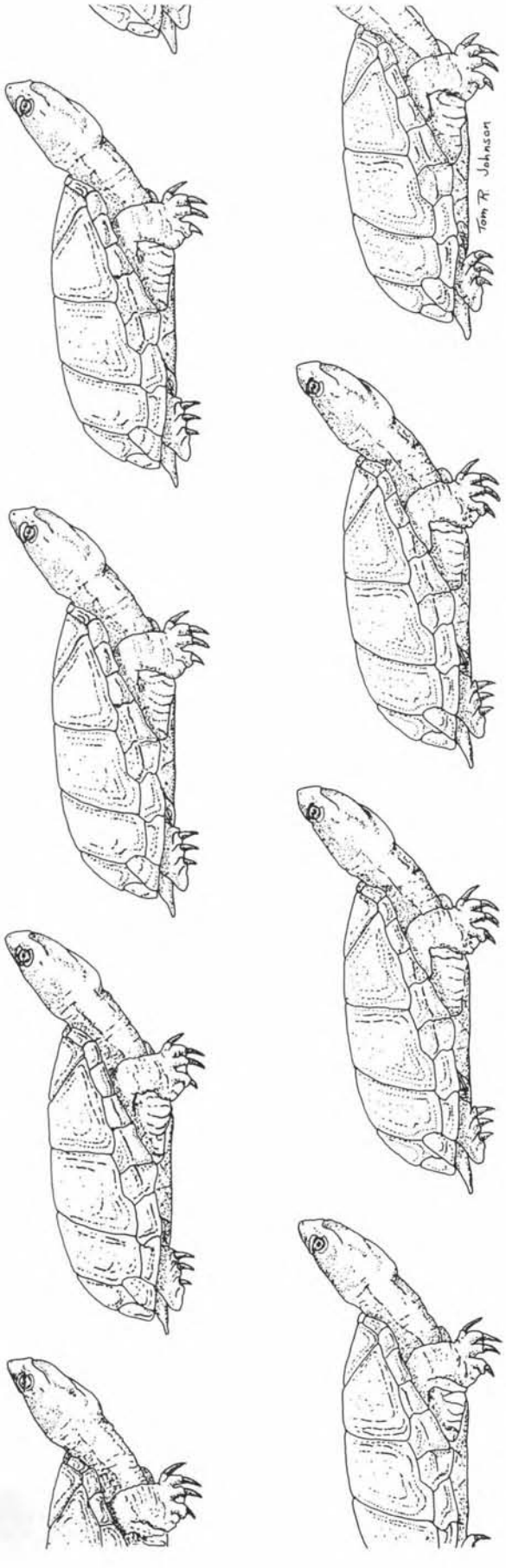
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Contributing member	$30.00
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Individuals are encouraged to join at the higher membership categories. Money from such support substantially helps promote the publications and services of the SSAR. For information about SSAR membership, write to:

Henri C. Seibert
SSAR Treasurer
Department of Zoology
Ohio University
Athens, Ohio 45701

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SSAR BUSINESS

THANKS DUE

The SSAR Officers, Board of Directors and membership are most grateful to the following persons who have served the Society during the past year:

Robin M. Andrews
Ray E. Ashton, Jr.
James L. Christiansen
Roger Conant
Herbert C. Dessauer
Douglas F. Fraser
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A LETTER TO SSAR MEMBERS AND OFFICERS

Effective 1 January 1982 I shall resign as Secretary of the Society for the Study of Amphibians and Reptiles. I have served the SSAR, in some capacity, since 1961 when I first became Secretary of its predecessor, the Ohio Herpetological Society. I derive satisfaction from having played a part in watching the Society grow from a few members in 1961 to the largest international herpetological society in the world today.

I count it fortunate to have been associated with many colleagues during those twenty-one years, and particularly enjoyed my interactions and friendships with Kraig Adler and Henri Seibert. Both have served the SSAR longer than I have, and we have spent many stimulating hours cussing and discussing various aspects of Society operations. We often were not in philosophic agreement, but apparently the mix of our ideas and philosophies did not harm the SSAR, and may have even contributed to some of its success. During the last fourteen years, beginning with my move from Ohio to Kansas, my involvement with the SSAR has been enthusiastically supported by the Director of my Museum, Philip S. Humphrey. His support of my SSAR activities has been considerable and good, and has made my SSAR involvement much less time-consuming.

The SSAR today is, in my opinion, the successful result of a particular philosophy unique to it as an international herpetological organization. Quite simply, the SSAR defines herpetology and the herpetological community in the broadest possible sense, and attempts to serve that constituency. The success of this philosophy is evident in the SSAR's large membership, diverse products and services, and well-attended annual meetings. I do not think that any other herpetological society in the world can approach the success of the SSAR without adopting this philosophy, and I hope that future officers of SSAR never forget that the Society's strength, diversity and success derive from the broad-based support it receives from herpetologists associated with zoos, regional herpetological societies, state and Federal wildlife agencies, non-University museums, nature centers, private research foundations, and particularly from enthusiastic individuals whose only herpetological credentials are an interest in amphibians and reptiles.

See you all next August at the SSAR Silver Anniversary meeting in Raleigh, North Carolina.

JOSEPH T. COLLINS ●

SSAR ELECTION RESULTS

One hundred and twenty SSAR members responded to the mail ballot sent out with **Herp. Review** 12(3) to elect 1981 officers. The following individuals were elected:

President-elect:	Ralph W. Axtell
Secretary:	Joseph T. Collins[1]
Treasurer:	Henri C. Seibert
Board of Directors: (Class of 1984)	Thomas Fritts Norman J. Scott

The SSAR thanks all candidates for accepting the nomination to run for SSAR office. In addition, the Society is grateful to David G. Baker, Dallas Zoo, for ably serving as SSAR elector for 1981.

[1]Joseph T. Collins has since resigned as SSAR secretary effective 1 January 1982. The SSAR Board of Directors has appointed James Jacob, Memphis State University, to serve Collins' 1982 term as SSAR secretary.

●

COLOR PLATES OF FIJI CRESTED IGUANA AVAILABLE

A few dozen additional sets of the 2 color plates of Fiji iguanas (see **Journal of Herpetology** volume 15, number 3, July 1981) are available for purchase. Each plate has been signed personally by the artist, David M. Dennis; the plates measure 7 X 10 inches and would be quite suitable for framing.

Sets of 2 plates are available for a minimum donation of $15 postpaid by sending your check made out to "SSAR" to Henri C. Seibert, Department of Zoology, Ohio University, Athens, Ohio 45701. Donations in excess of the minimum are solicited as we are several hundred dollars short of the actual cost of printing the plates for the **Journal.** ●

REPRODUCTIVE BIOLOGY OF REPTILES SYMPOSIUM VIDEOTAPES AVAILABLE

Color Betamax® videotapes of the 22 presentations at the Symposium on Reproductive Biology of Reptiles (held in conjunction with the 1981 joint annual SSAR/HL meeting at Memphis State University) are available for loan. Have your institution's library contact Interlibrary Loan, John W. Brister Library, Memphis State University, Memphis, TN 38152 and request specific presentations.

The tapes will be available for one week of in-library use only. If videotape players are unavailable in your library, use by requesting individual will be at the discretion of the borrowing library. Copies can be made by the borrowing institution as long as they are for educational use and are not sold. Contact James S. Jacob (Department of Biology, Memphis State University, Memphis, TN 38152) for a list of titles, or if you need further information. ●

PROCEEDINGS OF THE 1981 SSAR GENERAL BUSINESS MEETING AT MEMPHIS STATE UNIVERSITY

The annual general business meeting of the SSAR was called to order by President James B. Murphy at 4:45 PM on 11 August 1981 in the University Center Ballroom at Memphis State University.

President Murphy welcomed attending SSAR members to the business meeting, pointed out the wide variety of services and products provided by the Society to its membership, and encouraged members to volunteer for positions on Society committees in order to ensure active and meaningful membership participation in future Society programs.

Joseph Collins presented a brief report on the activities of the SSAR Secretary. President Murphy received a motion to approve the minutes of the 1980 SSAR General Business Meeting from Carl Gans (seconded by Ralph Axtell), and the motion passed unanimously.

Henri Seibert presented a concise report on the activities of the office of SSAR Treasurer, pointing out the many benefits that SSAR members receive, and announcing that non-U.S. memberships and subscriptions would have a $5.00 postal surcharge added to them effective 1 January 1982. Seibert further announced that, effective 1 January 1982, subscription to the Catalog of American Amphibians and Reptiles would increase to $10.00 for individuals and $15.00 for institutions.

President Murphy then called on the various Society editors for brief reports, the highlights of which were that: 1) Rodolfo

Ruibal announced the transfer of printing of the **Journal of Herpetology** from the current printer to Allen Press, Lawrence, Kansas, effective with volume 16; 2) Kraig Adler announced that, because of economy measures, no free small facsimile reprints would be issued during 1982; and 3) Adler presented a series of color slides showing illustrations which will appear in a book on Venezuelan turtles which the Society hopes to publish in the SSAR **Contributions to Herpetology** series in the near future.

President Murphy then called on the various SSAR committee chairpersons for brief reports, the highlights of which were that: 1) Kraig Adler announced that the SSAR will hold its 1983 annual meeting at the University of Utah, Salt Lake City: 2) Joseph Collins reported that his committee had completed preparing a second edition of "Common and Scientific Names for North American Amphibians and Reptiles," to be published as a **Herpetological Circular** by the SSAR in 1982, and that the **Herpetological Circular** series would no longer be sent free to the membership, but that members would have the opportunity to obtain this series at a reduced pre-publication price; 3) Martin Rosenberg announced the recipients of the SSAR Grants-In-Herpetology (see **Herp Review**); and 4) Michael Plummer announced the recipient of the 1981 Kennedy Award (see **Herp Review**).

Nominating Committee chairperson Jerry D. Johnson then presented the slate of nominees for 1982 SSAR offices, as follows:

For President-elect:	Ralph W. Axtell Thomas A. Jenssen
For Secretary:	Joseph T. Collins
For Treasurer:	Henri C. Seibert
For Board of Directors:	Robin Andrews Thomas H. Fritts Norman J. Scott Craig Weatherby

There being no nominations from the floor, President Murphy received a motion from Margaret M. Stewart (seconded by Patricia Riexinger) that the nominations be closed, and the motion passed unanimously.

President Murphy then called for additional reports, as follow: 1) Kraig Adler and Ray Ashton gave a slide presentation and report on the 1982 SSAR Silver Anniversary Meeting to be held at Raleigh, North Carolina, in August; 2) Joseph Collins reported that the constitutional amendment to the SSAR Bylaws, which would permit the SSAR Board of Directors to set dues for the Society, would be mailed this fall with the election ballots; 3) Arthur C. Echternacht announced that new guidelines had been established for symposia to be presented at future SSAR meetings; and 4) Kraig Adler reported that he would soon be in England to confer with the British Herpetological Society on a proposed arrangement by the BHS to adopt the **Journal of Herpetology** as their technical periodical.

President Murphy then yielded the floor to the Resolutions Committee, composed of Robert A. Thomas, Thomas H. Fritts, W. Ronald Heyer and Frances Irish, and Thomas (sometimes known as the New Orleans cowboy) presented the following resolutions:

1. **Whereas,** the 1981 Annual Meeting of the SSAR/HL was hosted by Memphis State University and the attending herpetologists have benefitted from the diligence, imagination and creativity of an esteemed local meeting committee, and

   Whereas, the coordination of the meetings has been superbly orchestrated, and

   Whereas, the facilities and academic ambience have been exceptionally conducive to the exchange of ideas and information on which the meetings are based, and

   Whereas, several organizations and individuals have cooperated to make the meeting a success, and

   Whereas, the office of the University Conference Coordinator substantially supported the meeting and the symposium, then

   Be It Resolved, that the officers and members of the SSAR/HL express their sincere gratitude to James S. Jacob, committee chairperson, and the following local committee members: George D. Baumgardner, Jack Cassidy, James Detterline, Jack Greenhaw, Leslie Johnson, Butch Odum, Sam Reynolds, Steve Sanders, and Richard Smith.

The resolution was adopted unanimously to enthusiastic applause.

2. **Whereas,** James L. Christiansen has effectively and capably carried out the responsibilities of the office of SSAR Assistant Publications Secretary, and

   Whereas, he has served in this capacity for eleven years, and

   Whereas, he will retire from this SSAR office at the end of 1981, then

   Be It Resolved, that the officers and members of the SSAR express their sincere gratitude to Jim Christiansen for his dedication and service to the Society on the occasion of its 24th annual meeting.

The resolution was adopted unanimously to abundant applause.

3. **Whereas,** Ernest E. Williams has provided the first HL Distinguished Herpetologist's Lecture summarizing his long and distinguished participation in anoloid research, then

   Be It Resolved, that the attendees of the SSAR/HL meeting express their sincere gratitude to Ernest Williams for putting our anoloid house in better order.

The resolution was adopted unanimously to resounding applause.

4. **Whereas,** the sober deliberations of the staid herpetologists in the Memphis State University housing led to an atmosphere of stable equilibrium, and

   Whereas, this equilibrium was punctuated by the tribal chants and dances of nomadic hordes in colorful, but abbreviated, native costumes, and

   Whereas, the customs of these both muscular and nubile chanters and dancers are foreign to the somber ways of herpetologists, and

   Whereas, said chanters and dancers are in need of close scientific evaluation to determine how so many bodies could possibly be free of zits, then

   Be It Resolved, that all future SSAR meetings hosting both herpetologists and cheerleaders be organized to ensure that each herpetologist is provided her or his choice of a cheerleader roommate.

The resolution was adopted to lusty applause.

5. **Whereas,** the meeting participants have come to Memphis from diverse geographic areas, and

   Whereas, these participants might forget where they are at night, then

   Be It Resolved, that the SSAR express its appreciation to Memphis State University for supplying cockroaches to each and every room in Richardson Towers, said small creatures to serve as reminders that Memphis is in the South.

The resolution was adopted to repulsive applause.

6. **Whereas,** the survey (requested of Jim Jacob in 1980 at Milwaukee) of Memphis honky-tonks and rock-and-roll dance halls has been provided and judged adequate by a distinguished panel of jurors, then

   Be It Resolved, that the herpetologists gathered in Memphis join the movement supporting the placement of the City of Memphis in the Texas Hall of Fame.

The resolution was adopted by selected applause from Robert Thomas and James B. Murphy.

President Murphy then yielded the floor to Joseph Collins for the presentation of a resolution adopted by the SSAR Board, as follows:

> "The Society for the Study of Amphibians and Reptiles actively discourages general collecting at the time of its annual meeting. Persons should have **bona fide** scientific or educational rea-

sons to collect and retain specimens, and then must have the necessary local, state and Federal permits to do so. Instead, photographs are recommended as a viable alternative to preserved specimens, although care must be taken not to harm animals or damage their habitat."

Steve Roble moved (seconded by Ray Ashton) the adoption of this resolution by the assembled SSAR members, and the resolution was adopted unanimously.

President Murphy then yielded the floor to Ray Ashton for the presentation of a resolution, as follows:

> **Whereas,** Secretary of the Interior Watt has publicly stated and is following a policy detrimental to the conservation of amphibians and reptiles, and habitats critical to their existence, then,
>
> **Be It Resolved,** that the SSAR take a formal stand in requesting his removal from office, and that a letter to this effect be sent to President Ronald Reagan and to the chairpersons of the appropriate legislative committees of the U.S. House of Representatives and the U.S. Senate.

It was moved by Steven Buth (seconded by Thomas Jenssen) to adopt the resolution. President Murphy opened the floor for discussion, and various members presented their views. There being disagreement among the assembled membership over the wording of the resolution, Edmund Brodie moved (seconded by Carl Gans) that the resolution be tabled for presentation to the SSAR Board at next year's meeting. The motion to table the resolution passed.

President Murphy then introduced Kraig Adler, who will assume the SSAR presidency for 1982, and presented him with the sacred SSAR gavel, but not before pounding the meeting adjourned.

Respectfully submitted,

JOSEPH T. COLLINS
SSAR Secretary ●

1981 SSAR GRANTS-IN-HERPETOLOGY AWARDS

The Society for the Study of Amphibians and Reptiles is pleased to announce the following awards in the 1981 Grants-In-Herpetology Program:

GRADUATE STUDENT RESEARCH:

James E. Lynch Jr., Department of Biological Sciences, University of Idaho, Moscow. "Induced Ovulation in the Coeur d'Alene Salamander." $187.

Charles R. Crumly, Department of Zoology and Physiology, Rutgers-The State University. "The Inter- and Intrageneric Relationships of Tortoises (Testudinidae): A Survey and Re-Evaluation of Anatomical Systems." $166.

HERPETOLOGICAL CONSERVATION:

Dr. Myrna E. Watanabe, New York College of Podiatric Medicine. "The Chinese Alligator *(Alligator sinensis):* A Behavioral Study and Population Survey." $315.

HERPETOLOGICAL RESEARCH IN ZOOS:

Stanley Held, Washington Park Zoo, Portland, Oregon. "Investigation Into Maintaining, Breeding and Exhibiting the Tailed Frog, *Ascaphus truei,* in a Zoological Park." $250.

Steve Connors, Cheyenne Mountain Zoological Park, Colorado Springs, Colorado. "The Effect of Temperature and Photoperiod on Reproduction in Snakes." $65.

REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS:

No proposals were received.

SSAR extends its congratulations to all recipients of awards and encourages the submission of proposals for next year's program. SSAR also expresses its thanks to the 1981 Grants-In-Herpetology Committee, composed of: Martin J. Rosenberg (Chairperson), Ralph W. Axtell (Graduate Student Research), Douglas Fraser (Regional Herpetological Society Programs), Terry E. Graham (Conservation Research), and John D. Groves (Herpetological Research in Zoos). ●

Federal Regulations Regarding the Transport Of Formalin Aboard Passenger Aircraft

Formalin is often carried as accompanied baggage aboard passenger aircraft by those of us who require voucher specimens as documentation of our field projects. The Federal government includes Formalin in the hazard class ORM-A (49CFR172.101) and regulates quantity, labeling, and packaging for legal transportation aboard passenger aircraft. Failure to comply with these regulations subjects the guilty party to a maximum penalty of $10,000 for each infraction of FAA regulations. In the following paragraphs, I have attempted to present the essence of the regulations in a language with which most of us are comfortable.

While no hazard labels (corrosive, flammable, etc.) are required, 10 gallons of Formalin is the maximum net quantity which may be carried in one package aboard a passenger airplane. Two copies of the following document (shipping papers) must be presented to the airline (previous to check-in, I presume):

This shipment contains **FORMALDEHYDE,** ORM-A, in the amount (insert amount).
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There is an official of the FAA at most large airports who is empowered to interpret these regulations; I advise anybody carrying Formalin in his baggage to get an official approval (in writing) before boarding the aircraft.

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1982 JOINT ANNUAL MEETING

SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

25th Anniversary Meeting

HERPETOLOGISTS' LEAGUE

30th Annual Meeting

Raleigh, North Carolina: State Museum of Natural History
1–6 August 1982

HL DISTINGUISHED HERPETOLOGIST LECTURE:

Thomas Uzzell (Academy of Natural Sciences, Philadelphia).

SSAR SILVER ANNIVERSARY SYMPOSIUM:

"MOLECULAR AND GENOMIC EVOLUTION OF AMPHIBIANS AND REPTILES"

David B. Wake (University of California at Berkeley), Organizer and Moderator.

This special symposium will focus on current questions concerning population structure and gene flow, species problems and relationships of taxa, and will include an overview of the newest techniques and approaches with a look to the future. The 30 participants, comprising the leading authorities from Europe and North America, will cover these topics in several keynote lectures, research papers and public discussion sessions.

TECHNICAL PAPER PRESENTATIONS

Research reports will be given in two formats: oral presentations (with several concurrent sessions) and poster sessions.

SOCIAL ACTIVITIES

Several evening events are planned, highlighted by a genuine Old Fashioned Carolina Pig Pickin' and Barbeque.

FIELD TRIPS

Several trips will be scheduled following the meeting to the North Carolina Coastal Plain and Green Swamp and to the Blue Ridge Mountains and Great Smoky Mountains. Collecting of specimens will not be permitted, only photography.

DISPLAYS

1. "Herpetological Art and Photograph Display", including contest.
2. "Amphibians of the Appalachian Mountains", a multimedia sound-and-slide presentation by David M. Dennis and Eric Juterbock.
3. "Live Amphibians and Reptiles of the Carolinas", a display sponsored by the North Carolina Herpetological Society. Photography will be permitted.
4. "Herpetologists Then and Now", a slide show organized by David M. Dennis.
5. Displays of Herpetological Films, Books and Equipment.

WORKSHOPS

1. "Program Funding, Administration and the Practicalities of Running a Regional Herpetological Society", sponsored by the SSAR Regional Society Liaison Committee and the North Carolina Herpetological Society.
2. "Gopher Tortoise Council", arranged by Richard Franz.
3. "Photography Workshop", a how-to-do-it session arranged by David M. Dennis.
4. "Funding Sources for Herpetological Research", sponsored by the SSAR Zoo Liaison Committee.

●

ADDITIONAL INFORMATION

A detailed Program and Call for Papers will appear in *Herpetological Review* and in *Herpetologica*. For other details write Ray E. Ashton, North Carolina Museum of Natural History, P.O. Box 27647, Raleigh, North Carolina, 27611, U.S.A. All interested persons are welcome to attend.

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BRITISH HERPETOLOGICAL SOCIETY

EVENING MEETINGS 1982

The meetings start at 7:00 p.m. and are held in the Lecture Theatre of the Linnean Society of London, Burlington House, Piccadilly, London W1, unless otherwise indicated. SSAR members passing through London during 1982 will be very welcome in celebration of the U.S. Society's 25th Anniversary Year.

February 23rd.
Mr. S. SPAWLS: Structure and ecology of a savannah population of snakes in northern Ghana (West Africa).

March 23rd.
Annual General Meeting, followed by Dr. H. R. BUSTARD (FAC Crocodile Breeding Project, India): Conservation of the Indian gharial.

April 22nd.
Dr. I. R. SWINGLAND, Chairman, IUCN/SSC Tortoise Group: A report on the Inaugural Meeting in Oxford, 1-2 October 1981; Dr. M.R.K. LAMBERT (IUCN/SSC Tortoise Group — West Palaearctic species): A report on the 2nd European Chelonian Symposium, Oxford, 3-4 October 1981, and Mr. M. L. HINE: *Testudo marginata* in the Pelopponese (S. Greece) and their captive management in Britain.

May 19th.
Prof. G.A.D. HASLEWOOD: Free-living lizards in a Sussex garden (S. England).

June 15th.
**Amphibians and reptiles of the Old World.* A discussion on the care and breeding with the BHS Captive Breeding Committee.

July 7th.
A visit to the London Zoo. A meeting organised by the BHS Captive Breeding Committee during a Members' Evening of the Zoological Society of London. BHS members should meet at the Fellows' Entrance in the Outer Circle of Regent's Park. If late, please tell the Gateman you are with Mr. S. TOWNSON.

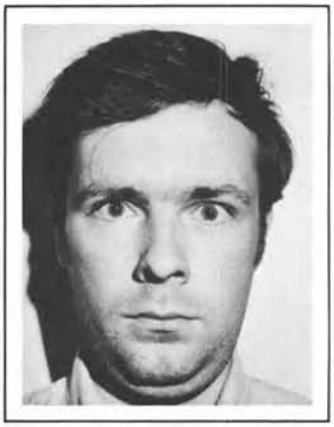
September 22nd.
**Amphibians and reptiles of the New World.* Details as for June 15th.

October 26th.
Prof. J. I. MENZIES (BHS Secretary 1952-7, lately Dept. Zoology, Univ. Papua New Guinea): Trouble with frogs, a taxonomist's problems in New Guinea.

November 24th.
Dr. B. GROOMBRIDGE (Editor, IUCN Red Data Book: Amphibia & Reptilia, SCMU, Cambridge): Compiling information on threatened amphibians and reptiles.

*Members should bring live animals, preserved specimens and 35 mm colour slides for display and to illustrate discussions.

WANTED



SLIDES of HERPETOLOGISTS

I AM PREPARING A MULTI-SCREEN SLIDE SHOW ENTITLED "HERPETOLOGISTS THEN AND NOW", WHICH WILL BE PRESENTED DURING THE 25TH ANNIVERSARY MEETING IN RALEIGH.

YOUR HELP IS VITAL TO THE PRODUCTION OF A GOOD SHOW. I NEED SLIDES OF AS MANY HERPETOLOGISTS AS POSSIBLE. IF YOU HAVE FUNNY OR EMBARRASSING SLIDES (NO PORNO PLEASE!) SEND THEM TO DAVID DENNIS, DEPARTMENT OF BOTANY, THE OHIO STATE UNIVERSITY, 1060 CARMACK ROAD, COLUMBUS, OHIO 43210.

YOUR SLIDES WILL BE HANDLED WITH EXTREME CARE, AND RETURNED PROMPTLY AFTER THOSE CHOSEN FOR THE SHOW HAVE BEEN DUPLICATED.

REMEMBER, YOUR FRIENDS WILL BE SENDING SLIDES OF YOU!

P.S. I CAN ALSO USE BLACK AND WHITE AND COLOR PRINTS!

GRAD STUDENTS! YOUR ANONYMITY WILL BE PRESERVED.

TITLES OF PAPERS

Presented at the 24th Annual SSAR Meeting and 29th Annual HL Meeting in Memphis, TN.

Aldridge, R. D. Department of Biology, St. Louis University. **THE OVARIAN CYCLE OF WATERSNAKES *(Nerodia).***

Andrews, R. M. Department of Biology, Virginia Polytech Institute and Smithsonian Tropical Research Institute. **SPATIAL VARIATION IN EGG MORTALITY IN *Anolis limifrons.***

Arnett, James. David Lipscomb College. **POPULATION STRUCTURE AND REPRODUCTIVE CYCLE OF THE NORTHERN SPINY LIZARD.**

Carol A. Beuchat. Ecology and Systematics, Cornell University. **PHYSIOLOGICAL AND ECOLOGICAL CONSEQUENCES OF VIVIPARITY IN A MONTANE LIZARD.**

Blackburn, Daniel G. Department of Anatomy, N.Y.S.C.V.M., Cornell University. **COMPARATIVE MORPHOLOGY, EVOLUTION, AND SYSTEMATICS OF SCELOPORINE LIZARDS.**

Blackburn, Daniel G., *et al.* Cornell University, Ithaca, NY. **NUTRITIVE VIVIPARITY AND PLACENTATION IN THE SKINK *Mabuya heathi.***

Bock, Brian C. University of Tennessee, Knoxville. **INDIVIDUAL DIFFERENCES IN THE BEHAVIOR OF NESTING COMMON GREEN IGUANAS.**

Brooks, Garnett R. College of William and Mary. **ECOLOGICAL SIGNIFICANCE OF SEXUAL DIMORPHISM IN BODY SIZE IN *Anolis lividus.***

Camazine, B. and Crews, D. Museum of Comparative Zoology, Harvard University. **THE ENDOCRINE CONTROL OF SEXUAL BEHAVIOR IN THE MALE RED-SIDED GARTER SNAKE *(Thamnophis sirtalis parietalis).***

Campbell, Jonathan A. University of Kansas. **REPRODUCTION IN THE MIDDLE AMERICAN HIGHLAND PITVIPER, *Bothrops godmani.***

Cannatella, David C. Museum of Natural History, The University of Kansas. **CLADISTIC RELATIONSHIPS OF *Rhinophrynus.***

Claussen, Dennis L. and Jack R. Layne, Jr. Miami University, Oxford, OH 45056. **GROWTH OF *Bufo woodhousei fowleri* MAINTAINED ON DIFFERENT DIETS.**

Congdon, J. D. Savannah River Ecology Laboratory. **REPRODUCTIVE ENERGETICS OF THE PAINTED TURTLE *(Chrysemys picta).***

Coomber, Brenda L. University of Guelph. **MITOTIC INHIBITION IN THE TISSUES OF THE REGENERATING LIMB OF THE NEWT *Notophthalmus viridescens.***

Cuellar, H. S. 4330 Kinglet, Houston, Texas 77035. **LIZARDS AND CLOCKS: CENTRAL REFRACTORINESS IN REPTILIAN REPRODUCTION.**

Daly, James J. *et al.* Department of Microbiology and Immunology, University of Arkansas for Medical Sciences, Little Rock. **ONCORNAVIRUS-LIKE PARTICLES IN THE RED BLOOD CELLS OF A WATER SNAKE.**

Daugherty, Charles H. and Maxson, Linda R. University of Illinois at Urbana-Champaign. **GENETIC RELATIONSHIPS WITHIN THE NEW ZEALAND GENUS *Leiopelma.***

Demmer, Richard J. University of Central Florida. **THE SOCIALLY FACILITATED HATCHING AND EMERGENCE OF LOGGERHEAD TURTLE *(Caretta caretta)* HATCHLINGS.**

Densmore, L. D. Louisiana State University Medical Center. **BIOCHEMICAL AND IMMUNOLOGICAL SYSTEMATICS OF THE CROCODILIA.**

Dowling, H. G. New York University. **THE TAXONOMIC SIGNIFICANCE OF HEMIPENIAL CHARACTERS.**

Dunham, A. E. University of Pennsylvania. **EVOLUTIONARY ECOLOGY OF LIFE HISTORY VARIATION AMONG POPULATIONS OF THE IGUANID LIZARD *Urosaurus ornatus.***

Edwards, James L., and Shultz, Jeffrey W. Michigan State University. **LOCOMOTION OF ELONGATE AND ROBUST SALAMANDERS IN AN ARTIFICIAL BURROW.**

Ehrhart, L. M. and Lee, R. C. University of Central Florida; U.S. Fish & Wildlife Service. **HYPOTHERMIC STUNNING OF MARINE TURTLES IN EAST-CENTRAL FLORIDA LAGOONS IN 1981.**

Estol, Carlos O. New York University. **SCALE MICRODERMATOGLYPHICS (MO) AND TAXONOMIC RELATIONSHIPS OF THE VIPERID SNAKE GENERA *Bothrops* AND *Trimeresurus.***

Etheridge Kay. University of Florida. **ASPECTS OF THE NATURAL HISTORY OF THE SIX-LINED RACERUNNER *(Cnemidophorous sexlineatus)* DURING HIBERNATION.**

Eudy, Sid F. and Baeyens, Dennis A. University of Arkansas, Little Rock. **A COMPARISON OF TOOTH MORPHOLOGY AND DIETARY PATTERN IN FOUR SNAKE SPECIES.**

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Feldman, Mark L. **EFFECTS OF ROTATION ON THE VIABILITY OF TURTLE EGGS.**

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Frazier, J. National Zoological Park, Smithsonian Institution. **INDIRECT MEASURES OF CLUTCH SIZE: WHY SOME "CLUTCHES" AREN'T CLUTCHES.**

Freed, Arthur N. University of Florida. **FEEDING ECOLOGY: PREY SELECTION BY THE GREEN TREEFROG *(Hyla cinerea).***

Fritts, Thomas H. and McGehee, M. Angela. U.S. Fish & Wildlife Service, Denver Wildlife Research Center. **EFFECTS OF PETROLEUM ON THE DEVELOPMENT AND SURVIVAL OF MARINE TURTLE EMBRYOS.**

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Ruiz, Georgita J., *et al.*, F.M.V.Z. Universidad Nacional Autónoma de México, Colina 145, Lomas Bezares, Mexico 10, D.F. **ARTIFICIAL INCUBATION OF SEA TURTLE EGGS AFFECTS SEX RATIO OF HATCHLINGS.**

Ryan, Michael J. Cornell University. **THE ADAPTIVE SIGNIFICANCE OF FEMALE MATE CHOICE IN A NEOTROPICAL FROG.**

Ryan, Michael J., *et al.*, Cornell Univ. **THE COSTS AND BENEFITS OF FROG CHORUSING BEHAVIOR.**

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Sanders, J. Stephen and Jacob, James S. Memphis State University. **THERMAL ECOLOGY OF THE COPPERHEAD *(Agkistrodon contortrix)*.**

William E. Sanderson. Louisiana State University: Dept. of Zoology. **TAXONOMIC RE-EVALUATION OF *Nerodia cyclopion* (SERPENTES; COLUBRIDAE).**

Savitzky, Alan H. Cornell University. **THE FEEDING MECHANISM OF *Fordonia*, A CRAB-EATING SNAKE.**

Schwalm, Patricia Ann. University of Chicago. **INFRARED REFLECTANCE IN TROPICAL HYLINE HYLIDS.**

Seigel, Richard A. Museum of Natural History, Univ. of Kansas. **ASPECTS OF THE ECOLOGY OF *Sistrurus catenatus* IN NORTHWEST MISSOURI.**

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Trauth, S. E. Department of Biology, Georgia Southwestern College. **NESTING SITES, CLUTCH SIZE, DURATION OF INCUBATION, AND EGG DYNAMICS OF THE TEIID LIZARD *Cnemidophorus sexlineatus* IN THE UNITED STATES.**

Troyer, Katherine. University of California, Davis. **ACQUISITION OF THE FERMENTATIVE MICROFLORA BY HATCHLING *Iguana iguana*.**

Trueb, Linda. Museum of Natural History, The University of Kansas. ***Rhinophrynus*: A HEAD-ON APPROACH.**

Vaeth, Randy H. and Sanderson, William E. Louisiana State University. **DESCRIPTIVE MORPHOLOGY OF THE PLEUROGLYPHOUS DENTITION IN SOME COLUBRID SNAKES.**

Van Devender, R. W. Department of Biology, Appalachian State University. **COMPARATIVE DEMOGRAPHY OF *Basiliscus basiliscus*.**

Vitt, L. J. and Price, H. J. Museum of Natural History and Department of Zoology, University of Georgia. **ECOLOGICAL AND EVOLUTIONARY DETERMINANTS OF RELATIVE CLUTCH MASS IN LIZARDS.**

Vogt, R. C. and Bull, J. J. Estacion de Biologia Tropical "Los Tuxtlas" and Department of Genetics, University of Wisconsin. **ECOLOGICAL AND BEHAVIORAL ASPECTS OF TEMPERATURE CONTROLLED SEX-DETERMINATION IN TURTLES.**

Wake, D. B. and Elias, P. Museum of Vertebrate Zoology, University of California, Berkeley and Museum of Comparative Zoology, Harvard University. **FOUR NEW GENERA OF PLETHODONTID SALAMANDERS FROM TROPICAL AMERICA.**

Wake, Marvalee H. and Hanken, James. Department of Zoology and Museum of Vertebrate Zoology, University of California, Berkeley. **CAECILIAN SKULL KINESIS AND STEGOKROTAPHY: PRIMITIVE OR DERIVED?**

Wassersug, Richard J. University of Chicago. **TADPOLE SCHOOL STRUCTURE: A PROGRESS REPORT.**

Wilhoft, D. C., *et al.*, Rutgers University. **TEMPERATURE-DEPENDENT SEX DETERMINATION IN THE SNAPPING TURTLE.**

Woolbright, Lawrence L. State University of New York at Albany. **SEASONALITY IN THE FORAGING BEHAVIOR OF A SUBTROPICAL ANURAN.**

Woolbright, Lawrence L. and Stewart, Margaret M. State University of New York at Albany. **INTERPOPULATIONAL VARIATION — MORPHOLOGY AS AN INDEX OF SELECTION PRESSURE IN *Eleutherodactylus coqui*.**

Wright, J. W., *et al.*, Section of Herpetology, Natural History Museum, Los Angeles. **MITOCHONDRIAL DNA AND THE ORIGIN OF THE PARTHENOGENETIC LIZARD *Cnemidophorus laredoensis*.**

Wygoda, Mark L. Department of Zoology, University of Florida. **LOW CUTANEOUS WATER LOSS IN CUBAN TREEFROGS *(Osteopilus septentrionalis)*.**

Xavier, F. Ecole Normale Supérieure, Laboratoire de Zoologie. **PROGESTERONE IN THE VIVIPAROUS LIZARD, *Lacerta vivipara* J.: OVARIAN BIOSYNTHESIS, PLASMA LEVELS AND BINDING TO TRANSCORTIN-TYPE PROTEIN DURING THE SEXUAL CYCLE.** ●

A Suggested Protective Declaration for Taxonomic Dissertations

In recent years the information in doctoral and other dissertations has become quickly and readily available to interested workers, primarily through Dissertation Abstracts and local or commercial reproduction facilities. Often dissertations are, quite in error, considered as publications even by their authors, particularly when compiling their curricula vitae with the expected list of publications. Thus new names and name combinations sometimes, usually inadvertently, appear in legitimate, scientific publications before the real originator publishes them. In such circumstances the nomenclatural novelties often must be credited, under the Law of Priority of the International Code of Zoological Nomenclature, to the inadvertent user, to his or her intense embarrassment and to the dismay of the unpublished originator. The injustice can be reversed in some instances by appeal to the International Commission on Zoological Nomenclature, but not always are the appeals successful, and invariably they are protracted and laborious.

Several instances that have come to my attention in recent years suggest that the problem is widespread and growing. Explicit attention needs to be called to it in order to forestall insofar as possible its unfortunate results.

A possible step in that direction is the inclusion, preceding the body of every taxonomic dissertation, of an explicit notice warning of the confidentiality of the information contained therein. A suggested form follows.

NOTICE

According to the International Code of Zoological Nomenclature (Art. 9), dissertations submitted in partial fulfillment of requirements for doctoral, master's or other degrees do not constitute publications in the nomenclatural sense, even when reproduced on microcards, by microfilm or other similar methods. Therefore the novel names or name-combinations proposed in taxonomic dissertations are not thereby entered into the public domain. The information given in such works is in effect confidential in scientific contexts and cannot ethically be utilized by anyone in any (Art. 8 of the Code) publication until the author of the dissertation has published it in a legitimate outlet (even Dissertation Abstracts may serve), unless the author or the author's adviser gives permission for someone else to do so, or unless after a reasonable interval neither can be consulted even with concerted effort (in conformance with the Code of Ethics, Appendix A of the International Code of Zoological Nomenclature).

Protection under the articles and appendices of the Code is hereby claimed for this dissertation.

HOBART M. SMITH
Department of Environmental Population and Organismic Biology
University of Colorado
334 Boulder, Colorado 80309 ●

CHECKLIST OF THE AMPHIBIANS AND REPTILES OF THE WORLD

The Association of Systematics Collections (ASC) is producing a checklist of the amphibians and reptiles of the world to be published when completed. The information to be carried with each species record will be: current name (following most recent literature), original name, author, type locality, deposition and museum number of type (when readily available), distribution, comment citing taxonomic controversy (if necessary) and revisory literature, and regulatory status under U.S. laws and international agreements. The intended purpose of this checklist is to provide ready access to the literature of systematic herpetology as well as much of the information that is necessary for taxonomic work. The legal information provided should make life a little easier for workers who collect specimens or send and receive loans of specimens. At this time we are soliciting unpublished checklists as well as other contributions from volunteers for possible inclusion into the ASC Checklist. Contributors will be acknowledged in the published checklist at the taxonomic level of their contribution, as will reviewers. The editorial committee for this undertaking is comprised of William E. Duellman, Chairman (Museum of Natural History, University of Kansas), Robert Drewes (California Academy of Sciences), Carl Gans (University of Michigan), Alice Grandison (British Museum of Natural History), and Marinus Hoogmoed (Rijkmuseum van Natuurlijke Histoire, Leiden). All correspondence should be addressed to Darrel Frost (Editor), Museum of Natural History, The University of Kansas, Lawrence, KS 66044. ●





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ENSIL ROSS ALLEN
1908-1981

Ross Allen, showman, athlete, and one of Florida's best known and most respected celebrities, died of cancer 17 May 1981 about a month prior to the opening of his long-planned Alligator Town, U.S.A. at Lake City. That tourist attraction was to be the culmination of his lifetime of work in handling and demonstrating reptiles.

Most persons who knew Allen will remember him as a handsome, soft-spoken, friendly, obliging man for whom nothing was too much trouble, especially if it concerned wildlife. Those of us who worked with him, particularly in the field, appreciated his wide knowledge of the reptiles of Florida and the help he invariably gave any herpetologist who needed specimens or information.

Allen was born in Pittsburgh, Pennsylvania, on 2 January 1908. His family moved to Winter Haven, Florida, when he was 16, and there he soon began assembling a private menagerie which, after graduating from high school and attending Stetson University for a year, he transferred to Silver Springs. His collection became the nucleus of what later was named, at the request of others, The Ross Allen Reptile Institute, and there he held sway for 46 years.

He had been milking snakes and selling the venom for some years, but at Silver Springs he made the extraction process pay double by doing it in view of groups of cash customers, largely tourists, who were fascinated by the process and by his down-to-earth talks about the snakes and other exhibits. For decades he was the chief supplier of diamondback rattlesnake and cottonmouth venom, but he greatly stepped up production prior to America's entrance into World War II, when Wyeth, Inc., of Philadelphia, was called upon to produce large quantities of antivenin for troops on maneuvers in the Southern States.

Because he was a powerful swimmer endowed with a splendid physique, Allen early learned how to capture alligators in their natural environment, wrestling them to the surface and then on shore. Handling 'gators became a natural part of his demonstration at the Reptile Institute.

Ross enrolled as a Boy Scout at an early age, and he retained interest in that organization throughout his life and received several of scouting's highest awards. One was given in recognition of his leadership and woodsmanship during a cross-Florida trek, from Daytona Beach to Yankeetown on the Gulf of Mexico, with eight boys, during which they lived exclusively off the land. They made the 153 miles in 13 days. Allen was 54 at the time. He delighted in working with young people and teaching them about wildlife. He sired seven children of his own, the youngest of whom was born when he was 61.

During his long career he led several trips to Latin American countries to bring back live specimens for his collection, including new



species of frogs. A large and colorful rat snake, *Elaphe obsoleta rossalleni,* bears his name.

Concurrent with his rising fame and because he was highly photogenic, Allen was much in demand for motion picture parts and, later, for television. He appeared in a number of films and on most of the regular TV series concerned with natural history or adventure.

All his life Ross Allen wanted to be a scientist, but he knew his limitations. Once, when we were in the field together in the Upper Florida Keys, he confided in me by saying, "I know I'm not college material and I'm a poor writer, but I love herpetology and want to do everything I can to further it, even if all I manage is to take you and others into the field and help by finding specimens for whoever needs them." He was as good as his word, and sent many of us snakes and other reptiles for study, always claiming they were surplus and were gifts for which no compensation was expected.

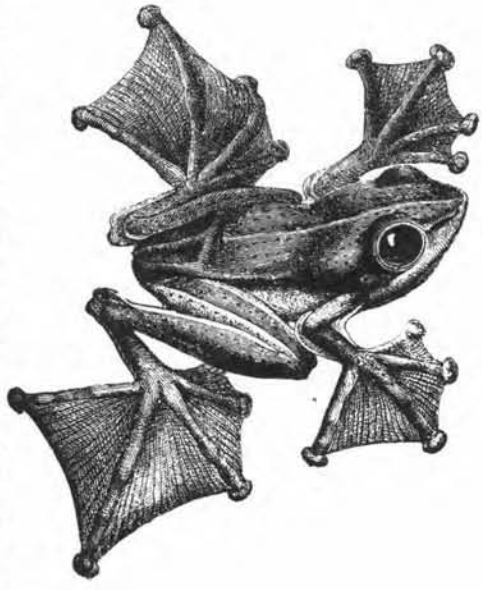
Despite his comments, Ross Allen's name appeared on many newspaper and magazine articles as well as on papers in herpetology. The majority, however, were co-authored, most of the more technical ones with the knowledgeable Wilfred T. Neill, who joined Allen at the Reptile Institute at Silver Springs for several years. Together they assembled a well-preserved study collection, specimens from which were designated as ERA-WTN from their combined initials.

It was probably inevitable that, while handling large numbers of venomous snakes, Ross would be bitten. Indeed, he sustained 12 bites, some of them extremely serious. Invariably he returned to work as soon as possible instead of abdicating, so to speak, and allowing the assistants, whom he had trained, to continue alone.

After his long tenure at Silver Springs, Allen went into retirement for a short time, but he soon emerged to become associated, first with the Sarasota Jungle Gardens and then with the Alligator Farm at St. Augustine. Above all, however, he wanted his own place, a life-long desire that came close to fulfillment. Such was to be Alligator Town at Lake City. As a naturalist he was annoyed with the crass indifference toward wildlife shown by so many Floridians, and especially the retirees who flooded into the area from the northern states during recent years. Also, as a person who had devoted his life to animals, he was upset by the tinsel and glitter surrounding such more recent attractions as Disney World, with their rides and other amusements. He was determined to prove there was still a place for the old-time showman, and that poisonous snakes and 'gators had not lost their glamour. He designed his dream exhibit and supervised its construction until rapidly declining health terminated his career. One can readily imagine the deep feeling of frustration that must have pervaded his final days as he realized he would not be on hand to preside over it.

Ross Allen had charisma, he was an excellent raconteur, and he had millions of admirers, thanks to his long career at various Florida institutions and the magic of television. Those of us who were his close friends will always think of him as an outstanding herpetologist who was distinguished from all others in his own inimitable and natural way.

ROGER CONANT
Department of Biology
University of New Mexico
Albuquerque, NM 87131



MUSEUM OF NATURAL HISTORY
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ANNOUNCES

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By Joseph T. Collins **Second (Revised) Edition**

To be issued in early spring 1982, this softbound volume is a thorough update of the 1974 edition, with new sections on alien species, introductions to the main groups, endangered species, an extensive and fully illustrated technical key, and an updated bibliography to the Kansas herpetofauna. In addition, the range maps have been enhanced by the addition of over 525 new county records obtained since 1974, and most of the 150 black and white photographs are new.

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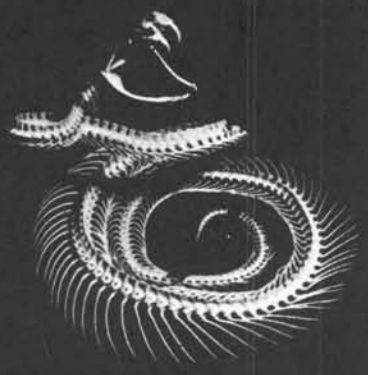
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NEWSNOTES

SSAR GRANTS-IN-HERPETOLOGY

The Society for the Study of Amphibians and Reptiles is pleased to announce that proposals are now being accepted for the 1982 Grants-In-Herpetology Program. This Program is designed to provide financial support to deserving individuals or organizations engaged in research on or conservation of amphibians and reptiles. Grant proposals will be considered in the following areas:

1) HERPETOLOGY-ORIENTED CONSERVATION. Proposals should address research on endangered or threatened species at the state, national or international levels, or address research on critical herpetological habitats. Proposals may be received from individuals only.
2) GRADUATE STUDENT HERPETOLOGICAL RESEARCH. Proposals may address any herpetological research endeavor and may be submitted by individual graduate students only, with a letter of support from the student's major advisor or committee chairperson.
3) REGIONAL HERPETOLOGICAL SOCIETY PROGRAMS OR PROJECTS. Proposals may address any herpetological research endeavor or project, provided said endeavor or project concerns herpetology within the implied geographic limits of the regional society. Proposals may be submitted by regional herpetological societies or by individual members of the society. If the latter, a sponsoring letter from the current societal president or an advisor should accompany the proposal.
4) HERPETOLOGICAL RESEARCH IN ZOOS. Proposals may address any herpetological research endeavor which is conducted at a zoo. A letter from the represented zoo or supporting institution should accompany the proposal.

Each proposal should include the following information: A) **Background & Objectives** of the proposed project, in terms of its relevance to herpetology, B) **Methods** of carrying out the research or conducting the project, C) **Budget** for the project, which should not exceed $400 in each category, and D) **Letter of Support** (if applicable). Proposals should be relatively brief (approx. 5 typed pages).

Successful applicants will be expected to submit to SSAR a written report of the results of their research or project, within a reasonable time after the project year is completed. They are also encouraged to submit for publication the results of their research or project, preferably to **The Journal of Herpetology** or **Herpetological Review.**

Members of the SSAR Grants-In-Herpetology Committee will evaluate all proposals, projects or programs. Committee members are: Martin J. Rosenberg (Chairperson), Terry E. Graham (Conservation Research), John B. Iverson (Regional Herpetological Society Projects), Linda R. Maxson (Graduate Student Research), and Lyndon A. Mitchell (Zoo Research).

Individuals submitting proposals should designate to which of the four areas their proposal applies. All proposals must be typewritten and submitted in duplicate no later than **15 APRIL 1982** to:

Martin J. Rosenberg
Department of Biology
Case Western Reserve University
Cleveland, Ohio 44106

●

1980 KENNEDY AWARD WINNERS

The 1980 Kennedy Award Committee has determined that the paper "Responses of Five-Lined Skins *(Eumeces fasciatus)* and Ground Skinks *(Scincella lateralis)* to Conspecific and Interspecific Chemical Cues," authored by David Duvall, Renée Herskowitz and Jeanne Trupiano-Duvall, was the best student paper published in Volume 14 (1980) of the *Journal of Herpetology*. For their efforts the authors were awarded a $100 check and a set of David Dennis' herpetological prints at the SSAR business meeting in Memphis, TN, 11 August 1981.

Congratulations to these students from the Kennedy Award Committee, which consisted of Robin Andrews, Alan Channing, Darrell Frost, John Iverson and Mike Plummer.

NSF SURVEY

The Division of Environmental Biology of the National Science Foundation (NSF) is evaluating how the Systematic Biology and Biological Research Resources programs might better serve the systematic biology community in the U.S. Two surveys, developed by the Association of Systematics Collections (ASC) under contract with NSF, will gather data concerning the physical resources available to the research community and demographic information on the individuals who comprise the community.

The first survey, to be mailed to collection curators and managers in November, 1981, will request information regarding the management, the financial resources available for support, the services provided, and the future needs of their collections. The second survey, to be mailed in July, 1982, will collect data on individual systematic biologists.

All curators and collection managers now have an opportunity to contribute to the development of the long-term policies and goals of NSF. To assure that the community has an opportunity for further comment, a preliminary report of the results of the survey will be presented at the ASC annual meeting in May, 1982. If you do not receive a survey form by November 15, 1981, please contact:

Nancy J. Wert
NSF Project Coordinator
Association of Systematics Collections
Museum of Natural History
University of Kansas
Lawrence, Kansas 66045
(913) 864-4867

When requesting a survey form, please indicate the taxonomic emphasis of your collection. ●

BAT CAVE LEASED BY NATURE CONSERVANCY

The Nature Conservancy has acquired through lease the 92-acre Bat Cave tract in Henderson and Rutherford Counties, North Carolina. Among the several biotic features of interest, this property contains the habitat of an unusual salamander population, the crevice salamander, formerly known as *Plethodon longicrus*, but now considered a variant of *Plethodon yonahlossee*. Access to the property is being strictly controlled by the Conservancy. "No Trespassing" signs have been posted along the boundaries, and the property is being patrolled regularly. Use of the tract will be limited to scientific research and monitoring, and two organized field trips each spring and summer.

As part of the Stewardship Master Plan, a herpetofaunal inventory, with emphasis on *Plethodon yonahlossee* and *Aneides aeneus* will be conducted in 1981 by Richard C. Bruce and students from Western Carolina University. In addition, George Labanick of the University of South Carolina at Spartanburg is beginning long-term population studies of *Plethodon yonahlossee*.

Herpetologists should not attempt to enter the Bat Cave property without permission. Collecting will be discouraged. Individuals with legitimate scientific interests will be considered eligible for study permits, and should contact the N. C. Nature Conservancy, P.O. Box 805, Chapel Hill, North Carolina 27514. ●

ERRATUM

HR 12(1): the title of HERPETOLOGICAL RECORDS FROM CENTRAL AND NORTH**EASTERN** ARIZONA should read HERPETOLOGICAL RECORDS FROM CENTRAL AND NORTH**WESTERN** ARIZONA. ●

HR REVIEWERS

Thanks are expressed to the following persons for reviewing manuscripts for **HR** the past few months:

James L. Christiansen
Robert Clarke
John Ferner
J. Whitfield Gibbons
Harvey Lillywhite
Paul Meglitsch
Larry D. Wilson
George Zug ●

Podocnemis INFO SOUGHT

The Milwaukee County Zoo would appreciate receiving information on any captive breeding program (successful or not) for turtles of the Genus *Podocnemis*, especially *P. expansa*. Please send information to:

Reptile Section
Milwaukee County Zoo
10001 West Bluemound Road
Milwaukee, WI 53226 ●

NEW BOOK

INVENTORY OF LIVE REPTILES AND AMPHIBIANS IN NORTH AMERICAN COLLECTIONS, CURRENT JANUARY 1, 1981
by
Frank L. Slavens

This book contains approximately 200 pages of information compiled from 160 (70 public and 90 private) reptile and amphibian collections. Detailed information, such as the location and sex of all individual specimens of 1,244 forms of 927 species; a list of species bred during 1980; and miscellaneous breeding information (including dates of egg laying and hatching, types of incubation media used, and temperatures); is included. For more information, contact: Frank L. Slavens; P.O. Box 30744, Seattle, Washington 98103.

BOG TURTLE PRESERVE

Environmental Conservation Commissioner Robert F. Flacke today announced acquisition of key habitat lands in southeastern Putnam County, which will be known as the Bog Brook State Nature Preserve.

Almost 132 acres of land were acquired from several owners at a total cost of more than $500,000. The project was funded through the unique-area category of the 1972 Environmental Quality Bond Act.

"The Bog Brook Preserve was acquired primarily to protect its population of bog turtles, one of our endangered species," Commissioner Flacke explained. "This is the first time the state has purchased land to protect a species that is in danger of extinction."

Studies by DEC over the past three years show that 47 percent of previously known bog turtle habitats in the state can no longer support this species. The state Nature and Historical Preserve Trust, which controls expenditure of funds for the purchase of unique areas, had recommended the Bog Brook acquisition, following confirmation of its population of bog turtles and of the danger that this habitat would be destroyed by development. Dr. John Behler, a herpetologist with the New York Zoological Society, was instrumental in identifying the Bog Brook habitat, and provided much essential information to DEC prior to the acquisition. About 30 percent of the Bog Brook acreage is in wet meadows. The remaining land in the acquisition slopes upwards, and is a mixture of old fields and deciduous woodlands. The upland areas in the Preserve were purchased to protect the wetland's water supply. ●

THE DIVERSITY OF FEEDING MECHANISMS OF SNAKES

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A Symposium Banquet and a Reception in the Reptile House of the Dallas Zoo are planned for the evening of 27 December.

Contributed papers about snakes will be scheduled for the following day, 28 December. ●

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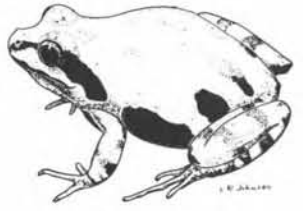
HR NEEDS HELP

Barbara Paschke will no longer be able to manage the myriad tasks associated with advertising in **HR.** As editor, I would like to express SSAR's sincerest appreciation, not to mention my own personal thanks, for her efforts these past several years. Her sincerity and energy in the task helped to advance the Society quite a bit financially; she is not a member, nor even a herpetologist.

I will be unable to absorb her workload. Hence, unless a capable volunteer steps forward for this task, revenue from ads in **HR** will take a tumble. Perhaps those few at August's Board meeting who clamored loudly for a **more active HR** ad program will now rush forward and demand to be the one to head the effort. Of course, as I recall, they did only say that **someone** should do it.

Anyway, we do need help. The work will require 2-5 hours a week, a fair amount of typing, excellent organizational ability, the ability to write personable as well as forceful letters, and an employer willing to pay modest postage costs (or the ability to launder said costs since there never was an advertising budget!).

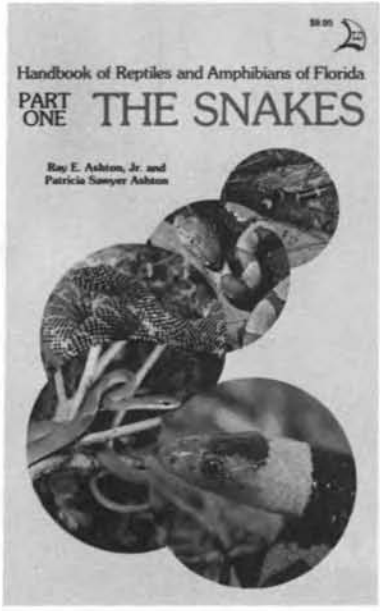
I am poised now, prepared to review the untold numbers of applications. ●



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TWO ABNORMAL STRIPING PATTERNS IN *EUMECES LATICEPS*

Among hundreds of adult and juvenile *Eumeces laticeps* observed in Alabama between 1976 and 1979, two phenotypically aberrant individuals were noted. Both were recently hatched individuals on a study area being censused repeatedly in a mark-recapture survey. Each was returned to the population after marking and neither was seen again. Although they may have emigrated, it is more likely that they died on the site since one was notably weak when captured, since aberrant phenotypes often have exceptionally high death rates, and even normal hatchlings are subject to a high mortality rate.

The first unusual specimen appeared normal except that its middorsal light stripe was interrupted above the pectoral girdle by a yellow oval the perimeter of which was of the same width and color as the middorsal line (fig. 1). Since the oval was continuous with the middorsal stripe anteriorly and posteriorly, it appeared to be formed by a bilaterally symmetrical branching of the stripe with convergence of the branches on the midline at each end. The lizard bearing the elliptical marking was captured on 7/13/78, the first day hatchlings appeared on the study site that year. Its weight was 0.81 g and its snout-vent length 33 mm.

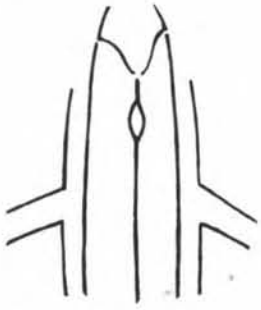


Fig. 1. Elliptical dorsonuchal striping anomaly.

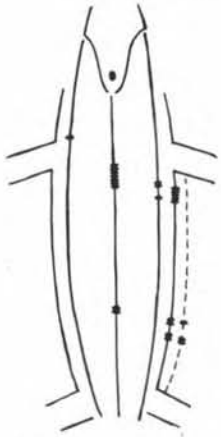


Fig. 2. Anteroposterior location of each blue scale on an otherwise yellow stripe is indicated by one dark line perpendicular to the stripe.

Although the stripes of the other specimen were normally aligned, there were numerous scales restricted to the stripes considerably anterior to the tail which were light blue rather than the normal yellow (fig. 2). Several photographs retained by the author document this phenomenon. Blue scales occurred in two oblique patches. In the anterior patch, just posterior to the pectoral girdle, one blue scale was located on the stripe just left of the middle stripe at the level of the pectoral girdle, seven blue scales were in the middorsal stripe just posterior to the pectoral girdle, four blue scales in three groups separated by yellow scales were a little further back on the stripe just to the right of the midline, and five consecutive blue scales were found at the same level on the next stripe. The posterior patch, located slightly anterior to the pelvic girdle, was restricted to the midline and the three stripes on the right side (*E. laticeps* often has seven). As in the anterior patch, the anterior-most blue scales were on the left-most affected stripe. The stripe just right of center lacked blue scales in the posterior patch, but proceeding to the right, the next stripe had two pairs of blue scales separated by three yellow ones, and the lateral stripe had one blue scale at the level of the anterior pair on the adjacent stripe and two blue scales at the level of the posterior pair.

Because the blue scales on the dorsal trunk occurred in patches and showed similar pigmentation to that normally found only on the tail and tail base, they probably indicate a genetically mosaic distribution of pigmentation.

The hatchling with anterior blue scales was captured on 8/2/79, four days after the first sighting of hatchlings on the study plot that year. Its size (36 mm snout-vent length and 0.77 g body weight) and absence of an open yolk scar suggest that it may have survived a week or more after hatching. However, it neither appeared nor acted vigorous. Besides its unusual stripe coloration, it had an abnormal kink in the last 15 mm of the tail.

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EXCAVATING BEHAVIOR IN *CONOPHIS LINEATUS* (SERPENTES: COLUBRIDAE)

An adult *Conophis lineatus* (*ca.* 45.0 cm SVL) collected near Managua, Nicaragua in February 1976 was housed in a glass enclosure 75 x 75 x 30 cm. The sides of the enclosure were covered with paper and observations were made through several small reclosable flaps. The enclosure included a water receptacle and several flat rocks on a pea gravel substrate. The rocks were of various sizes but all laid flush with the 1.5 - 2.0 cm - deep substrate. Late in the afternoon of the

day after being introduced into the enclosure the *Conophis* was observed excavating beneath one of the rocks. It would push its snout into the gravel beneath the rock, bend its head and neck into an acute angle around some of the gravel and then pull the gravel out from beneath the rock. This behavior was repeated until a cavity was formed beneath the rock. The snake then crawled into the cavity and assumed a coiled position with its head resting on a body coil.

The next morning, after the snake had left the cavity, we pushed pea gravel beneath the rock to once again make it flush with the substrate. Again, late in the afternoon, the snake excavated a cavity beneath the same rock and retreated into it. It then used that retreat for several days, until we again filled it in. Once again it was re-excavated. The snake fed readily on anoles and half-grown laboratory mice and frequently attacked them from its retreat.

Schmidt and Davis (1941:49) briefly discussed burrowing in snakes and noted that " . . . certain snakes have been seen to use a loop of the neck to scrape out small hollows in the sand . . . " but that " . . . no one knows why or how generally snakes use it." Williamson (1971) observed five species, representing five genera and three families (Boidae, Colubridae, Elapidae), to exhibit excavating similar to that described above for *Conophis lineatus.* He suggested that the behavior represented an attempt by the snakes to escape since the excavated areas were adjacent to the glass walls of their enclosures.

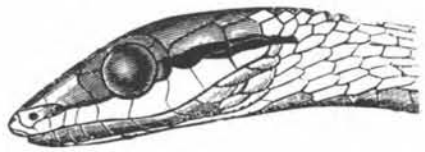
The behavior we observed in *C. lineatus* was obviously not an attempt to escape. The excavation took place under a rock centrally located in the enclosure and the snake was clearly making a retreat for itself. Whether the cavity merely represented a place to spend the night, a site from which to ambush prey, a retreat to return to when potential predators appeared, or a home base to be returned to repeatedly and which may have served various functions, is unknown.

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HAVE YOU SEEN A BULLFROG-GREEN FROG HYBRID?

The bullfrog, *Rana catesbeiana*, and the green frog, *Rana clamitans*, are two of the most common and the most widely-distributed frogs in North America. They are so similar in appearance that green frogs and small bullfrogs are frequently mistaken for each other by the casual observer. Using a biochemical measure, Wallace *et al.* (1973) found that these two species are closely related. In addition, there are striking similarities in their mating behavior. In both, receptive females enter into a male's territory which he defends, and females may mate more than once in the summer (Wells, 1977; Howard, 1978). Because of these similarities, the question arises as to whether hybrids between them can be produced.

Previous work indicated that hybridization could not occur. In the cross, *R. catesbeiana* ♀ x *R. clamitans* ♂, the embryos arrested at gastrulation, and in the reciprocal cross, *R. clamitans* ♀ x *R. catesbeiana* ♂, no eggs were fertilized (Moore, 1955). I found that the block to fertilization of the *R. clamitans* egg was overcome by enrobing the egg with *R. pipiens* jelly (Elinson, 1975a) or simply by using much higher concentrations of *R. catesbeiana* sperm (Elinson, 1975b). Once the block to cross-fertilization was circumvented, the resulting embryos developed in a normal fashion through metamorphosis (Elinson, 1975a). Such froglets grew into healthy, mature hybrid adults, and one, in fact, overwintered in an outdoor pond.

When the hybrids reached sexual maturity, I examined them for fertility. Several males (Elinson, 1977) and one female tested (Elinson, unpublished) were fertile. By back-crossing these fertile hybrids to the parental species, I have been able to do a genetic analysis of lethality in the *R. catesbeiana* ♀ x *R. clamitans* ♂ cross. The failure of these embryos to gastrulate may be due to only one early acting gene (Elinson, 1977, unpublished). The conclusions from these experiments are that fertile hybrids between *R. clamitans* and *R. catesbeiana* can be produced and that the lack of development in one direction of the cross does not indicate a large genetic difference between the species.

Is the hybrid produced in nature? A scenario for this would be for a large *R. clamitans* ♀ to wander into the territory of a small but virile *R. catesbeiana* ♂ and be amplexed by him. Problems with this are: 1) Do small, mature *R. catesbeiana* males release enough sperm at amplexus to fertilize *R. clamitans* eggs? 2) Would a *R. clamitans* which has survived years of predation by *R. catesbeiana* approach a *R. catesbeiana*? 3) Are there behavioral cues which could preclude a successful amplexus?

Despite these problems, I would like to alert you to the possibility of finding a hybrid in nature. A mature adult hybrid can be distinguished from the parental types without undue difficulty. The hybrid is sexually mature when it is about 7 cm snout to vent, similar to *R. clamitans*. Sexually mature *R. catesbeiana* are generally greater than 10 cm. *R. clamitans* has distinct dorsolateral folds which *R. catesbeiana* lacks. The hybrid has faint or no folds. So a 7-9 cm sexually mature "green" frog with faint folds would be likely candidate for a hybrid (see Elinson 1977, for pictures). If you suspect that a frog is a hybrid, the hybrid can easily be distinguished from the parental species with a more detailed morphological analysis (Scheuler and Elinson, unpublished) or by an examination of the enzyme lactate dehydrogenase (Elinson, 1975a). I would, of course, be interested to hear of any suspected hybrids. Happy hunting!

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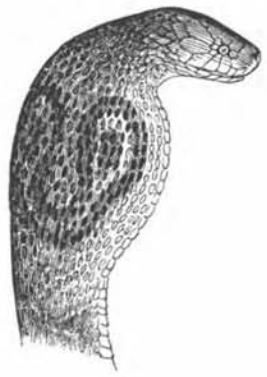
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Membership is open to anyone interested in amphibians and reptiles. Members have voting privileges in the Society. They receive the **Journal of Herpetology** (four issues per year), **Herpetological Review** (four issues per year), **Herpetological Circulars**, and several **Facsimile Reprints in Herpetology**. Members may purchase other Society publications at reduced rates.

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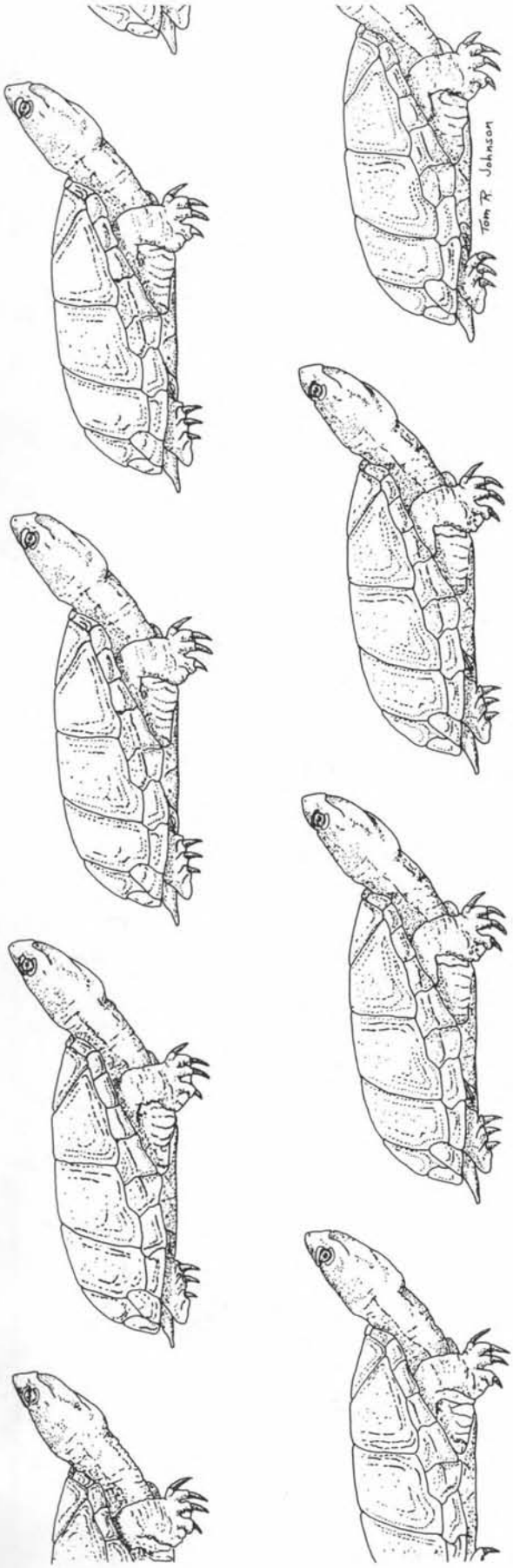
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SSAR 25th ANNIVERSARY MEETING

The dates for the 1982 Annual Meeting in Raleigh, North Carolina are August 1-6. Further details will be announced in December. ●

ATTENTION ALL CURRENT LITERATURE SCANNERS

To update the records of assignments for active CL scanners, it will be greatly appreciated if **all** scanners will submit a complete list of journals/sources each is currently responsible for to the new CL Coordinator, Joe Dinardo, as soon as possible. Please send this information to:

Joe Dinardo
Current Literature
16 Idlewild Road
Levittown, PA 19057 USA

It has become apparent that there is some duplication of effort taking place, while a number of other journals/sources are being neglected. These seem to have been dropped by previous scanners and not reassigned. In an effort to correct these deficiencies, the cooperation of everyone presently scanning for CL will be most appreciated. Only with this information at hand can the situation be rectified. ●

APPEAL TO ALL MUSEUM WORKERS AND LIBRARIANS

During the last several years, it appears that notification of many herpetological titles issued in the various publications series of natural history museums have escaped the attention of **HR's** Current Literature section. This is true not only of overseas institutions, but, oddly enough, of many North American museums and scientific societies as well.

Since many of these publications constitute important herpetological reference materials, this deficiency needs to be corrected. In an endeavor to get as many such publications listed in CL as possible, it will be greatly appreciated if any museum workers or librarians who have knowledge of such titles will bring them to the attention of Joe Dinardo, the Current Literature Coordinator, at the following address:

Joe Dinardo
Current Literature
16 Idlewild Road
Levittown, PA 19057 USA

In addition, in order to fill the gaps in the reporting of this information that has occurred in the past, it will be most useful if a list of all such titles published in the last five to ten years by your facility be supplied as well. Please include the following information for each title submitted: author(s), date of publication, title in full, publication source, volume and/or number and exact pagination.

The assistance and cooperation of all librarians and museum workers who supply this information will be most appreciated by the editors of Herp Review and its readership at large. ●

HERP CATALOGUE ACCOUNTS OPEN

CROCODYLIA

Volunteers are sought for three crocodilian accounts for the Catalogue of American Amphibians and Reptiles. The account for *Crocodylus acutus* and the generic accounts for *Alligator* and *Crocodylus* are still unassigned. Anyone wishing to volunteer for either of the accounts please contact:

HOWARD W. CAMPBELL
Crocodylia Editor
National Fish and Wildlife Laboratory
Gainesville Station
412 N.E. 16th Avenue, Room 250
Gainesville, FL 32601 ●

SERPENTES

I have been fortunate during my tenure as the Snake Section Editor for the Catalogue of American Amphibians and Reptiles in having the support of many colleagues who have volunteered to author most of the U.S. snake accounts. There are a few accounts, however, that remain unassigned. I want to take this opportunity to bring to your attention a list of these accounts in the hope that some of you may be interested in volunteering to write one or more of these accounts or that you might be able to suggest someone you think might be interested and/or qualified to write one or more. The list of unassigned U.S. snake accounts is as follows:

1. *Coniophanes*
2. *Masticophis lateralis*
3. *Nerodia cyclopion*
4. *N. erythrogaster*
5. *N. fasciata*
6. *N. harteri*
7. *N. rhombifera*
8. *N. sipedon*
9. *N. taxispilota*
10. *N. valida*
11. *Rhadinaea*
12. *Thamnophis radix*

I am also interested in hearing from people who would like to volunteer to write accounts of exotic snake species from elsewhere in the Western Hemisphere.

If you can help, please contact me at:

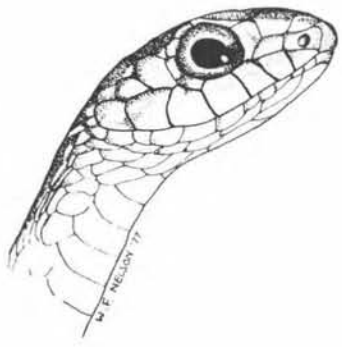
LARRY DAVID WILSON
Division of Intercurricular Studies
Miami-Dade Community College
Miami, Florida 33176 ●

SAURIA

The Catalogue of American Amphibians and Reptiles accounts of the lizard genera and species listed below have not been assigned to authors. Anyone interested in preparing one (or more) of these accounts should contact:

DR. C. J. McCOY
Sauria Editor, CAAR
Carnegie Museum of Natural History
4400 Forbes Ave.
Pittsburgh, PA 15213

Anolis
A. carolinensis
Callisaurus
Cnemidophorus
C. burti
C. exsanguis
C. flagellicaudus
C. gularis
C. inornatus
C. laredoensis
C. septemvittatus
C. sonorae
C. velox
Cophosaurus
Crotaphytus
C. collaris
C. insularis
Dipsosaurus
D. dorsalis
Eumeces
E. anthracinus
E. gilberti
E. inexpectatus
E. laticeps
E. septentrionalis
Gambelia
Gerrhonotus
Hemidactylus
Petrosaurus
P. mearnsi
Phrynosoma
P. cornatum
P. coronatum
P. douglassi
Sceloporus
S. graciosus
S. grammicus
S. scalaris
S. undulatus
Scincella
Urosaurus
U. graciosus
U. microscutatus
U. ornatus
Xantusia ●

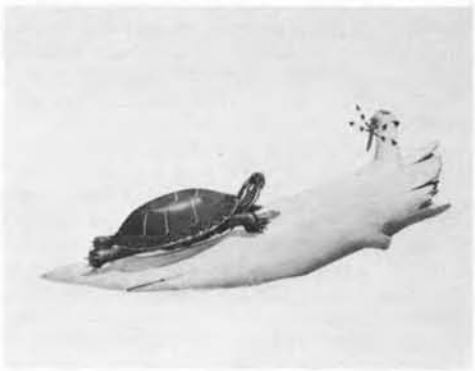


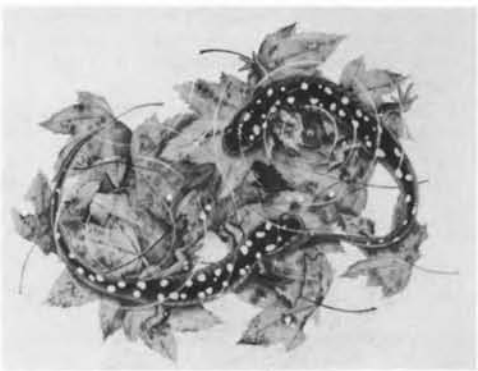
NATURAL HISTORY PRINTS
BY DAVID M. DENNIS

WE ARE PLEASED TO ANNOUNCE that wildlife prints by David Dennis are available for sale. These portraits are *full-color reproductions* of the original watercolor drawings, each printed on a sturdy paper stock measuring 20 by 24 inches and suitable for framing. Prints are *strictly limited to an edition of 500 copies, each of which the artist has numbered and signed individually.* Because of the relatively small size of the edition and the fact that this is the first offering of Mr. Dennis' work, these prints represent a sound investment as well as a visual delight. They would also be ideal for gifts.

Mr. Dennis is widely known to the scientific community as a wildlife artist specializing in watercolor portraits of lower vertebrates and insects. His self-taught artistry is complemented by his academic training in biology and his personal field experience with each of the animals he paints. Mr. Dennis earned his undergraduate degree in zoology from The Ohio State University in 1966 and since then he has held a succession of positions as biological illustrator at the Columbus Zoological Gardens, the University of Kansas Museum of Natural History and now at Ohio State. He has illustrated numerous biology textbooks including one which he co-authored, but is perhaps best known to vertebrate biologists for the exquisite series of watercolors published in *Hylid Frogs of Middle America* (The University of Kansas Press, 1970). Originals of Mr. Dennis' watercolors have been exhibited in art galleries and museums throughout the United States and also at numerous scientific meetings.







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REGIONAL SOCIETIES

Manuscripts on the biology of amphibians and reptiles are wanted for publication by the Chicago Herpetological Society. The CHS publishes a BULLETIN 4 times per year and material for 1981 issues is needed. Black and white photos of amphibians and reptiles are also needed. Please submit material to the: Publication Secretary, Chicago Herpetological Society, 2001 North Clark Street, Chicago, IL 60614. ●

THE VIRGINIA HERPETOLOGICAL SOCIETY IS RESTRUCTURED

In March of 1981 the VaHS held a meeting at Longwood College in Farmville, Va.

The purpose of the meeting was to restructure the society after a two year lapse of formal meetings.

The Board of Directors was replaced by an elected body of officers. The officers are:

President - Bob Bader
Vice-President - Jack Brooks
Secretary - Joseph C. Mitchell
Editor - Don Merkle

A new bulletin will be published this summer before a Sept. 1981 meeting. After the meeting if there is enough interest the bulletin, which is called CATESBEIANA, will be published semi-annually.

Although the main interest of the VaHS is still the herpetology of the state, we will not limit ourselves to just state wide herp information.

Anyone wishing to receive the bulletin this summer please contact Don Merkle at Longwood College, Biology Dept., Farmville, Va. 23901. ●



Bipes IN ALTA CALIFORNIA

The recent exchanges in *Herpetological Review* regarding the presence of *Bipes* in the United States (Campbell, 1980; Gans and Pappenfus, 1980; Dundee, 1980 and Smith and Holland, 1981) reminded us of an overlooked report of *Bipes* in Central California. The report was one of more than a dozen historical accounts given orally in 1877 by Jose Francisco Palomares, an early pioneer in California, and recorded by the historian Thomas Savage (Temple, 1955). The manuscript containing the remembrances was deposited in the Bancroft Library, University of California, Berkeley, and a translation by Temple was published in 1955. Since this report is not in the herpetological literature and otherwise not readily available in most libraries, we have taken the liberty of quoting it as it was published in the *Memoirs of Jose Francisco Palomares* (Temple, 1955:33-36):[1]

"Curious case of an Indian who died as the result of an ajolote.

"Once we were hunting deer in company with Don Ygnacio Ortega, a man well versed in matters of the hunt and of a very harsh character. One night while we were resting in camp, located at La Poza del Fresno (the pool of the fresno), after having skinned the deer that we had killed during the day, we noticed that there crawled out of the water a great number of little animals resembling [salamanquesas], ravenously consumed the blood that had collected there. We paid little attention to such vermin and everyone retired without any misgivings.

"Some of us slept and others rested, when there were heard some hearty shrieks from the Indian Ygnacio, servant of Ortega, yelling, 'Ouch! Ouch! the snake, he crawl in! Ouch! Ouch! the snake he crawl in!' Immediately, we were all moving around and snatching some live fire brands went to see what was happening to Ygnacio, whom we found squatting down with his hand clenched under his anus, from which there writhed the tail of an animal, which we at once recognized as an ajolote . . . 'This snake hurts very much, Señor! With his claws he is tearing me,' replied the Indian.

"Then Ortega went to where the patient was lying and said to him, 'Let me grab it and I'll pull it out.' The Indian answered, 'But don't let him get in any further, Señor, no! here, I have hold it.' The Indian released his hand and Don Ygnacio yanked, but the animal would not budge, perhaps because it was hooked on to the insides by its small sharp claws . . . Then Ortega, with the faggot in hand, burned the Indian about the thighs, pulling at the same time on the tail of the ajolote. The patient let out a scream of pain and Ortega yanked out the animal and flung it away from there.

"The anus of the Indian looked on the outside like a rosette, and then we saw that he had jagged wounds from which the blood flowed freely. For all that we did we could not stanch the flow. Ortega, grumbling and swearing, ordered us to break camp, but not before some of us went to where the ajolote lay and killed it. Examining it we found that on [las dos patitas que tenia por delante], very similar to human hands, you could see some short, little claws, steel-like and as sharp as needles. Then we realized that those little knives must have horribly wounded the insides of the hapless Ygnacio . . . Finally, after twenty-four hours of bleeding from his wounds, José Ygnacio expired at La Panocha Chiquita; the body was brought to the Mission of San Juan Bautista, where he belonged, and there he was given Christian burial."

There can be little doubt that the ajolote described by Sr. Palomares was a *Bipes*. His description of the animal (a snake with sharp claws on its two small human-hand-like paws) is a reasonably accurate one for *Bipes*. Ajolote is the common name applied to *Bipes biporus* of Baja California. Furthermore, the description of the behavior of the ajolote is similar to the behavior attributed to *Bipes* in the La Paz area; however, there it more commonly involves women rather than men. Although it would not be unreasonable to question the veracity of some aspects of the circumstances of the encounter with the ajolote, it remains an intriguing possibility that they actually found and killed a *Bipes* in Central California.

The hunt related probably took place in the 1820's. Sr. Palomares was born in 1806 and his hunting companion, Don Ygnacio Ortega, died in 1829. The location of the hunt was somewhere near Little Panoche Creek (La Panocha Chiquita) in the Panoche Hills in what is now western Fresno or adjacent San Benito County, California. The Poza del Fresno could have been what is now called Mercy Hot Springs. This area lies in the western edge of the San Joaquin Valley. The habitat consists of rolling sandy hills dominated by annual grassland with a mixture of shrubs (*Atriplex polycarpa, Ephedra californica* and *Haploppus racemosus*) (Barbour and Major 1977:495), and is well suited for a burrowing animal like *Bipes*. The area is sparsely populated and remains, from a herpetological standpoint, one of the least explored in California.

Does *Bipes* await rediscovery in Central California?

[1]Bracketed sections are in the original Spanish from the manuscript in the Bancroft Library.

Literature Cited

Barbour, Michael G. and Jack Major. 1977. Terrestrial vegetation of California. John Wiley and Sons, New York, 1002 pp.

Campbell, J. Howard. 1980. Edwin James' report on *Bipes* reconsidered. Herp. Rev. 11(1):6-7.

Dundee, Howard A. 1980. A comment on J. Howard Campbell's *Bipes* report. Herp. Rev. 11(3):74-75.

Smith, Hobart M. and Richard L. Holland. 1981. Still more on *Bipes*. Herp. Rev. 12(1):8-9.
Temple, Thomas W., II. 1955. Memoirs of José Francisco Palomares. Glen Dawson, Los Angeles, 69 pp.

JOHN W. WRIGHT
Section of Herpetology
Natural History Museum
Los Angeles, CA 90007
and
WILLIAM M. MASON
Section of Historical Records
Natural History Museum
Los Angeles, CA 90007

BOOK REVIEWS

J. D. Romer, **Illustrated Guide to the Venomous Snakes of Hong Kong** H.K. Government Press: Hong Kong.

The most popular of the Hong Kong Urban Services Publications, this small colorful booklet was originally published in 1959. An unexpected demand by tourists, teachers and students, and the general public resulted in a revised edition (1965), additional impressions (1966, 1972) and the present updated impression (1975).

Mr. Romer, who has served many years as Senior Pest Control Officer for Hong Kong, has been in an excellent position to survey the venomous snake fauna of the colony. In addition to responsibilities for insect and rodent control, his office responds to calls on snakes. Many-banded kraits entwined in telephone cables and Chinese cobras in Kowloon housing estates are not uncommon events.

Additionally, Mr. Romer has published numerous articles on both reptiles and amphibians, including an annotated checklist and key to the snakes of Hong Kong in 1970. However, only this guide to venomous snakes is still in print.

Eight snakes are pictured: *Bungaris fasciatus, B. multicinctus, Callophis macclellandi, Naja naja, N. hannah, Trimeresurus albolabris, T. monticola,* and *Hydrophis cyanocinctus.* An excellent chart detailing the features of dead venomous snakes constitutes the centerfold and neatly divides the booklet in half. The first twelve pages complete the narration in English. The last twelve pages are a repetition in Chinese and read from what westerners would consider to be the back cover. The pictures and center chart are illustrated but once and are captioned in both languages. This bilingual format is rather unusual and is a refreshing acknowledgment that the colony is mostly Chinese. It also accounts for the booklets exceptional popularity.

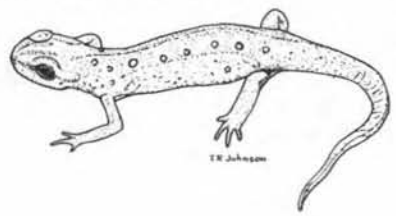
Page-long narratives on the description, occurrence and venom of each snake compliment the color plates. Recommendations for first aid for snake bite reflect the small size of the colony and the ready supply of antivenom.

The whole booklet is printed on heavy slick paper and stapled as one signature. Copies used as class manuals have admirably taken several years' wear. While it will not provide technical data new to the professional herpetologist, it is an excellent model of an educational booklet for a local scene.

(Copies currently sell for under U.S. $2.00 from the Hong Kong Government Printer, General Post Office Building, Central, Hong Kong. Surface mail should cost less than U.S. $.50, airmail not more than U.S. $2.00.)

References: Romer, J. D. "Annotated Check List with Key to the Snakes of Hong Kong" Mem. Hong Kong Nat. Hist. Soc. 1970.

JOHN RICHARD SCHROCK
Department of Entomology
University of Kansas
Lawrence, Kansas 66045



SOUTH AFRICAN FROGS

N.I. Passmore & V.C. Carruthers

"This book will guide the newcomer gently into the specialized world of frogs, and show him beauty he would never expect. It will also guide him to the work still to be done — work to which the keen amateur can contribute." — Professor Hugh Paterson, Head of the Department of Zoology, University of the Witwatersrand, Johannesburg.

An authoritative guide to the diverse frog fauna of South Africa. Written and illustrated at a level of proficiency that will make it a standard reference work for herpetologists, ecologists, teachers, conservators and anyone with an interest in natural history. Profusely illustrated with photographs of living animals. A twin-page description for every species includes at least one colour photograph, several black and white photographs, a distribution map and in most cases a sonogram of the mating call. An annotated gramophone record of the calls of the majority of the species is included. 1979. 288 pp., 136 coloured plates, over 500 black and white photographs, drawings and distribution maps, 1 record of frog calls. Cloth R22.

WITWATERSRAND UNIVERSITY PRESS
1 Jan Smuts Avenue
2001 Johannesburg, South Africa

Kluger, M. J. 1979. **Fever. Its Biology, Evolution, and Function.** Princeton Univ. Press. xxi + 195 pp, 49 figs. $15.00.

I doubt that many herpetologists will be induced to examine a book with such a clinical title as this one. Nonetheless if you can be intrigued by the thought of a lizard or a fish having a fever, you might be just the person to find this little exposition on the subject of fevers to be quite fascinating. The discovery that ectotherms (including reptiles and amphibia) do indeed possess febrile reactions to various pyrogens has reinforced the belief that any organic event with such a widespread evolutionary background must have an adaptive value and that the re-setting of the thermostat at an elevated temperature is a beneficial thermoregulatory response by the organism. As a logical conclusion to these discoveries, the clinical approach to fever (not to be confused with hyperthermia) should be to maintain it rather than to abate it with antipyretic drugs. It is demonstrated that the principal difference between ectotherms and endotherms lies in the effector arm of the thermoregulatory reflex arc rather than the sensory or integrating segments which are basically similar in all vertebrates. Once again we have a demonstration how laboratory experimentation with reptiles and amphibians can have a beneficial bearing on human welfare.

HENRI C. SEIBERT
Department of Zoology
Ohio University
Athens, Ohio 45701

NEW BOOK

REPTILES OF THE SOLOMON ISLANDS by Michael McCoy. WAU ECOLOGY INSTITUTE Handbook No. 7, 1981. 80 pages; 8 color plates; 12 half-tone plates. Price: Kina 3.00, Sol. 4.00, US $5.00.

This handbook treats all of the reptiles known from the Solomon Islands (including Bougainville I. which is part of the nation of Papua New Guinea). Seventy-two species are described with information on distribution, characteristics, color in life, ecology and life-cycle. There are keys to all categories. Many of the species are illustrated both in color and half-tone. In addition, there are diagrams to assist in the use of the keys and descriptions. There is a glossary, a bibliography, instructions for preserving specimens and an index.

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LIFE HISTORY NOTES

LIFE HISTORY NOTES is analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Longevity, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1978. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

CAUDATA

DESMOGNATHUS MONTICOLA (Seal Salamander). **COLORATION.** The only heretofore known literature record of a completely albino *Desmognathus* is apparently that of *D. monticola* from North Carolina reported by Brame (1962, Abh. und Berichte fur Naturk. Vorgesch. 11(3):65-81). During a collecting trip for the Kentucky Nature Preserves Commission (KNPC), a completely albino male *D. monticola* was collected from the Lower Pigeon branch of Elkhorn Creek, 2.6 km east of Hylton, Pike County, Kentucky on 13 Oct 1978. The specimen was taken along with 28 normally colored individuals including 2 *D. fuscus*, 3 *D. welteri*, and 23 *D. monticola*. Identification of the albino was confirmed by the use of toe pad characteristics and tooth morphology (Caldwell and Trauth, 1979, J. Herp. 13(4):491-497. The collection site was a small 2 m high steep-walled seepage area that had a small but continuous flow over layered moss-covered sandstone. A small overhanging ledge capped the wall. The east-facing area was littered with numerous leaves from the surrounding beech-hemlock-rhododendron forest.

The specimen measured 60 mm snout-vent length and had 13 costal grooves (3 intercostal spaces between adpressed limbs). Epidermal pigment was entirely lacking; the animal appeared completely white in normal daylight and possessed pink eyes. Underlying blood vessels were readily visible over the entire body. The tip of the tail had been lost and was being regenerated at the time of capture.

Following collection, the specimen was preserved in 10% formalin, then transferred to 70% isopropyl alcohol and is currently stored in the KNPC collection at Frankfort, Kentucky. The abdominal cavity was subsequently opened and examined. The only evidence of internal pigmentation was that of the blood. No food material was found in the stomach or intestine. Multiple testicular lobes were present and were scored as 2.5 on the right and 2.0 on the left according to Tilley (1973, Ecology 54(1):3-17). Lobe measurements in mm were as follows (posterior-most lobes recorded first): right = 3.0, 4.0, 4.0; left = 5.0, 3.5. The vasa deferentia were well developed and wavy in appearance. Based upon methods of assessing testicular characteristics (Humphrey, 1922, Biol. Bull. 43:47-67), the age of the albino was estimated at between 4 and 5 years.

Submitted by **WAYNE C. HOUTCOOPER,** Field Representative, Kentucky Nature Preserves Commission, 407 Broadway, Frankfort, Kentucky 40601

NECTURUS MACULOSUS LOUISIANENSIS (Red River Mudpuppy). **COLORATION.** Albinos of the subspecies *N. m. louisianensis* have not previously been reported. An albino *N. m. louisianensis* was collected on 9 March 1980 by Mr. Bill Todd, a local fisherman, from the Cache River near Egypt in Craighead County, Arkansas (T14N, R1E, Sec. 12). The mudpuppy is an adult (215 mm SVL). The specimen was donated to the Department of Biological Sciences, Arkansas State University, and was maintained in an aquarium for several months.

The specimen (Figure 1) has pink eyes. Its ground color is yellowish white with blotches of faint yellow in contrast to the lighter ground color. The yellow coloration is probably due to concentrations of lipophores, melanophores being absent. The ground color of the dorsum fades into a more translucent white on the venter, allowing portions of the circulatory and darker viscera to be seen. The circulatory system causes a pink cast to develop on the venter.



Fig. 1. Dorsal view of albino *Necturus maculosus louisianensis* from Craighead County, Arkansas.

The authors thank Mr. Bill Todd for donating the specimen, and Dr. Jeffrey H. Black, Oklahoma Baptist University, for providing technical materials. The specimen is now preserved in the Arkansas State University Herpetological Museum (ASUHM #3940).

Submitted by **CHRIS T. MCALLISTER,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203 and **C. RENN TUMLISON** and **LYNITA M. COOKSEY,** Department of Biological Sciences, Arkansas State University, P.O. Box MM, State University, Arkansas 72467

PLETHODON CINEREUS (Redback Salamander). **COLORATION.** During investigations on the ecology of *P. cinereus* at Victory Woods (1.7 km W Put-In-Bay), South Bass Island, 131 unstriped and 1 striped *P. cinereus* were collected. The striped morph (SV 25mm) was found with several unstriped morphs under a decaying log in typical woodland habitat for *P. cinereus* (Heatwole, 1962). This specimen, being the first record for the striped morph from the monomorphic unstriped South Bass Island population, was released at the capture site after being photographed.

The nearest *P. cinereus* populations in northern Ohio have greater percentages of striped morphs (7-80% striped; Pfingsten and Walker, 1978) and are now separated from South Bass Island by at least 4 km of water. Twelve thousand five hundred years ago though, the bottom of Lake Erie was virtually dry and was covered with forests (Forsyth, 1973, Compass Sigma Gamma Epsilon 51:16-26). During this period, South Bass Island could have been populated by salamanders following the retreating glacier. The subsequent reflooding of the western basin (3,500 to 4,000 years ago) would have isolated South Bass Island with its *P. cinereus* population (*ibid.*). The progression toward a monomorphic unstriped condition in this isolated population could then have occurred simply by genetic drift. Hence this lone striped *P. cinereus* may represent a relict gene in the population.

The field work would not have been possible without the help of T. Bonace, R. Carter, M. Duffy, D. Michael, and P. Zock. Dr. G. Dalrymple constructively criticized the manuscript.

Submitted by **NORMAN G. REICHENBACH,** Department of Zoology and The Center for Lake Erie Area Research, The Ohio State University, Columbus, Ohio 43210. ●

ANURA

BUFO PUNCTATUS (Red-spotted Toad). **LARVAL COLORATION.** There has been no record of an albino *Bufo punctatus*. On 25 August 1979, six albino Red-spotted toad tadpoles *(Bufo punctatus)* were found in No Thoroughfare Canyon, Colorado National Monument, just west of Grand Junction, Colorado. The canyon is arid, rocky, and divided by a small stream which is intermittently dry. Five of the albino tadpoles were found in one small pond. The other albino was in a separate pond 13 m downstream.

The site in No Thoroughfare Canyon was visited weekly between 25 August and 1 November 1979. A single albino tadpole was last seen on 7 October. Albinistic adults were not found during the study period. No albino toads or tadpoles have been discovered in the area since.

Submitted by **LAWRENCE K. LUEPSCHEN,** 837 Belford Ave., Grand Junction, Colorado 81501. ●

RANA CLAMITANS (Green Frog). **COLORATION.** An aberrant female Green frog, *Rana clamitans*, captured among a group of normally colored individuals on 13 July 1968 at Allenton Marsh, T11N, R18E, Sec. 35, Washington Co., Wisconsin, resembled a "melanoid" variant of *R. pipiens* described by Richards *et. al.* (1969, Copeia (4):850-852).

Color of live frog — Dorsum ground color was light tan to grayish-brown with heavy pigmentation from nape to vent producing a dusky appearance. The head and snout had small pigmented patches connected by short dark lines giving a net-like pattern. Laterally, dark coloration was confined to the proximity of the lateral folds. The legs had dark bar-like markings over a light grayish-brown ground color. Some areas beneath the rear legs had a dusky translucent appearance. The ventrum had a translucent appearance. Viscera were visible through the abdominal covering as darkened areas immediately caudal to the front legs. The iris of the eyes were totally black, lacking the normal gold flecked coloration.

Measurements (mm): S-V 60; head width 21; interocular distance 3.5; internasal distance 5; nostril-eye 4.5; snout-tympanum 15.3; eye-tympanum 1.3; tympanic diameter 7; eye diameter 8.

After preservation in 10% formalin and maintenance at 45° to 70° F for one year, the color pattern was compared to the living specimen using color notes and photographs. The dorsum was light gray and the dark areas were not altered by preservation. The light tan coloring disappeared, revealing 25 small spots on the dorsum above the vent. The widely spaced dark pigmented cells on the translucent ventrum were conspicuous after preservation. Two types of pigmented cell aggregations were observed on the ventrum. The first were very small (ca. 0.025 mm) and rounded, lying in the outer layer of the skin. The second were larger (ca. 0.076 mm) and more oval than rounded, and were located below the first group.

I thank Dr. Max Allen Nickerson for reviewing this manuscript. The preserved specimen has been deposited in the vertebrate collection at the Milwaukee Public Museum (18200).

Submitted by **RICHARD H. RADAJ,** 24130 W. Loomis Rd., Hales Corners, WI 53130. ●



SERPENTES

CEMOPHORA COCCINEA COPEI (Northern Scarlet Snake). **REPRODUCTION.** Relatively little is known of this species' distribution or life history in New Jersey. Therefore, the following new locality and reproductive data are of note.

On 1 July 1974, a gravid female *C. c. copei* (total length = 66.5 cm) was collected at Lake Oswego, Burlington County, New Jersey. The specimen was crossing an asphalt road at 2335 hr on a warm, damp evening with banks of low fog rising to about 76 cm above substrate. The week prior to collection was marked by heavy, intermittent rain.

The female was typical of the subspecies (Williams and Wilson, 1967, Tulane Stud. Zool. 13(4):103-124). On 7 July 1974, the female deposited eight white elongate eggs in a water bowl lined with moist sphagnum moss that had been placed in the specimen's enclosure for that purpose. The eggs adhered together in a single mass and ranged from 2.6-3.0 cm in length ($\bar{x}$=27.5cm) and 1.3-1.5 cm in width ($\bar{x}$=1.4 cm). These dimensions compare favorably with those of a clutch of eggs from North Carolina reported by Palmer and Tregembo (1970, Herpetologica 26:300-302).

The eggs were incubated in a plastic 20x15x10 cm refrigerator dish with multiple 4 mm holes drilled in the sides and top. The eggs were artificially incubated in moist sphagnum moss. Room temperature was approximately 24-25° C. Artificial heat was not used during incubation. All eight eggs hatched on 23 September 1974, seventy-eight days after deposition.

The young were similar in appearance to the adult. They were 16.5-18.5 cm in total length ($\bar{x}$=17.6 cm), and weighed 2.1-2.8 g in weight ($\bar{x}$=2.5 g).

Submitted by **ROBERT L. BRANDNER,** Department of Herpetology, New York Zoological Society, Bronx Zoo, Bronx, New York 10460. ●

CROTALUS LEPIDUS LEPIDUS (Mottled Rock Rattlesnake). **COLORATION.** Tryon (1979, Herp. Rev. 10(1):45) reviewed the many accounts of color and pattern deviations in snakes, and more recently Irwin (1979, Herp. Rev. 10(3):85) reported an aberrantly patterned *Crotalus viridus viridis* and *Sistrurus catenatus tergeminus*. In September or October, 1975, a male *C. l. lepidus* was collected 38.6 km north of Comstock in Val Verde Co., Texas. The body of the specimen is light gray and patternless dorsally, and cream-colored ventrally (Fig. 1). Small flecks of gray pigment occur randomly on the ventral scales. Its tail is cream-colored, except that the distal 1/3 of the ventral surface is rust-colored. Scale counts fall within the range for *C. l. lepidus*. Snout-vent length in November 1979 was 56.4 cm, and the animal appears to have grown little since collection.

The specimen is currently being maintained alive at the Houston Zoological Gardens, Texas (E-268). Upon death it will be placed in



Fig. 1. Patternless *Crotalus lepidus lepidus.*

the Texas Cooperative Wildlife Collection, Texas A & M University.

Submitted by **HUGH QUINN** Department of Herpetology, Houston Zoological Gardens, P.O. Box 1562, Houston, Texas 77001. ●

LAMPROPELTIS GETULUS CALIFORNIAE (California Kingsnake). **COLORATION.** On 13 March 1980, an unusual *Lampropeltis getulus californiae* was collected in northern San Diego County, California, by a resident collector. I obtained the specimen on 22 March and am presently maintaining it alive. Unfortunately, size was not recorded when the animal was collected. As of 22 July 1980, the snake weighed 14.1 g, and was 31.5 cm in length.

Both ventrally and laterally, the specimen is completely unpigmented, with the exception of a few flecks of yellow on the most anterior scutes, and normal pigmentation of the dorso-lateral head region. Because these unpigmented areas are quite translucent, most of the major internal organs can be clearly discerned through the body wall. The heart contractions can be seen, and consumed food items can be followed visually down the esophagus.

Dorsally, a light brown vertebral stripe, approximately 8-9 scale rows wide at the mid-body, runs the length of the specimen. This is broken by 36 irregularly shaped yellow crossbands, most at oblique angles to this dorsal stripe. Each of the crossbands averages 2-3 scale rows wide. The vertebral stripe appears to be only lightly pigmented, and is somewhat washed-out along the edges. Under magnification, many of the dorsal scales can be seen to be only marginally or apically pigmented.

The specimen appears to be normally pigmented on the dorsal medial head surfaces. The parietals are predominantly dark brown, with a few yellow spots. The frontals and supraoculars are dark brown posteriorly and yellow anteriorly. The prefrontals are completely yellow, with a suffusion of brown pigment along the margins. The internasals are medially margined with brown pigment, become yellow in the center of each scale, and are unpigmented along the distal margins. The nasals are completely unpigmented, except along the posterior margins where they are yellow. The rostral is yellow. The margins of both the upper and lower labials are unpigmented, with a few of the scales containing a central light suffusion of yellow pigment. The dorsal brown pigments darken as they descend from the vertebral stripe in the cervical region of the snake to a point just below (ventral to) the jaw axia.

The specimen presently appears to be in good health, and is feeding on newly born laboratory mice (approximately 1-2 g) 3 times per week.

When this snake reaches sexual maturity, selective captive breeding experiments are planned to determine the genetic nature of the phenomenon. The author solicits information on any similar specimens.

Submitted by **VINCENT N. SCHEIDT,** 6218 Syracuse Lane, San Diego, CA 92122. ●

LAMPROPELTIS G. HOLBROOKI (Speckled Kingsnake). **REPRODUCTION.** A gravid female speckled kingsnake *(Lampropeltis g. holbrooki)* was collected in Mohawk Park, Tulsa County, Tulsa, Oklahoma on 15 May 1979. The snake measured 63.0 cm SVL, 72.8 cm TL and weighed 159.5 g. It was found on the bank of a small creek bordered by willows and sedges at 1104 h. Air temperature was 27.5° C and substrate temperature was 27.0° C.

The snake was retained for observation. Ecdysis occurred on 8 June 1979 and 9 eggs were deposited in a box containing dampened paper towels on 20 June 1979.

Mean dimensions of the eggs were 32.0 mm (range = 29.0 - 36.5 mm) X 20.0 mm (range = 19.0 - 20.5 mm). Carpenter (1958, Herpetologica 14(2):113-115) recorded average egg dimensions of 29.8 mm X 20.3 mm from a female measuring 94.1 cm SVL and 105.3 cm TL. Mean dimensions of 16 eggs recorded by Force (1930, Copeia (2):25-39) were 36.7 mm X 19.2 mm.

One egg weighed 8.3 g. The remaining eggs were adherent and were not weighed. The eggs were incubated in a closed container of dampened vermiculite (Tryon, 1975, Bull. N. Y. Herp. Soc. 11:33-37) at 24 - 32° C.

The snake weighed 93.5 g following egg deposition. After consuming a dead mouse on 22 June, it was scale clipped as part of a herpetological survey of the area and released at the capture site on 26 June.

Hatching began on 9 August and all young had emerged by 10 August, an incubation period of 51 days. Anderson (1965, The Repts. of Mo.) noted an incubation period of 64-67 days and Gloyd (1928, Trans. Kans. Acad. Sci. 31:115-141) stated eggs laid on 22 June pipped 24 August, a 63 day incubation period. The young were measured via the squeeze-box technique. Mean SVL was 20.5 cm (range = 19.6 - 21.7 cm), mean TL was 24.1 cm (range = 23.2 - 25.2 cm), and mean weight was 6.3 g (range = 5.6 - 7.0 g). All young were released on 12 August at the female's capture site.

Submitted by **RUSSELL D. GRIMPE** and **GERALD E. BENEFIELD,** Department of Herpetology, Tulsa Zoological Park, 5701 E. 36th N., Tulsa, Oklahoma 74115. ●

OPHEODRYS V. VERNALIS (Smooth Green Snake). **REPRODUCTION.** A female (brown color phase) captured 2 July 1968 (gravid condition not noted while captive) laid 12 eggs under a plastic tile. The eggs were removed 5 August. Portions of the eggs were wrinkled and flattened, indicating an earlier laying date. Wright and Wright (1957, Handbook of Snakes of the US and Canada) report an egg laying period for this species from 24 June to 15 September. Incubation was in a sealed plastic bag containing a layer of damp aquarium gravel and maintained at 19° - 22° C in subdued natural light. The eggs regained a normal shape the following day. Egg slitting began on 24 August (Table 1). Wright and Wright *(ibid.)* quoted Blanchard, "The interval from laying to hatching varied on the cases under observation from 4 to 23 days." Table 2 shows the total length of hatchlings. These lengths fall into the species' normal range.

Table 1. Egg Slitting Sequence (day of August 1968/no. hatched/hours). Four eggs failed to hatch.

24/1/1800	27/1/0730
25/1/0900	27/1/1800
25/1/1330	28/1/1900
26/2/0730	

Table 2. Hatchling Size (mm).

Number of Hatchlings	Total Length	Tail Length
1	114.3	25.4
5	127.0	31.8
1	120.7	38.1
*1	95.3	28.5

* Backbone deformed in 5 places.

Often, the hatchlings would not leave the egg after slitting the shell. Instead, they would project only their head and a small part of their body, sometimes retreating into the protective egg. One individual took two days to completely leave the egg. Upon complete emergence, the hatchlings would construct a depression along the plastic wall, below the surface of the gravel.

The hatchlings' dorsal color was slate-gray to brown with a bronze sheen, and their abdominal surface was white. The typical green coloring began to develop on 5 September, and by 1 November, four hatchlings transformed to the light green coloring while four hatchlings retained the grayish-brown coloration. The young began accepting small field crickets and red worms on 8 September.

I thank Dr. Max Allen Nickerson for reviewing this manuscript. The four brown color phase hatchlings have been deposited in the vertebrate collection at the Milwaukee Public Museum (18201 thru 18204).

Submitted by **RICHARD H. RADAJ,** 24130 W. Loomis Rd., Hales Corners, WI 53130. ●

Society for the Study of Amphibians and Reptiles

BALLOT

This is the official ballot of the SSAR to elect officers for 1982. All SSAR members are urged to vote and return this ballot no later than 1 October 1981 in the enclosed self-addressed envelope.

For President-elect (vote for one):

- ☐ Ralph W. Axtell
- ☐ Thomas A. Jenssen

For Secretary (unopposed):

- ☐ Joseph T. Collins
- ☐ _____

For Treasurer (unopposed):

- ☐ Henri C. Seibert
- ☐ _____

For Board of Directors (Class of 1984 — vote for two):

- ☐ Robin Andrews
- ☐ Thomas H. Fritts
- ☐ Norman J. Scott
- ☐ Craig Weatherby

Information about each candidate is provided on the reverse of this ballot.

In compliance with the requirements of the SSAR constitution, the following amendment to the SSAR By-laws was approved by the SSAR Board of Directors, published in Herpetological Review 12(1): 3, presented during the general business meeting of the SSAR at Memphis, and is here presented for a vote by the entire SSAR membership.

Shall Article VII, section 2 of the SSAR By-laws be amended to read:

"The amount of dues shall be established by the Board of Directors."

☐ Yes ☐ No

Return this ballot to:

DAVID G. BARKER
SSAR ELECTOR
DALLAS ZOO
621 E. CLARENDON DRIVE
DALLAS, TEXAS 75203

NOT

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The Candidates

RALPH AXTELL, Professsor of Biological Sciences, Southern Illinois University, Edwardsville; PhD, University of Texas, Austin; Research interests: systematics, zoogeography and evolution of amphibians and reptiles (especially iguanid lizards); SSAR activities: Acting Board director for annual meeting, reviewer for Grants-in-Herpetology program, reviewer for **Journal of Herpetology;** Publications: 35 research publications plus reviews, essays, maps and paintings.

ROBIN ANDREWS, Assistant Professor, Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg; PhD, University of Kansas, Lawrence (1971); Research interests: ecological energetics of reptiles; SSAR activities: member of Kennedy Award Committee; Publications: *ca.* 20 publications on the ecology of tropical lizards.

JOSEPH T. COLLINS, Vertebrate Zoologist, Museum of Natural History, University of Kansas, Lawrence; Research interests: natural history of North American amphibians and reptiles; SSAR activities: President (1978), Secretary (1962-1971; 1980 to date), Editor Herp Review (1967-1969), Co-editor Herp Review (1977-1979), numerous committees, etc.; Publications: *ca.* 90 publications (including 4 books).

THOMAS H. FRITTS, Wildlife Biologist, U.S. Fish and Wildlife Service, Tulane University Museum of Natural History, Belle Chasse, Louisiana; PhD, University of Kansas (1972); Research interests: evolution and ecology of reptiles and amphibians, especially in southern U.S., Latin America, and in arid and montane temperate and tropical regions, plus special research interests in marine turtles, land tortoises and iguanid evolution; SSAR activities: member of Kennedy Award Committee; Publications: 29 publications in herpetology and related fields.

THOMAS A. JENSSEN, Associate Professor of Zoology, Virginia Polytechnic Institute and State University, Blacksburg; PhD, University of Oklahoma; Research interests: behavioral ecology and animal communication of amphibians and lizards; SSAR activities: member of **Journal** editorial board; Publications: 28 papers and chapters in 3 books.

NORMAN J. SCOTT, JR., Zoologist, U.S. Fish and Wildlife Service, and Adjunct Associate Professor, Department of Biology, University of New Mexico, Albuquerque; PhD, University of Southern California (1969); Research interests: biogeography of reptiles and amphibians of northwestern Mexico, and distribution and systematics of the herpetofauna of Paraguay; SSAR activities: SSAR symposium organizer (1977); Publications: 14 publications (9 of which are on reptiles and amphibians).

HENRI C. SEIBERT, Professor of Zoology, Ohio University, Athens; PhD, University of Illinois, Urbana (1947); SSAR activities: Treasurer (1970 to date), Publications Secretary (1966-1976), Board of Directors (1962 to date); Publications: dozens.

CRAIG WEATHERBY, Assistant Professor of Biology, Adrian College, Adrian, Michigan; PhD pending, Auburn University, Alabama; Research interests: ecology, ethology and evolution, with particular emphasis on endangered species and population genetics.

THREE ALBINO SNAKES from Nicaragua: An Update. Villa & Rivas (1972, Rev. Biol. Tropical 19:159-163) reported on 3 albino snakes from Nicaragua: *Boa constrictor imperator* Daudin (Boidae), *Leptodeira annulata rhombifera* Günther (Colubridae) and *Crotalus durissus durissus* Linnaeus (Crotalidae). At that time two of the snakes were living and the third was preserved in a museum. Changes in the status of all these snakes, and frequent inquiries on their whereabouts, prompts this note.

Boa constrictor imperator. — This snake was owned by Gustavo Villanueva, who obtained it near Juigalpa (Departmento de Chontales, Nicaragua) in 1970. Repeated attempts were made to purchase or borrow the snake for breeding purposes but he did not oblige. He had promised to deposit it, once dead and preserved, in the Museo de Juigalpa. The last time I saw the albino boa it had nearly doubled in size to about 2 m. Since then, in 1980 it escaped from its cage and was killed by neighbors. Because of differences Villanueva had with the Museo de Juigalpa, the snake was neither preserved nor donated. Instead, he buried it in an undisclosed site, and it is therefore no longer available.



Crotalus durissus durissus. — I obtained a preserved albinistic specimen of this rattlesnake (Fig. 1) from an unknown locality in Nicaragua, and deposited it in the Museo Nacional de Nicaragua in 1960. The museum was largely destroyed by an earthquake in December 1972. Although some materials were salvaged from the museum, much was looted and destroyed. None of the alcoholic specimens were recovered; thus, the white rattlesnake is also no longer available.



Leptodeira annulata rhombifera. — An albino individual of this form was collected near Rivas (Departamento de Rivas, Nicaragua) by Amado Jiménez in 1970. The snake died in 1972 after regurgitating 3 small, recently eaten leptodactylid frogs. It is now preserved in the herpetological collection, Museum of Natural History, The University of Kansas (KU 187897).

Submitted by **JAIME VILLA,** Department of Biology, University of Missouri, Kansas City, Missouri USA 64110. ●

SAURIA

***XENOSAURUS GRANDIS.* FOOD.** Published information regarding the diet of *Xenosaurus grandis* is restricted to King and Thompson (1968, Bull. Fla. St. Mus. 12(2):93-123). Discussion of food studies occupy a single paragraph which states "No food studies have been made on these lizards. Presumably they feed on soft-bodied invertebrates . . . ."

Examination of x-rays of specimens *Xenosaurus grandis* from Cuautlapan, Vera Cruz, Mexico (USNM series 111525-27) revealed the presence, in a female specimen, USNM 111525, of a second vertebral column, a portion of tail vertebrae, and complete hindlimbs and forelimbs of a prey item. Removal of the stomach contents revealed an undigested lizard minus head and distal portion of the tail.

Identification of the remains clearly indicated the genus *Sceloporus.* Without a complete specimen, and therefore lacking several key characters, a tentative identification of *Sceloporus formosus* Wiegmann was obtained. Identification was based on Smith and Taylor (1950, U.S.N.M. Bull. 199). This species of *Sceloporus* is known to occur in the vicinity.

The taking of lizards as a food item is quite common in many lizards, (*e.g., Tupinambis* and *Callopistes,* Family Teiidae; in *Gerrhonotus,* Family Anguidae; *Varanus,* Family Varanidae; *Crotaphytus,* Family Iguanidae). All of these species are known to take a variety of food items ranging from small soft-bodied arthropods to small mammals and birds.

Submitted by **WILLIAM PRESCH,** Department of Biological Sciences, California State University, Fullerton, California 92634. ●

TESTUDINES

CHELONIA MYDAS MYDAS (Green Turtle). **NESTING.** There are no known nesting records for this species in Georgia. To date, the northernmost published record for nesting in *C. m. mydas* is 16 km north of the Volusia County line, Florida (Stoneburner et al., 1979, Herp. Rev. 10(3):103-104). The nesting reported herein occurred approximately 242 km north of that record.

A female *Chelonia m. mydas* was observed nesting on Jekyll Island, Glynn County, Georgia on 27 June 1979 at 0335 hours. The crawl extended approximately 82 meters from the water to the spring tide line, and the nest was constructed 2.5 meters above that on a small incline in an advancing dune area, where 115 eggs were deposited. Unlike loggerhead sea turtles *(Caretta caretta),* this green turtle held both rear flippers together over the nest cavity during oviposition. The turtle measured 96.5 cm straight-line carapace length; straight-line carapace width was 76.5 cm. The turtle was untagged, and bore no tag scars. We placed two plastic tags on the front flippers: GA0235 (left, blue Jumbo Rototag) and GA0628 (right, yellow Riese tag). Although the beach was patrolled nightly until 15 August, reemergence by this individual was not observed.

The eggs were placed in the loggerhead hatchery on the island, which was unfortunately destroyed by Hurricane David. The eggs were salvaged and opened after the storm, and 92.2% (106 of 115) were fertile. Preserved embryos and photographs of the female on the nest document this report.

Submitted by **SALOME C. LITWIN,** Department of Zoology, University of Rhode Island, Kingston, R.I. 02881. ●

CHRYSEMYS CONCINNA TEXANA (Texas River Cooter). **MORPHOLOGY.** On 15 April 1978, a dicephalic *Chrysemys concinna texana* was collected in Mesquite City Lake Park, Dallas County, Texas. The collector was J. Hemby who later gave the turtle to James Murphy at the Dallas Zoo. When the turtle died, Murphy preserved it and placed it in the University of Kansas Collection (KU 180253).

The turtle was normal in all other respects. The turtle was a juvenile, estimated to be about two months old, with a shell length of 30.2 mm. Width was impossible to determine because of the condition of the specimen. It died from causes unknown. Both heads appeared fully functional.

I wish to thank Joseph T. Collins and William Duellman for allowing me to examine the specimen. Also, I wish to thank James Knight for help with the measurements and for providing additional information.

Submitted by **JIM PILCH, JR.** 808 West 27th Street, Lawrence, Kansas 66044. ●

GOPHERUS AGASSIZI (Desert Tortoise). **LONGEVITY.** Reported longevity records for the desert tortoise, *Gopherus agassizi* range from 2+ yrs. (Conant & Hudson, 1949, Herpetologica 5:1-8) to 30+ yrs. (Patterson & Brattstrom, 1972, Herpetologica 28:169-171). All records are from captive specimens or tagged individuals, as it is impossible to age tortoises by reading growth rings (Miller, 1955). The following record indicates that the desert tortoise has a longer life span than previously reported.

David L. Jennings (in a letter to the author), reports he was given a male desert tortoise in the fall of 1928 from a group of three individuals collected by neighbors from the Mojave Desert near Victorville, San Bernardino County, California during the summer of the same year. This tortoise has been in continuous possession of the Jennings family for the past 52 years.

According to Mr. Jennings, the tortoise was approximately " . . . as long as a legal sized envelope . . . " (23 cm) at the time of receipt. Photographs of the specimen from the early 1930's confirm this. Thus, with an approximate carapace length of 23 cm, the tortoise was presumably an adult when it was brought

into captivity and is likely an additional 15 to 20 years older than its known 52 years (Patterson and Brattstrom, *ibid.*).

The tortoise's measurements as of May 18, 1980 are as follows: plastron length, 34.2 cm; carapace length, 29.4 cm; greatest carapace width, 24.8 cm; shell height, 12.5 cm; weight, 5.67 kg. The specimen was still alive at the time this paper was submitted (November 20, 1980).

My thanks to David L. Jennings, Roy F. Jennings, and Helen V. Sowers Jennings for their contributions to this manuscript.

Submitted by **MARK R. JENNINGS,** Department of Fisheries, School of Natural Resources, Humboldt State University, Arcata, California 95521, USA. Present Address: 605 Ellfred Court, Santa Paula, CA 93060. ●

TRIONYX SPINIFERUS (Spiny Softshell). **MORPHOLOGY.** A clutch of 12 eggs of *Trionyx spiniferus* was partially exposed by storm erosion two meters from the water line and 2/3 meters above the water line on 22 June 1980 in the Fobb Bottom area of the Red River arm of Lake Texoma, Marshall County, Oklahoma.

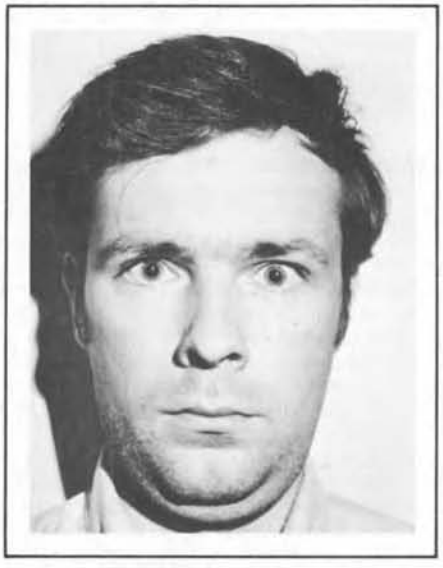
These eggs were collected and incubated in a screen cylinder under sand in the open. The eggs were checked weekly. When observed on 20 July, one egg appeared slightly cracked and was removed to check the progress of development. Fortuitously, when opened, this egg contained twin embryos (see illustration). Both embryos showed movements of the front legs and eyelids and appeared to be near hatching. None of the other eggs contained two embryos. The twin embryos were bathed with physiological salt solution and were still alive when preserved three days later.



Submitted by **CHARLES C. CARPENTER,** Department of Zoology, Sutton Hall, University of Oklahoma, Norman, Oklahoma 73019. ●

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Geographic Distribution

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles** , Collins, Huheey, Knight and Smith, 1978), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Joseph T. Collins, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

CAUDATA

EURYCEA BISLINEATA BISLINEATA (Northern Two-lined Salamander). CANADA: QUEBEC PROVINCE: (1) Frontenac Co: 6 km SSE of Audet. Elev. 510 m. 45° 36' N, 70° 46' W. 30 July 1980. 3 larvae. National Museum of Canada (NMC 20915). Roadside stream in hemlock-birch sugar maple forest, Chaudière R watershed; (2) Frontenac Co: 4.5 km SE of St.-Ludger. Elev. 440 m. 45° 42' N, 70° 37' W. 30 July 1980. (NMC 20916). Roadside stream in second growth alders, Chaudière R watershed; (3) Frontenac Co: 14.5 km ENE of Audet. Elev. 450 m. 45° 42' N, 70° 32' W. 30 July 1980. (NMC 20917). Linière R, Chaudière R watershed; (4) Dorchester Co: 6 km S of St.-Zacharie. Elev. 480 m. 46° 09' N, 70° 20' W. 31 July 1980. (NMC 20919). Metgermette Centrale R, in cut-over spruce forest, Chaudière R watershed; (5) Dorchester Co: 10.5 km E of St.-Zacharie, near USA border. Elev. 460 m. 46° 08' N, 70° 14' W. 31 July 1980. (NMC 20920). SW branch of St. John R in spruce forest. (6) Dorchester Co: 3 km E of St.-Louis-de-Gonzague. Elev. 410 m. 46° 16' N, 70° 18' W. 31 July 1980. (NMC 20921). Roadside stream in second growth spruce forest, St. John R watershed; (7) Montmagny Co: 3.5 km NE of Daaquam-Nord on route 283 to Lac-Frontière. Elev. 360 m. 46° 38' N, 70° 03' W. 31 July 1980. (NMC 20922). Rivière à La Loutre, in seepage area on bank, St. John R watershed; (8) L'Islet Co: 4.5 km SE of St.-Adelbert. Elev. 340 m. 46° 50' N, 69° 53' W. 31 July 1980. (NMC 20923). Brown R, in second growth alders, St. John R watershed; (9) L'Islet Co: 8 km SNE of St.-Cyrille-de-l'Islet on road to Lac des Plaines. Elev. 370 m. 47° 03' N, 70° 10' W. 1 August 1980. (NMC 20924). Stream in second growth alders, tributary to Bras-St.-Nicholas R, St. Lawrence R watershed; (10) Sherbrooke Co: on Mt. Orford at elev. 680 m. 45° 19' N, 72° 15' W. 5 July 1980. (NMC 20926). Small stream in mountain maple and yellow birch forest. (11) Bonaventure Co (Gaspé Peninsula): Lac Pabos. Elev. 160 m. 48° 19' N, 64° 55' W. 8 August 1961. (NMC 6727). In detritus filled moose hoofprint in sandy lake shallows.

Records 1 to 9 close the range gap between southern Quebec and the St. Lawrence River. (See map in Bleakney, NMC Bull. 155. 1958. p. 85.) All verified by F. R. Cook, National Museum of Canada.

Submitted by **NORRIS S. DENMAN,** 350 William Birks St., St. Bruno, Quebec, Canada, J3V 1P2. ●

DESMOGNATHUS FUSCUS FUSCUS (Northern Dusky Salamander). CANADA: QUEBEC PROVINCE: Frontenac Co: 17.5 ENE of Audet. Elev. 500 m. 45° 42' N, 70° 36' W. 30 July 1980. Adult. National Museum of Canada (NMC 20918). Under log in seepage area in hemlock-yellow birch forest. Verified by F. R. Cook.

Submitted by **NORRIS S. DENMAN,** 350 William Birks St., St. Bruno, Quebec, Canada, J3V 1P2. ●

PLETHODON CINEREUS (Redback Salamander). CANADA: QUEBEC PROVINCE: (1) Gaspé-Est Co: Cap Bon Ami, 6.5 km S of Cap-des-Rosiers-Est. Sea level. 48° 46' N, 64° 12' W. 8 August 1961. National Museum of Canada (NMC 6726). Spruce forest. (2) Rouville Co: 6 km NE of L'Ange-Gardien-de-Rouville. Elev. 90 m. 45° 23' N, 72° 51' W. 7 August 1980. (NMC 20927). Forest of hemlock, yellow and white birch, beech, sugar maple. (3) St.-Hyacinthe Co: 5 km SE of St.-Denis. Elev. 25 m. 45° 45' N, 73° 07' W. August 1960. (NMC 5078). Dry streambed in sugarbush. (4) Chambly Co: Mt. St.-Bruno. Elev. 150 m. 45° 33' N, 73° 19' W. 4 May 1980. (NMC 20914). Mature St. Lawrence lowlands forest. All verified by F. R. Cook, National Museum of Canada.

Submitted by **NORRIS S. DENMAN,** 350 William Birks St., St. Bruno, Quebec, Canada, J3V 1P2. ●

ANURA

BUFO AMERICANUS AMERICANUS (Eastern American Toad). CANADA: QUEBEC PROVINCE: Gaspé-Ouest Co: Gaspésie Provincial Park. NE slope of Mt. Albert. Elev. about 460 m. 48° 57' N, 66° 08' W. 31 July 1961. National Museum of Canada (NMC 6742). In virgin black spruce-white birch forest. Verified by F. R. Cook, National Museum of Canada.

Submitted by **NORRIS S. DENMAN,** 350 William Birks St., St. Bruno, Quebec, Canada, J3V 1P2. ●

HYLA CRUCIFER CRUCIFER (Northern Spring Peeper). CANADA: QUEBEC PROVINCE: Bonaventure Co: (Gaspé Peninsula) Port Daniel Reserve. 48° 15' N, 64° 59' W. 6-7 August 1961. National Museum of Canada (NMC 6714, 6716). Verified by F. R. Cook, National Museum of Canada.

Submitted by **NORRIS S. DENMAN,** 350 William Birks St., St. Bruno, Quebec, Canada, J3V 1P2. ●

RANA CLAMITANS MELANOTA (Green Frog). CANADA: QUEBEC PROVINCE: (1) Bonaventure Co: (Gaspé Peninsula) Port Daniel Reserve. Various elevations. 48° 15' N, 64° 59' W. 6 August 1961. National Museum of Canada (NMC 6718-6722). Roadside ditches and lakes. (2) Gaspé-Est Co: (Gaspé Peninsula): 7 km from Lac Grande Etang. Elev. 160 m. 49° 06' N, 64° 39' W. 4 August 1961. (NMC 6712). Lake beside hwy 132. (3) Brome Co: 800 m SE of Knowlton's Landing. Elev. 250 m. 45° 09' N, 72° 18' W. 10 October 1959. (NMC 5070). In cattle-watering pond. All verified by F. R. Cook, National Museum of Canada.

Submitted by **NORRIS S. DENMAN,** 350 William Birks St., St. Bruno, Quebec, Canada, J3V 1P2. ●

RANA PALUSTRIS (Pickerel Frog). CANADA: QUEBEC PROVINCE: Bonaventure Co: (Gaspé Peninsula) Port Daniel Reserve. Elev. 30 m. 48° 15' N, 64° 59' W. 7 August 1961. National Museum of Canada (NMC 6723). In grass on banks of the Rivière Port Daniel. Verified by F. R. Cook, National Museum of Canada.

Submitted by **NORRIS S. DENMAN,** 350 William Birks St., St. Bruno, Quebec. Canada, J3V 1P2. ●

RANA SEPTENTRIONALIS (Mink Frog). CANADA: QUEBEC PROVINCE: Gaspé-Ouest Co: Gaspésie Provincial Park, 3.5 km NE of confluence of the Rivière Ste.-Anne and the Rivière Ste.-Anne-Nord-Est. Elev. 610 m. 49° 58' N, 66° 05' W. 1 August 1961. National Museum of Canada (NMC 6717). In ditches along logging road. Verified by F. R. Cook, National Museum of Canada.

Submitted by **NORRIS S. DENMAN,** 350 William Birks St., St. Bruno, Quebec, Canada, J3V 1P2. ●

RANA SYLVATICA (Wood Frog). CANADA: QUEBEC PROVINCE: (1) Gaspé-Ouest Co: Gaspésie Provincial Park, 3.5 km NE of confluence of the Rivière Ste.-Anne and the Rivière Ste.-Anne-Nord-Est. Elev. 610 m. 49° 58' N, 66° 05' W. 1 August 1961. National Museum of Canada (NMC 6711). In ditches beside logging road. (2) Sherbrooke Co: Summit of Mt. Orford. Elev. 830 m. 45° 19' N, 72° 15' W. 5 July 1980. (NMC 20925). Small permanent pond in gulley at summit in boreal forest zone. (3) Chambly Co: Greenfield Park. Elev. 20 m. 45° 29' N, 73° 29' W. 10 April 1959. (NMC 5066). Calling in flooded meadows, water temp. 7° C. Verified by F. R. Cook, National Museum of Canada.

Submitted by **NORRIS S. DENMAN,** 350 William Birks St., St. Bruno, Quebec, Canada, J3V 1P2. ●

SCAPHIOPUS COUCHI (Couch's Spadefoot). USA: COLORADO: Otero Co: 24 km S, 10.5 km E of La Junta. 15 May 1977. L. Livo and S. Wilcox. Univ. Colorado Mus., Boulder (UC 51536); 23 km S, 9 km E of La Junta. 23 July 1977. L. Livo and S. Wilcox. (UC 51530). Verified by T. P. Maslin. These are the first records for the state and extend the range north approximately 210 km. The specimen of 15 May was one of at least five males observed calling at night from a small impoundment of water. The 23 July specimen was AOR. (Conant, 1975. A field guide to reptiles and amphibians of eastern and central North America, Houghton Mifflin Co.).

Submitted by **LAUREN J. LIVO,** Department of Biology, University of Colorado, Denver, Colorado 80202. ●

TESTUDINES

CHELONIA MYDAS AGASSIZI (Pacific Green Turtle). USA: ALASKA: *ca.* 1 November 1976. Eliza Harbor, Admiralty Island (Lat. 57.16 N., Long. 134.15 W.). Dead on beach at mean high tide level; head, body and limbs intact; apparent predation on neck by terrestrial mammal (mink?); estimated shell length 76 cm.; carcass discarded (Ken Gilpin, Petersburg, Alaska, pers. comm.). Skull (Figure 1) in



private collection of Ken Gilpin with eventual deposition in herpetological collections, Tongass Historical Society Museum, Ketchikan, Alaska. Skull examined and identified by author on 2 July 1981. The log of the Petersburg, Alaska fishing vessel TETA contains the following information: 9 October 1976, 9:30 a.m., Pt. Macartney, Kuprenoff Island, air temperature 8-10 Degrees C., slight ripple at surface, overcast, turtle alongside boat, basking at surface, as boat approached within 1.5 m. turtle submerged and surfaced approximately 9 m. from boat then disappeared, swimming actively, estimate shell length 76 cm. (Dale Bosworth, Petersburg, Alaska, pers. comm.). The Bosworth sighting apparently is the same turtle as the Gilpin specimen. Pt. Macartney is approximately 9 km. due southeast of Eliza Harbor. When shown unidentified illustrations/photographs of all sea turtles by author on 2 July 1981 Gilpin and Bosworth independently identified turtle as *Chelonia mydas.* In the northeastern Pacific Ocean, *Chelonia mydas agassizi* has been

recorded from Ucluelet, British Columbia (48.15 N. Lat.) and Eliza Harbor, Alaska (57.16 N. Lat.) which is the northernmost Pacific Ocean record to date (Hodge, 1976, Amphibians and reptiles in Alaska, the Yukon and Northwest Territories, Alaska Northwest Publishing Company, Anchorage). *Chelonia mydas agassizi* is the second species of turtle recorded from Alaska wasters. *Dermochelys coriacea schlegeli* has previously been reported (Hodge, R. P. 1979. Geographic Distribution: *Dermochelys coriacea schlegeli*. SSAR Herp. Review 10(3):102). The *Dermochelys* sightings occurred in August and September, the *Chelonia* sighting in October.

Submitted by **ROBERT PARKER HODGE,** Tongass Historical Society Museum, 629 Dock Street, Ketchikan, Alaska 99901. ●

SAURIA

CNEMIDOPHORUS GULARIS (Texas Spotted Whiptail). USA: TEXAS: Young Co: 8 km NE of Eliasville on FM 701 at Brazo's River-Clear Fork bridge. 5 June 1981. C. T. McAllister. Verified by J. R. Glidewell. North Texas State University Herpetological Collection (NTSUHC #R-701). New county record and partly fills distributional gap of tri-county area in extreme northcentral Texas (Raun and Gehlbach, 1972. Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No. 2). Several other specimens were collected and released. Intensive collecting efforts for *C. gularis* may reveal populations for adjacent distributional hiatus in Baylor, Jack and Clay Counties, Texas.

Submitted by **CHRIS T. MCALLISTER AND MICHAEL C. WOOTEN,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203. ●

EUMECES ANTHRACINUS PLUVIALIS (Southern Coal Skink) USA: ARKANSAS: Ashley Co: 0.6 km S of Crossett on AR 133, T19S, R8W, S23. 14 May 1976. C. R. Tumlison. Verified by E. J. Bacon and V. R. McDaniel. Private collection of C. R. Tumlison (#50); Drew Co: 16 km N of Monticello on AR 81, T11S, R8W. 6 April 1969. D. Walls, and T13S, R8W, S18. 3 May 1969. V. Ward. Verified by E. J. Bacon. UAM Collection of Vertebrates (UAM 341-342); Union Co: 3.2 km E of Strong on AR 82, T18S, R12W, S26. 22 April 1978. C. R. Tumlison. Verified by E. J. Bacon. UAM Collection of Vertebrates (UAM 1414).

Additional records indicate that the species is more widely distributed throughout southeastern Arkansas, but is uncommon in many localities (Dellinger, S. C. and J. D. Black. 1938. Occ. Pap. U. Ark. Mus. (1):1-47. Dowling, H. G. 1957. Occ. Pap. U. Ark. Mus. 3:1-51; Conant, R. 1975. A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston. McAllister, C. T. 1980. Geographic distribution: Eumeces anthracinus pluvialis. SSAR Herp. Review 11(4):1).

Submitted by **E. J. BACON** and **C. R. TUMLISON,** Department of Natural Sciences, University of Arkansas at Monticello, Monticello, Arkansas. ●

SERPENTES

COLUBER CONSTRICTOR FOXI (Blue Racer). USA: MICHIGAN: Benzie Co: 12.1 km. N. Bear Lake on US 31, 2.4 km. N. border Manistee County. 3 September 1978. J. W. Fitzpatrick. Identified by A. Resetar. Field Museum of Natural History (FMNH 207692). This is the first record of the occurrence of *Coluber constrictor foxi* in Benzie County. This species occurs in Manistee County which forms the southern boundary of Benzie County (Pentecost and Vogt, 1976. Environmental Status of the Lake Michigan Region. Volume 16. Amphibians and Reptiles of the Lake Michigan Drainage Basin). This DOR specimen was found about 1000 hours 30 m. from beech-maple forest edge among open, old cherry plantations and young pines in old field.

Submitted by **ALAN RESETAR,** Division of Amphibians and Reptiles, Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, Chicago, Illinois 60605. ●

ELAPHE GUTTATA GUTTATA (Corn Snake). USA: KENTUCKY: Hardin Co: Killed in a garden on Lee School Road, 4 km SE White Mille. 26 May 1981 by Mrs. Floyd Booker. Verified by R. E. Todd, Jr. Collection of R. E. Todd, Jr. (RET 761). First known specimen from Hardin County. Supplements state records by Collins (1970, Trans. Kentucky Acad. Sci. 31(1-2):49-50) and Todd (1976, Geographic Distribution: SSAR Herp Review 7(4):178).

Submitted by **ROBERT E. TODD, JR.,** Route 1, Box 90-B, Sonora, Kentucky 42776. ●

STORERIA OCCIPITOMACULATA OCCIPITOMACULATA (Northern Redbelly Snake). CANADA: QUEBEC PROVINCE: Brome Co: 3.2 km E of Bolton Centre. Elev. 230 m. 45° 12' N, 72° 19' W. 25 July 1954. National Museum of Canada (NMC 2964). Verified by F. R. Cook, National Museum of Canada.

Submitted by **NORRIS S. DENMAN,** 350 William Birks St., St. Bruno, Quebec, Canada, J3V 1P2. ●

THAMNOPHIS SIRTALIS PALLIDULA (Maritime Garter Snake). CANADA: QUEBEC PROVINCE: Bonaventure Co: (Gaspé Peninsula) Port Daniel Reserve. Elev. 30 m. 48° 15' N, 64° 59' W. 7 August 1961. National Museum of Canada (NMC 6725). In grass on banks of the Rivière Port Daniel. Verified by F. R. Cook, National Museum of Canada.

Submitted by **NORRIS S. DENMAN,** 350 William Burks St., St. Bruno, Quebec, Canada, J3V 1P2. ●

NEW DEPARTMENTAL RECORDS OF *Liolaemus wiegmannii* FROM URUGUAY

The iguanid lizard *Liolaemus wiegmannii* (Duméril and Bibron, 1837) is known to occur on the southern Uruguayan coast at the Departamentos de Canelones (Devincenzi, 1926), San José, Maldonado (Vaz-Ferreira and Soriano, 1960), and Rocha (Lema and Fabián-Beurmann, 1977). A recent study on its ecology has shown that this lizard occupies the southern sandy coastal biotope, so the absence of literature records from the remaining coastal Departamentos was an enigma. Revision of material at the Dpt. Zoologia-Vertebrados, Facultad de Humanidades y Ciencias (ZVC-R) and Museo Nacional de Historia Natural (MNHN) provided the following new departmental records:

DPT. RÍO NEGRO: Río Negro, in front Villa Soriano. 18-23 December 1968. C. S. Carbonell and F. Achaval. ZVC-R 774; DPT. SORIANO: Mouth Río San Salvador. 12 August 1956. G. Debores. MNHN 154; DPT. COLONIA: Santa Aana, Artilleros. 6 February 1958. R. Larrosa. MNHN 165. Nueva Palmira. 10 January 1973. Marta Leprati. ZVC-R 1967 to 1969. 3 km E Martín Chico. 11 November 1973. A. Langguth. ZVC-R 2164. Balneario Brisas del Plata. 30 March 1975. A. Langguth. ZVC-R 2105. Cerro San Francisco. 22 February to 2 March 1974. V. Bonino. ZVC-R 2109; DPT. MONTEVIDEO: Alrededores de Montevideo. No date. R. Escalante. MNHN 142. Malvín. 1939. No collector. MNHN 163. Malvín. 30 April 1965. E. García and S. Klappenbach. MNHN 1064. Malvín. February 1965. S. Klappenbach. MNHN 1065. Parque Rivera. 11 December 1964. S. Klappenbach. MNHN 1079.

Thus, the distribution is now documented to the South Río Uruguay, Río de la Plata and Atlantic Ocean coasts. This lizard is continuously distributed over about 750 km of sandy coasts in southern Uruguay. All specimens were verified by Federico Achaval, who is acknowledged for his permission to examine the material under his care (ZVC-R and MNHN).

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Devincenzi, G. J. 1926. Fauna erpetológica del Uruguay. An. Mus. Nac. Montevideo, Serie 2, 2(2):1-66, 1-4 fig.

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DISTRIBUTIONAL STATUS OF AN INTRODUCED LIZARD IN FLORIDA: *Anolis sagrei*

Since the early record of *Anolis sagrei* from Key West, Monroe County, Florida by Garman (1887), the range of this introduced

lizard in Florida has been reported to include: Hillsborough County, Tampa; Pinellas County, St. Petersburg; Palm Beach County, Lake Worth (Oliver, 1950); Dade County, Miami (Bell, 1953); metropolitan Broward, Dade, Monroe and Palm Beach Counties (King, 1960; King and Krakauer, 1966) Collier County, Chokoloskee Island (Conant, 1975); Glades County, Palmdale, Fisheating Creek Camp Ground (Corwin *et al.*, 1977); St. Johns County, St. Augustine (Maylan, 1977); St. Lucie County, Ft. Pierce (Myers, 1978); Lee County, Sanibel Island; Levy County, Waccasassa Marina (Funk and Moll, 1979). Herein, we report 29 additional localities for *A. sagrei* in Florida, including nine new county records, and comment on its present distributional status within the state. Unless otherwise indicated, all localities represent established (breeding) populations for which voucher specimens (collected and verified by J. S. Godley) are available at the University of South Florida, Tampa. Successful breeding was inferred from large population size and/or multiple size class representation at a site.

ANOLIS SAGREI (Brown Anole). USA: FLORIDA: Collier Co: Monroe Station, 14.2 and 21.2 km S US 41 on SR 94 (Loop Road). 24 April 1976. JSG 5343-44. Common on limestone rocks and shrubs bordering SR 94; only *A. carolinensis* seen in adjacent hammock and wet prairie habitats. Collier Co: Naples, US 41. 12 September 1977. Common within city limits; no voucher specimens taken. Dade Co: Everglades National Park, Anhinga Trail Visitors Center and Pa-Hay-Okee Overlook. 24 April 1976. No voucher specimens taken within Park. Common in shrubs and on boardwalk at Anhinga Trail Visitors Center. At Pa-Hay-Okee Overlook only one subadult male seen on boardwalk; may not be established at this site. Dade Co: 3.8 km SE Goulds (R40E, T56S, Section 21). January-July 1979. J. Rossi. Verified by J. S. Godley. Dade Co: 12.9 km ENE Homestead (R40E, T56S, Section 5). January-July 1979. J. Rossi. Verified by J. S. Godley. Dade Co: 5.3 km SE Florida City (R39E, T58S, Sections 3 and 4). January-July 1979. J. Rossi. Verified by J. S. Godley. The last three localities are the first records of *A. sagrei* from non-edificarian habitats in southern Florida. All specimens (N=95) were taken by J. Rossi in drift fence pit-fall traps set in Brazilian pepper *(Schinus terebinthifolius)* or Australian pine *(Casuarina equisetifolia)* habitats. Traps were set 0.32 km to 2.89 km ($\bar{x}$=1.48 km) from the nearest paved road. Highlands Co: Lake Placid, jct US 27 and SR 17, Lewis' Truck Stop. 16 October 1977. J. N. Layne. Verified by J. N. Layne. Archbold Biological Station, Florida (ABS 44). New county record. Hillsborough Co: Brandon, jct. SR 60 and Parsons Ave. 26 March 1978. JSG 7023. Hillsborough Co: Lutz, US 41. 10 September 1978. No voucher specimens taken. Hillsborough Co: Plant City, jct. I-4 and McIntosh Road, Stuckey's. 31 October 1977. JSG 6900. Hillsborough Co: Thonotosassa, Lake Thonotosassa Fish Camp on SR 580. 21 July 1977. No voucher specimens collected. Species taken in every Hillsborough County city that has been searched; only known from urban areas. Lee Co: Boca Grande, Gasparilla Island, jct. East Ave. and 11th St. 17 August 1977. H. Curtis. Verified by J. S. Godley. Lee Co: Fort Myers, 1548 Barcelona St. 17 August 1977. H. Curtis. Verified by J. S. Godley. H. Curtis reports species common in Fort Myers, Boca Grande and Sanibel Island. Manatee Co: Bradenton, jct. US 41 and 57th Ave. W. 10 September 1977. JSG 6761. New county record. Common throughout city. Marion Co: Ocala, jct. I-75 and US 27 at Howard Johnson's Motel. 20 September 1979. D. R. Jackson. Verified by J. S. Godley. New county record. D. R. Jackson reports thriving colony at Howard Johnson's but could not find species at several other locations in Ocala; may be recently established. Orange Co: Orlando, Belle Isle, 2123 Nela Ave. 19 June 1978. JSG 7036. New county record. Species established, but patchily distributed in the Orlando area. Osceola Co: jct. I-4 and SR 192, Hyatt House Motel World. 12 October 1977. JSG 8155-56. New county record. Pasco Co: New Port Richey, 58 Blue Heron Drive. 16 April 1977. JSG 6686. New county record. Pinellas Co: Clearwater, St. Petersburg Junior College campus. 21 August 1977. JSG 6748-49. Pinellas Co: Oldsmar, *ca* 1 km E SR 584 on SR 580, McDonald's restaurant. 21 August 1977. JSG 6751. Pinellas Co: Safety Harbor, Safety Harbor City Hall. 21 August 1977. JSG 6750. Polk Co: Bartow, Polk County courthouse. 9 June 1979. JSG 8151. New county record. Moderately common in suburbs. Polk Co: Lakeland, jct. SR 92 and Wabash Ave. 31 November 1977. JSG 6901. Species also seen by F. E. Lohrer in south Lakeland on 14 January 1976. Polk Co: jct. I-4 and US 27, Howard Johnson's Motel. 7 October 1979. JSG 8152-53. Sarasota Co: Lido Key, Limetree Motel. 11 September 1977. JSG 6765. New county record. Common in urban areas of Lido Key and Longboat Key. Sarasota Co: Sarasota, jct. US 41 and SR 780. 11 September 1977. JSG 6764. Species also collected in Sarasota at Ringling Museum on 20 April 1978 by F. E. Lohrer (ABS 82) and at 37 South McIntosh Rd. on 25 November 1978 by D. T. Gross; observed on 23 December 1979 by F. E. Lohrer at Turtle Bay Park, Siesta Key, Sarasota.

The above records document that *Anolis sagrei* now inhabits much of peninsular Florida as disjunct colonies generally confined to urban settings. The new localities from Look Road (SR 94) in Monroe County, and east of Goulds, Homestead and Florida City in Dade County suggest that *A. sagrei* is invading some semi-natural habitats in southern Florida. However, all of these sites represent either road-side localities or habitats dominated by populations of introduced Brazilian peppertree or Australian pine.

We are most familiar with the distribution of *A. sagrei* in the Tampa Bay area, where it has been established since about 1942 (Oliver, 1950). In this region the lizard is now common in every urban area that has been searched, but no specimens have been collected from native habitats. Considering only the region within a 75 km radius of Tampa, and assuming that the species occurs only in cities where it has been collected (N=13), we estimate conservatively that this population of *A. sagrei* has invaded *ca* 1200 sq km of urban habitat in about forty years. As many more distant localities probably represent introductions from the Tampa parental stock (see below), the present range of this population easily could be twice the above estimate.

Earlier reports (Oliver, 1950; King, 1960) suggested that *A. sagrei* was restricted to major Florida seaports (i.e., Key West, Miami, Tampa), where ships bound with cargo from Cuba accidentally introduced the species. Although within-state coastal shipping and pleasure boating may have been responsible for some additional coastal introductions, this mode of transport cannot explain the occurrence of *A. sagrei* at the numerous inland localities (N=17), and probably does not explain most coastal locations.

We suggest that the subsequent dispersal of *A. sagrei* from the known mainland ports of entry (i.e., Miami and Tampa) has been accomplished by two major modes of "rafting:" (1) the transport of propagules on vehicles (cars, trucks, etc.) operating between these source areas and other urban centers within the state, and (2) the transport of adults and/or eggs in ornamental plants, especially via the commercial plant nursery trade. The species commonly perches and sleeps on vehicles or ornamental plants, and is readily transported in this manner. In addition, most of the isolated localities for *A. sagrei* are cities or gas stations, motels and restaurants located along major highways (e.g., I-4, I-75, US 19, US 27, US 41), all of which have high volumes of traffic and are planted with shrubbery. In this respect, the high incidence of *A. sagrei* colonies among coastal cities probably reflects the distribution and movements of human populations in Florida, not habitat preferences of the lizard or multiple invasions from the West Indies.

The apparent affinity of this lizard for urban "islands" suggests that the present pattern of colonization of *A. sagrei* in Florida can be interpreted best in terms of island biogeographic theory (Mac Arthur and Wilson, 1967). The probability of successful *A. sagrei* colonization at a site appears to be determined primarily by (1) distance from source areas and (2) island (=city) size. Rates of rafting are, in turn, dependent upon human and plant traffic patterns within the state, and lizard population size. Of course, the establishment and subsequent population expansion at one location would increase the probability of successful introductions onto neighboring urban islands, creating an archipelago effect.

Acknowledgments

We thank H. W. Campbell, H. Curtis, K. B. Godley, D. T. Gross and D. R. Jackson for providing locality records and/or specimens. We also thank G. E. Woolfenden and A. Schwartz for commenting on the manuscript.

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Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Houston Zoological Gardens, Houston, Texas 77001.

NOTES ON CAPTIVE REPRODUCTION AND BEHAVIOR IN THE MEXICAN CANTIL *(Agkistrodon bilineatus)*

There is little published information regarding reproduction and feeding behavior of the Mexican cantil, *Agkistrodon bilineatus*. Most publications have dealt with field records that contain taxonomic and/or geographical data (Bogert and Oliver, 1945; Burger and Robertson, 1951; and Henderson, 1978). The following account includes information regarding the reproduction and diet of captive *A. bilineatus*.

On 18 April, 1966, the Oklahoma City Zoo received a subadult male from an unknown source and on 1 June, 1973, received two adult females from an unknown locality. Upon arrival, each animal was quarantined in separate holding cages for approximately 30 days. In early fall 1973, the two females and male were placed in a glass-fronted wooden enclosure measuring 79 x 61 x 46 cm that was sparsely decorated with polyethylene vegetation, rocks, and gravel substrate. Measurements recorded in July, 1979, were as follows: female A total length 854 mm, weight 519 g; female B tl 879 mm, weight 445 g. Measurements were not recorded for the male although he was judged to be of similar size (Mike Blakely, pers. comm.).

On 24 June, 1973, 12 young were found with female B and 15 days later, on 9 July, 1973, six young were found with female A. Six of 18 died shortly after birth. Measurements were not recorded. The only published estimate of mean litter size is 12 (Fitch, 1970).

On 28 April, 1976, at approximately 0730 hrs., a routine check of the cage disclosed that the male and female B were engaged in copulation. They were connected for about nine hours (Rusty Grimpe, pers. comm.). No further courtship or copulation was observed and on 26 December, 1976, the male died of post-operative trauma after removal of a tumor from the mid-dorsal area.

Both females were kept in the same display cage and on 28 May, 1977, at 0900 hrs., nine young were discovered beneath an artificial plant in the rear portion of the exhibit. All appeared in good condition and were actively shedding skin. No fluids or membraneous tissue were detected. Although female A was involved in the last observed copulation, I could not definitely determine which female was the mother.

The time lapse between the observed mating on 28 April, 1976, until parturition on 28 May, 1977, gives a possible gestation period of 395 days. Such a long range might suggest sperm retention or delayed fertilization although additional matings could have occurred.

The juveniles were basically reddish brown with broad light-edged crossbands against a light brown background. As in some other juvenile pit vipers (Neill, 1960), a large portion of the posterior tail region of each animal had a characteristic yellowish-green color. No measurements were recorded for these juveniles.

From the beginning, the young were quite reluctant to feed, though they were offered small lizards *(Anolis carolinensis)*, frogs *(Acris crepitans blanchardi* and *Hyla versicolor)*, newborn mice and various insects. The first feeding occurred during the night of 17 June, 1977, when four of the nine juveniles ate one newborn mouse each. Unexplainably, food was refused for the next eight weeks and by 21 August, only two snakes remained alive.

On 27 August, 1977, both surviving young were offered one juvenile *Nerodia r. rhombifera* each. The water snakes were born at the Herpetarium in June, 1977, and were only slightly smaller than the cantils. On the following morning, a check of each cage revealed that both *Nerodia* had disappeared while each *A. bilineatus* was noticeably larger. As of January, 1979, one juvenile remained alive, was feeding on brown snakes (*Storeria* spp.) and ringneck snakes (*Disdophis* spp.), and had only recently accepted small, furred mice (Frank Bryce, pers. comm.).

Bogert and Oliver (1945) reported that the stomach contents of one *A. bilineatus* from Sonora contained an adult *Imantodes gracilimus*. Henderson (1978) found a mass of mammal hair in the lower intestine of a Belize specimen. It is possible that the cantil is an opportunistic feeder, as Conant (1975) suggests for *A. piscivorus*. Unfortunately, there are no extensive records concerning food habits in the wild.

Allen (1949) and Neill (1960) confirmed the use of caudal lures as a response to prey for juvenile *A. bilineatus*. Although most of the captive juveniles often held the tail vertically, tail undulation was observed rarely. Slight tail twitching was sometimes observed when various frogs were introduced, but these potential prey were not bitten. Tail twitching was not observed when other prey items (lizards, mice, snakes, insects, *etc.*) were introduced. However, as previously mentioned, food was consumed at night and active caudal luring could have taken place at twilight or even nighttime, although one would not expect a primarily visual lure to be used in total darkness. Allen (1949) believed that the tail is kept down at night.

Acknowledgments

I would like to thank Rusty Grimpe, Mike Blakely, and Darell Pickering for help with the data collection. Also, I would like to give special thanks to Dr. Douglas Mock and Mr. Bern Tryon for commenting on the manuscript.

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LONGEVITY RECORDS AT THE OKLAHOMA CITY ZOO

How long reptiles and amphibians live has long been an interest of herpetologists, particularly to those involved with public institutions such as zoos. Bowler (1977) was the first to attempt a comprehensive listing of longevity records of reptiles and amphibians maintained in living collections within the United States. The following is a listing of what we feel are significant records of specimens in the herpetological collection at the Oklahoma City Zoo (OCZ). All specimens listed were alive at the time this report was prepared and were received as wild-caught adults when they entered the collection at OCZ.

OCZ Number	Species	Years	Months	Days (as of 11/18/79)
809-01	*Litoria caerulea*	10	2	23
823-02	*Ceratophrys calcarata*	12	2	18
4722-01	*Phelsuma madagascariensis kochi*	4	4	3
4741-02	*Varanus prasinus*	4	4	18
999-02	*Cordylus giganteus*	10	2	18
975-01	*Anolis equestris*	12	10	16
3185-02	*Python boeleni*	6	4	18
1045-01	*Python curtus brongersmai*	14	3	18
1061-01	*Lampropeltis c. calligaster*	12	5	18
4719-03	*Lampropeltis triangulum gaigeae*	4	4	18
1798-02	*Oxybelis aeneus*	8	3	18
1120-02	*Sistrurus catenatus tergeminus*	13	5	18

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Bowler, J. K. 1977. Longevity of Reptiles and Amphibians in North American Collections. Soc. Stud. Amphib. Rept., Misc. Pub., Herp. Circ. 6, pp. i-iii + 1-32.

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SECOND EUROPEAN CHELONIAN SYMPOSIUM, 1981
to be held in
THE DEPARTMENT OF ZOOLOGY, UNIVERSITY OF OXFORD
Saturday/Sunday, 3rd and 4th October 1981

The Symposium will be held in conjunction with the International Herpetological Congress, 3rd-9th October 1981, and will follow-on from the Inaugural Meeting of members of the IUCN/SSC Tortoise Specialist Group on 1st and 2nd October 1981. Investigations on terrestrial forms will primarily be considered at the Symposium, but papers on fresh-water species may also be submitted, either as part of the Symposium or as part of the International Congress. There will be Proceedings.

The language of the International Congress is English, and also of the Symposium. In exceptional cases and in deference to the First Symposium, papers in French and, possibly, German will be considered, provided a written Summary in English is available for circulation.

Titles of papers to be offered, with a written summary, should be sent to the Symposium organiser: Dr. M.R.K. Lambert, Secretary, British Herpetological Society, c/o Zoological Society of London, Regent's Park, London NW1 4RY, England, no later than 10th September 1981. Papers will not be considered unless a written summary is submitted, and should not be more than 30 minutes. Requests for further details should be sent to the Congress organiser: Mr. J. Coborn, Zoo Director, Dudley and West Midlands Zoological Society, 2 The Broadway, Dudley, West Midlands DY1 4QB, England. Oxford accommodation advice is available.

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No material was received for this issue. The section is being revised by coordinator Dinardo, and readers are referred to notes on page 74 of this issue.

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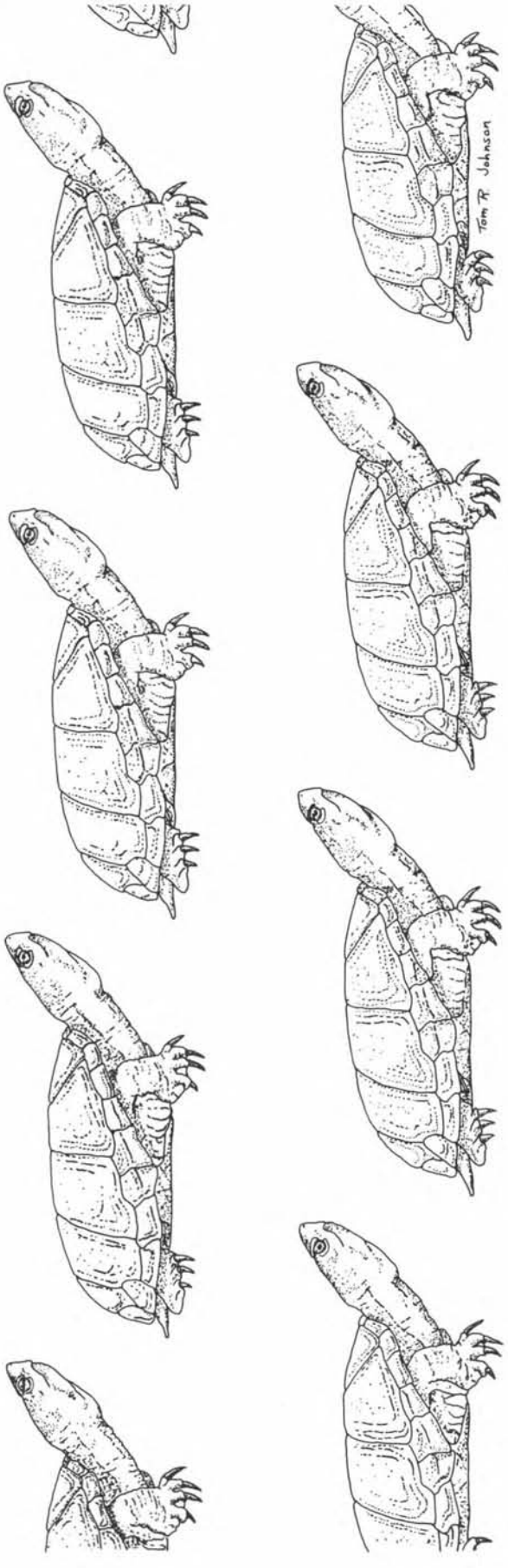
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OBSERVATIONS ON *CROTALUS V. VIRIDIS* (RAFINESQUE) AND THE HERPETOFAUNA OF THE KEN-CARYL RANCH, JEFFERSON COUNTY, COLORADO

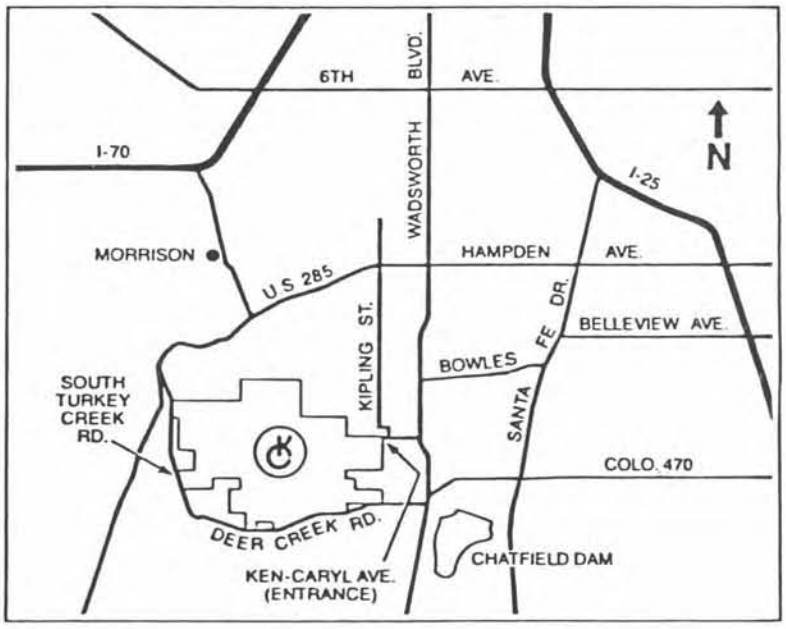
The Ken-Caryl Ranch is a ten thousand acre property located in central Jefferson County, about ten miles southwest of Littleton, Colorado (Map 1). Until the early 1970's, it was essentially an undisturbed wilderness. Residential development was begun on the ranch in the mid-1970's. At that time, the presence of large numbers of rattlesnakes on the property became highly undesirable. Therefore, a rattlesnake control program was initiated in 1976. Information was collected on the prairie rattlesnake *(Crotalus viridis viridis)* as well as other reptiles and amphibians during the course of the work, which is ongoing. The project consists basically of summertime collecting when possible, plus den location and subsequent capture of rattlesnakes present in spring and fall. Rattlesnakes collected are either donated to local universities for research purposes or relocated.

Ken-Caryl Ranch is an exceptionally large and diverse property. It is situated on Colorado's Front Range. The ranch extends one and one-half miles east of the Dakota Hogback (the first uplift) and west into the foothills some two and one-half miles. It contains elements of mixed prairie, mountain shrubland and coniferous forest habitat types, as well as some riparian situations. Elevations range from 5,800 to nearly 8,000 feet.

Ken-Caryl Ranch provides excellent habitat for the prairie rattlesnake. Consequently, a large population has developed. It is known from virtually throughout the property. Rattlesnakes are most abundant in the prairie dog towns, and on the hogbacks to the west. However, a few individuals have been collected on forested northern slopes at 7,500 foot elevations. Field observations indicate that much of the eastern population of *viridis* spends the summer in the prairie dog towns. In the fall, these snakes migrate to den sites on the west side of the Dakota Hogback. Unlike snakes in some areas, Ken-Caryl's rattlers do not hibernate in prairie dog burrows to any major extent.

In the late spring and summer, the snakes again disperse outward from the dens. Prairie dog towns provide many of them with excellent summer habitat. They utilize the burrows for shelter and prey upon mice *(Peromyscus)*, ground squirrels *(Citellus)*, voles *(Microtus)*, rabbits *(Sylvilagus)*, and nestling passerines of several species. Rattlesnakes will often rest in the mouth of a prairie dog burrow, retreating into it when threatened.

Adult *viridis* from Ken-Caryl Ranch range from 28 to 34 inches in total length. The largest example collected to date was 45 inches long. Adults are highly variable both in temperament and coloration. They range from light tan to greenish to dark brown. Their aggressiveness is also highly variable. Some individuals are quite docile — declining to rattle or strike, even when captured. Others will lash out at intruders when approached. Most specimens exhibit behavior between the two extremes.



Map 1. Vicinity map of the Ken-Caryl Ranch showing relationship of major highways. Approximate scale: 1 inch = 5.5 miles.

One would expect *viridis* to be on a biennial reproductive cycle at this latitude (Fitch, 1970). Alternate-year breeding (in a given female) has been observed in South Dakota, Wyoming, Utah, and California (see Klauber, 1972). However, the period of activity for *viridis* is considerably longer here than in, say, South Dakota. Thus, annual breeding, which does occur farther south, is at least a possibility. I have observed neither copulation nor parturition on Ken-Caryl Ranch. Young of the year are occasionally seen in the fall. They may or may not be near major denning areas. When observed at a denning ground, they are usually near small crevices, rather than at the holes used by the adults. A. M. Jackley (in Klauber, 1972), observed that young born near the den would not follow the adults to it in the first year. Klauber (1972) suggested that they would not hibernate in a fissure-type den with the adults due to the risk of being crushed. A large number of juveniles are undoubtedly overlooked in collecting activities. Bullsnakes *(Pituophis melanoleucus sayi)* and racers *(Coluber constrictor flaviventris)* often den in the same crevices as *viridis*.

To date, four major denning areas have been located on Ken-Caryl Ranch. All are situated in holes or crevices of sedimentary rock outcroppings. The Massey Draw and Dutch Creek dens are on the southern exposures of water gaps (canyons) in the Dakota Hogback. Denning crevices are situated at the base of the wall formed by the caprock. A talus slide in the Ft. Hays member of the Niobrara limestone formation forms a third den (the Niobrara formation lies immediately east of the Dakota Hogback). The fourth den is located in the Lytle sandstone formation on the western aspect of the Dakota Hogback. This den is situated about midway between the base of the ridge and the top rather than being associated with the caprock. Because of its remote location, it is not being disturbed at this time. Also, it is under periodic investigation by myself and students from the University of Colorado.

The Massey Draw, Dutch Creek and Niobrara dens have produced a total of 162 rattlesnakes to date. The snakes were collected by hand or trapped. Trapping is accomplished by using a box with a one-way gate placed in the den entrance. These traps can be highly effective if the den entrance is suitable.

Rattlesnake traps are most useful in the spring. They are placed in the den entrances throughout the emergence period. Traps are checked and emptied regularly. Fall trapping is possible, but best employed after the snakes have arrived at the dens. It is usually difficult to provide a way for the snakes to enter the

traps from outside the dens. If the traps are in place too early, new arrivals will be unable to enter the dens and may move to other areas. Thus, traps are placed in den entrances during late October to capture snakes emerging to bask. Hand collection is used to supplement trapping.

Collecting and trapping has virtually eradicated *viridis* from the Massey Draw and Niobrara dens. This is evident from the declining numbers of snakes captured each season (see Table 1).

Rattlesnakes have also been collected in non-denning situations throughout the ranch. These summer collections have produced 135 snakes to date. Summer collections are less effective in population control, but may suggest the location of dens. The vast majority of these captures have been on the eastern half of the ranch. Relatively few snakes have been collected in the foothills. Apparently, population densities decrease as elevation increases.

Locating rattlesnake dens is surprisingly difficult. The broken topography of the Front Range provides such an apparent abundance of denning habitat that locating them by the appearance of the strata is not possible. This means that all likely areas must be searched in the spring and fall.

Dens are usually identifiable only by the presence of snakes. Thus, the would-be collector must be fortunate enough to walk within a few yards of the den when the snakes are basking. Basking en masse seems to be rare on the ranch. Also, the snakes often bask in surface crevices, beneath shrubs, and under rocks near the den entrance. Though the Massey Draw dens produced 54 *viridis* in the fall of 1977, no more than 3 snakes were ever observed at any one instant. Large aggregations of basking snakes, which do occur in the plains states, are apparently rare in this area.

The Massey Draw and Dutch Creek dens have certain similarities. As previously stated, both are associated with water gaps in the Dakota Hogback. These gaps occur at fairly regular intervals along this north-south ridge. They are typically spaced less than 2 miles from one another. Where adjacent to suitable habitat, these gaps probably provide among the best denning sites. The advantages they exhibit are abundance of crevices, shelter from north winds, dryness, and warm, sunny, southern slopes. Thus, it would be easy to assume that water gaps are simply *the* denning areas. However, this is not entirely true. The other two dens known on the property are not associated with water gaps. They are simply rock outcroppings with suitable crevices. Their geologic origin, type of fractures, vegetation, elevation and slope are fairly dissimilar. It is the presence of suitable crevices that is the snakes' number one priority in choosing a den. Proximity to summer feeding grounds is undoubtedly also important.

On Ken-Caryl Ranch, rattlesnakes have been seen at dens as early as 28 March and as late as 16 November. In the fall, snakes begin to arrive at the dens in late September. Their migration continues through most of October. In the spring, the most productive period to hunt is from early April through mid-May.

Table 1. Summary of rattlesnakes collected over a three-year period at Ken-Caryl Ranch.

Period	Talus slide den (Niobrara formation)	Massey Draw den (Dakota formation)	Dutch Creek den (Dakota formation)	Non-denning situations
Summer 1976	N/A†	N/A		32
Spring 1977	13	N/A§		20
Summer 1977	N/A	N/A		22
Fall 1977	2	54		14
Spring 1978	6	42	N/A§	4
Summer 1978	N/A	N/A		18
Fall 1978	4	16		7
Spring 1979	5	5		3
Summer 1979	N/A	N/A		10
Fall 1979	3	7	5	5
Location Totals	33	124	5	135
Grand Total 297				

† Dens are not hunted in the summer
§ Den location unknown at the time

Obviously, emergence of the snakes will be affected by weather conditions. Temperatures must be at least in the mid-60's for the snakes to bask. Dens with west or southwest exposures are best visited between noon and 6 p.m. A summary of the phenology of rattlesnakes, as observed on the Ken-Caryl Ranch, is shown in Table 2. A complete list of reptiles and amphibians identified to date is shown in Table 3.

Discussion

It is now apparent that there are some significant differences between dens on Ken-Caryl and the more classical *viridis* dens of plains country. In South Dakota, for example, several hundred snakes have been taken at a single denning ground. Dens are often widely scattered and snakes must sometimes travel a mile or more to return to them (Jackley, 1947). One might term such a situation "regional" denning. That is, a large population hibernates together and disperses over a wide area during the summer. The Massey Draw den, actually six crevices along 600 feet of wall, could be considered a regional den. It was used by about 150 *viridis* in recent times. My observations indicate many, if not most, of its residents dispersed eastward for a mile or more into the prairie dog towns.

The other three dens on the ranch might be termed "local" dens. Here populations of say, 35 or fewer snakes hibernate together and disperse shorter distances into the shrublands of the hogback. The Dutch Creek and Talus Slide dens are situated only 0.57 miles from one another.

The paucity of snakes at these smaller dens can't be attributed to a low overall population. Prairie rattlesnakes are as abundant on the ranch as anywhere I have hunted them. Obviously, numbers of snakes at a particular hibernaculum could be restricted by the size of the cavity itself. The den populations documented to date cannot possibly account for all the snakes present during the summer. Thus, there must be several more of these local dens, each used by a sub-population with a fairly short dispersal radius. It seems that, along the hogbacks, denning crevices are readily available and the snakes need not travel far or concentrate greatly. Of course, these observations are somewhat speculative. Confirmation would require capturing, marking, releasing, and recapturing a considerable number of snakes. Unfortunately, releasing rattlesnakes would not be very popular on the ranch.

If it is correct that a small percentage of the total population uses each denning area, then effecting control will be difficult. A population is most vulnerable to control when it is greatly concentrated at a few dens. If a given population is denning in a number of scattered locations, in relatively small concentrations, removing a high percentage of the snakes will be difficult and time consuming. The selective and reproductive implications of this scattered-denning behavior are also interesting to consider.

Conclusion

There are certainly rattlesnake dens as yet undiscovered on Ken-Caryl Ranch. Continuing abundance and summer distribution of *viridis* on the ranch strongly support this conclusion. There is good evidence that there are a greater number of dens, with smaller concentrations of snakes in this area than might be expected. Rattlesnakes are also occasionally seen in the foothills over three miles from the hogback dens. Thus, there must be dens in these foothill areas. Yet, no dens have been located in any Precambrian (granitic) formations on the ranch.

Undoubtedly, rattlesnake captures made to date have reduced the total population. Perhaps more important, location and eradication of dens proximal to human habitations has resulted in localized population reduction. If this results in a diminished snakebite

Table 2. Phenology of rattlesnake activities over a one-year period at Ken-Caryl Ranch.

January 1 to Late March
Snakes in hibernation. Encounters very rare.

Late March to Late April
Basking at the dens occurs when weather conditions are favorable. Most snakes re-enter the den each evening.

Late April to Late May
Snakes gradually begin to disperse from the denning areas onto summer ranges.

Late May to Mid-September
Snakes are feeding, shedding, breeding, and giving birth on the summer ranges.

Mid-September to Early October
Snakes gradually begin to migrate back to dens.

Early October to Early November
Snakes are arriving at the dens, basking occurs when weather conditions are favorable.

Early November to December 31
Snakes in hibernation, encounters very rare.

Table 3. Reptiles and amphibians recorded from the Ken-Caryl Ranch, Jefferson County, Colorado. Nomenclature follows Smith, *et al.*, 1965.

REPTILES

SNAKES

Prairie rattlesnake (*Crotalus viridis viridis* Rafinesque).
Ubiquitous; most common below 7,000 feet in rocky areas and prairie dog towns.

Bull snake (*Pituophis melanoleucus sayi* Schlegel).
Most common in prairie dog towns and on the hogbacks; rarely in the foothills to 7,000 feet.

Eastern yellow-bellied racer (*Coluber constrictor flaviventris* Say).
Rocky areas of the hogbacks; common.

Western garter snake (*Thamnophis elegans vagrans* Baird and Girard).
Moist environs of the western foothills.

Red-sided garter snake (*Thamnophis sirtalis parietalis* Say).
Occasional in eastern riparian areas.

Western plains garter snake (*Thamnophis radix haydeni* Kennicott).
Moist areas east of the foothills.

Smooth green snake (*Opheodrys vernalis blanchardi* Grobman).
Rare; known from one hillside, southern exposure, elevation 7,200 to 8,000 feet.

Western hognose snake (*Heterodon nasicus nasicus* Baird and Girard).
Uncommon; known from 2 specimens in Deer Creek drainage between hogbacks and foothills.

Central plains milk snake (*Lampropeltis triangulum gentilis* Baird and Girard).
Secretive and uncommon; known from 4 specimens from 2 rocky canyons.

LIZARDS

Northern prairie lizard (*Sceloporus undulatus erythrocheilus* Maslin).
Common in rocky areas of the hogbacks and foothills.

Prairie racerunner (*Cnemidophorus sexlineatus viridis* Lowe).
Locally common in dry, sandy areas below 7,000 feet.

Northern short-horned lizard (*Phrynosoma douglassi brevirostre* Girard).
Rare; known only from plains prairie dog towns.

TURTLES

Painted turtle (*Chrysemys picta belli* Gray).
Introduced? Known from one specimen in pond, western foothills meadow.

AMPHIBIANS

Tiger salamander (*Ambystoma tigrinum mavortium* Baird).
Locally common, but secretive in plains and western foothills; subterranean or aquatic most of the year.

Northern leopard frog (*Rana pipiens brachycephala* Cope).
Common in drainages east of the foothills.

Boreal chorus frog (*Pseudacris triseriata maculata* Agassiz).
Common; vocal resident of western foothills ponds.

danger, then the objective of the program is being met.

In my opinion, complete eradication of *viridis* from the ranch is neither feasible nor desirable. Rattlesnakes, like all wildlife species, serve a useful purpose in the ecosystem. In remote, undisturbed areas, their presence is an asset, not a liability.

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AN ALBINO EASTERN GARTER SNAKE, *THAMNOPHIS SIRTALIS SIRTALIS*, FROM WESTERN MASSACHUSETTS

Wright and Wright (1957) stated in their section on abnormal coloration of *Thamnophis s. sirtalis* that "several albinos have been recorded," but report only the one case of a partial albino attributed to Eaton (N.Y., 1945).

On 22 August 1979, a newborn albino specimen of *T. s. sirtalis* was collected by a local youngster in or about the environs of a woodpile in a semi-urban area of Pittsfield, Berkshire County, Massachusetts. The specimen was brought to the Berkshire Museum in Pittsfield where it underwent its post-natal shed, but steadfastly refused food. On 5 September 1979, the snake was given to R. D. Bartlett, and was immediately housed in a 10 gallon aquarium with adequate areas of seclusion. Although no interest was displayed in food introduced to the cage, the animal did feed that night upon an earthworm while both the specimen and the worm were being handheld. Additional food was accepted daily for the next week when offered in like manner.

On 13 September 1979, the specimen began tracking and consuming earthworms introduced to its cage, and on 16 September 1979 it accepted two small fish. Subsequently, the specimen has eagerly tracked and consumed earthworms, small fish, *Plethodon c. cinereus, Eurycea b. bislineata,* and *Hyla c. crucifer.* Although newborn mice have been offered, they have, to date, been refused after a cursory investigation by the snake.

Size on the date of collection was 190 mm (est.), which compared favorably with normally colored newborns from other areas. On 26 October 1979, after a second ecdysis, the specimen measured 240 mm in overall length.

Pattern is strongly evident, the background coloration and stripes being chalk-white. Between the mid-dorsal and lateral stripes are two rows of alternating light pink spots. Temporal blotches are light pink, this becoming darker towards the posterior terminus of each blotch. Eyes are completely pink.

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FIRST RECORD FOR THE STRIPED COLOR MORPH OF *Plethodon cinereus* FROM A LAKE ERIE ISLAND

High percentages of the unstriped morph of the red-backed salamander, *Plethodon cinereus,* have been reported from northern Ohio and include a monomorphic unstriped population from South Bass Island (located in the western basin of Lake Erie), Ottawa County, Ohio (Pfingsten and Walker, 1978).

During investigations on the ecology of *P. cinereus* at Victory Woods (1.7 km W Put-In-Bay), South Bass Island, 131 unstriped and 1 striped *P. cinereus* were collected. The striped morph (SV 25mm) was found with several unstriped morphs under a decaying log in typical woodland habitat for *P. cinereus* (Heatwole, 1962). This specimen, being the first record for the striped morph from South Bass Island, was released at the capture site after being photographed.

The nearest *P. cinereus* populations in northern Ohio have greater percentages of striped morphs (7-80% striped; Pfingsten and Walker, 1978) and are now separated from South Bass Island by at least 4 km of water. Twelve thousand five hundred years ago though (after the last glaciation), the bottom of Lake Erie was virtually dry and was covered with forests (Forsyth, 1973). During this period, South Bass Island could have been populated by salamanders following the retreating glacier. The subsequent reflooding of the western basin (3,500 to 4,000 years ago) would have isolated South Bass Island with its *P. cinereus* population (Forsyth, 1973). The progression toward a monomorphic unstriped condition in this isolated population could then have occurred simply by genetic drift. Hence this lone striped *P. cinereus* may represent a relict gene in the population.

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AN INTERGRADE *Lampropeltis triangulum* FROM WEST TEXAS

On 8 August, 1978, the authors secured a DOR specimen of *Lampropeltis triangulum* during the late morning on Highway 90, 0.8km west of Sanderson, Terrell Co., Texas. Upon examination the specimen appeared to be an intergrade between *L. t. celaenops* and *L. t. annulata.* Personal communication with Dr. Kenneth L. Williams further indicates that this is the first specimen of *L. triangulum* recorded from this area. It is deposited in the University of Michigan Museum of Zoology under the number UMMZ 156483.

The data on lepidosis and coloration of the specimen are given below:

Supralabials 7-7; infralabials 7-8; preoculars 2-?; postoculars 2-?; loreals ?; temporals 2-?. Dorsal scale rows 21-21-19; ventrals 184; sub-caudals 48; total length ca. 464mm; tail length 75mm; tail length/total length ratio 0.161.

Top of head mostly black; white mottling present on supralabials, supraoculars, prefrontals, internasals, rostral, nasals, loreals, preoculars, and temporals. Frontal and postoculars on the left are entirely black; infralabials white with small amounts of black concentrated in the sutures; chin white with sparse amounts of black flecking.

The first white ring extends from the posterior 1/3 of the parietals to 2 1/2 scales back; length of remaining white rings 2 scales middorsally. White bands are all complete across the venter, although the black bands will sometimes encroach to form an imperfect alternating pattern. The number of white annuli on body 18; the number on the tail 5 with one more forming on the side. There is a very light amount of black flecking on all white rings with the least amount occurring on the two rings at each extremity.

Length of the first black ring 3 1/2 scales; middorsal length of remaining black rings 2-3 scales (mostly 2); lateral length of remaining black rings 1/2-1 scale (mostly 1). Number of black rings on body 35 (plus 1 directly above the vent); number of black rings on tail 7. The black rings never cross the red pigment middorsally, although a light suffusion of black pigment occurs on some red annuli.

Length of first red ring 8-10 scales; length of remaining red rings 3-5 1/2 scales middorsally. Number of red rings on body 18; number on tail 2.

The black annuli completely encircle the venter; in addition, the middle 3/5 of each ventral saddle is black. All of these black ventral saddles contain small white blotches or flecks of white. The tail has 3 large solid black annuli instead of saddles. The first 3 saddles on the anterior section of the specimen consist of a double row of black dots connecting the black annuli. This pattern gradually fills in to form the saddle pattern present along the remainder of the specimen.

Several of the features of this specimen suggest intergradation between *L. t. celaenops* and *L. t. annulata* (see Williams, 1978). These are:

1) The intermediate amount of black pigment on the head and chin.
2) The intermediate width of the black ventral saddles.
3) The progressive increase in the black ventral pigment from the throat to the first black ventral saddle.
4) The presence of white markings in the black ventral saddles.

In addition to these definitive intergradational characteristics, the scale counts and lengths of the body annuli fall within the range of variation of both subspecies.

We would like to thank Dr. Kenneth L. Williams for examining the data on this specimen and for his helpful comments.

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TWO *PHILODRYAS PATAGONIENSIS* FROM ONE EGG

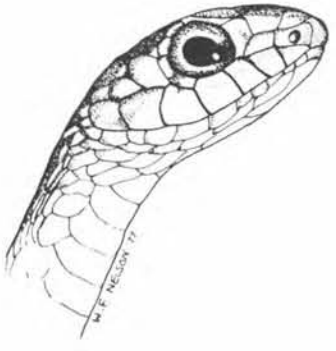
On 29 October 1978, one of us (JCG) collected a 920 mm total length 'Parejera' *(Philodryas patagoniensis)* at Cerro Penitente, Departamento de Lavalleja, Uruguay. On 23 December, the snake laid 13 eggs. As this species lays eggs in *Acromyrmex* ant hills, the clutch was placed in a plastic bag with damp sawdust to provide the necessary humidity. Artificial heating was not provided. Most eggs were attacked by fungus, and 10 were removed. On 29 January 1979, one of the eggs was opened, and a well developed embryo was found. Its stage is similar to Zehr's (Copeia 1962:322-329) stage 36.

During the night of 20 February, one individual hatched (weight 2.50 g). This specimen is now (September 1979) 190 mm total length, and has eaten a diminute frog (*Pseudopaludicola falcipes*, Leptodactylidae) and a lizard's tail (*Pantodactylus schreibersii schreibersii*, Teiidae).

On 21 February, the remaining egg was opened, and two individuals joined by their umbilical cords to a common anexus were found. They were put in a clean plastic box with damp paper to provide humidity. One of the specimens has everted hemipenes. They are referred to Zehr's *(op. cit.)* stage 36. On 23 February, they lost their umbilical cords. The individuals refused to eat, and one of them was affected by an orbital abscess that gave the head a "salted" appearance.

On 6 March, one of the individuals died (133 mm total length, weight 1.45 g). The other snake was preserved on 11 March (144 mm total length, weight 1.40 g). They were deposited at the Departamento de Zoologia Vertebrados, Facultad de Humanidades y Ciencias (ZVC-R 2830 and 2831).

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(Letter to Editor) EXPERIMENTAL CLEFT LIP AND PALATE IN *ALLIGATOR MISSISSIPPIENSIS*

Dean *et al.* (1980) provided a case report of bilateral cleft lip and palate in the progeny of a *Crotalus viridis viridis* Rafinesque. In this they highlighted the dearth of information on such anomalies in reptiles. It might therefore be of interest to point out that *Alligator mississippiensis* is being used as an experimental animal model in which to study developmental mechanisms in normal and abnormal palate formation (Ferguson, 1979a & b, 1981b, c, d, e, i). Basically, the advantages of the alligator system accrue from the fact that the crocodilians are the only animals which possess a true mammal-like secondary palate and which develop in an external egg. This means that all kinds of precise surgical and pharmacological experiments on early alligator embryos are possible, such experiments being impossible in the mammalian fetus because of its intra-uterine position and the deleterious effects of loss of amniotic fluid.

The alligator embryo is extremely sensitive to teratogenic chemicals introduced into the egg, and it is possible to induce various types of cleft lip and palate by injecting 0.01 mg of 5 Fluoro 2 Desoxyuridine (F.U.D.R.) dissolved in 0.1 ml of injectible water into the yolks of developing eggs at various times in incubation. Thus, the injections are performed on day 12 to induce cleft lip without cleft palate, on day 14 to induce cleft lip and palate, and on day 17 to induce cleft palate without cleft lip. *A fortiori* a technique has been evolved to grow normal alligator embryos in shell-less and semi shell-less culture (Ferguson, 1981a, e). By administering the teratogen at precise times in relation to several clearly defined embryonic stages in shell-less culture it is possible for the first time to reproducibly induce cleft lip on either the right or left sides (Ferguson, 1981e). By the same token, an injection of 0.01 mg of F.U.D.R. on day 10 blocks the migration of cranial neural crest cells into the lower jaw but not into the upper jaw, resulting in the development of an embryo with a normal palate but virtually no lower jaw or tongue. Using the combination of shell-less culture and this precise teratogenic schedule it is possible to study and film (using time lapse photography) the sequence of events in the development of the alligator palate. Ferguson (1981e) has reviewed the multiple advantages of the alligator as a model for experimental investigations of craniofacial embryology, whilst detailed histological and ultrastructural accounts of the structure and development of the alligator palate are available in Ferguson (1979a & b, 1981b-e). The pathogenesis of the induced anomalies appears to be related to a depression of the synthesis of hyaluronic acid, an extra-cellular glycosaminoglycan which normally provides a conducive milieu for neural crest cell migration into the palate. Numerous other defects, *e.g.* cyclopia, hydrocephalus, polydactyly and syndactyly can also be induced experimentally in the alligator.

Not only is the alligator model of enormous scientific and medical interest, but it has also had many spin-off applications in crocodilian farming and conservation. Thus, in order to evolve the shell-less culture technique it was necessary to perform an extensive investigation into the structure, chemical composition and mineral kinetics of the alligator eggshell and eggshell membrane (Ferguson, 1980, 1981a, f - h). This showed that normally the alligator eggshell is degraded by extrinsic bacteria present in the alligator nest and that this degradation increases the porosity of the eggshell and weakens it, causing it to crack, so facilitating hatching (Ferguson, 1981c, f - h). If alligator eggs are artificially incubated without nesting media, the hatchlings usually die either from respiratory defects or from an inability to break out of the abnormally tough eggshell due to a lack of extrinsic bacterial degradation of the eggshell. Other investigations have correlated the natural malformation rate in the wild with the age and diet of the female, whilst a tentative relationship between the temperature of egg incubation and the sex of the hatchling has been detected (Ferguson, 1981e & i).

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TECHNIQUES

SURGICAL EXCISION OF A PERICLOACAL MASS FROM A KING SNAKE *(LAMPROPELTIS MEXICANA)*

Subject and History

The subject was an adult female king snake, *Lampropeltis mexicana*, that had been in captivity for four years. The animal was collected 21 June 1975 in Nuevo Leon, Mexico, and has been maintained in a group cage (60 x 60 x 50 cm) with another female and a male since August 1976. The cage provided photic and thermal regimens which were varied seasonally; summer maximum was 16:8 L:D, 28 ±4° C, and winter minimum (artificial hibernation) was 2:22 L:D, and 12 ±2° C. Lighting was with Vita-Lite fluorescent tubes (Duro-Test Corporation, Secaucus, N. J.). Water was available *ad libitum*. Each snake was offered 10 or more live juvenile mice per week during summer activity period; the snakes were not offered food during hibernation. Under this environmental regimen the subject mated and produced fertile clutches in 1977, 1978 and 1979.

When collected, the king snake had a 2 mm diameter palpable subcutaneous nodule lateral to the cloaca on the right side. The nodule regressed during 1976 but enlarged anteriorly after each yearly oviposition to approximately 3 cm long and 0.5 cm wide (Fig. 1). Prior to hibernation in November 1979, feeding and defecation were abnormal, and general activity was reduced. Surgery was performed during hibernation because the subject could be expected to heal before the spring reproductive period.

Surgery and Postoperative Care

The snake was anesthetized with Brevitol Sodium (1.5 mg/kg BW) (Wang, Kubie, and Halpern 1977) injected intraperitoneally. The skin was prepared with 70% ethanol and an incision approximately 2 cm long was made between the first and second scale rows dorsal to the ventral scutes. The incision was begun 1.5 cm anterior to the cloaca and continued posteriorly. Care was taken to cut between and not through individual scales. The skin was gently teased away from the underlying muscle and ribs. This exposed two ovoid masses approximately 1.25 x 0.5 cm and 1.0 x 0.5 cm, and several smaller ellipsoid masses grading to less than .1 cm long. These masses were soft to palpation and were covered with an elastic envelope. They were poorly vascularized and contained a pale yellowish, slightly granular material. All but one mass was easily removed by simply teasing away the surrounding tissue with curved serrated forceps. The last mass was posterior and lateral to the cloaca and was connected to a highly elastic conical portion of tissue whose tip was attached deeply posterior to the cloaca. The mass and tissue were excised by cutting the conical tissue as close as possible to its tip. The entire procedure resulted in minimal hemorrhage. The excision site was subsequently irrigated several times with sterile reptilian Ringer's saline. Finally, the incision was closed using 6-0 Prolene polypropylene suture (Ethicon, Somerville, N. J.) in a simple interrupted pattern between each scale. Past experiences with surgery on snakes have shown that cutting and suturing between scales facilitates healing, alleviates problems with ecdysis, and reduces cosmetic damage. No antibiotic therapy was given.

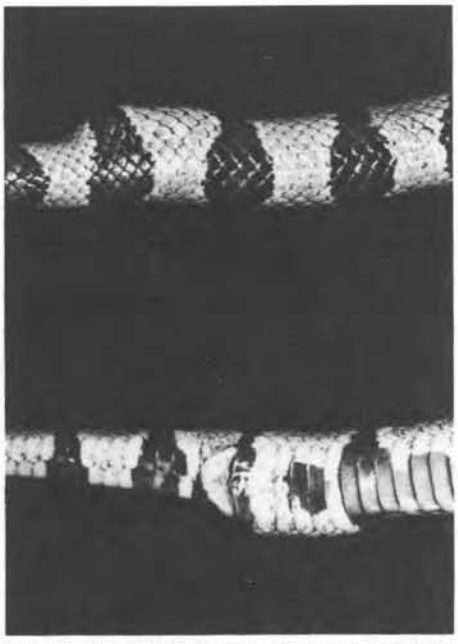


Fig. 1. Appearance of the nodule prior to surgery, dorsal (L) and ventral (R) aspects.

The subject was placed in an isolation cage which provided a 12:12 L:D photic cycle and a temperature of 18° C (± 2° C). Recovery from anesthesia was slow, requiring approximately 48 hours. The wound drained serous fluid for 24 hours and was edematous for 72 hours. Healing appeared complete after one week, at which time the subject was returned to hibernation in the group cage. The photic cycle was changed to 10:14 L:D on 21 March 1980 and the subject became active within a few days. The first observed feeding was 4 April. Copulation was observed 7 and 21 May. The sutures were shed with the skin on 8 June (Fig. 2). Oviposition of 11 eggs was on 16 June.

Histology

The masses (Fig. 3) were placed in neutral buffered 10% formalin while the conical portion of tissue was placed in Bouins fixative. The tissues were embedded in paraffin, sectioned at 7 μm and stained with hematoxylin and eosin. Histologic examination of tissue sections revealed that the masses were composed of cystic structures with an epithelial lining. The lumens contained eosinophilic cellular debris with cholesterol clefts and occasional bacterial colonies. Examination of sections of the conical tissue revealed it to be a folded structure containing a lumen lined by a thick stratified squamous epithelium. The epithelium of the gland was multifocally infiltrated with heterophils and the



Fig. 2. Sutures present in the shed skin.

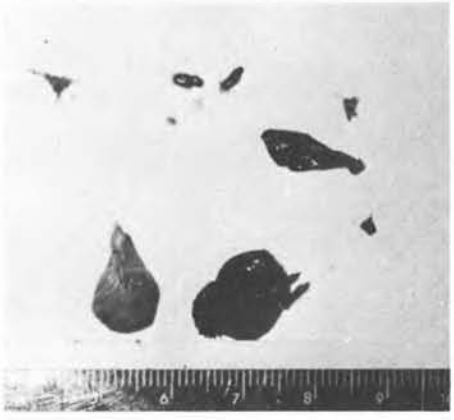


Fig. 3. Masses removed in the surgical procedure.

lumen contained cellular debris and numerous bacteria. The surrounding subcutaneous tissues contained occasional foci of mixed inflammatory cells. Histologically the folded conical structure was consistent with being a cloacal gland. The pathologic changes probably resulted from a bacterial infection or injury of the right cloacal gland. The lumen of the gland was occluded and had apparently ruptured and healed with the lumen opening into the subcutaneous space. Glandular products and debris of the infection then formed the masses. The relation of the symptoms to reproductive periods may have resulted from either a lowered resistance to the chronic infection during pregnancy, or pregnancy-related activity of the gland.

Acknowledgments

The authors wish to thank David Crews for the use of surgical facilities.

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A NEW TECHNIQUE FOR RECOGNITION OF SNAKES

Being able to recognize individual specimens in zoo collections is important for several reasons. Among these are: the data that can be provided by the particular individual with respect to its species; to insure proper care and maintenance of the specimen; and, simply, to keep track of the individual from the time of its arrival until the time of departure.

In snakes, particularly those species with patterns, it has been traditional to locate some pattern irregularity and to verbally describe or make a sketch of it, record the shape and location of pre-existing scars, clip certain scales, or use photographs for the purpose of identifying individuals.

The Ellen Trout Zoo is currently using a unique method for this purpose that employs portions of the exuvia. This technique, developed by the zoo's reptile and bird technicians, consists of locating the particular pattern irregularity, scar or other distinctive characteristic on the exuvia and removing this portion of the skin. After it has sufficiently dried, the portion of the exuvia is split in an appropriate place so that the identifying mark may be displayed in the same fashion that it can be observed on the living snake. The segment is then placed on the specimen's data card and covered with clear, adhesive plastic, thereby preserving it for future reference.

This method has proven useful to us for several reasons: it is more accurate than a description or drawing, especially when considering two, or more, individuals of the same species that may have similar patterns; it does not involve mutilation of any sort; and it is cheaper and does not require the time and equipment necessary to photograph specimens.

Useful as it is, this method of distinguishing individuals is not without its drawbacks. It is most useful with species that have definite patterns or on individuals with distinct scars. Hence, it is not as useful with species that are virtually unicolor, or individuals without scars, or in those species that exuviate in flakes. In metachrotic species, the specimen samples are changed after the color change has been completed.

Acknowledgment

I would like to acknowledge J. Kevin Steltzlen and B. R. Smith for their ingenuity and imagination in developing this technique.

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LEGISLATIVE ALERT

Once again there is a Congressional move (i.e., Chafee in the Senate, Breaux in the House) to introduce legislation that will "tighten" controls on illegally taken fish and wildlife. The main points of S. 736 and H.R. 1638 are as follows: 1) consolidation of the Lacey and Black Bass Acts to cover all species of fish and wildlife that are subject to federal, state, and/or foreign conservation laws; 2) extend protection to plants that are subject to state conservation laws and provide federal assistance to states with plant conservation laws; 3) increase the maximum civil penalty to $10,000 (current maxima are $5,000 under Lacey Act and $200 under Black Bass); 4) increase the maximum criminal penalties to $20,000 and 5 years imprisonment (current maxima are $10,000 and 1 year under Lacey Act, and $200 and 3 months under Black Bass); 5) defines the criminal culpability standard — the government will be required to prove only that a defendant had knowledge of the underlying conservation statute, but will **not** be required to prove that the person also had knowledge of the Lacey Act; 6) provides a "relaxation" of labelling provisions currently in effect for shipping fish and wildlife, but allows the Secretaries of Interior and Commerce to promulgate joint regulations **re:** labelling which are consonant with industrial practices and which satisfy enforcement; and 7) adds Native American regulations to the Lacey Act to ensure that fish and wildlife regulations applicable to Native American reservations will be subject to federal enforcement.

Copies of the proposed legislation are available from the following offices: S.736 — Committee on Environment and Public Works (Sen. John H. Chafee-R, RI), Dirksen Senate Office Bldg., Washington, D.C. 20510; H.R. 1638 — Committee on Merchant Marine & Fisheries (Rep. John B. Breaux-D, LA), Rayburn House Office Bldg., Washington, D.C. 20515.

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FUNDING OPPORTUNITY

AWARDS FOR STUDY AT ANSP

The Academy of Natural Sciences of Philadelphia, through its Jessup and McHenry funds, makes available each year a limited number of awards to support students pursuing natural history studies at the Academy. These awards are primarily intended to assist predoctoral and immediate postdoctoral students. Awards usually include a stipend to help defray living expenses, and support for travel to and from the Academy. Application deadlines are 1 April and 1 October each year. Further information may be obtained by writing to: Chairman, Jessup-McHenry Award Committee, Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, Pennsylvania 19103. ●

BOOK REVIEWS

A. M. Alekperov **The amphibians and reptilians of Azerbaidjan** (in Russian) Baker, 1978, 264 pp. Illustrated.

This monograph is the author's 1957 doctoral dissertation but contains some new observations since then and new literature about the herpeto-fauna of Azerbaidjan—part of the Caucasian area of the U.S.S.R. The book contains detailed chapters about the history of herpetological research and collections in this area and descriptions of known species of Azerbaidjan. The systematic and taxonomic problems are not discussed in detail and discuss only information about distribution and ecology of species in Azerbaidjan. The chapter about general problems of ecology of amphibians and reptilians contains classifications of herpeto-fauna of various biotopes for forests, mountains, and arid biotopes. It also presents some of the author's observations about anthropological factors affecting herpeto-fauna (modern human's activity, agriculture, construction, industry and herpeto-fauna in these cultural landscapes). However, these observations would benefit from more detail and greater studying of ecology of some species. The book contains a chapter about the history of Azerbaidjan herpeto-fauna and its origins that includes some new physical analysis and description of herpeto-fauna of the East Caucasian and High Mountain districts, the Asiatic district, and detailed description of specialized forms in these regions. It is especially of interest to herpetologists specializing in this region. But, the maps of species areas in Azerbaidjan may be useful for any collectors and amateurs.

The chapter about the practical importance of amphibians and reptilians includes some Azerbaidjan observations: feeding by harmful insects, turtles in this area may be harmful as eaters of useful fishes and vegetables and as reservoirs of infection (also some other species of herps). The author states that lizards may be used as laboratory animals as are frogs. The materials about epidemiology of snake bite is very interesting. Snakes bite up to 25% of domestic animals and 200 humans yearly (47% of these are 16-50 years of age; 90-95% bites are to feet of agricultural workers, but the lethality is only 1.3%). According to the author, venomous snakes also need protection as venom producers for medical research. In Azerbaidjan, there are snake farms with 2000 snakes that give up to 2 kg of venom yearly. As a regional monograph, this book is useful for any students, animal lovers, or zoologists. But only a few copies are available, as limited circulation is due to a very small press run. The book gives scientific names and native names of species, but no foreign names (including English) are used.

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V. Ischenko **The dynamical polymorphisms of brown frogs in fauna of U.S.S.R.** Moscow, Science Publication 1978, 148 pp. with illustrations (in Russian).

This book discusses the ecological structure of populations in various species of brown frogs, and their genetic structure including problems of evolution, management and mathematical models of these processes. Also included is some material about ecology of various populations. The author's work is based on collection and study of a large quantity of frogs: 19,000 *Rana arvalis*, 493 *Rana temporaria*, 558 *Rana cheusinensis*, 4,495 *Rana macrocnemis*, 5,215 *R. camerans*, 275 *R. dalmatina*, 412 *R. amurensis*. The author presents his concepts of the population biology of these species, and discusses the difference in characters within species between populations. The work incorporates early research of the well known Soviet ecologist S. Shwarz, and includes chapters on: Description of anuran polymorphics, Description of brown frogs, Structure of species and populations, Specification of morphs and abiotic factors in population existence and Experimental management of populations. This book is for ecologists, zoologists and herpetologists, too, but not for amateurs as it is too technical. Only a few copies of this book are available; it is out of print and rare in the trade.

NOTE: All cited Russian literature (including yearly reviews) are listed in the Russian language version only. Not printed in English version.

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Editor's note: Sincere thanks are extended to Jan Elder and Fran Williams for typing drafts of these manuscripts. GRP. ●

Common Snakes of South East Asia and Hong Kong, by Frank Reitinger. Heinemann Educational Books Ltd.: Hong Kong 1978.

Ditmars' observation that snakes are nowhere more common than in stateside fields and forests holds true in the small British colony of Hong Kong. While the coastal region is heavily urbanized, the inland hills of Hong Kong are uninhabited and overgrown to the extent the slope and shallow soil permit. Daytime field trips by biology classes that overturn any stones within sight consistently fail to yield reptiles.

Dr. Reitinger's success in collecting a wide range of snakes from this area rests with the discovery that the water catchment system acts as an entrapment. Hong Kong relies heavily on rainfall to supply water for over four million people clustered in the county-sized colony. Typhoon rains that convert mountainsides to temporary waterfalls are intercepted by concrete ditches that channel the torrents around the mountains to inland reservoirs. These channels, or water catchments, are often up to twenty feet wide and deep, and run many miles with intermittent tunnels through ridge crests. Snakes swept downhill into these trenches during heavy seasonal rains are often unable to scale the vertical concrete walls. Eventually they make their way to the tunnelled sections and thrive on the abundance of frogs and invertebrates. Weekly nighttime hunts along the largest catchments has permitted Dr. Reitinger to sample the wide range of snakes sparingly found in the area, including several new records, in the brief six years he has resided in the colony.

Ironically, a description of this entrapment, which has provided the bulk of the author's specimens, has been intentionally omitted from this book. In a culture where snakes are heavily utilized for both food and medicine, such a disclosure would result in a regular gleaning of the catchments.

While this paperback handbook is designed to appeal to the tourist market, it is a welcome text to the regional biology teacher interested in conveying the life histories of non-venomous as well as poisonous snakes. It may also prove to be a handy occasional reference for herpetologists worldwide.

The first thirty pages cover the general biology of snakes in a lively style. The middle half of the text systematically outlines information on each of fifty species of snakes: scientific name, description, food and habitat, breeding and field notes. Although the field observations are narrated, the descriptive segments are in telegraph style and restrict the whole section to reference and identification work.

The keys to families, genera and species are well-organized and clear, and a complete glossary that assumes no previous experience in the field is available. Therefore, local teachers and students alike can approximate the identity of their specimens. Dr. Reitinger has reared snakes both in Hong Kong and in Vietnam, where he served as a medical officer, and he includes observations on rearing captive snakes. An index, essential to a reference book, is present.

Reflecting Dr. Reitinger's medical training, the general account of venoms, snakebite and particulars for each venomous species is more complete than in most regional guidebooks.

Photos are excellent, and the author makes an unusually strong effort to recognize the contributions of his photographer in the section headings, author line and copyright.

The author also makes a strong pitch for conservation of snakes within the colony. His nine recommendations on reptiles and general conservation reflect years of dealing with regional dealers, exporters and colonial law. Some comments on conservation rather ramble, with mathematical examples often straining the points (Rats are bred to two trillion in ten generations. And many will not react favorably to "coldly" valuing a human life at US $10,000 to make an economic comparison).

Recognizing that the book will primarily be marketed with tourists, the discerning reader and the professional herpetologist may expect more.

—A co-listing of snake names in Chinese characters would have been handy for individuals trying to compare this modern information with older accounts of uncertain species.

—Medical jargon abounds (Necrosis, vasodilation, etc.) but the general reader's vocabulary will readily expand by reference to the glossary.

—Range maps in the text would be superior to the regional distribution chart that checks off countries of residence (a snake is found in the Philippines . . . all of the islands?).

—The bibliography is diminuitive . . . ten citations of mostly general and old texts with western authors. Since not all of the citations are still in print, it is not evident why the list is not more extensive, including journal articles. Not only herpetologists, but general readers converted to an amateur interest would appreciate the leads to further literature.

—Line drawings of head scale pattern for eighteen selected snakes are clustered in the back of the book. All lack labels of distinguishing features, lack a reference scale (the largest drawing is of the minute blind snake) and will receive little perusal since each is divorced from its description in the text.

The lack of a justified right margin and the seclusion of the magnificent color plates to one final signature at the end of the book is a necessary evil, acknowledging the high cost of books in Hong Kong, and thankful that this small paperback will not be too expensive.

An ultimate sin has been committed by the publisher, however. The binding readily comes apart . . . a critical blow to a text that could serve a heavy reference function throughout Hong Kong schools.

For the herpetologist, no other book covers the non-venomous snakes of this area for modern times. Should you buy a copy, have it rebound.

(Available from: Heinemann Educational Books (Asia) Ltd., K.P.O. Box 96086, Tsim Sha Tsui Post Office, Kowloon, Hong Kong, 1978. Current price is US $5.00. Packing and postage for surface mail is about US $.65 additional and requires a minimum of two months delivery time. Air mail postage would run about US $2.50.)

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HERP CATALOGUE ACCOUNTS OPEN

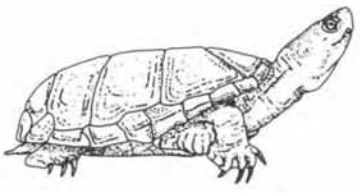
Volunteers are sought for three crocodilian accounts for the Catalogue of American Amphibians and Reptiles. The account for *Crocodylus acutus* and the generic accounts for Alligator and Crocodylus are still unassigned. Anyone wishing to volunteer for either of the accounts please contact:

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Gainesville, FL 32601

Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Houston Zoological Gardens, Houston, Texas 77001.



FIRST SUCCESSFUL CAPTIVE PROPAGATION OF SCHNEIDER'S SMOOTH-FRONTED CAIMAN, *PALEOSUCHUS TRIGONATUS*

EDITOR'S NOTE

Through a baffling, infuriating and most unfortunate set of circumstances, this article was hopelessly scrambled in the last issue. We apologize to Mr. Jardine and to readers, and here reprint the entire article in correct format.

INTRODUCTION

Of all the crocodilians, the genus *Paleosuchus* is perhaps the least known. Neither of the two species assigned to the genus, *P. palpebrosus* (Cuvier, 1807) and *P. trigonatus* (Schneider, 1801) is well known. Specimens of the genus are found in South America, in swift moving, often turbulent waters of the tropical rain forest. The southernmost locality appears to be Bahia; to the west it is found from Rio Abuna, Bolivia, and from the Huallaga and Ucayali in Peru. In the north, it is known from the Rios Sansa and Ocoa, Colombia, and as far north as Angostura on the Rio Orinoco, Venezuela. To the east, it is found mainly in Guiana, Surinam and Mexiana Island. Both species apparently occur together not only over most of the Amazon and Orinoco basins, but even as far as extreme eastern Brazil (Medem, 1958).

Although their hide, because of its osteoderm, is of little value, they are hunted by natives for use as food, and such activity very likely has reduced their range since the above distribution was recorded. Medem (1958) noted that individuals, even juveniles, were always solitary. It is known that they hide most of the day and hunt in late evening (Medem, 1958). There are a few *Paleosuchus* in captivity. In a survey of American zoos, only 15 animals were located: 5 males, 3 females and 7 of undetermined sex (Dobbs & King, 1975). Information on reproduction in the genus is incomplete. Only recently has work been done on *P. palpebrosus* (Medem, 1972), resulting in successful propagation, and only preliminary reproductive data from eggs found in the wild are available for *P. trigonatus* (Dixon & Soini, 1975). Here I report the first successful captive propagation of *Paleosuchus trigonatus*.

MATERIALS AND METHODS

The Zoological Society of Cincinnati obtained a juvenile male *P. trigonatus* in March, 1966, and a juvenile female in May, 1967. Both were purchased from the same individual but no locality data are available. Eventually they were placed in a circular pool, with a concrete island, located in the Reptile House lobby. The pool housed many other species of crocodilians of varying ages and sizes. Breeding was first observed early in 1975. Eggs were laid on the night of 24 March, 1975, on the

island. Unfortunately they rolled into the water and all were broken but one, which proved to be infertile. It was then decided to concentrate efforts with these *Paleosuchus* and isolate them in a separate enclosure, which was provided in September, 1975.

The new enclosure is a large indoor exhibit located at one end of the Bird House. The area is densely vegetated with live plants and covered with a large skylight which provides a natural photo-period. The enclosure consists of a pool 3.35 x 3.66 x 1.22 m in depth, rising at a gradual incline to a land area of 3.66 x 2.44 m. The water temperature ranged from 21° C in winter to over 27° C in summer. The air temperature was about 21° C in winter, with the summer temperature determined largely by the outside natural conditions. The area was readily open to the public, with only a railing fence as separation. Prior to isolation in the new enclosure, the female specimen was 1.22 m in length and the male specimen was quite large at just over 1.83 m. Their diet consisted of blue fish, horse meat, and rats as supplements. They were fed twice a week in summer and offered feed every 10 days in winter, but the animals showed little interest in feeding during the winter. The move to the new enclosure proved to be quite traumatic for the two caiman and resulted in both animals going off feed for nearly one year. No signs of breeding were noted, but early in 1979 eggs were produced. These eggs were removed and incubated artificially. They were placed in a styrofoam container (180 mm deep and 415 mm square) and covered with peat moss. The eggs were buried in the center, and the container was covered with a sheet of glass. Incubation temperature fluctuated from 29°-31° C and from 92-100% relative humidity. Periodically the peat moss was sprayed with water. Temperature and humidity of the peat moss were monitored twice daily (early morning and late afternoon) and a visual check of the eggs was made weekly. The artificial incubation resulted in the hatching of six caiman.

RESULTS AND DISCUSSION

Seventeen eggs were observed on 8 January, 1979, at 0200. The eggs had apparently rolled into the water, but could not be retrieved until 0700. Water temperature upon removal was 15° C. When removed, the eggs were covered with a clear gelatinous substance. Because it was unknown if the five hours in water had ruined the eggs, one egg was opened after 28 days. It was found to be fertile and there was visible body development (eyes and beginnings of leg protrusions and a visible heart beat).

Since the incubation period for *P. palpebrosus* is known to be 90-92 days (Medem, 1972), the eggs were candled on 4 April, after 94 days of incubation, and of the 16 eggs remaining, 7 were found to be fertile. All eggs were uniform in size and weight with a rough calciferous surface (Fig. 1). With no signs of hatching after 102 days, another egg was opened on 10 April. This particular egg was selected because it had a small crack in one end of the shell, with a clear substance containing blood vessels protruding. The egg

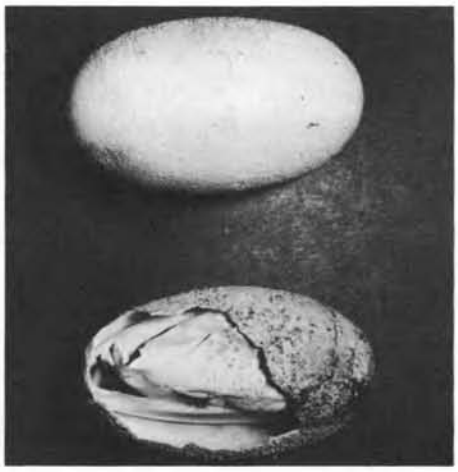


Figure 1. Unhatched and hatched egg; note inner membrane separated from outer shell in hatched egg. Janet Ross, Zoological Society of Cincinnati.



Figure 2. Young caiman after entering water. Fred Straub, Cincinnati Enquirer.

contained a live, alert animal thought to be 1-3 weeks premature. The animal measured 180 mm and was fully developed except for a small amount of scale area around the yolk sack attachment area. The young caiman, still in the lower half of the egg, was placed in a small covered container with a moist paper towel to retard moisture loss. It lived for 25 hours, during which time it remained alert and defensive but made no effort to free itself from the egg sack. The animal was preserved (CVG-A. 38089).

Although incubation had gone well beyond the expected time, it was decided to let the remaining eggs run their full course. Beginning 1 May, 112 days after oviposition, the eggs were uncovered daily and a grunt call was made along with a gentle movement of the eggs to simulate the actions of the adult female caiman (Medem, 1972). The peat moss covering was sprayed with water each time to replace any moisture loss and maintain the desired humidity level. On 3 May, after 114 days of incubation, as the eggs were moved, a crack developed in one. Because the crack neither extended nor widened and no return call came from the egg, it was covered again and left for the night. The next morning (14 hours later) the cracked egg looked the same. However, after the movement of the egg and calling procedure was repeated, in a single motion, the young caiman propelled itself headfirst out of the egg. The hatchling was covered with a thin clear mucus, like that noted by Medem (1972) for *P. palpebrosus*. Since Medem (1972) found that a hatchling *P. palpebrosus* placed directly into water died, the young caiman was placed in a tank containing a mixture of moistened sheet moss and peat moss and a piece of cork bark under which it could hide. The caiman was kept in this container for 24 hours, in keeping with the notion that hatchlings in the wild spend from 24-48 hours in debris and dry leaves to allow the mucus to dry completely and to allow a toughening of the hide to occur. This procedure was repeated with the remaining hatchlings.

TABLE 1. Weight and Length Measurement for Six Hatchling *Paleosuchus trigonatus* on 9 May, 1979

	Length (mm)		Weight (g)
	Snout-Vent	Tail	
1.	112.0	110.0	45.5
2.	111.0	110.0	46.2
3.	111.0	96.0	46.5
4.	110.0	112.0	43.5
5.	110.0	110.0	44.0
6.	109.0	112.0	47.5

By 7 May, 118 days after the eggs were laid, six caiman had hatched (Table 1). Three responded to the call and egg movement procedure and immediately emerged; one came out at night on its own, and two cracked their eggs and returned a call but remained in the egg up to 48 hours before completely emerging. After the 24-hour drying-out period, the young were placed in a 30-gallon aquarium with one end elevated about three inches. The higher end contained moistened peat and sheet moss mixture; the lower end contained water and a cork bark shelter. All hatchlings remained on the elevated moss area, often digging under moss for seclusion, and then entered the water during the dark evening hours. They continued their seclusion under the bark and seldom left the water (Fig. 2).

The adult female caiman is known to aid in the cracking of the shell if the hatchlings cannot get out on their own (Medem, 1971). In the present case, the hatchlings readily cracked the eggs themselves. Actually, at the point of hatching, the hard, brittle outer shell seemed to be visibly weakened with the hairline cracks and fell away easily from the thick inner membrane as the young emerged. Of the six hatchlings, one developed an abdominal problem and died two weeks after birth. The animal was preserved (CVG-A. 38131). The remaining five were alert and healthy in appearance and were offered a first food of crickets (dusted with vitamins) after 14 days. When these were readily accepted, live gold

fish and live juvenile mice were added to the diet and kept available to the caiman at all times. As of 19 October, 1979, all five are doing well and growing rapidly.

Acknowledgments

I would like to thank Edward Maruska, Dr. Kraig Adler, Dr. Leslie Garrick, and Dr. Richard Davis for reviewing this manuscript, and those others who gave helpful comments. The two dead embryos (CVG-A. 38089, CVG-A. 38131) are in the Cincinnati Zoo's preserved collection.

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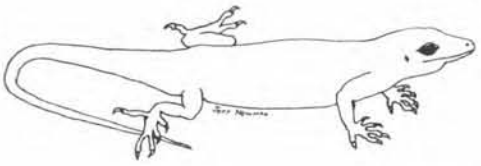
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BREEDING AND REARING OF CAPTIVE SOLOMON ISLAND GROUND BOAS, *Candoia carinata paulseni*

This paper concerns captive breeding and rearing of the Solomon Island Ground Boa, *Candoia carinata paulseni,* in four successive years. Prior descriptions of the reproductive biology of this species are scarce. *International Zoo Yearbook* (1975) mentions two litters born in 1973, one in Bristol, England, and the other at the Institute for Herpetological Research in Redwood City, California. Murphy *et al.* (1978) commented on the use of vestigial limbs in the courtship of *Candoia bibroni,* and reported the birth of 64 still-born *Candoia carinata* in February 1974. No breeding information was given.

Materials and Methods

Two female *Candoia carinata paulseni* (*A* and *B*, total lengths 82 cm and 58 cm, respectively) were obtained in June 1973. That September a 57 cm male was received. Two additional females (*C* and *D*, total lengths of 60 cm and 105 cm, respectively) were available in 1977 on breeding loan. Sexes were determined by the presence (males) or absence (females) of spurs. No historical data were available for any of the specimens. During the study all snakes were maintained under indoor conditions in Tampa, Florida (27°58'N, 82° 32'W).

Snakes were housed in two glass-fronted wooden cages (90 x 52 x 62 cm) with Sani-Cel® (ground, dehydrated corn husk) provided for bedding. Except during the winter, cage temperature and humidity were dependent upon natural environmental conditions; from December through February the room was heated to maintain a minimum temperature of 14° C; the maximum was 21° C. Presence of a large window near the cage fronts provided a natural light cycle. Adults were offered mice and young rats weekly. Young were fed one to two weeks after birth on small *Anolis sagrei* or day-old pinkie mice. Anoles and pinkie mice were offered every ten days thereafter, except to Litter 6 which was offered food every five days.

Observations

First Breeding Season

From the time of acquisition the male was housed alternately with females *A* and *B*. During this period I observed no courtship or copulatory behavior. Early in March of 1975, the male was caged alone. On 19 April 1975, the male (62 cm) was returned to the cage with the two females (67 cm and 92 cm). No signs of courtship or mating were observed. On 20 April 1975, at 1400 h, I observed copulation for the first time between the male and female *A*. The tails were entwined vent to vent and the snakes were motionless. Breeding in this manner occurred periodically for approximately four weeks, with the longest duration of continuous copulation lasting about four hours. The last date of observed mating was 20 May 1975. Copulation was never noted between the male and smaller female *B*. The specimens were not fed during this period. By the end of May, all of the animals, still housed together, were again feeding well. By mid-October female *A* appeared heavier than would be warranted from the amount of food ingested and was assumed to be gravid.

On 2 November 1975, at 0130 h, eight neonates were noted in the cage, some crawling around and some within amniotic membranes. At this time I observed two more births; each took approximately three minutes with a 15 minute interval. By 1000 h, the entire brood of 27 young had appeared. All were active, some had undergone their initial shed, and all shed by the second day. The cloacal region of each neonate was examined for the presence or absence of spurs. Information concerning the sex and size of young is presented in Table 1. All young possessed one of two distinct dorsal patterns on a grayish ground color. One dorsal pattern consisted of a continuous dark gray dorsal stripe resembling that of the adult male, the other a lighter gray broken stripe resembling that of the adult female. These patterns were not sexually dimorphic.

Second Breeding Season

The second brood was produced by the smaller female *B*. All three snakes (male, females *A* and *B*) were housed together throughout the spring and summer months of 1976. Although I observed no courtship or copulation, it likely occurred during the

Table 1. Data for breedings and broods of *Candoia carinata paulseni*

Litter #	Year	Female	% Males	% Females	Weight of Young (g) Mean (Range)	Length of Young (cm) Mean (Range)
1	1975	A	55.6	44.4	4.6 (4.4-4.7)	23.6 (22.1-24.0)
2	1976	B	63.2	36.8	4.2 (4.0-4.5)	21.5 (19.0-22.3)
3	1977	A	40.9	59.1	4.4 (4.1-4.8)	22.8 (22.3-23.5)
4	1977	C	50.0	50.0	4.3 (4.0-4.8)	22.7 (21.6-23.3)
5	1977	D	48.5	51.5	4.5 (2.8-5.2)	23.2 (18.5-24.7)
6	1978	B	45.8	54.2	4.3 (4.0-4.7)	22.5 (22.1-23.1)
Grand Means			50.4	49.6	4.4 (2.8-5.2)	22.8 (18.5-24.7)

Table 2. Average growth of juvenile *Candoia carinata paulseni;* feeding regimen as described in text. Sizes in table given as length in cm (weight in g).

Litter #	1	2	3	4	6
Birthdate	11/2/75	1/7/77	12/6/77	12/22/77	11/10/78
Age (Months)					
0	23.9	22.2	23.6	23.3	22.8
	(4.6)	(4.4)	(4.6)	(4.7)	(4.5)
4	—	—	—	—	25.5
	—	—	—	—	(9.6)
5	25.6	26.0	—	—	—
	(10.8)	(10.9)	—	—	—
6	—	—	26.1	26.8	—
	—	—	(11.6)	(12.0)	—
8	—	—	—	—	34.0
	—	—	—	—	(21.4)
12	—	29.8	—	—	—
	—	(19.3)	—	—	—
14	30.5	—	—	—	—
	(18.5)	—	—	—	—
15	—	—	34.7	34.1	—
	—	—	(21.5)	(20.2)	—
18	—	36.0	—	—	—
	—	(28.6)	—	—	—
19	34.2	—	51.0	56.7	—
	(22.7)	—	(38.0)	(42.6)	—
26	38.6	43.2	—	—	—
	(33.5)	(50.7)	—	—	—
30	—	56.3	—	—	—
	—	(97.5)	—	—	—
31	44.2	—	—	—	—
	(44.8)	—	—	—	—
40	48.2	—	—	—	—
	(58.4)	—	—	—	—
44	59.7	—	—	—	—
	(96.1)	—	—	—	—

months of June through August in my absence. By December female *B* appeared gravid.

On 1 January 1977, at 1430 h, female *B* gave birth to 19 young; 15 were alive, two perfectly formed but stillborn, and two deformed and stillborn. Shedding occurred two to four days after birth. Sizes and sex ratios are given in Table 1.

Third Breeding Season

In April 1977, the male was introduced to females *A* and *B* after a three month separation. Within two hours copulation occurred with female *A*. One week later the male was transferred to the cage containing females *C* and *D*. During the next two weeks the male copulated with each of these females. The male was then reintroduced to females *A* and *B* and copulation occurred with female *A*. A few days later the male was placed with females *C* and *D*, and copulation occurred with each of these females. By the end of May all mating activity had ceased.

On 6 December 1977, female *A* gave birth to 22 young of which five were stillborn. Female *A* died on 10 March, three months after giving birth. She was not autopsied.

On 22 December 1977, female *C* gave birth to 16 neonates, 11 of which were stillborn. On 5 January 1978, female *D* gave birth to 33 perfectly formed stillborns.

Fourth Breeding Season

The male was introduced to female *B* in April 1978, and copulation occurred within 30 minutes. After one week the male was removed and placed with females *C* and *D*. Copulation was not observed and after two weeks the male was returned to female *B*. Again, copulation began immediately with female *B* and recurred sporadically over the next two weeks, after which time the male was reintroduced to females *C* and *D*. Once again no copulation was observed and after two weeks, in early June, the male was placed with female *B*. No further copulation was observed.

On 10 November 1978, female *B* gave birth to 24 live young.

Summary of Breeding Observations

The preceding observations indicate that captive *Candoia carinata paulseni* may follow a fixed reproductive pattern. Females seem to be receptive for a period of about two months (April — May), during which time copulation occurs intermittently. Unlike *Candoia bibroni* (Murphy *et al.*, 1978), *Candoia carinata paulseni* do not appear to use the pelvic spurs during courtship. Furthermore, females appear to be receptive only every other breeding season. Huff (1978) mentions that many, if not all, of the insular forms of *Epicrates* follow this biennial reproductive cycle.

The large proportion of stillborns in Litters 4 and 5 may have been caused by either of two factors: 1) the very harsh winter (although the temperature never dropped below 14° C, it may have remained low for too long a period of time), or 2) insufficient time for the females to adjust to the new environment, since they had been placed in the collection two months prior to copulation.

Behavior of Young

All young *Candoia* specimens resembled the adults in coloration and pattern. Their light gray color tends to become more vivid and distinct with age, and at three years they possess the adult coloration.

From my observations, the young are hardy, feed well from birth, and adapt easily to captivity. Growth data are summarized in Table 2.

Two protective traits not seen in the adults were noted in newborn snakes. When disturbed, the young feigned death (appearing stiff and lifeless) or, less frequently, balled up (tucking head into middle of coils). This balling behavior observed in the young also has been seen in adult *Candoia aspera* (Bustard, 1969).

Acknowledgments

My sincerest thanks go to Bob Wallen who loaned me specimens, to Sandy Russo who typed the early drafts, to Karyn Wallace who typed the manuscript, to Paul Halibrin, Steve Godley and Dr. Roy McDiarmid for reading early drafts. A special thanks goes to Dr. Dale Jackson for guidance and critically reading the manuscript.

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REPRODUCTION OF *LAMPROPELTIS TRIANGULUM ELAPSOIDES* FROM ONSLOW COUNTY, NORTH CAROLINA

There are few reports of reproduction of the scarlet kingsnake *(Lampropeltis triangulum elapsoides)* in the literature. Williams (1978) summarized the known data, citing accounts from North Carolina (Palmer: 1961, *in litt.*), Mississippi (Allen, 1932), and Duval County, Florida (Groves and Sachs, 1973). Reproductive data from a Dade County, Florida specimen has also been published (Groves and Assetto, 1976) (Table 1). This report deals with the oviposition, incubation, and hatching of a clutch of eggs from a gravid female from North Carolina.

On 30 April 1979, a female *L. t. elapsoides* (total length 492 mm, snout-vent length 421 mm) was collected under a rusty lawnmower near Holly Ridge, Onslow County, North Carolina (Barten, 1979). She was placed in a ten gallon aquarium with newspaper substrate, a piece of cork bark, and a water dish. On 4, 8, and 27 May 1979, she ate frozen-thawed newborn mice. She shed on 25 May 1979. A plastic shoe box was filled with sawdust that had been collected from an abandoned logging camp near the female's capture site. A 2 cm access hole was cut in one side, and the box was placed in the aquarium with the female. She was observed to spend much time burrowing through the sawdust.



Fig. 1. Hatching scarlet kingsnake, *Lampropeltis triangulum elapsoides.*

On three occasions during the week of 7-14 May 1979, the female was placed with a male *L. t. elapsoides* that had been captured at the same site five years earlier. The male was observed to court the female, who fled whenever mounting was attempted. Actual copulation was not observed. On 14 May 1979, the caudal one-third of the female was observed to be quite distended. The snake was diagnosed gravid and was separated from the male.

At 0700 hours on 4 June 1979, five eggs were discovered in the sawdust. They were presumed to have been deposited the previous evening, just 7 days after the female's last meal. The eggs were adhered together in a cluster. Measurements with a vernier caliper were 24.8-26.2 x 13.5-14.0 mm (mean 25.2 x 13.8 mm). Incubation was accomplished by removing the female from the aquarium and leaving the eggs in place in the sawdust. The temperature ranged from 23-28° C during the day and 20-23° C at night.

On 5-6 August 1979, after 63 days, the eggs hatched. The 2 male and 3 female hatchlings ranged in size from 178-188 mm (mean 182.6 mm). The natal skins were shed on 11-13 August 1979. All five hatchlings ate metallic skinks *(Leiolopisma metallicum)* and ground skinks *(Leiolopisma laterale)*, both alive and frozen-thawed. They refused newborn brown snakes *(Storeria dekayi)*, small anoles *(Anolis carolinensis)*, and western chorus frogs *(Pseudacris triseriata)*.

TABLE 1. Reproductive Data for the Scarlet King Snake *(Lampropeltis triangulum elapsoides).*

Copulation	29 May	Palmer (*in litt.*)
Gravid Female Collected	30 April	Barten
	May	Groves and Sachs (1973)
	June	Allen (1932)
	September	Groves and Assetto (1976)
Oviposition	3 June	Barten
	3 June (2 clutches)	Groves and Sachs (1973)
	4 July	Palmer (*in litt.*)
	8 October	Groves and Assetto (1976)
Egg Size	24.8-26.2 x 13.5-14.0 mm	Barten
	27.7 x 10.8 mm	Palmer (1961)
	21.2-28.4 x 9.4-11.7 mm	Groves and Sachs (1973)
	23.2-30.2 x 9.6-11.8 mm	Groves and Assetto (1976)
Clutch Size	3, 4, and 6 eggs	Palmer (1961), (*in litt.*)
	5 eggs	Groves and Assetto (1976)
	5 eggs	Barten
	4 and 7 eggs	Groves and Sachs (1973)
Hatching	5-6 August	Barten
	7 and 9 August (2 clutches)	Groves and Sachs (1973)
	23-24 August	Palmer (1961)
	11 September	Palmer (*in litt.*)
	12 December (dead embryo removed from egg)	Groves and Assetto (1976)
Measurements of Neonates	146 and 159 mm	Palmer (1961)
	138.0-203.4 mm	Groves and Sachs (1973)
	150 mm	Groves and Assetto (1976)
	178-188 mm	Barten

Acknowledgments

Thanks to Jerry Reynolds for collecting and donating the female *L. t. elapsoides.*

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NEWSNOTES

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The titles below (plus numerous others omitted for brevity) were presented at the 1980 Symposium; the proceedings volume may be obtained by writing to:

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Titles:

Mr. John Coborn (Symposium Organiser): "Introductory Speech."

Prof. H. S. R. Glaser (Giessen, W. Germany): "The programmable environmental control system for the Amphibian and Reptile exhibit at the Roeding Park Zoo, Fresno, California."

Dr. T. Hagström (Göteborg, Sweden): "Reproductive strategy and success of frogs and newts in waters acidified by atmospheric pollution."

Dr. T. Beebee (BHS Conservation Committee): "Ecology and conservation of the Natterjack Toad, *Bufo calamita*, in Britain."

Dr. D. Dolmen (Trondheim, Norway): "Distribution and habitat of the common newt *Triturus vulgaris* and the warty newt, *T. cristatus* in Norway."

Dr. K. Klemmer (Frankfurt, BRD): "Amphibian conservation in Hessen - Bundesrepublik Deutschland."

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Reproduction in the mole king snake, *Lampropeltis calligaster rhombomaculata* (Serpentes, Colubridae).

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B. Camazine and D. Crews
Museum of Comparative Zoology, Harvard University

Reproductive Energetics of the Painted Turtle *(Chrysemys picta)*
J. D. Congdon
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H. S. Cuellar
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H. S. Fitch
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S-m. Ho, S. Kleis, S. Taylor and I. P. Callard
Department of Biology, Boston University

Water Relations and Structure of Reptilian Eggs
G. C. Packard, M. J. Packard and T. J. Boardman
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School of Biological Sciences, University of Sydney

Comparative Demography of *Basiliscus basiliscus*
R. W. Van Devender
Department of Biology, Appalachian State University

Ecological and Evolutionary Determinants of Relative Clutch Mass in Lizards
L. J. Vitt and H. J. Price
Museum of Natural History and Department of Zoology, University of Georgia

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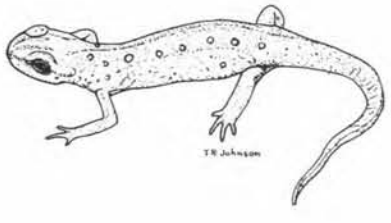
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Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles** , Collins, Huheey, Knight and Smith, 1978), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address).

Some further comments. This geographic distribution section does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Joseph T. Collins, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

CAUDATA

GYRINOPHILUS PORPHYRITICUS PORPHYRITICUS (Northern Spring Salamander). USA: MASSACHUSETTS: Middlesex Co: 1.2 km S of Ashby. DOR found 16 June 1969 by Eric Davis of Fitchburg State College. Verified by T. E. Graham. Fitchburg State College (FSC-061669). Extends the range one county eastward (Lazell, 1972, Reptiles & Amphibians in Massachusetts, Publ. Massachusetts Audubon Society, 35 pp.)

Submitted by **TERRY E. GRAHAM,** Department of Biology, Worcester State College, Worcester, Massachusetts 01602. ●

HEMIDACTYLIUM SCUTATUM (Four-toed Salamander). USA: ILLINOIS: Lawrence Co: About 5.5 km W Lawrenceville, in Red Hills State Park. 18 September 1963. G. R. Thurow. Verified by H. Marx, Field Museum of Natural History. Western Illinois University Collection (WIU 106). This record was transmitted orally to P. W. Smith, and through him to R. Conant, where the record is shown on the distribution map (Conant, 1975, A field guide to reptiles and amphibians of eastern and central North America, Houghton Mifflin Co.), but no detailed locality is given. This record details one of the sporadic localities in the southern three quarters of Illinois.

Submitted by **G. R. THUROW,** Department of Biological Sciences, Western Illinois University, Macomb, Illinois 61455. ●

ANURA

HYLA CHANEQUE. MEXICO: VERACRUZ: Sierra de Santa Marta, Arroyo Claro, approximately 26 km SE Catemaco and 14 km NE Soteapan, 1100 m above sea level. 22 September 1978. G. Pérez-Higareda. Verified by W. E. Duellman, Univ. Kansas Mus. Nat. Hist. Deposited in the herpetological collection of the Estación de Biología Tropical "Los Tuxtlas", U.N.A.M. (EBT 457). One adult specimen was found on a humid tree covered with ferns nearby a stream. This is a new state record and extends its range approximately 160 km to the northeast of the previously recorded localities (Duellman, 1970, The hylid frogs of Middle America, Mon. Mus. Nat. Hist. Univ. Kansas, Vo. 2:249-753).

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TESTUDINES

PSEUDEMYS SCRIPTA ELEGANS (Red-eared Slider) USA: WEST VIRGINIA: Wirt Co: 0.8 km S Elizabeth, Little Kanawha River. July 1979, September 1980. One adult male and one adult female. James Gould. Marshall University, West Virginia Biological Survey collection (WVBS 4453-4454). Extension of range 62 km NE in the Ohio River Valley. OHIO: Lawrence Co: Floodplain of Ohio River, 1 km W Chesapeake. April 1979, two sub-adults, M. E. Seidel, (MES 752). Vesuvius Lake, April 1980, Paul Seidel, (MES 753). These records fill a gap in the range between the Scioto River, Ohio, and Kanawha River, West Virginia (Adler, 1968, J. Herpetol. 2:117-120).

Submitted by **MICHAEL E. SEIDEL** and **N. BAYARD GREEN,** Marshall University, Huntington, West Virginia 25701. ●

SAURIA

HELODERMA HORRIDUM EXASPERATUM (Rio Fuerte Beaded Lizard). MEXICO: Sonora: Movas. 5 August 1979. L. Corral and J. R. Ottley. Identified by J. R. Ottley. Brigham Young University (BYU 34504). Extends range approximately 140 km north of the Alamos-Guirocoba area (Bogert and Martin del Campo, 1956, The Gila Monster and Its Allies, Bull. Amer. Mus. Nat. Hist., vol. 109:238 pp.). Movas is in the western foothills of the Sierra Madre Occidental, a transition zone between the thorn forest and desert scrub. *H. h. exasperatum* probably occupies much of the Sonora foothill region where the thorn forest provides suitable habitat.

Submitted by **JOHN R. OTTLEY,** Department of Herpetology, 290 MLBM, Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah 84602. ●

HELODERMA SUSPECTUM CINCTUM (Banded Gila Monster). USA: CALIFORNIA: Inyo and San Bernardino counties: Kingston Range, 5.5 km ENE Horse Thief Springs, 945m 4 May 1980; 1.4 km W Porcupine Tanks, 1220m 20 May 1980; 2.6 km W Kingston Peak, 1130m 3 June 1980. R. S. Ford. Three adults sighted, no specimens taken due to protected status. Documentation made with a black and white photograph (Fig. 1). All three individuals were found in sandy washes in the vicinity of large boulders. Plant associates included *Acacia greggii, Ambrosia dumosa, Ephedra funerea, Larrea tridentata,* and *Prunus fasiculata.* Three sightings of *H. s. cinctum* have been previously reported in the Mojave Desert of California. One specimen was taken at the base of the eastern slope of the Clark Mountains (Bradley and Deacon, 1966, Copeia (2): 365-366). Another was taken from the western slope of the Providence Mountains (Brown, 1976, unpublished report prepared for the Bureau of Land Management, Riverside, California). The third was taken from the California side of Imperial Dam on the Colorado River (Funk, 1966, Herpetologica 22(4): 254-258). This report presents the fourth reported location for *H. s. cinctum* in California, and represents a 48 km range extension northwest of Clark Mountain. Bradley and Deacon (1966) also cited a specimen taken from the eastern slope of the Spring Range in southeastern Nevada. With the exception of Imperial Dam, all of these sightings are associated with cool, high desert areas. This fact supports the hypothesis that these sightings represent populations existing only as small isolated relicts of the Pleistocene epoch when the climate of the Mojave region was much cooler and the potential range of Gila Monsters much wider. *Heloderma suspectum* is recognized as a resident species in California and is fully protected by California Department of Fish and Game.

Submitted by **R. S. FORD,** Environmental Field Program, University of California, Santa Cruz, California 95064. ●



Fig. 1. *Heloderma suspectum cinctum* found in a sandy wash at the bottom of a canyon 1.4 km west of Porcupine Tanks, 1220m, Kingston Range, San Bernardino County, California, 20 May 1980.

HELODERMA SUSPECTUM SUSPECTUM (Reticulate Gila Monster). MEXICO: Sonora: 19.7 km (by Mex. Hwy 001) WNW Alamos. 9 August 1979. J. R. Ottley and K. A. Stockton. Identified by J. R. Ottley. Brigham Young University (BYU 36848). Extends the range eastward approximately 16 km into the thorn forest desert scrub transition. In July 1974 I identified and released an adult *H. horridum exasperatum* 16.8 km WNW Alamos. These observations indicate a likely range overlap between the two species in that area.

Submitted by **JOHN R. OTTLEY,** Department of Herpetology, 290 MLBM, Monte L. Bean Life Science Museum, Brigham Young University, Provo, Utah 84602. ●

PETROSAURUS THALASSINUS REPENS (Central Baja Rock Lizard). MEXICO: Baja California del Norte: Jaraguay. 9 June and 6-7 July 1978. J. R. Ottley, R. W. Murphy, and J. C. Cram. Identified by J. R. Ottley. Brigham Young University (BYU 33934-33953). Second record for subspecies in Baja California del Norte. The previous and most northerly record for this subspecies is from the Pacific drainage at a locality 17.4 km northeast of Rancho Santa Catarina (Bostic, 1971, Trans. San Diego Soc. Nat. Hist., 16:237-263). The Jaraguay specimens extend the range approximately 32 km east by southeast onto the Sierra Columbia uplift. Although *P. t. repens* and *P. mearnsi mearnsi* have not been found together, their ranges indicate a sympatric relationship in this region since the Jaraguay *P. t. repens* penetrate well into the range of *P. m. mearnsi;* the latter having been taken by us 12.8-25.6 km north (Catavina and Santa Inez, BYU 33915, 34889-34890) and 14.4 km south (El Pedregoso, BYU 33916) of Jaraguay.

Submitted by **JOHN R. OTTLEY,** Department of Herpetology, Monte L. Bean Life Science Museum, 290 MLBM, Brigham Young University, Provo, Utah 84602, and **ROBERT W. MURPHY,** Department of Biology, University of California, 405 Hilgard Avenue, Los Angeles, California 90024. ●

SERPENTES

CARPHOPHIS AMOENUS AMOENUS (Eastern Worm Snake). USA: NEW YORK: Albany Co: corner of Everett Road and Watervliet Avenue extension, West Albany. 26 June 1975. D. Bauer. 322 mm total length. New York State Museum (NYSM 32864). NEW YORK: Albany Co: west Albany 27 May 1976 male, 240 mm total length. 3 June 1976 female, 285 mm total length, taken and released, John Rossi. NEW YORK: Albany Co: Karner's Corners, Amoena Brook specimen taken 20 May 1902, (NYSM 102), D. A. Trask. The recent records follow a period of 73 years without any report of the species in the Albany area. The nearest known area of occurrence in New York is in Orange County, Bear Mountain State Park, Lake Tiorati, (144 km to the south). The Albany Pine Plains, where the worm snake occurs, is under the threat of development and the northernmost known colony of this species may soon disappear. The Pine Plains lie between the cities of Albany and Schenectady; fourteen species of amphibia and thirteen reptile species have been recorded in the area during recent surveys by Rossi.

Submitted by **E. M. REILLY, JR.,** N.Y.S. Museum and Science Service, Cultural Education Center, Room 3140, Albany, New York 12230 and **JOHN ROSSI,** Biology Department, University of South Florida, Tampa, Florida 33612. ●

CROTALUS VIRIDIS HELLERI (Southern Pacific Rattlesnake). MEXICO: Baja California del Sur: *ca.* 7 km E Guerrero Negro. 8 April 1974 S. G. Bennett. Verified by R. B. Loomis. LACM 132250. This snake was maintained in the live herpetological collection at California State University, Long Beach for nearly seven years. This is the second record of this species (and subspecies) from Baja California del Sur. It was found approximately 50 km W and slightly N of the other specimen from 14 km S El Arco (Smith, H. M., R. L. Holland and R. L. Brown. 1971. The prairie rattlesnake in Baja California del Sur. J. Herpetol. 5(3-4):200.). These two specimens represent the southernmost limit for this subspecies.

Submitted by **LAWRENCE L. C. JONES,** Department of Biology, California State University, Long Beach, Long Beach, California 90840. ●

CROTALUS VIRIDIS HELLERI (Southern Pacific Rattlesnake). MEXICO: Baja California del Sur: 25.6 km (by paved road) SSW El Arco, BCN. 17 July 1979. J. R. Ottley and L. E. Hunt. Identified by J. R. Ottley. Venom Research Lab, V.A. Hospital, Salt Lake City and Brigham Young University (BYU untagged). Represents the second known record of the subspecies for the state and extends the known range 9.6 km to the south (Smith et al., 1971, J. Herp., 5:200). The specimen is an adult female with a total length of 775 mm and fits the parameters set for the subspecies (Klauber, 1972, Rattlesnakes, Univ. California Press, Berkeley and Los Angeles) with a slight tail-pattern alteration in that the juvenile yellow-gold color is retained.

Submitted by **JOHN R. OTTLEY,** Department of Herpetology, Monte L. Bean Life Science Museum, 290 MLBM, Brigham Young University, Provo, Utah 84602, and **LAWRENCE E. HUNT,** Division of Herpetology, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. ●

DROMOPHIS LINEATUS. KENYA: Nyanza Province: Kisumu Dist: Chemelil. 11 October 1976. Leo G. Hoevers. Verified by Robert C. Drewes, California Academy of Sciences (CAS 147997). First record of the genus from Kenya; adult female; stomach contents a large *Bufo.*

Submitted by **LEO G. HOEVERS,** P.O. Box 177, Muhoroni, Kenya; Field Associate, California Academy of Sciences, San Francisco. ●

DUBERRIA LUTRIX ATRIVENTRIS. KENYA: Western Province: Kakamega Dist: Mumias. 17 January 1976. Leo G. Hoevers. Verified by Robert C. Drewes, California Academy of Sciences (CAS 141532). First record of the subspecies from Kenya.

Submitted by **LEO G. HOEVERS,** P.O. Box 177, Muhoroni, Kenya; Field Associate, California Academy of Sciences, San Francisco. ●

MEIZODON CORONATUS. KENYA: Nyanza Province: Kisumu Dist: Chemelil. 7 October 1978. Leo G. Hoevers. Verified by Robert C. Drewes, California Academy of Sciences (CAS 150931). Known previously from Tana River delta, new record extends range ca. 600 km northwest.

Submitted by **LEO G. HOEVERS,** P.O. Box 177, Muhoroni, Kenya; Field Associate, California Academy of Sciences, San Francisco. ●

PITUOPHIS MELANOLEUCUS MUGITUS (Florida Pine Snake). USA: Florida: Dade Co: Old Cutler Road, between 177 and 176 streets. 16 February 1980. Dorie Karl and Gary Patterson. Verified by Peter Meylan (Florida State Museum). Florida State Museum (UF 45970). This is the second record for this species in Dade County. The previous record (University of Miami UMRC 55-394) reported by Duellman and Schwartz (1958. Amphibians and reptiles of southern Florida. Bull. Florida St. Mus. Biol. Sci. 3(5):181-324.) lists southwestern part of Miami as the locality. Additional evidence suggests that their specimen may have been an escaped pet (Albert Schwartz, pers. comm.). No evidence was found to suggest that this present specimen was an escaped pet. This record extends the southern range given by Carr and Goin (1955. Reptiles, Amphibians, and Freshwater Fishes of Florida. University of Florida Presses; Gainesville.) a minimum of 75 km.

Submitted by **TODD M. STEINER,** Archbold Biological Station, Route 2, Box 180, Lake Placid, Florida 33852. ●



POLEMON CHRISTYI. KENYA: Western Province: Kakamega Dist: Kakamega Forest. 22 December 1977. Leo G. Hoevers. Verified by Robert C. Drewes, California Academy of Sciences (CAS 147905). Second known specimen from Kenya, submitted because of record size (850 mm, female).

Submitted by **LEO G. HOEVERS,** P.O. Box 177, Muhoroni, Kenya; Field Associate, California Academy of Sciences, San Francisco. ●

RHINOCHEILUS LECONTEI LECONTEI (Western Longnose Snake). USA: California: Monterey Co: Palo Colorado Canyon, 22.5 km SSE Carmel Highlands. 12 July 1967. DOR. Steve Moore. Verified by John Davis. Pacific Grove (California) Museum of Natural History (PGMNH R/1). Hastings Natural History Reservation, 4 km E Jamesburg. 9 June 1973. DOR. Ruth Griffin. Verified by John Davis. MVZ 175787. First records for Monterey County and extend distribution 60 km WSW and 42 km SW, respectively, of previously recorded nearest locality (near Cook P.O., Bear Valley, San Benito County, California).

Submitted by **JOHN DAVIS,** Hastings Reservation, Star Route, Box 80, Carmel Valley, California 93924, and **PHILIP A. MEDICA,** University of California, Laboratory of Biomedical and Environmental Sciences, P.O. Box 495, Mercury, Nevada 89023. ●

SALVADORA GRAHAMIAE LINEATA (Texas Patchnose Snake). USA: TEXAS: Llano Co: 13.4 km S of Llano off TEX 16. 29 March 1981. C. T. McAllister. Verified by E. G. Zimmerman. Arkansas State University Herpetol. Mus. (ASUHM 3941). First record for the county and fills the Edwards Plateau distributional hiatus between the adjacent Mason, Gillespie, Blanco, Burnet and San Saba Counties (Raun and Gehlbach, 1972. Amphibians and Reptiles in Texas, Dallas Mus. Nat. Hist. Bull. No. 2).

Submitted by **CHRIS T. McALLISTER, MICHAEL C. WOOTEN** and **TIMOTHY L. KING,** Department of Biological Sciences, North Texas State University, Denton, Texas 76203. ●

VIRGINIA VALERIAE (Smooth Earth Snake). USA: ILLINOIS: McDonough Co: About 3.5 km W Macomb (Sec. 27, T6N, R3W). 25 June 1978. R. Henry. Verified by H. Marx, Field Museum of Natural History. Western Illinois University Collection (WIU 641). Duplicate specimens seen or collected between 1968-1980 by G. Thurow from two nearby localities also N of the east fork of the LaMoine River; from within Macomb city limits; and from S McDonough County near Grindstone Creek, and near Camp Creek. One specimen also identified from the valley just below the dam at Siloam Springs State Park, Adams County. First records for McDonough and Adams counties, and fills in a west central Illinois northern gap (Conant, 1975, A field guide to reptiles and amphibians of eastern and central North America, Houghton Mifflin Co.).

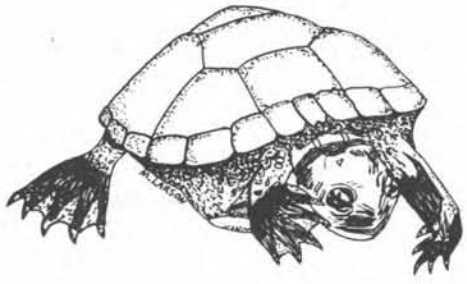
Submited by **G. R. THUROW,** Department of Biological Sciences, Western Illinois University, Macomb, Illinois 61455. ●

OBSERVATIONS ON *CARETTA C. CARETTA:* A RECORD INTERNESTING MIGRATION IN THE ATLANTIC

On 9 July 1979, at Cape Lookout National Seashore, Carteret County, North Carolina, a nesting female Atlantic loggerhead, *Caretta c. caretta,* was observed approximately 4.8 km north of Cape Point. Over-curvature carapace measurements were 97.5 cm in length and 92 cm in width. Maximum head width was 21 cm. Jumbo Roto Tags, NC0024 and NC 0025, were attached to the front flippers.

On 28 July 1979, at Canaveral National Seashore, Brevard County, Florida, the same female was observed laying a clutch of eggs on Playalinda Beach, approximately 1.5 km north of Florida Route 402. During the 19-day interval that occurred between nestings on the two rookery beaches, the turtle had moved a minimum (point to point) distance of 725 km. These observations constitute the longest single season internesting migration record known for *Caretta c. caretta* in the Atlantic Ocean.

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A PERIPHERAL MEXICAN RECORD FOR *CROTAPHYTUS RETICULATUS* FOUND ERRONEOUS

The Múzquiz, Coahuila, record for *Crotaphytus reticulatus* has been a source of annoyance to interested herpetologists for some time. Based on a specimen collected 10 May 1938 by Ernest G. Marsh, FMNH 28612 is important because it represents a record well within the known range of *C. collaris* in north-central Coahuila (Montanucci, 1971, 1974). This implied sympatry has been the focus of at least two unsuccessful attempts to find additional *C. reticulatus* in the Múzquiz area (Montanucci, 1974:96). On a recent visit to the Field Museum, I probed the history of this record as I have long doubted its veracity. Reference to the permanent Museum catalog showed nothing unusual, so I decided to compare Marsh's original field numbers against the Museum's entry. On page 87 opposite field number 90, Marsh entered the following: "large lizard collected 10th [May] 2 mi. N. of Nava [Coahuila]." Marsh's field number 90 also appears on the line bearing the number FMNH 28612 in the Field Museum's catalog. I found no other *Crotaphytus* collected on 10 May nor any other collared lizard listed as coming from "Múzquiz" in Marsh's catalog.

Allan Resetar, a member of the Museum staff, tells me that he has located several entries in the permanent catalog that disagree with Marsh's original field numbers.

Interestingly, Schmidt and Owens (1944) listed the Nava locality in their work on northern Coahuila, but they indicated no catalog number. The citation thus became a literature record, but when inquiries were made about the specimen's whereabouts, it could not be located on the Museum's shelves.

I thank Allan Resetar and Hyman Marx for numerous courtesies extended. Mary Stephenson graciously typed the manuscript.

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ADDITIONS TO THE SNAKE FAUNA OF EL SALVADOR

Although the herpetofauna of El Salvador is relatively well known, recent work has demonstrated the presence of four additions to the known snake fauna of this country. These additions are discussed below.

Crisantophis nevermanni (Dunn)

Crisantophis nevermanni is known to range from the vicinity of San José, Costa Rica (Río Poás de Aserrí), through central and western Nicaragua to southern Honduras (Villa, 1969, 1971; Wilson, McCranie, and Porras, 1979). This report records its occurence in El Salvador.

The Salvadoran specimen of *C. nevermanni* (MHNES 30-216) was collected on 7 May 1977 at an elevation of 250 m in Cantón San Antonio Chávez, 10 km N San Miguel, Departamento de San Miguel. This place is within the Subtropical Moist Forest (Hot) formation of Holdridge (1975).

The specimen is a male with the following characteristics: ventrals, 166; anal plate divided; subcaudals, 84; dorsal scale smooth; dorsal scale reduction formula *19* 3+4(90) *17* (166); supralabials, 8-8, with 4th and 5th entering orbit; infralabials, 9-10; loreal, 1-1; preoculars, 2-2; postoculars, 2-2; temporals, 2+2 on the left and 2+3 on the right; total length, 632 mm; tail length, 175 mm. The color in preservative (alcohol) is: dorsal ground color dark brown, with four narrow white stripes running length of body; the lateral pair of these stripes is on the 1st and 2nd rows; the dorsolateral pair is on the 6th and 7th rows. Each dorsolateral stripe originates immediately posterior to the rostral and passes posteriorly to the nape along the canthus rostralis and the lateral margin of the supraocular scale. Dorsum and sides of head dark brown; supra- and infralabials white with black sutures; supralabials with black dorsal margins. Ventral ground color white, with black flecks on the lateral margins of the ventral scales. The hemipenis may be described as follows: subcylindrical; bilobed; when everted reaches the 12th subcaudal; basal two-thirds naked; covered distally by minute spines, these becoming scarcer towards the middle; *sulcus spermaticus* bifurcates at the 9th subcaudal.

The scutellation and color pattern of the Salvadoran specimen agree well with Dunn's (1937) original description and with those given by Wellman (1963) and Villa (1969, 1971). The ventral count (166), however, even though approximate, is well below the lower end of the range of *C. nevermanni* (173-183). This number of ventrals falls within the known range of *Conophis lineatus dunni* (159-178) as given by Wellman (1963). Examination of the hemipenes of both species, however, demonstrates that the specimen from El Salvador is *Crisantophis nevermanni*.

Ninia atrata (Hallowell)

Until recently *Ninia atrata* was known no further north than Costa Rica (Burger and Werler, 1954; Dunn, 1935), but Meyer and Wilson (1971) have recently recorded this species in southwestern Honduras. In May 1979, I collected 4 specimens (HH 604-07) in Cantón Palo Blanco, 10 km NE Perquín, Departamento de Morazán. The Salvadoran specimens came from an area that falls within the Subtropical Lower Montane Moist Forest formation of Holdridge (1975), at an elevation of 1900 m. They were collected from under logs, clumps of fallen orchids in the forest, and piles of cornstalks in a clearing.

The specimens from El Salvador are all males with the following characteristics: ventrals, 142-146; anal plate single; subcaudals, 50-60 (3 specimens); dorsal scales keeled and striated; dorsal scales in 19 rows throughout; supralabials, 7-7, with 3rd and 4th entering orbit; infralabials, 7-7; loreal enters orbit; preoculars absent: postoculars, 2-2; temporals, 1+2; body length, 205-325 mm; tail length, 56-78 mm (3 specimens). The color in life was: dorsum dark gray; no pale nuchal collar; supralabials cream; venter cream, immaculate or with some dark gray fleckings; ventrals with dark gray outer margins; underside of tail dark gray, becoming most pronounced posteriorly.

Scale counts of the four Salvadoran specimens fall within the ranges given for *N. atrata* by Burger and Werler (1954). Regarding coloration, typical *N. atrata* have a pale nuchal collar. The Honduran specimens reported by Meyer and Wilson (1971), however, were collarless. Similarly, Roze (1966) stated that this collar may be completely absent in some Venezuelan specimens. This collarless pattern is also shared by the Salvadoran specimens I have examined, which, because of this fact, I regard as representatives of *Ninia atrata*. As more material becomes available, it will be possible to better determine the extent of variation of this species in northern Central America.

Sibon nebulata (Linnaeus)

Peters (1960) recorded the range of *Sibon nebulata* as extending from Michoacán and Campeche in México, including all of the Yucatán Peninsula, south to Ecuador and Brasil and the islands of Trinidad and Tobago. This species had been expected to occur in El Salvador but previously no specimens have been collected there.

A single specimen of *S. nebulata* (CG 26) is now available from El Salvador. It was collected in November 1973 in the region of Laguna San Diego, Hacienda San Diego, 6 km S Metapán, Departamento de Santa Ana, altitude 450 m. The snake was captured at night in a tangle of vines growing on volcanic lava (Tropical Dry Forest formation of Holdridge, 1975).

The Salvadoran specimen is a female and has the following characteristics: ventrals, 185; anal plate single; subcaudals, 90; dorsal scales smooth; dorsal scale rows 15 throughout; supralabials, 7-7, with 4th and 5th entering orbit and 6th enlarged; infralabials, 8-7, first pair in contact behind mental; loreal enters eye; no preoculars; postoculars, 2-2; temporals, 1+2; mental groove present; 3 pairs of chin shields; total length, 707 mm; tail length, 184 mm. The color in preservative (formalin) is: dorsal ground color yellowish white; body with 40 irregular chocolate brown blotches, joined ventrally, with cream edges; interspaces pale brown variegated with blotch color, from 1-4 scales wide; supralabials and infralabials cream, with chocolate brown sutures; dorsum of head pale brown stippled with chocolate brown; temporals uniform chocolate brown. Ventral ground color cream. Tail with 15 rings colored as body.

In scutellation and color, the Salvadoran specimen agrees well with the descriptions given by Peters (1960) and Roze (1966) for *S. n. nebulata*, the subspecies expected to occur in this area.

Thamnophis fulvus (Bocourt)

Meyer and Wilson (1971) have recently recorded this snake (as *Thamnophis cyrtopsis*), a species previously unknown south of Guatemala (Stuart, 1963), in southwestern Honduras. Webb (in press) has demonstrated the specific distinctness of *Thamnophis fulvus* from *T. cyrtopsis*. On 5 April 1979 I collected 3 specimens at Cantón El Zancudo, 12 km NE Perquín, Departamento de Morazán. This locality is within cloud forest (Subtropical Lower Montane Moist Forest formation of Holdridge, 1975), at an elevation of 1800 m. These snakes were captured at night in ponds of a creek in a grassy meadow.

The Salvadoran specimens are one male (HH 609) and two females (HH 610-11) and have the following characteristics, in that order: ventrals, 147, 142, 143; anal plate single; subcaudals, 71, 64, 64; dorsal scales keeled, first row weakly keeled; dorsal scale row formula, 19-17; supralabials, 8-8, with 4th and 5th entering orbit; infralabials, 9-10, 10-10, 10-10; loreals, 1-1; preoculars, 1-1; postoculars, 3-3; temporals, 1+2 or 1+3; body length, 350, 383, 408 mm; tail length, 118, 118, 119 mm. The color in life was: dorsal ground color olive to olive brown, with an incomplete vertebral and 2 lateral whitish yellow stripes, these becoming pale brown posteriorly; vertebral stripe separates 2 large black blotches on the nape; dorsum with 2 alternating rows of black spots above lateral stripe; black spots fade posteriorly; lateral stripe confined to 2nd and 3rd scale rows; a series of black spots on the 1st scale row present or absent. Dorsum of head olive brown; supralabials grayish white, with black sutures. Ventral ground color whitish to greenish gray; infralabials and chin creamish white; outer margins of ventrals olive or olive brown. Tongue all black. These specimens are obviously referable to *Thamnophis fulvus*, as defined by Webb (in press).

For allowing me to examine specimens used in the preparation of this paper, I am indebted to Sr. Carlos Guillén, (CG private collection); and Srita. Maria E. Sánchez, Museo de Historia Natural de El Salvador (MHNES). My thanks are also extended to Sres. Miguel A. Ramírez, José García, Roque García for their field assistance, and Gilberto Argueta for his hospitality at Cantón El Zancudo. I am especially grateful to Drs. Larry D. Wilson, Thomas H. Fritts, Robert G. Webb, and Mr. Van Wallach for providing me with

helpful information. In addition, I sincerely thank Drs. Larry D. Wilson and W. Ronald Heyer for criticizing the manuscript. Sra. Estela de Gómez typed the manuscript. The initials HH refer to my private collection in El Salvador.

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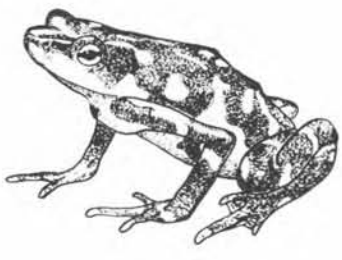
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PROBABLE NATIVE POPULATION OF BULLFROG, *RANA CATESBEIANA,* IN SOUTH TEXAS

The bullfrog, *Rana catesbeiana* Shaw, is a large ranid native to most of the United States east of the Rocky Mountains, but its "natural western limits are now hopelessly confused" (Conant, 1975, A field guide to reptiles and amphibians of eastern and central North America, Houghton Mifflin Co., Boston). *R. catesbeiana* occurs over most of Texas except for the more arid western sections and was "probably absent from the Edwards Plateau, southern Texas south of Nueces County, and the Trans-Pecos region" (Raun and Gehlbach, 1972, Bull. Dallas Mus. Nat. Hist. 2(1):1-61). The only contemporary report of the bullfrog from Webb County (Karges, 1979, Herp. Rev. 10:119-121) are stock pond specimens which may represent introductions.

On 22 February 1828 a Mexican boundary expedition camped at La Parida, Webb County, at which point the expedition "heard for the first time the frog whose astounding call resembles the bellowing of a bull. This frog is rarely seen and is as large as the head of a man. The croaking, by its monotony and marked rhythm does not fail, in the silence of night, to arouse sadness" (Sanchez, trans. by Castaneda, Southwestern Hist. Quart. 29: 250-288). This species was different from the "water frogs" (probably *Rana berlandieri*) which were sighted elsewhere.

This bullfrog locality report (unfortunately not substantiated by a specimen) extends the known native range of *R. catesbeiana* in south Texas approximately 180 kilometers west of Nueces County. The Webb County record was along Beccero Creek, a tributary of San Casimiro which flows into the Nueces River. The previously accepted native range of *R. catesbeiana* followed approximately the boundaries of the Austroriparian and Texan Biotic Provinces (Blair, 1950, Tex. T. Sci. 2:93-117). This new record extends the native range into the Tamaulipan Biotic Province which is characterized by scrub brush, i.e. chapparal, vegetation. While the Nueces River allows a mesic strip of dilute Austroriparian biota to intrude upon this area, the Beccero Creek locality was 24 to 34 km southwest of the Nueces River channel.

The biogeographical origin of this population can never be determined with certainty. *R. catesbeiana* may have migrated up the Nueces drainage during a very recent mesic period, e.g. the Little Ice Age (see Price and Gunter, 1942, Trans. Tex. Acad. Sci. 26:138-156). Subsequent drought periods would have restricted suitable bullfrog habitat to small areas of permanent water on generally intermittent drainages. Existence of this population could date from Late Wisconsin-Early Holocene times when *R. catesbeiana* existed in areas of the Balconian Biotic Province where it did not apparently occur naturally within historical times (Holman, 1966, Tex. T. Sci. 28:372-377).

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TEXAS AMPHIBIANS AND REPTILES: SOME NEW DISTRIBUTIONAL RECORDS, PART III

This is the third serial report of new distributional records of Texas amphibians and reptiles (see Karges 1978, 1979), substantiated with specimens in the Texas A & I University Collections (TAIC). These records are additions since Raun and Gehlbach (1972), and are from two south Texas counties, Jim Hogg and Zapata. Parenthetical numbers refer to the numbers of individuals, in a series, with a single TAIC catalogue number. Nomenclature follows Collins, *et al.* (1978), and I verified the identifications. I thank Dr. A. H. Chaney for access to the collection and R. R. Schmidt for allowing me to report on specimens that he collected.

CAUDATA

Ambystoma tigrinum mavortium (Barred Tiger Salamander); JIM HOGG Co. 2.9 km WSW Hebbronville. 6 February 1970. J. A. Rickner, *et al.* TAIC-1391(46). 16.1 km SW Hebbronville. 12 April 1969. G. Ellison, TAIC-1960.

SALIENTIA

Bufo marinus (Giant Toad): JIM HOGG Co. 30.1 km S Hebbronville on TX 16. 4 June 1978. R. R. Schmidt. TAIC-4367. 10.7 km S Randado on FM 649. 4 June 1978. J. P. Karges. TAIC-4490. Both specimens were taken on brushland roads at night and confirm range-margin extension in this county. Axtell and Wasserman (1953) reported that Blair (1947) released several *Bufo marinus* near Hebbronville although Blair only alludes to release in his note. It seems unlikely that these two specimens are from that stock because of the distance of capture localities from Hebbronville and because I found seven other DOR *Bufo marinus* (unpubl. field notes) between Randado and the Starr Co. line, a 41.6 km stretch of FM 649, on the same night. It appears that *Bufo marinus* has an extensive distribution in Jim Hogg Co.

SERPENTES

Hypsiglena torquata jani (Texas Night Snake): JIM HOGG Co. 12.9 km S Hebbronville on TX 16. 4 June 1978. R. R. Schmidt. TAIC-4384.

Masticophis flagellum testaceus (Western Coachwhip): JIM HOGG Co. 2.2 km SE Hebbronville on FM 1017. 6 May 1978. J. P. Karges & S. White. TAIC-4310.

Masticophis taeniatus schotti (Schott's Whipsnake): JIM HOGG Co. 3.2 km S Randado on FM 649. 4 June 1978. J. P. Karges. TAIC-4398.

Rhinocheilus lecontei tessellatus (Texas Longnose Snake): JIM HOGG Co. 2.1 km W Hebbronville on TX 359. 29 April 1978. J. P. Karges & R. R. Schmidt. TAIC-4268. ZAPATA Co. Bustamante. 4 June 1978. R. R. Schmidt. TAIC-4365. 27.4 km NW Zapata on TX 16. 5 June 1978. R. R. Schmidt & J. P. Karges. TAIC-4389.

Salvadora grahamiae lineata (Texas Patchnose Snake): JIM HOGG Co. 1.6 km NE Hebbronville. 31 May 1968. J. Davis. TAIC-1524.

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NEW *HR* SECTION

HR's feature article file is burgeoning to the point of ridiculousness, and the current lag time to publication is about 18 months. A number of manuscripts on "hold" are ones which could be condensed into rather brief notes, following the same general format as ***GEOGRAPHIC DISTRIBUTION.*** Hence, beginning with this issue, ***HR*** will start a ***LIFE HISTORY NOTES*** section analagous to Geographic Distribution. Individual notes are to concern only one species, and authors are requested to choose a keyword which ***BEST*** describes the nature of their note (*e.g.*, Reproduction, Longevity, Coloration, Morphology, *etc.*). Figures are permissible to illustrate any data, but should ***REPLACE*** words rather than embellish them. The section's intent is to convey information rather than demonstrate prose. Articles will still be reviewed and edited prior to acceptance.

General format is: SCIENTIFIC NAME in caps (Common Name in parentheses — use Collins, *et al.* 1978. STANDARD COMMON AND CURRENT SCIENTIFIC NAMES FOR NORTH AMERICAN AMPHIBIANS AND REPTILES, for North American forms). KEYWORD in caps. Data on the animal (references may be *briefly* cited in text — ***DO NOT*** include complete literature reviews — use summary articles wherever possible). Place of deposition or intended deposition of specimen(s) and catalog number(s). Then, skip a line and close with Submitted by (Name(s) in caps) (addresses). Recommended citation for items appearing in this section is as for Geographic Distribution notes.

Additionally, I shall review our stock of articles on hand and begin to reformat manuscripts best suited to this section. I do not expect this to cause trauma to authors, but should you ***NOT*** want your paper expedited into print, please let me know. ***GRP***

LIFE HISTORY NOTES

CAUDATA

CRYPTOBRANCHUS ALLEGANIENSIS (Hellbender) **LONGEVITY.** Bowler (1977. Longevity of reptiles and amphibians in North American collections. SSAR Herp. Circ., 6:1-32) reported 6 years the maximum longevity for a wild-caught, captive hellbender in a North American collection. Nickerson and Mays (1973. The hellbenders: North American "Giant salamanders." Publ. Biol. Geol. Milwaukee Pub. Mus., 1:1-106) published reports of ages of 30 and 55 years based on specimens maintained in collections outside North America.

On 24 June 1972, Max A. Nickerson collected an adult hellbender in the Niangua River, 0.8 km downstream from Bennett Springs, Dallas County, Missouri. It was donated to the Museum of Natural History, University of Kansas, where it has been maintained alive as of this date, a longevity of over ten years. It has been kept at room temperature in a thirty gallon aquarium with gravel substrate, and fed newborn mice on a weekly basis. It appears to be thriving and will be placed at the Oklahoma City Zoo in the near future.

A number of persons have cared for the hellbender since its arrival at the Museum, and they deserve credit for the success in maintaining it. They are: Janice J. Perry, Ray E. Ashton, Andrea Stammler, Mary E. Dawson, Kelly J. Irwin, Eric M. Rundquist and Hank Guarisco.

Submitted by **JOSEPH T. COLLINS,** Museum of Natural History, University of Kansas, Lawrence, Kansas 66045 *and* Research Associate, Dallas Zoo, 621 East Clarendon Drive, Dallas, Texas 75203. ●

AMBYSTOMA TALPOIDEUM (Mole Salamander) **MORPHOLOGY.** A five-legged mole salamander *(Ambystoma talpoideum)* was collected on 5 March, 1981 from a pitfall trap and drift fence at Flamingo Bay, Aiken County, South Carolina (Fig. 1). The specimen was a gravid female with a snout-vent length of 54.5 mm. Both legs are functional, but only one leg at a time is used for locomotion, alternating between the two limbs. An X-ray indicated the extra limb has a normal skeletal structure.

This anomaly apparently occurs infrequently in natural populations. While monitoring five breeding populations of *A. talpoideum* and recording greater than 17,935 original captures (8,590 juveniles, 9,345 adults) since 1978, a five-legged individual has occurred only once, a resultant frequency of 0.000056. Other abnormalities recorded include at least two individuals with forked tails and dozens with forked and fused toes, the latter often being induced from toe-clipping.

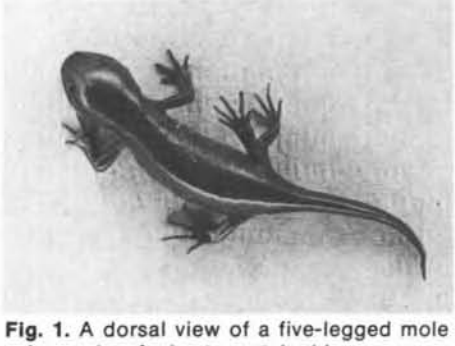


Fig. 1. A dorsal view of a five-legged mole salamander, *Ambystoma talpoideum.*

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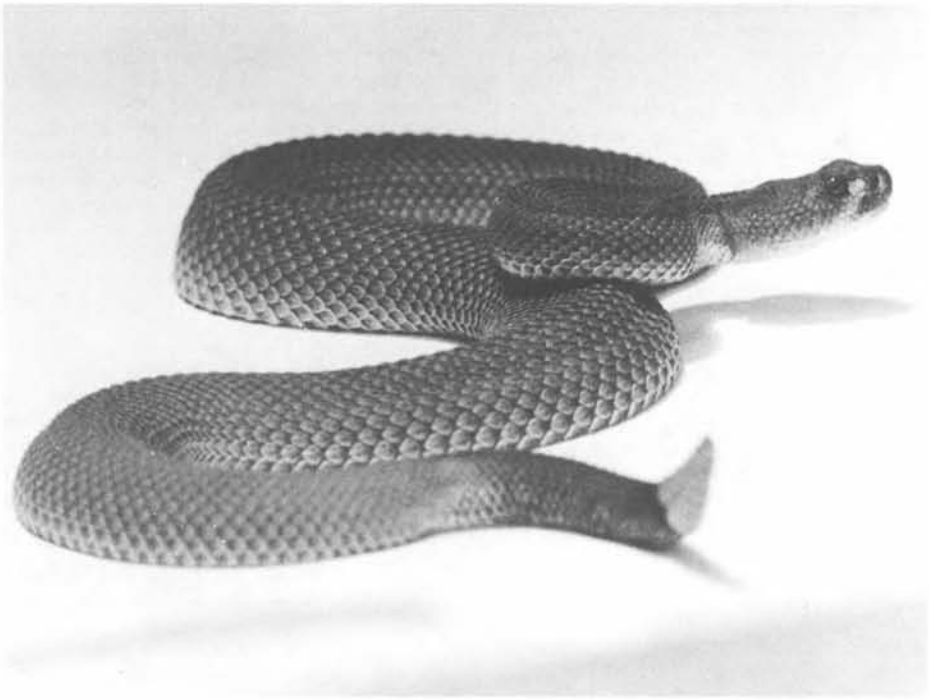
SERPENTES

CROTALUS ATROX (Western Diamondback Rattlesnake). **COLORATION.** An adult male, approximately 85 cm. in total length, collected spring of 1981 by Harry and Bill Sakewitz, near the town of Manor, in northeast Travis County, Texas.

The snake is completely patternless except for a dull yellow stripe in front of each eye, which is similar to that found in typical morphs. The dorsum is uniformly gold-brown in color and the tail, instead of having alternating black and white bands, is solid black suffused with the gold-brown dorsal color. Other aberrant color patterns have been found in *Crotalus atrox* (Klauber, L. M. 1972. Rattlesnakes. Their habits, life histories, and influence on mankind. University of California Press, Berkeley and Los Angeles. 2 Vols.; Nickerson, M. A. and C. E. Mays. 1968. More aberrations in the color patterns of rattlesnakes (genus Crotalus). Wasmann Journal of Biology. 26(1):125-131). However, I have found no other examples of this variation in the literature.

This snake is presently being exhibited alive in the reptile collection of the San Antonio Zoo and will be used for breeding experiments. Upon its death, it will be added to the zoo's collection of preserved specimens.

Submitted by **ERIK HOLMBACK,** Reptile Dept./San Antonio Zoo, 3903 N. St. Mary's St., San Antonio, TX 78212. ●



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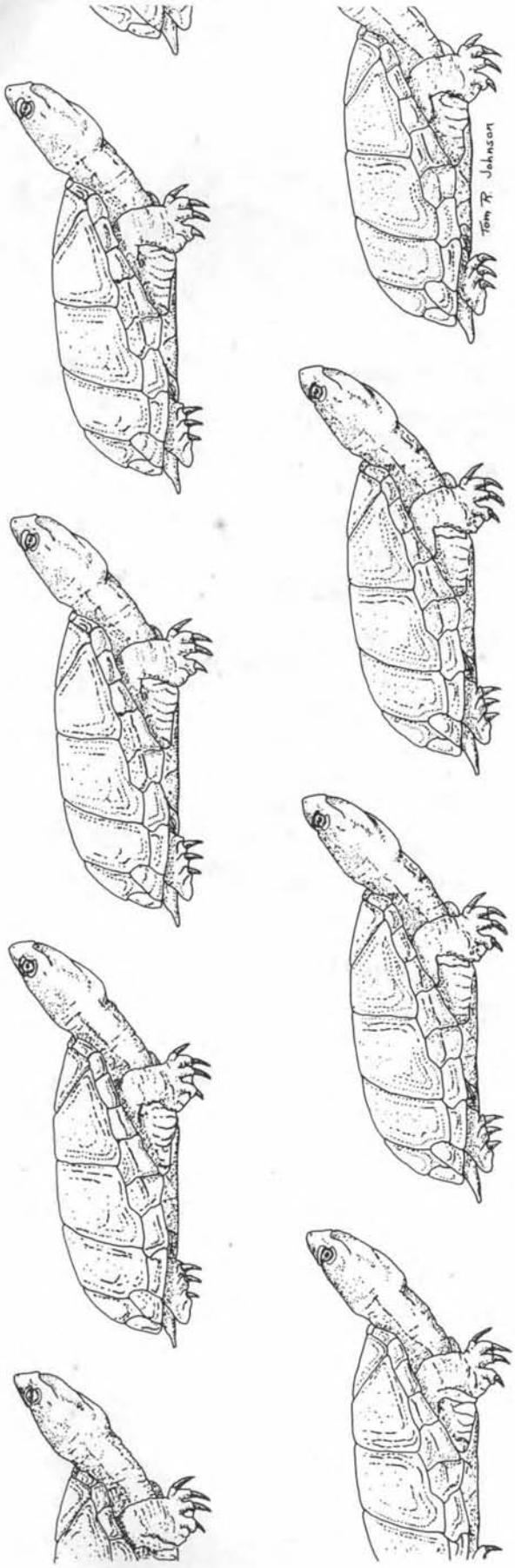
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Volume 12 **March 1981** **Number 1**

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SSAR ANNUAL MEETING NEWS



Fig. 1. The Administration Building is located in the center of the 60 ha Main Campus. It houses administrative offices and the University's computer facilities.

HERPETOLOGY AT MEMPHIS STATE UNIVERSITY

The 1981 joint annual meetings of The Society for the Study of Amphibians and Reptiles and The Herpetologists' League will be hosted by Memphis State University with Dr. James S. Jacob serving as local chairman. The host institution was founded in 1912 as West Tennessee State Normal School on the site of an old plantation. In 1925 the name was changed to West Tennessee State Teachers College and the curriculum was expanded to a four-year program. The name was shortened five years later to State Teachers College, and in 1941 the institution became Memphis State College. The undergraduate program was reorganized into three schools in 1951 and a graduate school was added. In 1957, by action of the Tennessee Legislature, the institution was designated Memphis State University. The University, with an enrollment of approximately 21,000, is comprised of eight schools and colleges: Graduate School, Cecil C. Humphries School of Law, College of Arts and Sciences, Fogelman College of Business and Economics, College of Communication and Fine Arts, College of Education, Herff College of Engineering, and University College. Seventeen undergraduate degrees in 60 different programs are offered through the seven undergraduate colleges. The Graduate School offers nine Masters degrees in 57 programs and three Doctoral degrees in six departments. The Division of Public Service and Continuing Education offers a wide variety of credit and non-credit courses and programs both on and off campus.

The Department of Biology, consisting of 32 faculty, occupies two buildings on Main Campus, Ellington Biological Sciences and Life Sciences. The Ecological Research Center, which houses the Museum of Zoology and most of the vertebrate zoology research laboratories, is located on South Campus. M.S. and Ph.D. degrees in biology are offered by the department with concentrations in Botany, Cell and Molecular Biology, Invertebrate Zoology, Microbiology, and Vertebrate Zoology. Located in the Life Sciences Building, The Center for Electron Microscopy houses both scanning and transmission instruments. Support facilities such as this and Computer Services are available for graduate student and faculty research at no cost to the investigator. Meeman Biological Field Station is located ca. 40 km north of Memphis adjacent to Meeman-Shelby Forest State Park, Shelby Wildlife Management Area, and the Mississippi River.

Dr. Jacob joined the faculty in 1977. He is currently involved in a scanning electron microscopy study of the lungs of the copperhead, *Agkistrodon contortrix*, and cottonmouth, *A. piscivorus*. Three students have recently completed undergraduate herpetological problems. Anita M. Steed, now at The University of Oklahoma pursuing an M.S. with Dr. Charles C. Carpenter, worked on comparative morphology and histology of the lungs of *Agkistrodon contortrix* and *A. piscivorus*. The effect of temperature on the heart rate-ventilatory response in *Agkistrodon contortrix* was investigated by Steven L. Carroll. Michael A. Rinehart looked at female reproductive cycle of *Agkistrodon piscivorus* in western Alabama. Four graduate students are pursuing Masters degrees under the supervision of Dr. Jacob. J. Stephen Sanders' thesis topic is thermal ecology of *Agkistrodon contortrix*. He is also working on microdermatoglyphics of selected colubrid snakes and thermoregulation of six-lined racerunner, *Cnemidophorus sexlineatus*, in western Ten-



Fig. 2. John Willard Brister Library houses more than 700,000 bound volumes and *ca.* 1,000,000 pieces of micromaterial.



Fig. 3. Malls have been constructed at MSU in an effort to establish a pedestrian campus. The original Brister Library Building (left rear) is one of the oldest structures on campus and was recently added to the National Register of Historic Places.

nessee. Leslie F. Johnson has just completed work on a project looking at the male reproductive cycle of *Agkistrodon piscivorus* in western Alabama. Her thesis research in an investigation of the relationship between pituitary activity and male reproductive cycle of *Cnemidophorus sexlineatus* in Tennessee. Comparative parasite loadings in *Agkistrodon piscivorus* and three species of *Nerodia* from western Alabama is James L. Detterline's thesis project. James J. Greenhaw has just begun work on the reproductive cycle of male rough green snakes, *Opheodrys aestivus*, in central Arkansas. Samuel L. Reynolds recently finished his Masters at Marshall University with Dr. Michael E. Seidel and has just started work on his Ph.D. with Dr. Jacob. His thesis was titled "Electrophoretic and morphological analysis of the musk turtle, *Sternotherus odoratus*." Dr. Lewis B. Coons, Director of The Center for Electron Microscopy, has recently begun a project with Dr. Jacob looking at the ultrastructure of lung parenchyma in *Agkistrodon contortrix* and *A. piscivorus*.

Since Jacob's arrival at MSU, the Collection of Amphibians and Reptiles in the Memphis State University Museum of Zoology has expanded rapidly. Specimen collection data will soon be placed on computer files, using the SELGEM program for data retrieval. The emphasis of the collection is in the Mid-South area, much of which is poorly known herpetologically.

Reproductive Biology of Reptiles will be the topic for the featured symposium. It is scheduled for Monday through Wednesday, 10-12 August. Dr. Ernest Williams will present the first Distinguished Herpetologist Lecture, sponsored by The Herpetologists' League, on Monday, 10 August. Student paper awards presented by the societies at the Memphis meetings will include additional prizes donated by David M. Dennis and Ben Greishaw. David Dennis is providing a set of his magnificent prints to SSAR for the Kennedy Award. Ben Greishaw is giving The Herpetologists' League one of his exquisite wood carvings of a hatching turtle for the HL student prize. Several commercial supply firms and publishers are helping to sponsor the 1981 meetings, and they will be exhibiting on Monday and Tuesday, 10-11 August. Paper sessions, the featured symposium, business meetings, and most exhibits will be held on the third floor of the University Center.

Memphis is located in West Tennessee on the bluffs of the Mississippi River adjacent to Arkansas and Mississippi. Average rainfall for August is *ca.* 8 cm with daytime temperature ranging between 29 and 35°C. Metropolitan Memphis, with a population of over 900,000, offers a wide variety of entertainment, including museums, art galleries, amusement parks, and various nocturnal activities.

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SSAR BUSINESS

PROPOSED AMENDMENT TO THE SSAR BYLAWS

The members of the Society for the Study of Amphibians and Reptiles are hereby notified of a proposal approved by the SSAR Board of Directors to amend Article VII, section 2 of the SSAR Bylaws (1970. *Journ. Herp.*, 4(1-2):98), which currently reads:

"Dues shall not exceed $15 annually."

to read:

"The amount of dues shall be established by the Board of Directors."

This proposed amendment will be on the agenda for discussion at the 1981 SSAR general business meeting at Memphis, Tennessee, in August 1981. A ballot on the amendment will be submitted by mail to the SSAR membership after the annual meeting in Memphis.

Respectfully submitted,
Joseph T. Collins
SSAR Secretary ●

1981 REGIONAL SOCIETIES MEETING

The 1981 Regional Herpetological Societies Meeting will be held Sunday, 9 August 1981 at Memphis State University in conjunction with the SSAR/HL meetings. A symposium, *Alien Amphibians & Reptiles: The Problem of Introduced Species*, will be part of this year's meeting. The second part will be a slide presentation. Contributors for the slide presentation are asked to bring 15 of their best slides and provide narration. The goal is to present photos of every North American species of amphibian and reptile, and as many other species as possible. Anyone interested in participating in the symposium or slide presentation is asked to contact: John C. Murphy, Regional Herp. Societies Liaison Committee Chairman, 201 Peerless Dr., Plainfield, IL 60544 before 1 May 1981. ●

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OPEN LETTER FROM THE ASSOCIATION OF SYSTEMATICS COLLECTIONS

Dear George:

As you know, the Society for the Study of Amphibians and Reptiles is a member society of the Association of Systematics Collections. However, because relatively few institutions employing systematists have formal systematics collections (and hence relatively few are institutional ASC members), many systematists are unaware of ASC's existence and/or are unaware that ASC actively serves individuals in the systematics community as well as collection-oriented institutions. The reason for this is partly because ASC's name identifies the organization with collections and partly because ASC has failed to address itself directly to systematics beyond its member institutions.

Therefore, I am writing to request that the enclosed letter and accompanying announcement be published in your journal and/or newsletter. As you can see from the announcement, ASC currently is engaged in a variety of activities of vital interest to systematists in general. We would like to do more, and need feedback from various disciplines.

I must emphatically add that we will at no point endeavor to compete with discipline-oriented societies. However, most of ASC's activities span several disciplines and have proven to be of value to systematists at member institutions. Therefore, I am confident that these activities can be of value to colleagues elsewhere.

I thank you for the opportunity to present ASC to your colleagues, and hope that they will respond so that we may continue to serve the systematics community.

Sincerely,

Peter H. Raven
President

Dear Reader:

I am happy to have this opportunity to address the relationship between the Association of Systematics Collections and the needs of the systematics research community. The Association needs your input now more than ever,

as we begin preparation of a position paper on the long range needs of systematic biology.

The institutions that currently comprise the Association's membership maintain collections for the purpose of supporting research in the various disciplines of systematic biology. Decisions and national policies that affect these collections may have considerable impact on the research community and should not be made (or developed) without the participation of researchers.

A brief overview of activities the ASC has undertaken in the past is presented below. We are particularly interested in how these activities affect the research community, how they might be directed to better serve the systematics community as a whole, and the relevance of the activities to research programs.

Therefore, the ASC would appreciate feedback from systematists at member and non-member institutions concerning the problems faced in your research programs, and we would appreciate any suggestions you may have as to how we might help resolve these problems. We would also like to know about any discipline-oriented problems that you feel might be addressed through the ASC.

Also, the opportunity to share appropriate comments and suggestions with others in the systematics community through the **ASC Newsletter** would be most welcome.

It is our fervent hope that this letter and accompanying brief description of ASC activities will encourage exchange between the systematics community and ASC.

Sincerely,

Peter H. Raven
President

ACTIVITIES OF THE ASSOCIATION OF SYSTEMATICS COLLECTIONS

Representation.— ASC officers and staff have addressed congressional committees, federal agencies, and the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) on a variety of matters directly affecting systematics collections and the systematists who use those collections. For example, the ASC has been responsible for obtaining a blanket exemption for international transfer of specimens of species listed in the appendices to CITES; contributed to the process that led to an exemption of public buildings housing systematics collections from federal temperature standards; testified before the Federal Council on the Arts and the Humanities concerning the needs of museums that maintain systematics collections; and testified before congressional committees on the proposed revisions in the Endangered Species Act. ASC is currently collaborating with the American Association of Museums in a lobbying effort designed to represent the needs of all types of museums.

ASC staff and consultants have successfully represented the needs of state and university systematics collections and their personnel to higher budgetary authorities when fiscal crises threatened the existence of those collections.

ASC maintains up-to-date information on the status of legislation affecting systematics *e.g.* government agency authorization and appropriation bills, regulatory actions, and species listings).

Funding.— Notice of most funding opportunities for systematists are circulated by the academic research administrations in their institutions. ASC maintains and makes available data on grants awarded by selected agencies for research programs and resource maintenance in systematics. ASC has assisted in locating funding for workshops, seminars, and short courses involving problems faced by systematists and systematics collections. ASC has repeatedly interfaced between the systematics community and federal funding sources other than NSF (*e.g.* Department of Energy, Environmental Protection Agency, Fish and Wildlife Service, and National Institutes of Health).

Interaction with member societies and provision of discipline-oriented services.— ASC has aided the production and dissemination of various publications on systematics resources generated by professional societies in eleven disciplines. ASC is cooperating on a contractual basis with the American Society of Mammalogists to maintain computer files of literature citations that are published as "Recent Literature of Mammalogy" in their journal and will be used for literature searches in the future.

Also in cooperation with the American Society of Mammalogists, the ASC maintains the *Checklist of the Mammals of the World.* ASC is developing a catalog of collections (domestic and foreign) containing specimens of mammal species listed as being "endangered" by the U.S. Endangered Species Act (files reference collection name, catalog numbers of specimens, and in some cases, locality data).

ASC cooperated on an at-cost basis with the North American Benthological Society in publishing *First Symposium on the Systematics and Ecology of Ephydridae (Diptera)* (1979. D. L. Deonier, Editor).

Center for Biosystematics Resources (CBR).— A registry of systematists and systematics collections is maintained by the ASC. This registry was originally designed for, and used extensively by, private industry and government agencies to locate biological specialists and/or collections. It is being refined to be of greater value to systematists seeking to locate other systematists or collections of special interest. As the data base expands, CBR will be able to profile the resources of the systematics community; *e.g.* personnel, funds, and facilities; and how these are distributed through time, according to discipline, and between institutions.

Systematics and the Law.— ASC maintains official lists of controlled species for both the federal government and Parties to the CITES. A liaison has also been established with representatives in each state responsible for maintaining lists of protected non-game species. This ensures that information about controlled species (federal, international, and state) is available to systematists via ASC publications and contact with our Law Project Biologist. ASC maintains up-to-date permit information for institutions and systematists working with controlled species.

ASC will soon publish *Pest Control in Museums: A Status Report (1980)* which contains chapters on federal statutes and regulations governing pesticide use, institutional liabilities, museum pest control procedures, and other aspects of the pest control problem. Appendices to this publication include pesticide descriptions, bibliography to pertinent literature, and an Annotation to Federal Pesticide Regulations.

Publications.— The *ASC Newsletter*, published six times each year, carries member institution and society profiles, funding opportunities, position announcements, legislative and curatorial information, equipment available for exchange, news and feedback from readers, book reviews, classified advertising, and other items of general interest to systematists. It is available free upon request in North America. Recipients outside North America must remit postage fees ($8.00 in U.S. funds) annually.

Miscellaneous.— ASC maintains an extensive bibliography of literature pertaining to "computerization" of collections and has prepared profiles on individual computer-oriented cataloging projects. ASC frequently serves as a clearinghouse for information on museum computerization projects and mid-range computer hardware.

ASC continually interfaces with various groups from outside the systematics community — private corporations, government agencies, and non-profit service organizations. ASC has coordinated workshops, seminars, and short courses involving problems faced by systematists. During the next year, the ASC through its Council on Curatorial Practices will formulate guidelines for the management and acquisition of voucher specimens, including suggested fee schedules.

A list of titles published by ASC may be obtained without charge by writing to the Association of Systematics Collections, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. ●

BEHAVIORAL OBSERVATION IN BULLSNAKES

An incident involving two bullsnakes *(Pituophis melanoleucus sayi)* was observed on 21 May, 1976, at approximately 5 P.M. by members of a University of Nebraska State Museum field party. The observation was made on the Kuhre Ranch road in extreme northern Brown County, Nebraska (SE¼, NE¼, SW¼, SW¼, Sec 32, T33N, R23W, USGS 15" Norden Quad).

The snakes were observed for approximately 25 minutes. Each was roughly one meter (39.37 inches) in length. Their bodies were very loosely intertwined and one individual had a firm grip on the right rear portion of the other's head (Figs. 1, 2, and 3). Neither animal acknowledged the presence of the observers.

During the observation, the biting snake was the more vigorous of the two, releasing its grip only once in order to grip the passive snake from the left. At irregular intervals, the biting snake would temporarily apply an additional loop against, but not around, the body of the other, well anterior of its vent. During the observation, the only movement offered by the passive snake was a very weak lashing of its body, perhaps in resistance to the actions of the vigorous snake. Blood was clotted upon the head of the passive snake and on the roadway.

As the snakes proceeded, there was no tight intertwining of bodies, nor elevation of anterior body portions of either snake, postures which are typical of ritualistic male combat in various snake species (Bogert and Roth, 1966; Shaw, 1951). No attempt at copulation was observed nor did the aggressive snake make any muscular undulations or twitches as described in courting males of *Pituophis m. melanoleucus* (Shaw, 1951). No third snake was obvious.

The two snakes were pulled from the roadway for their own safety, whereupon the biting snake took alarm and fled. Its sex is unknown. Nearly dead, the remaining snake was captured and found to be male upon eversion of hemipenes. Its stomach contained one, little-digested pocket gopher, *Geomys bursarius*. The macerated skeleton of the snake showed the parietal and prootic bones to be crushed and four vertebrae to be cracked. This damage, which may explain the passivity of the snake, is less extensive than one might expect had the animal been struck squarely by a vehicle, yet such crushing ability in the jaws of a colubrid is unlikely. It is conceivable that the injuries were caused by a glancing blow from the tire of a passing automobile.

Regrettably, the significance of this observation is ambiguous, for its inception was not observed, the sex of the vigorous snake is unknown, and the action was interrupted prior to its natural conclusion. However, three explanations for the observed behavior seem possible: 1) the behavior was combat; 2) the behavior was courtship, unusual, though, in that a male was in the passive role; 3) the interaction was an attempt by the aggressor to consume the injured snake.



Figure 1: Two individuals of *Pituophis m. sayi* loosely intertwined in roadway. Ascertained male has light ventral surface upwards. Ice pick, 20 cm long gives scale.





Figures 2 and 3: Close up views of the two snakes. Head of ascertained male in jaws of second bullsnake.

The body postures of the two snakes do not support either of the first two explanations, for they correspond poorly with the distinctive postures of combat and courtship described by Lowe (1948), Shaw (1948 and 1951), Lowe and Norris (1950), and Bogert and Roth (1966). Indeed, considering the estimated lengths of the snakes and conflicting reports of minimum adult length in *P. m. sayi* (36 in., Wright and Wright, 1957, and 50 in., Conant, 1975), the adult status of the individuals and their readiness to perform any vigorous combative or courtship activity is uncertain.

It is perhaps more probable that the aggressive individual was attempting to swallow the other snake, as ophiophagy (Porter, 1972) and even cannibalism (Klauber, 1947) have been reported in *Pituophis*. But while the aggressor physically may have been attempting to consume the injured snake, it is possible, given the observed behavior to be predation, that the incident was a natural response to the scent of the recently ingested pocket gopher on the head and mouth of the passive bullsnake.

ACKNOWLEDGMENT

I wish to express my thanks to Dr. J. D. Lynch, University of Nebraska-Lincoln for his review of this report.

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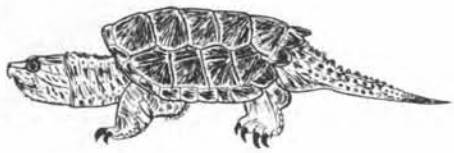
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ALBINISTIC NORTHERN WATER SNAKE IN ALABAMA

Hensley (1959) has previously reported 10 albino or albinistic northern water snakes, *Natrix sipedon*. Six of these specimens were born in the same litter of a normally colored individual from Michigan. These specimens were said to have the areas of dark markings flesh colored and a Virginia specimen was described as having a very faint pattern.



Figure 1. A juvenile albinistic *Natrix sipedon pleuralis* collected in Lee County, Alabama, in April 1976. Photo by Tom French.

A similar juvenile *Natrix sipedon pleuralis* (Figure 1) was captured on a warm, rainy night on a county highway, 4.5 air miles (7.2 km) south of Auburn, Lee County, Alabama, in April 1976. The eyes of this specimen were bright pink. The banded pattern was quite apparent but appeared a dark flesh color outlined in white and lacking melanic pigment. The areas between bands were a paler flesh color. This snake was kept in captivity for three months, and was fed small mosquitofish, *Gambusia affinis*. During this time, it never refused food or acted lethargic as Eells (1978) suggests some albinistic lizards and salamanders do. This specimen was photographed but not preserved.

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STATUS OF THE OUTER BANKS KINGSNAKE, *LAMPROPELTIS GETULUS STICTICEPS*

The recognition of a subspecies is in part a matter of taste; no genuine consensus on the matter has emerged despite a plethora of discussion in the literature. Recently, Blaney (1979) has submerged the trinomial designation of the common kingsnake endemic to the Inter-Capes Zone of North Carolina's Outer Banks, claiming it shows "no characteristics unique enough to warrant the status of subspecies." Nevertheless, the suite of characters given as diagnostic by Lazell and Musick (1973) is unique. No specimen of nominate *getulus*, no specimen of *L. g. floridanus*, and no intergrade between those forms can match the combined characteristics of *sticticeps*.

Blaney has suggested a possible origin for *sticticeps* from an "intergrade population" between *getulus* and *floridanus*. It is not an origin with which we agree, but we admit conclusive evidence is currently lacking. Biochemical evidence should be sought. In any case, *sticticeps* is in no sense an intergrade between any other two forms today, either morphologically or geographically. If it originated as such, it has undergone dramatic differentiation from that stock. It is worth noting that none of the photographs provided by either Lazell and Musick (1973) or Blaney (1979) shows a dorsal interspace or the distinctive punctuations of *sticticeps*. The specimen shown by Blaney as Figure 1C is not a *sticticeps* and not from within the range of that subspecies.

Lampropeltis getulus sticticeps is easily identifiable at the 100 percent level within its range and qualifies as a valid subspecies in accord with the strictures elucidated by, for example, Simpson (1961). No one, of course, can be required to recognize it, or any other subspecies, but it is a most remarkable form behaviorally and ecologically (Lazell, 1979). It is demonstrably unique.

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COURTSHIP BEHAVIOR OF MALE *TERRAPENE CAROLINA MAJOR* (REPTILIA, TESTUDINES, EMYDIDAE).

Except for that of *Terrapene carolina carolina* (Evans; 1953, 1968), the male courtship patterns of the subspecies of the eastern box turtle have been poorly described. Evans (1953, 1968) reported that a male *T. c. carolina* approaches a female but stops about 10 cm away. His legs are straightened (often one raised off the ground) and his head is held high. Next he circles around the female, biting her shell as he goes, or pushing her carapace with his head and shell a few degrees upon its axis and then biting it. The pushing-biting sequence is repeated several times. The male sometimes grasps the marginals of the female's carapace and drags her while he backs up. Rarely, the male will butt her carapace with his anterior plastral margin, ducking in his head just prior to impact. Next, he mounts her carapace from the rear and hooks his hind claws between her carapace and the closing plastron. When pinioned in this position, he leans back slowly until his carapace rests on the ground and then slides his hind feet forward until they lie medially to her hind feet. Coitus follows. Evans (1968) remarked that the mating of *T. c. major* takes place in shallow water, but in other respects resembles closely that of *T. c. carolina*.

Penn and Pottharst (1940) observed several aquatic matings of *T. C. major*, and thought higher air temperatures and high humidity were the most important stimuli to courtship and mating. Either stimulus alone was thought capable of initiating reproductive behavior. Some of their turtles had bite wounds on the cervical and first marginal scutes which they attributed to fighting among the males, and on females to the "post-mating caresses of their mates." After mating (and sometimes before) the males usually shoved the closed-up females with their heads.

My observations since 1969 on a captive, adult male *Terrapene c. major* (18.5 cm CL, 16.5 cm PL), while similar in some respects, have revealed differences from those courtship patterns reported above. During this period the male has courted several *T. c. carolina*, *T. c. triunguis* and *T. ornata* of both sexes, and males of *T. c. bauri*, *T. o. luteola*, *Clemmys insculpta*, and *Rhinoclemmys pulcherrima rogerbarbouri*. The only turtles kept with him that have not been courted were larger male *Geochelone elegans* and *Gopherus polyphemus*, and a female *Gopherus agassizii*. All the turtles were kept at low humidity in an indoor enclosure at temperatures greater than 20° C, and exposed to outside light. Increased photoperiod seemed to be the primary stimulus initiating courtship activity which occurred each year from March through June. During this time the *T. c. major* courted both day and night, and on land and in water. Individual attempts sometimes lasted for as long as three hours.

The behavior is always the same regardless of the sex involved, so it is thought to be courtship rather than just aggressive behavior. The male actively pursues his intended mate from behind with his head and neck fully extended forward (but not raised). First he places his nose close to (sometimes touches) the tail at the vent, hind legs and posterior carapacial marginals and appears to be smelling these. Occasionally he will bite these parts of the other turtle, but usually he moves to the side, and with head and neck still extended carefully "smells" the bridge, especially the inguinal area. After this he moves to a position where he can smell the head, neck

and forelegs of his intended mate, and then begins vigorously to bite these (the bite marks on Penn and Pottharst's females probably were due to such biting during courtship, not after mating). If he cannot reach the head region, due to the other turtle being closed-up or facing a wall, the male will ram and push the other turtle's carapace, sometimes for a distance of up to a meter. Finally, he moves posteriorly and attempts to mount in the manner described by Evans (1953).

That Evans (1953, 1968) and Penn and Pottharst (1940) should have failed to recognize some apparent olfactory behavior is a major deletion. The olfactory behavior of the male *T. c. major* is similar to that described by Eglis (1962) for the smelling of potential food by this subspecies. Pheromonal cues probably elicit courtship in aquatic turtles (Jenkins, 1979), and may account for the long pursuits of females by the males of terrestrial emydids and tortoises (Testudinidae) (Weaver, 1970; Auffenberg, 1978). Such a chase by male *Terrapene ornata* is described by Brumwell (1940) who also reported that a male of that species nosed about the lower carapacial margin of a female during courtship. Also, during the mating period, I have observed wild male *T. c. carolina* smelling the ground as they prowl through the woods, perhaps following a pheromone trail left by a female.

Terrapene carolina lack mental glands (Winokur and Legler, 1975), but perhaps pheromones are produced in undiscovered cloacal or inguinal glands (Rathke's glands of Ehrenfeld and Ehrenfeld, 1973).

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STILL MORE ON *BIPES*

Naturalists in the state of Colorado, as well as elsewhere, have long been concerned with the mention of an encounter with "*Chirotes*" by members of the Long expedition to the Rocky Mountains in 1820. Drs. Richard G. Beidleman of Colorado College and T. Paul Maslin of the University of Colorado have been "on the scene," as it were, for 30-40 years, making periodical efforts to determine the bases for the report, and several graduate students at the University including Richard L. Holland and Geoffrey A. Hammerson, have likewise tried their hand at a solution. Considerable publicity resulted, at intervals, the most notable being an article that appeared in one of the local papers. All these efforts yielded only more anecdotes and speculation, hence were not recorded.

The revival of speculation on the subject in the formal literature of herpetology by Campbell (1980), however, calls for a "progress report" that is long overdue.

Taylor's casual dismissal (1938) of the Long expedition report was fully justified on the basis of knowledge at that time, for two reasons of both of which he was well aware. For one, the description in James' account, that "They were so active, that it was not without some difficulty that we succeeded in obtaining a specimen", is completely erroneous. *Bipes*, as Taylor knew from field experience in 1932 and later, is sluggish, secretive, no more difficult to catch — once discovered —than *Lumbricus*. The James description of behavior cannot possibly fit *Bipes*, which is neither constructed for nor inclined toward quick, elusive movements. On the contrary, the slender *Eumeces multivirgatus*, moderately abundant where the *Bipes* was reputedly found, does fit the description very well. The Bell account (1957) of the same journey does not mention "*Chirotes*." Secondly, amphisbaenids are exclusively tropical and subtropical reptiles, so far as is known; survival of any member of that suborder through the notoriously rigorous, protracted winters of northeastern Colorado defies credence.

Hence Taylor (*op. cit.*) was quite justified in rejecting the credibility of the James account of *Bipes*. Gans and Pappenfuss (1980) agree on similar grounds with that conclusion.

A haunting awareness remains, however, that such reputable zoologists as Say, James and Peale could scarcely confuse *Bipes* in hand with a *Eumeces*. The suspicion arises that the confusion concerned behavior only, that of *Eumeces* being transferred in memory to that of *Bipes*. Such confusion could possibly have been promoted by Thomas Say's ill health suffered through much of his travels in Colorado. Certainly the fact that the *Bipes* account had to be reconstructed from memory could have been a contributing factor in confusion.

The behavioral discrepancy can thus be accounted for with some credibility, but the climatic discrepancy remains a formidable hurdle to acceptance of the actual observation of *Bipes* on the Long expedition.

The record might remain in this very dubious, if not completely untenable state if there were no other grounds for acceptance. Dundee (1980) relates a disturbing anecdotal "record," and Dr. T. Paul Maslin also experienced two startling anecdotes supportive of the thought that *Bipes* occurs in northeastern Colorado. These were mentioned but not described by him (p. 72) in his 1959 summary of the Colorado herpetofauna.

On one occasion a well-educated janitor at Colorado State University in Ft. Collins, where Maslin taught at the time (in 1946), described in minute detail what could only have been a *Bipes* that he had discovered some years before on a farm he owned southeast of Ft. Collins. Shown a *Eumeces multivirgatus*, the janitor dismissed it at once, commenting that these skinks were common and well known to him, whereas the "two-legged lizard" was far different. Maslin was strongly of the opinion that no fabrication was involved, and that the observation was not based on *Eumeces*.

Shortly afterwards, a graduate student at CSU described in equally convincing detail an encounter with another supposed *Bipes* found under a rock on the west side of a hogback a few miles west of Loveland. She did know about the *Bipes* controversy, but the janitor did not. His awareness of the existence of such creatures had to have been solely through his own observations, unlike the situation in southeastern Arizona where most local residents are fully aware of the reputed occurrence there of *Bipes* and are only too eager to string panting herpetologists along with tales of encounters with the animals.

Nevertheless substantiation of the more recent Colorado reports remains elusive. Beidleman around 1955 circulated some 35 form letters, with a sketch of *Bipes*, to biology teachers, wildlife officers and others in northeastern Colorado where they might have encountered them, or were in a position to contact others who might have observed the animals, without any pertinent response whatever.

Thus on somewhat different grounds Maslin, Beidleman and ourselves have come to essentially the same conclusion as Campbell and Dundee — that *Bipes* does occur in extreme rarity in the sand belt of eastern Colorado and western Nebraska, or did so until very recently. Substantive proof remains to be obtained — a challenge to future naturalists that is likely to be even more frustrating than the search for the Loch Ness monster.

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SEVEN NESTS RECORDED FOR LOGGERHEAD TURTLE *(CARETTA CARETTA)* IN ONE SEASON

On the night of 9 August 1979, a female loggerhead turtle was documented laying her seventh nest for the 1979 season on Little Cumberland Island (LCI), Camden County, Georgia. Although green turtles *(Chelonia mydas)* have been observed laying seven nests (Carr *et al.*, 1978) in a single season, the greatest number reported in the literature for a loggerhead has been five nests (Hughes, 1974). Worth and Smith (1976) suggested that one loggerhead in their study may have laid six nests and several instances of loggerheads nesting six times in a season have been recorded on Little Cumberland Island (Richardson, pers. comm.).

The loggerhead was tagged (Blue Rototags, GA0471 GA0472) while laying a nest on 19 May on the north end of Cumberland Island (CI) just south of Little Cumberland Island. She layed six additional recorded nests: 4 June (CI), 18 June (LCI), 2 July (CI), 15 July (LCI), 27 July (CI) and 9 August (LCI). The 1979 nesting season on the two islands extended from 12 May to 21 August. Since the mean inter-nest interval was 13.67 days (SE = 0.56 days), it is unlikely that additional nests were missed.

The fact that this female bore tag scars from a previous year plus her measurements (Carapace Length 103.5 cm, C. Width 97.0 cm, Head Width 21.5 cm; all measurements over the curve) indicate that 1979 was not the first nesting season for this turtle.

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TECHNIQUES

INEXPENSIVE CONTAINERS FOR LARGE HERPETOLOGICAL SPECIMENS

It has always been difficult to store whole, large herpetological specimens (*e.g.*, turtles, crocodiles, large snakes, adult varanids, *etc.*). Museums have historically used various containers for this purpose; crocks, barrels, specially made large tanks of wood or fiber glass, stainless steel tanks, and extra large glass jars. In general, a container with a wide orifice but a limited volume permits easy retrieval of specimens in a collection where frequent retrieval and permanent storage are both major objectives. We have used stainless steel tanks and large glass jars extensively in the past. Their major disadvantages are the high cost of tanks (*ca.* $2.66 per liter of storage volume) and the narrow orifice (120-130 mm) and fragility of the glass jars.

In the last 10-15 years, museums have tried various "plastic" containers for specimen storage, particularly various kinds of covered garbage containers and buckets. Most of these containers fail because they are difficult or impossible to seal, they become grossly deformed when filled to capacity, and they crack unpredictably.

A completely satisfactory plastic container has been in use in the University of Utah turtle collections for approximately 5 years. This container is inexpensive and durable and seems ideal for most large specimen storage problems. This description is prepared chiefly because many curators are still unfamiliar with these containers.

The containers are Saturn® all plastic, open head, shipping pails (hereinafter "plastic buckets") (Figs. 1 & 3). Construction is of high density virgin grade polyethylene, about which the supplier writes, "this material is compatible with most chemical compounds such as acids, etc. *Exceptions:* solvents that are petrochemical derivatives such as benzene and toluene." The plastic buckets come in 1, 2, 3½, 4, 5, and 6 gallon sizes and cost $.81-$3.12 each in the western U.S. in January 1980. Each container is supplied with a wire carrying handle (including a plastic grip) and with a locking lid. The tight-fitting lids are available with or without gaskets.

Saturn® buckets are manufactured in the U.S. by Roper Plastics Inc., P.O. Box 63198, Los Angeles, California, 90063. Price per 5-gallon bucket in Salt Lake City, Utah (January 1980) with plain lid was $2.48 ($2.55 with poured gasket, $2.65 with O-ring gasket). An equivalent product is marketed by All Dispensing Supplies (P.O. Box 81, San Souci, N.S.W. 2291) in Australia at $2.76AUS per 5-gallon bucket.

Saturn® buckets seal tightly. If the opposing surfaces of lid and rim are clean and undamaged, a bucket can rest in any position without leaking. This tight seal can be achieved with any of the 3 kinds of lids mentioned. Lids are properly seated by applying simple force with the heel of the hand or with a rubber mallet. There is a characteristic resonant snapping sound when the lid seats itself. The lids can be easily and properly removed only with special tools. The Roper Opening Tool ($6.50) works on a pliers principle and is adequate (Fig. 2). We have



Fig. 1. Three kinds of containers used for large herpetological specimens at the University of Utah (glass jar, stainless steel tank -bottom, and Saturn® plastic buckets - on shelf at right and stacked on dolly in background. Note translucency and easily discernible fluid levels).



Fig. 2. Roper Opening Tool.

designed a simpler hook which fits under the edge of the lid without damaging the gasket (Figs. 3 & 4).

Use of these containers at U.U. has been entirely positive. We can detect no deterioration or change in the containers or their gaskets when used in the usual manner with solutions of alcohol and formalin. We also use the containers to fumigate bones with chloroform and as shipping containers (for which purpose they were originally made).

The plastic material used in construction has a soft surface texture and the entire bucket and lid are flexible enough to be deformed without breaking. The walls are translucent, permitting easy visual determination of internal fluid levels.

We use the 5-gallon size almost exclusively. Overall dimensions are: diameter 30.5 cm; height with lid 35.5 cm. When fully loaded these containers weigh approximately 20 kg and can be carried easily. They fit nicely onto open museum shelving without excess allowance for clearance. The lid is recessed and permits secure stacking. Full buckets can be stacked 4 high on a movable dolly (total



Fig. 3. Hook-type opening tool in use.

height ca. 147.5 cm) without deforming the bottom bucket. Empty buckets nest neatly. The low cost and durability of Saturn buckets permit carefree use for shipping and field work.

The disadvantages of plastic buckets are few and minor: they are not transparent and they cannot be opened properly without a special but simple tool. Their advantages, in summary, are as follows: tight seal; noncorrosible; practically unbreakable; stackable

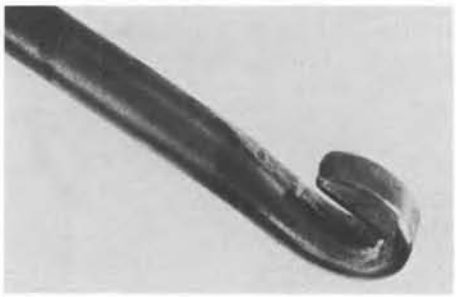


Fig. 4. Detail of hook-type opening tool.

when full and nestable when empty; large enough to accommodate most large herpetological specimens but small enough to be moved easily to provide easy access to contents; compatible with standard open shelving.

The cost of storage space per unit of volume in a plastic bucket (19 l, $2.56) is approximately 5% of that of a stainless steel tank (56.3 l, ca. $150.00).

Mr. Darrell MacBeth (Industrial Container and Supply Co., Salt Lake City) provided samples and information used in the preparation of this paper.

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PRESERVING ANURAN SKINS BY DRYING

The preparation of amphibia for systematic study as dried skins was introduced by Kincaid (1948) and Juszczyk (1952), but has only been used, to my knowledge, by Turner (1959) in his study of variation in *Rana pretiosa* in Yellowstone Park, Wyoming, and by me (Schueler, 1973, 1979).

Juszczyk (1952) and Turner (1959) dried the skins on glass in the open air, a procedure that requires laboratory facilities and makes removal of the dried skin difficult. Kincaid (1948; cited by Cook, 1965) floated skins onto paper to which they adhered as they dried, so that the paper was warped as the skin shrank. In a notice of geographic variation in *Rana sylvatica* in northern Ontario I mentioned the drying of skins between waxed paper in a plant press (Schueler, 1973); this note describes this method of preservation and some attributes which can be assessed on dried skins which may be of interest in studies of variation.

PREPARATION OF SKINS

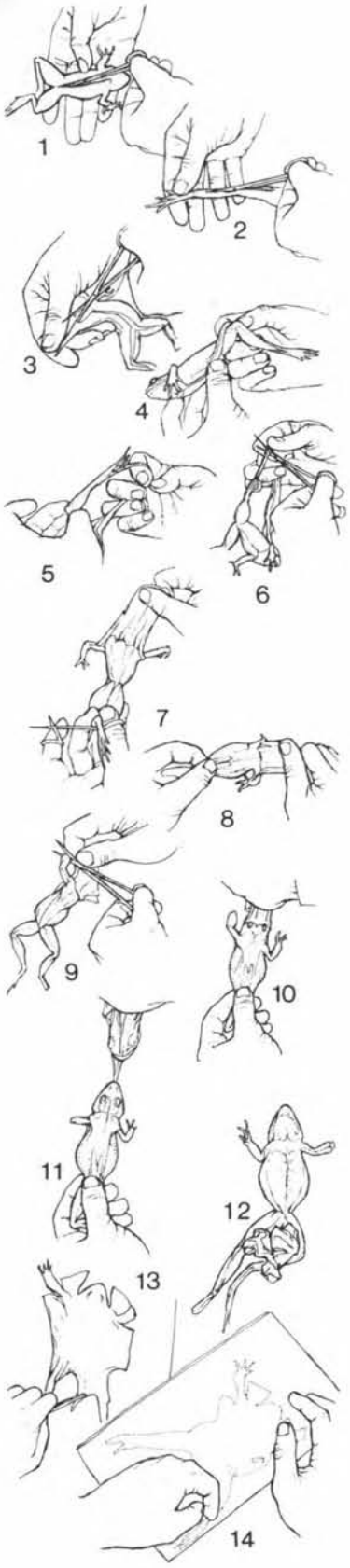
Juszczyk (1952) killed amphibia by destroying the base of the skull and the upper spinal column with scissors, a procedure that is not satisfactory if the skeleton is to be preserved; Turner (1959) used chloretone or dilute formalin. I find that color is well preserved if frogs are killed by over-anesthesia with dilute ethyl or isopropyl alcohol. I cut the skin with scissors along the ventral midline of the frog from the pectoral girdle to the vent (Figure 1) and along the ventral midlines of the legs. I strip the skin from the frog (Figures 5-11) leaving one hand and one foot on both the skin and on the carcass (by cutting through the joints; Figures 6 & 9). The skin is less likely to tear as it is pulled from the head if the midventral incision is not extended to the throat until the skin is removed. I rinse any blood or dirt from the skin in water, and keep it wet until spreading it (Figure 12). The skin is spread on half of a sheet of waxed paper (Figure 13). A thin paper label will stick to the outside of a smooth skin or to the flesh side of a rough skin (such as *Bufo*; thicker paper is more likely to work loose from the skin with bending and humidity changes). I then fold the waxed paper over the skin, smooth out wrinkles and air bubbles (Figure 14), and dry it between blotters in a plant press.

Skinning is most rapid if sharp pointed scissors are used, and spreading is facilitated by a hard, rounded object such as the single end of forceps or a pen cap. With experience, it takes little more than a minute to skin a 40-80 mm *Rana*, and a little less than a minute to spread the skin on the waxed paper. Larger and smaller specimens take longer to prepare, as do taxa with lumpy skins or skin adherent to bone. A novice skinner may take 15 minutes or longer to deal with a specimen. If dry blotters are changed twice, the skin will be dry in 24 h at 20-25° C.

When the skin is dry it can be removed from the waxed paper by first peeling the paper from the one side of the skin and then drawing the paper over the sharp edge of, *e. g.*, a table, so that the paper pulls off the skin from below. Newly dried skins will curl, and should be kept lightly pressed until they reach equilibrium with ambient humidity. Some skins of *Rana pipiens* are shown in Figure 15. For storage, I glue skins, by the hand left on the skin, to 100% rag content typing paper with a permanent white glue. Rubber cement will discolor the skins (Turner, 1959), and will eventually fail. Collection data should be written on the paper, as the field labels may come unstuck from the skins after a lapse of years. Skins of *Rana pipiens* prepared by Joyce C. Cook and C. Bruce Powell in 1963 (National Museum of Natural Sciences 19405) show no apparent signs of deterioration or of separating from the paper on which they were dried.

ATTRIBUTES OF DRIED SKINS

All pigmentary colors are initially preserved by drying (Juszczyk, 1952), though the structural green of anurans is lost. I have found that after 9 years, the ventral orange of *Rana palustris* and *Hyla versicolor* is lost, and that the ventral yellow of *Rana sylvatica* and *R. clamitans* is somewhat faded. Dermal secretory glands are often conspicuous by their translucency in the dried skin. Colors and color patterns can be measured directly or by comparison with standards, and relatively undistorted linear and area measurements



Stages in the skinning of a Northern Leopard Frog (*Rana pipiens*; see text).

can be made of dorsal pattern elements and of glandular structures such as the warts of toads and the glandular ridges of leopard frogs. The dispersion of pigment in melanophores and other pigment cells is very well preserved, and can be examined in detail by microscopy. The bones of the feet can be measured in the skin, and the rest of the skeleton is also available, as are all of the internal organs and musculature.

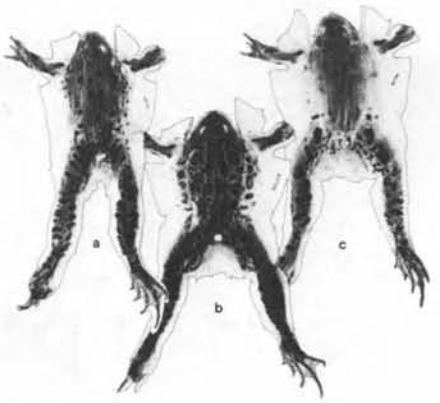
I have made linear measurements with a plastic ruler and area measurements with a grid of points in clear photographic film while the skin was illuminated by reflected or transmitted light (Schueler, 1979), but the two-dimensional character of the skins predisposes them to use with digitizers, reflecting photospectrometers, and other semi-automatic methods of measurement.

Making a three-dimensional skin into a two-dimensional object necessarily distorts the surface, but such shrinkage and buckling as occurs seems to leave the dorsal skin relatively undistorted. In 16 *Rana* skins on which I measured the distance from the pineal spot to the posterior limit of the dorsal lymph sac (SKIN LENGTH) both when the skins were wet (in waxed paper) and a month later when they were dried (and removed from the paper) the two measurements were correlated at r=0.97, and there was an average of 4.7% shrinkage. Dried SKIN LENGTH is highly correlated with other measures of body size (Snout-vent length, cube root of body mass) among 30 male (r's=.98) and 40 female (r's=.99) *Rana pipiens* from Carleton Co., Ontario, collected in August 1979. In a random sample of 100 male *R. pipiens* from the specimens listed in Schueler (1979), on the other hand, SKIN LENGTH and the cube root of body mass are less correlated (r=0.83), but these frogs were collected in many places over several years, and the error varianace (21.5% of the total) may be due more to the measurement of "size" as mass (because of differences in the physical condition and hydration of the frogs and among the scales used) than to any "true" lack of correlation between SKIN LENGTH and "size."

Three analyses from a study of geographic variation amont 828 *Rana pipiens* skins provide some evidence that the skins are presrved with little (or at least uniform) distortion: the high loadings (0.92-0.96) of characters which measure parts of the skin (rather than pigmentation or dermal glands) on their first principal component (Table II-10 in Schueler, 1979), the absence of any effect of the circumstances of preparation (fresh or frozen specimens; slower or faster drying) on variation in pigmentation and dermal glands (Table II-2 in Schueler, 1979), and the high correlations between patterns of geographic variation in the skins with that found in fluid-preserved specimens (Table IV-1 in Schueler, 1979).

ACKNOWLEDGMENTS

These methods were developed for a thesis at the University of Toronto Department of Zoology (Schueler, 1979). I have been generously supported by the National Engineering and Research Council through their grants to J. D. Rising and a fellowship at the National Museum of Natural Sciences. I thank Aleta Karstad for drawing Figures 1-14 and thank her and Francis R. Cook for reading the manuscript.



Skins of spotted (FWS 3271) and apparent *burnsi* (FWS 3258) and *kandiyohi* (FWS 3288) *Rana pipiens* from the tip of Long Point, Norfolk County, Ontario, September 1972 (deposited in the National Museum of Natural Sciences but not yet catalogued).

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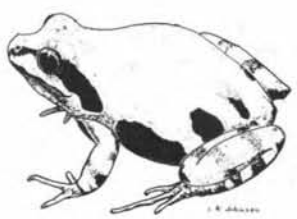
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SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES

Geographic Distribution

Herpetological Review publishes brief notices of new geographic distribution records in order to make them available to the herpetological community in published form. Geographic distribution records are important to biologists in that they allow for a more precise determination of the range of a species, and thereby permit a more significant interpretation of the biology of same.

These geographic distribution records have a **standard format,** and all authors should adhere to that format, as follows: SCIENTIFIC NAME, COMMON NAME (as it appears in **Standard Common and Current Scientific Names for North American Amphibians and Reptiles** , Collins, Huheey, Knight and Smith, 1978), LOCALITY, (use **metric** for distances), DATE (day, month, year), COLLECTOR(S), VERIFICATION BY, PLACE OF DEPOSITION AND CATALOG NUMBER (required), COMMENTS, CITATION(S), SUBMITTED BY (give name and address).

Some further comments. This geographic distribution does not publish "observation" records. Records submitted should be based on preserved specimens which have been placed in a university or museum collection (private collection depository records are discouraged).

Please submit new geographic distribution records in the **standard format** only to Joseph T. Collins, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Short manuscripts are discouraged, and are only acceptable when data **cannot** be adequately presented in the standard format.

Recommended citation for new distribution records appearing in this section is: Jones, J. 1980. Geographic distribution: *Lampropeltis triangulum multistrata.* SSAR Herp. Review 10(1):1.

ANURA

RANA SYLVATICA (Wood Frog). USA: ARKANSAS: Pope Co: NW 40 acres of NW ¼ sec. of sec. 34, R19W, T12N. 11.7 km SE of Pelsor. 26 June 1979. L. Lewis. Arkansas Tech University Collection. No. 235. Verified by G. Turnipseed. County record for Pope County.

Submitted by **GLYN TURNIPSEED,** Department of Biology, Arkansas Tech University, Russellville, Arkansas 72801. ●

SAURIA

ANOLIS CAROLINENSIS CAROLINENSIS (Green Anole). USA: TEXAS: Navarro Co: collected within the city limits of Corsicana. 28 March 1980 by Cary Crum. Verified by Thomas Vance. Navarro College (NC 1980.3. 28.1L). First recorded for Navarro County and extends known range approximately 25 km W of the previously recorded locality of Henderson County (Raun and Gehlbach, 1972, Dallas Mus. Nat. Hist. Bull. 2:1-1). The specimen is a female with a broken tail.

Submitted by **THOMAS VANCE,** Biology Department, Navarro College, Corsicana, Texas 75110. ●

ANOLIS SAGREI (Brown Anole). USA: FLORIDA: St. Lucie Co: Hutchinson Island, Fort Pierce, Hernando Avenue. 10 September 1978. S. Myers and B. Hutchinson. Verified by P. Meylan. Florida State Museum (UF 44103-44106). Found on houses and shrubs. This locality lies 82.6 km N of Riviera Beach population (King, 1960, Quart. J. Fla. Acad. Sci. 23(1):71-73) and 25.4 km S of Vero Beach record (Myers, 1978, SSAR Herp. Review 9(3):107). This series represents the first voucher specimens from St. Lucie County including Hutchinson Island. Previously observed on mainland Ft. Pierce (Myers, 1978, SSAR Herp. Review 9(3):107).

Submitted by **STEVEN MYERS,** Department of Herpetology, Fort Worth Zoological Park, Fort Worth, Texas 76110. Present address: The University of Texas Health Science Center at Dallas, Division of Comparative Medicine, Animal Resources Center, Dallas, Texas 75235 ●

EUMECES ANTHRACINUS PLUVIALIS (Southern Coal Skink). USA: Arkansas: Pike Co: collected within a picnic area of Lake Greeson, 2 km W Daisy. 9 September 1979. Thomas Vance. Verified by Thomas Vance, Navarro College, Corsicana (NC 1979.9. 30.11L). First record for Pike County which partly fills a hiatus within the southwestern part of its range. (Dellinger and Black, 1938, Occ. Papers Univ. Arkansas Mus. 1:2-47; Dowling, 1957, Occ. Papers Univ. Arkansas Mus. 3:3-51; McAllister, 1980, Herp. Rev. 11(4):115; and Smith and Smith, 1952, Univ. Kansas Sci. Bull. 34(11):679-694). This specimen was found in damp and decomposing leaf litter.

Submitted by **THOMAS VANCE,** Biology Department, Navarro College, Corsicana, Texas 75110. ●

EUMECES FASCIATUS (Five-lined Skink). USA: OHIO: Erie Co: 1 km N Castalia. 13 August 1980. Gordon W. Schuett and Fred Kraus. Verified by G. W. Schuett and F. Kraus. University of Michigan Museum of Zoology (UMMZ 170388 and 170389). First records for Erie County (see Conant, R. 1951. Amer. Midl. Nat. 33:1-284.). An adult male and female were collected beneath a railroad tie in a disturbed field next to State Route 269. Three other individuals were seen at this locality that day. This skink has also been found by us in nearby Resthaven Wildlife Area in Erie County.

Submitted by **GORDON W. SCHUETT** and **FRED KRAUS,** Department of Biology, University of Toledo, Toledo, Ohio 43606, and, University of Michigan Museum of Zoology, Ann Arbor, Michigan 48109. ●

XANTUSIA VIGILIS VIGILIS (Desert Night Lizard). USA: CALIFORNIA: Fresno Co: 14.8 km S on BLM access road off Little Panoche Road at Mercy Hot Springs, R11E, T14S, Sec. 32. 11 September 1978. J. S. Kaufmann and K. Tollestrup. Verified by H. Greene, University of California, Berkeley. Museum of Vertebrate Zoology, U. C. Berkeley (MVZ 172250). This is the first record for Fresno County. Specimen found at the base of a dead *Yucca whipplei.* This plant appears to be restricted to the upper west-facing slopes of the Panoche Hills.

Submitted by **JEFFEREY S. KAUFMANN,** Department of Biological Sciences, University of Illinois at Chicago Circle, Chicago, Illinois 60680, and **KRISTINE TOLLESTRUP,** Department of Biology, University of Chicago, Chicago, Illinois 60637. ●

SERPENTES

AGKISTRODON CONTORTRIX CONTORTRIX (Southern Copperhead). USA: ARKANSAS: Newton Co: collected 19 km W Jasper. 24 June 1980 by Thomas Vance. Verified by Thomas Vance. Navarro College (NC 1980. 6.24.1S). First record for Newton County which partly fills the area between most surrounding Arkansas counties (Dellinger and Black, 1938, Occ. Papers Univ. Arkansas Mus. 3:3-47, and Dowling, 1957, Occ. Papers Univ. Arkansas Mus. 3:3-51). The neck of this specimen is partly mutilated due to it being injured and the overall color pattern is darker and more intense than southern representatives of this subspecies.

Submitted by **THOMAS VANCE,** Biology Department, Navarro College, Corsicana, Texas 75110. ●

COLUBER CONSTRICTOR PRIAPUS (Southern Black Racer). USA: ARKANSAS: Pike Co: collected 7 km E Athens on Hwy 84. 7 April 1980 by Thomas Vance. Verified by Thomas Vance. Navarro College (NC 1980. 4.7.2S). First record for Pike County and partly fills the area of the southern part of its range between most surrounding counties (Dellinger and Black, 1938, Occ. Papers Univ. Arkansas Mus. 1:3-47, and Dowling, 1957, Occ. Papers Univ. Arkansas Mus. 3:3-51).

This specimen is a juvenile with typical markings of the subspecies *constrictor*, and was collected at 1115 hours as it was crawling across the road.

Submitted by **THOMAS VANCE,** Biology Department, Navarro College, Corsicana, Texas 75110. ●

ELAPHE GUTTATA EMORYI (Great Plains Rat Snake). USA: TEXAS: Navarro Co: collected 0.8 km S Mildred and 9.6 km S Corsicana. 10 October 1980 by Randall Roper. Verified by Thomas Vance. Navarro College (NC 1980.10.6.1S). First record for Navarro County and partly fills the area within its east Texas range (Raun and Gehlbach, 1972, Dallas Mus. Nat. Hist. Bull. 2:1-61). This is a juvenile specimen with typical characters exhibited by this taxon (Conant, 1975, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston).

Submitted by **THOMAS VANCE,** Biology Department, Navarro College, Corsicana, Texas 75110. ●

ELAPHE OBSOLETA LINDHEIMERI (Texas Rat Snake). USA: TEXAS: Freestone Co: Collected within the city limits of Donie. 21 September 1980 by Jill Pickens. Verified by Thomas Vance. Navarro College (NC 1980.9.21.1S). First record for Freestone County which partly completes its known range in east-central Texas (Raun and Gehlbach, 1972, Dallas Mus. Nat. Hist. Bull. 2:1-61 and Vance, 1980, Bull. Chicago Herp. Soc. 15(3):70-76). This specimen is a juvenile with typical characters of this taxa (Conant, 1975, A Field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Co., Boston).

Submitted by **THOMAS VANCE,** Biology Department, Navarro College, Corsicana, Texas 75110. ●

HETERODON PLATYRHINOS (Eastern Hognose Snake). USA: ARKANSAS: Searcy Co: collected 12 km NNW Marshall on the Buffalo River, Buffalo National River. 29 June 1980 by Macon Edwards. Verified by Thomas Vance. Navarro College (NC 1980.6.29.1S) soon to be relinquished to the Buffalo National River Museum, Harrison, Arkansas. First record for Searcy County and partly fills the area for the northern part of its Arkansas range between most of the surrounding counties (Dellinger and Black, 1938, Occ. Papers Univ. Arkansas Mus. 1:3-47 and Dowling, 1957, Occ. Papers Univ. Arkansas Mus. 3:3-51). This specimen is a juvenile which was caught as it was swimming along the shore of the Buffalo River.

Submitted by **THOMAS VANCE,** Biology Department, Navarro College, Corsicana, Texas 75110. ●

HYPSIGLENA TORQUATA (Night Snake). MEXICO: Baja California del Norte: Isla La Ventana, 28°55' N, 113°32' W. 30 April 1980. Allan W. Smits. Verified by Darrel Frost and Lawrence Hunt. Specimen is mummified, rodent chewed, lacking head (KU 186728). Represents first record of this genus from the island.

Submitted by **ALLAN W. SMITS,** Department of Physiology and Cell Biology, University of Kansas, Lawrence, Kansas 66045. ●

STORERIA DEKAYI (Brown Snake). USA: OHIO: Ottawa Co: Middle Bass Island. 24 June 1979. Gordon W. Schuett and Fred Kraus. Verified by G. W. Schuett. University of Michigan Museum of Zoology (UMMZ 170387). First record for Middle Bass Island (see Langlois, T. H. 1964. Ohio J. Sci. 64(1):11-25.). This snake is abundant on Middle Bass, and has recently been collected by us on North Bass Island.

Submitted by **GORDON W. SCHUETT** and **FRED KRAUS,** Department of Biology, University of Toledo, Toledo, Ohio 43606, and University of Michigan Museum of Zoology, Ann Arbor, Michigan 48109. ●

THAMNOPHIS SIRTALIS SIRTALIS (Eastern Garter Snake). USA: ARKANSAS: Marion Co: collected *ca.* 17 km SE Yellville on a dirt road near the Buffalo River, Buffalo National River. 29 June 1980 by Macon Edwards. Verified by Thomas Vance. Navarro College (NC 1980.6.29.2S). First record for Marion County and partly fills the area for the north-central part of its Arkansas range (Dellinger and Black, 1938, Occ. Papers Univ. Arkansas Mus. 1:3-47 and Dowling, 1957, Occ. Papers Univ. Arkansas Mus. 3:3-51). This specimen is a DOR and was somewhat decomposed at the time it was collected, but it is still identifiable.

Submitted by **THOMAS VANCE,** Biology Department, Navarro College, Corsicana, Texas 75110. ●

ELEUTHERODACTYLUS BRANSFORDII (COPE): AN ADDITION TO THE FROG FAUNA OF HONDURAS

Among the materials collected by Arden H. Brame, Jr. in Honduras, during 1969 and not available for inclusion in Meyer and Wilson's (1971) account of Honduras amphibians is a small frog (LACM 45200) completely overlooked during the intervening years. The individual is a juvenile female *Eleutherodactylus,* 15.5 mm in standard length, taken from Departamento de Olancho: 0.8 km SE San Jose de Rio Tinto, approx. 14 km NE Catacamas at an elevation of 330 m. It was collected February 20, 1969.

The example agrees in every respect with specimens of *Eleutherodactylus bransfordii* as described by Savage and Emerson (1970) and in direct comparison to material from Costa Rica and Nicaragua. This species cannot be confused with any other form in Mexico or Central America because of the combination of rudimentary disks on fingers (no disks on fingers I-II) and toes, no toe webbing, an inner tarsal fold and numerous strongly developed small pungent plantar tubercles. This example has the following character formula, according to the system of Savage and Emerson (1970), M Z_1 C X B P R: Morph II.

The specimen is the first record for Honduras and comes from a locality approximately 170 km NE of the previously northernmost record for the species in the Bonaza mining area (200-300 m) of Departamento de Zelaya, Nicaragua. The site of capture is in a narrow ecotone between lowland moist forest and premontane wet forest according to the Holdridge (1967) terminology. It probably lies in what is essentially a gallery forest predominated by vegetation of the latter type. The few records of this species from eastern Nicaragua as compared to its ubiquitous presence at lowland sites in Atlantic slope Costa Rica suggest that this frog does not occur in the lowland pine savanna areas of Nicaragua and Honduras. From southeastern Nicaragua northward the species is to be expected only along the margins of the Honduras-Nicaragua uplands in especially humid situations and gallery forests. The lack of collecting in such places in eastern Honduras, because of their inaccessibility, probably explains the absence of other records of the republic. Three other species of *Eleutherodactylus (mimus, noblei* and *ridens)* that are relatively common in Atlantic slope Costa Rica and adjacent southeastern Nicaragua, are similarly known from only a single locality in eastern Honduras (Meyer and Wilson, 1971). The *E. mimus* and *E. noblei* records are also from Departamento de Olancho from habitats that seem similar to that at the Rio Tinto locality.

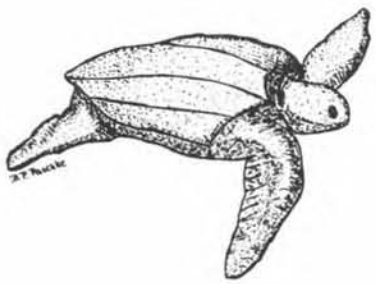
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A RANGE EXTENSION AND LOW ELEVATIONAL RECORD FOR THE ARIZONA RIDGE-NOSE RATTLESNAKE *(CROTALUS W. WILLARDI)*

The Arizona ridgenose rattlesnake *(Crotalus w. willardi)* is a montane subspecies of limited distribution in southeastern Arizona, having been recorded only from Carr and Ramsey Canyons in the Huachuca Mountains and from the Santa Rita Mountains. Specimens have been observed at elevations ranging from 1700 m to over 2740 m (Stebbins, 1954; Klauber, 1972) in plant associations dominated by Arizona white oak *(Quercus arizonica)*, big-tooth maple *(Acer grandidentata)*, New Mexican locust *(Robinia neomexicana)*, Douglas fir *(Pseudotsuga taxifolia)* and white fir *(Abies concolor)* (Wright and Wright, 1975). Lowe (1964) states that this rattlesnake is present from the Transition Zone to the Upper Sonoran, and is most commonly found on conifer forest floors. Shaw and Campbell (1974) have suggested that this snake may favor canyon bottoms dominated by deciduous trees such as maple, oak and ash.

An adult male *C. w. willardi*, measuring 550 mm in length, was observed seven kilometers west of Parker Lake, Cochise County, Arizona, in the rolling foothills southwest of the Huachuca Mountains. The snake was found coiled under a piece of bark near a decomposing oak log along a south-facing slope of a small tributary canyon of Brushy Canyon. Dominant vegetation included Arizona sycamore *(Platanus wrightii)*, Mexican pinyon *(Pinus cembroides)*, one seed juniper *(Juniperus monosperma)*, Arizona ash (*Fraxinus velutina*), Emory oak *(Quercus emoryi)* and Mexican blue oak *(Quercus oblongifolia)*. This plant community has been described as pine-oak woodland by Lowe and Brown (1973), also exhibiting characteristics of the deciduous woodland community. Elevation is 1600 meters.

The presence of this subspecies at a previously unrecorded elevation and in a characteristic southern oak-juniper community raises the possibility that it may be more widespread than previously suspected, and certainly not as restricted to higher elevations and more montane habitats. Canyon systems in this area, with their lush vegetation, thicker canopy and rockier substrate may provide a means for dispersal from isolated mountain ranges into more arid, less habitable environments.

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HERPETOLOGICAL RECORDS FROM A RELICT PRAIRIE IN OHIO

Killdeer Plains is a relict prairie in northwestern Ohio that developed during the xerothermic period following the last glaciation (Sears, 1942, Bot. Review 8:708-736). The original prairie was 30,000 acres, but due to intensive farming, only 7,000 acres remain and are contained primarily in the Killdeer Plains Wildlife Area, Wyandot County (7 km E Marseilles). We recorded 16 species of reptiles and amphibians during the course of a field study on *Thamnophis radix* (an endangered species in Ohio which is isolated, 483 km E of the rest of this species' distribution; Conant, Thomas, and Rausch, 1945, Copeia 1945:61-68) and *T. sirtalis*. Four of these species are records for Wyandot County and supplement Conant (1951, The reptiles of Ohio, Univ. Notre Dame Press). Individual specimens are in the Ohio State University Museum of Zoology (uncatalogued), unless otherwise stated.

Storeria occipitomaculata (Redbelly snake). On County Road 75 between CR 123 and CR 103. 2 October 1979. L. Reichenbach and N. Reichenbach. 5 DOR specimens. New Ohio county record and the second record for the till plains physiographic region in Ohio, 95 km SW of nearest record. A third isolated locality in the sparsely occupied area (W Ohio, E Indiana, N Kentucky) of this species distribution (Conant, 1975, *A Field Guide to Reptiles and Amphibians of Eastern and Central North America*, Houghton Mifflin, Boston).

Storeria dekayi (Brown snake). On CR 75 between CR 123 and CR 103. 2 October 1979. L. Reichenbach and N. Reichenbach. 10 DOR specimens. New Ohio county record, 39 km SW of nearest record.

Clonophis kirtlandi (Kirtland's snake). Pond #6. 4 September and 16, 20 October 1979. F. Dulin, M. Brown, G. Baker, J. Kinney, L. Reichenbach, G. Dalrymple, and N. Reichenbach. 9 specimens (7 adult, 2 juv.). New Ohio county record, 18 km NW of nearest record.

Chelydra serpentina (Common snapping turtle). Pond #6. 26 May 1978. W. Nichols and N. Reichenbach. Released at capture site. New Ohio county record, 27 km NE of nearest record.

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A PACIFIC LOGGERHEAD CAPTURED OFF CALIFORNIA'S NORTHERN CHANNEL ISLANDS

A small Pacific loggerhead, *Caretta caretta gigas*, was captured in waters near Santa Cruz Island, California, on 15 March 1978. The encounter occurred three nautical miles off Valley Anchorage at 33° 56' N and 119° 39' W during a Bureau of Land Management Cetacea Survey.

The turtle, observed floating quietly at the surface of the water, was captured and brought on board the survey vessel, and was identified as a young female Pacific loggerhead. Straight line measurements of the keeled carapace were 457 mm (17.9 inches) in length and 381 mm (15.0 inches) in width. Approximate weight was 8.6 kg (18 pounds). A single species of barnacle and three small crabs were the only commensals associated with the turtle. These organisms were removed and preserved for specific identification.

Several investigators have reported the presence of *Caretta caretta gigas* in the waters of Southern California and Baja California, Mexico (Shaw, 1947; Caldwell, 1962; Marquez, 1969), but the loggerhead has not been previously reported this far north in the Southern California Bight. This record represents a northern extension of the range of the species on the Pacific coast.

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HERPETOLOGICAL RECORDS FROM CENTRAL AND NORTHEASTERN ARIZONA

During the past 2 years, the Bureau of Land Management, Department of the Interior, Phoenix District, has been conducting herpetological inventories in areas from Phoenix, north to the Prescott National Forest and Wickenburg, northwest to Kingman.

Listed below are records that have been determined to be range extensions. Voucher specimens are on file at the Phoenix District herpetological museum unless otherwise noted. Vegetative associations listed are based on Brown and Lowe (1974).

ANURA

Bufo alvarius—Mohave County, Arizona, ca 3,200 ft. Alamo Spring, 15 km E Signal, T13N, R12W, SE, Sec. 9, Arizona Upland, 13 July 1977, KBJ 3314 Extends range WNW 100 km from that reported by Hahn and May (1972). Not collected.

Bufo woodhousei—Mohave County, Arizona, ca 1,600 ft. Big Sandy River, 10 km S Wikieup, T14N, R13W, NW, Sec. 12 Mesquite Bosque, 30 May 1979, BLM 2400 Extends range established by Stebbins (1966) by 150 km to the northwest.

TESTUDINES

Kinosternon flavescens—Mohave County, Arizona, ca 1,860 ft. In canal on Big Sandy River, 3 km S Wikieup, T16N, R13W, SE, Sec. 35, Mesquite Bosque, 26 March 1979, BLM 2378 Extends records 325 km of those cited by Iverson (1978)

SAURIA

Cnemidophorus velox—Mohave County, Arizona, ca 5,300 ft. Hualapai Mountains—Blue Tank Wash, 40 km NW Wikieup, Arizona T19N, R15W, SW, Sec. 33, Interior Chaparral (5 records), 28 September 1978, 12 October 1978 and 11 June 1979, BLM 2192, 2209, 2261, 2270, 2401 Extends range established by Stebbins (1966) 125 km to the west.

Cnemidophorus exanguis—Mohave County, Arizona, ca 4,700 ft. Hualapai Mountains, off Peacock Mountain Road, 26 km ESE Kingman T19N, R15W, SW, Sec. 12, Interior Chaparral, 14 May 1979, BLM 2402 Extends distribution 100 km (Stebbins, 1966).

Eumeces gilberti arizonensis—Mohave County, Arizona, ca 4,600 ft. Hualapai Mountains, 15 km S Kingman, T20N, R16W, SE, Sec. 10 Pinyon-Juniper-Interior Chaparral integrade (4 records), 14 May 1979, (3) 22 May 1979, BLM 2403-2406 Additional records by legal: T19N, R15W, SE, Sec. 12; T19N, R15W, NE, Sec. 32; T16N, R15W, NE, Sec. 15; T16N, R15W, NW, Sec. 24 An uncommon lizard found in Interior Chaparral, Desert Grassland, and Mixed Broadleaf Riparian of the Hualapai Mountains, Bozarth and Goodwin mesas, and Burro Creek, Santa Maria and Big Sandy River drainages. Extends record by Medica and Vitt (1974) 100 km to the northwest.

Cophosaurus texana—Mohave County, Arizona, ca 4,600 ft. Cerbat Mountains, 10 km NW Kingman, T22N, R17W, NW, Sec. 28, Mohave Desertshrub, 13 May 1977, BLM 5001 Extends range 50 km to the NNW (Stebbins, 1966).

Sceloporus clarki—Yavapai County, Arizona, ca 2,100 ft. Santa Maria River, 85 km SE Wikieup, T12N, R9W, NE, Sec. 10, Mesquite drainage, 10 October 1979, BLM 1710 Extends distribution 100 km to the WNW (Stebbins, 1966).

Sceloporus undulatus—Mohave County, Arizona, ca 7,045 ft. Hualapai Mountains, 25 km SSW Kinghan, T19N, R15W, SE, Sec. 5, Pineoak, 28 September 1978 BLM 2186 The most common lizard in the Hualapai Mountains above 4,500 ft. Extends range of this species 50 km WSW (Stebbins, 1966).

Xantusia vigilis vigilis—Mohave County, Arizona, ca 4,000 ft. Southern end of Hualapai Mountains, 12 km W Wikieup, T15N, R13W, SE, Sec. 7, Juniper w/Yucca *elata* and *Nolina* sp., 18 September 1978, (3 records) BLM 2369-2371 Extends distribution ENE 50 km of the Yucca Arizona area (Stebbins, 1966).

Xantusia arizonae—Mohave County, Arizona, ca 4,700 ft. Hualapai Mountains, off Peacock Mountain Road, 26 km ESE Kingman, T19N, R15W, SW, Sec. 12, Interior Chaparral, 3 May 1979, BLM 2407 Extends range 75 km to the WSW (Stebbins, 1966).

SERPENTES

Tantilla planiceps atriceps—Mohave County, Arizona, ca 1,860 ft. Big Sandy River 3 km S Wikieup, T16N, R13W, SE, Sec. 35, Mesquite Bosque, 29 May 1979, BLM 2408 Extends the record of Hahn and May (1972) by 60 km to the northwest.

Leptotyphlops humilis—Mohave County, Arizona, ca 2,240 ft. 14 km SSE Wickieup, T15N, R12W, SE, Sec. 28, Arizona Upland, 1 May 1979, BLM 2409 Extends records at Fort Mohave, Arizona by Fowlie (1965) 75 km to SE and 150 km to the west of that reported by Hahn and May (1972).

Phyllorhynchus decurtatus—Mohave County, Arizona, ca 2,020 ft. Big Sandy River, 4.6 km N Wikieup, on Hwy 93 T16N, R13W, SW, Sec. 10, Mesquite Bosque 7 July 1977, KBJ 3800 Extends range 35 km NW (Hahn and May, 1972). Not collected.

Chilomeniscus cinctus—Maricopa County, Arizona, ca 2,200 ft. 20 km ENE Wickenburg, T6N, R2W, NE, Sec. 9, Mesquite-dry wash, 20 June 1979, BLM 1288 A common resident of sand bottom washes even at the margins of its distribution. Over 25 individuals recorded in 12 different locations. Extends record by Hahn and May (1972) 70 km to the west of Fort McDowell.

Lichanura trivirgata—Mohave County, Arizona, ca 4,200 ft. Cerbat Mountains, 15 km NNW Kingman, T22N, R17W, SW, Sec. 13, Mohave Desertshrub in the vicinity of a mine, 8 August 1977, BLM 5002. Extends record by Hahn and May (1972) by 125 km to the NW. One additional record at the Boriana Mine Hualapai Mountains, T18N, R16W, NW, Sec. 35, ca 3,900, Mohave desertshrub, 19 April 1979.

Masticophis bilineatus—Mohave County, Arizona, ca 4,800 ft. Hualapai Mountains, 24 km ESE Kingman, T20N, R14W, NW, Sec. 18, Interior Chaparral-Pinyon-Juniper Integrade, 5 May 1979, BLM 2411 Extends distribution 80 km to the northwest (Medica and Maza, 1974).

Masticophis taeniatus—Mohave County, Arizona, ca 4,860 ft. Hualapai Mountains, 25 km ESE Kingman, T20N, R14W, SW, Sec. 19, Interior Chaparral-Pinyon-Juniper integrade, 7 June 1979, BLM 2412 Extends distribution by Stebbins (1966) 75 km to the west.

Thamnophis cyrtopsis—Mohave County, Arizona, ca 4,700 ft. Hualapai Mountains, 40 km SSE Kingman, T19N, R16W, NW, Sec. 33, Old Camp Well, Interior Chaparral, 11 August 1977, BLM 2413 Extends range (Stebbins, 1966) 150 km to the WNW.

Crotalus viridis cerberus—Mohave County, Arizona, ca 5,240 ft. Hualapai Mountains—Blue Tank Wash, 40 km NW Wikieup, T19N, R15W, SW, Sec. 33, Interior Chaparral, 24 May 1979, BLM 2414 Extends the range established by Fowlie (1965) 60 km to the SW. Not collected. Photos of this specimen available.

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The Society for the Study of Amphibians and Reptiles is pleased to announce that proposals are now being accepted for the 1981 Grants-In-Herpetology Program. This program is designed to provide financial support to deserving individuals or organizations engaged in research on or conservation of amphibians and reptiles. Grant proposals will be considered in the following areas:

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4) **HERPETOLOGICAL RESEARCH IN ZOOS.** Proposals may address any herpetological research endeavor which is conducted at a zoo. A letter from the represented zoo or supporting institution should accompany the proposal.

Each proposal should include the following information: A) **Background & Objectives** of the proposed project, in terms of its relevance to herpetology, B) **Methods** of carrying out the research or conducting the project, C) **Budget** for the project, according to the guidelines set forth below, and D) **Letter of Support** (if applicable). Proposals should be relatively brief (approx. 5 typed pages).

Budgets for the proposals should not exceed **$250** in each category. The budget request should specifically relate to the project under consideration.

Successful applicants will be expected to submit to SSAR a written report of the results of their research or project, within a reasonable time after the project year is completed. They are also encouraged to submit for publication the results of their research or project, preferably to **The Journal of Herpetology** or **Herpetological Review.**

Members of the SSAR Grants-In-Herpetology Committee will evaluate all proposals, projects or programs. Committee members are: Martin J. Rosenberg (Chairperson), Douglas Fraser (Regional Herpetological Societies), Terry Graham (Conservation), John Groves (Zoo Research) and Ralph W. Axtell (Graduate Student Research).

Individuals submitting proposals should designate to which of the four areas their proposal applies. All proposals must be typewritten and submitted in duplicate no later than **15 APRIL 1981** to:

Martin J. Rosenberg
Department of Biology
Case Western Reserve University
Cleveland, Ohio 44106

Herpetological Husbandry

This section of **Herpetological Review** deals specifically with the husbandry of captive reptiles and amphibians. Articles concerning any aspect of successful exhibit design, techniques for maintenance and breeding, egg incubation, and rearing of the young are acceptable based on the success of the husbandry program, the quality of written work, and the overall value of the presented material to the herpetological community. Reproductive articles should stress the actual methods and specimen manipulation involved but may also include observations of behavior, growth, and statistical data. Of particular interest are reports describing consistently successful, long term programs which deal with large numbers of a single species or genus.

Longer husbandry manuscripts should be divided into appropriate sections including Literature Cited. Black and white photos and line drawings are acceptable. All manuscripts will be reviewed by the Section Editor, and frequently by another individual within the particular area of expertise. Reports which do not deal with herpetological husbandry *per se* (for example, the description of eggs and young from a wild-caught gravid female) will be forwarded to the Editor for consideration as a Feature Article. In order to reduce publication time, husbandry articles should be sent directly to the Section Editor, Bern W. Tryon, Houston Zoological Gardens, Houston, Texas 77001.

FIRST SUCCESSFUL CAPTIVE PROPAGATION OF SCHNEIDER'S SMOOTH-FRONTED CAIMAN, *PALEOSUCHUS TRIGONATUS*

INTRODUCTION

Of all the crocodilians, the genus *Paleosuchus* is perhaps the least known. Neither of the two species assigned to the genus, *P. palpebrosus* (Cuvier, 1807) and *P. trigonatus* (Schneider, 1801) is well known. Specimens of the genus are found in South America, in swift moving, often turbulent waters of the tropical rain forest. The southernmost locality appears to be Bahia; to the west it is found from Rio Abuna, Bolivia, and from the Huallaga and Ucayali in Peru. In the north, it is known from the Rios Sansa and Ocoa, Colombia, and as far north as Angostura on the Rio Orinoco, Venezuela. To the east, it is found mainly in Guiana, Surinam and Mexiana Island. Both species apparently occur together not only over most of the Amazon and Orinoco basins, but even as far as extreme eastern Brazil (Medem, 1958).

Although their hide, because of its osteoderm, is of little value, they are hunted by natives for use as food and such activity very likely has reduced their range since the above distribution was recorded. Medem (1958) noted that individuals, even juveniles, were always solitary. It is known that they hide most of the day and hunt in late evening (Medem, 1958). There are a few *Paleosuchus* in captivity. In a survey of American zoos only 15 animals were located: 5 males, 3 females and 7 of undetermined sex (King and Dobbs, 1975). Information on reproduction in the genus is incomplete. Only recently has work been done on *P. palpebrosus* (Medem, 1972), resulting in successful propagation, and only preliminary reproductive data from eggs found in the wild are available for *P. trigonatus* (Dixon and Soini, 1975). Here I report the first successful captive propagation of *Paleosuchus trigonatus.*

MATERIALS AND METHODS

The Zoological Society of Cincinnati obtained a juvenile male *P. trigonatus* in March, 1966, and a juvenile female in May, 1967. Both were purchased from the same individual but no locality data are available. Eventually they were placed in a circular pool, with a concrete island, located in the Reptile House lobby. The pool housed many other species of crocodilians of varying ages and sizes. Breeding

was first observed early in 1975. Eggs were laid on the night of 24 March, 1975, on the island. Unfortunately they rolled into the water and all were broken but one, which proved to be infertile. It was then decided to concentrate efforts with these *Paleosuchus* and isolate them in a separate enclosure, which was provided in September, 1975.

The new enclosure is a large indoor exhibit located at one end of the Bird House. The area is densely vegetated with live plants and covered with a large skylight which provides a natural photo-period. The enclosure consists of a pool 3.35 X 3.66 X 1.22 m in depth, rising at a gradual incline to a land area of 3.66 X 2.44 m. The water temperature ranged from 21°C in winter to over 27°C in summer. The air temperature was about 21°C in winter, with the summer temperature determined largely by the outside natural conditions. The area was readily open to the public, with only a railing fence as separation. Prior to isolation in the new enclosure, the female specimen was 1.22 m in length and the male specimen was quite large at just over 1.83 m. Their diet consisted of blue fish, horse meat, and rats as supplements. They were fed twice a week in summer and offered feed every 10 days in winter, but the animals showed little interest in feeding during the winter. The move to the new enclosure proved to be quite traumatic for the two caiman and resulted in both animals going off feed for nearly one year. No signs of breeding were noted, but early in 1979 eggs were produced. These eggs were removed and incubated artificially. They were placed in a styrofoam container (180 mm deep and 415 mm square) and covered with peat moss. The eggs were buried in the center, and the container was covered with a sheet of glass. Incubation temperature fluctuated from 29°C-31°C and from 92-100% relative humidity. Periodically the peat moss was sprayed with water. Temperature and humidity of the peat moss were monitored twice daily (early morning and late afternoon) and a visual check of the eggs was made weekly. The artifical incubation resulted in the hatching of six caiman.

RESULTS AND DISCUSSION

Seventeen eggs were observed on 8 January, 1979, at 0200. The eggs had apparently rolled into the water, but could not be retrieved until 0700. Water temperature upon removal was 15°C. When removed, the eggs were covered with a clear gelatinous substance. Because it was unknown if the five hours in water had ruined the eggs, one egg was opened after 28 days. It was found to be fertile and there was visible body development (eyes and beginnings of leg protrusions and a visible heart beat).

Since the incubation period for *P. palpebrosus* is known to be 90-92 days (Medem, 1972), the eggs were candled on 4 April, after 94 days of incubation, and of the 16 eggs remaining, 7 were found to be fertile. All eggs were uniform in size and weight with a rough calciferous surface (Fig. 1). With no signs of hatching after 102 days, another egg was opened on 10 April. This particular egg was

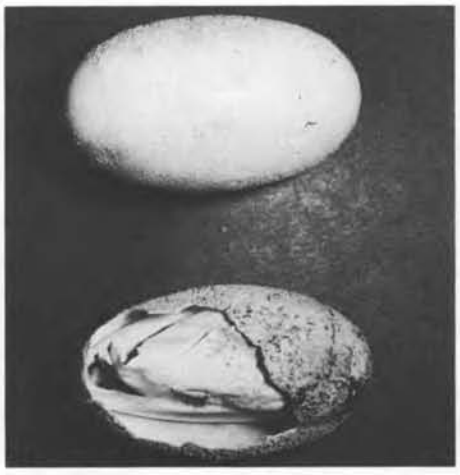


Figure 1. Unhatched and hatched egg; note inner membrane separated from outer shell in hatched egg. Janet Ross, Zoological Society of Cincinnati.



Figure 2. Young caiman after entering water. Fred Straub, Cincinnati Enquirer.

noted by Medem (1972) for *P. palpebrosus*. Since Medem (1972) found that a hatchling *P. palpebrosus* placed directly into water died, the young caiman was placed in a tank containing a mixture of moistened sheet moss and peat moss and a piece of cork bark under which it could hide. The caiman was kept in this container for 24 hours, in keeping with the notion that hatchlings in the wild spend from 24-48 hours in debris and dry leaves to allow the mucus to dry completely and to allow a toughening of the hide to occur. This procedure was repeated with the remaining hatchlings.

By 7 May, 118 days after the eggs were laid, six caiman had hatched (Table 1). Three responded to the call and egg movement procedure and immediately emerged; one came out at night on its own, and two cracked their eggs and returned a call but remained in the egg up to 48 hours before completely emerging. After the 24-hour drying-out period, the young were placed in a 30-gallon aquarium with one end elevated about three inches. The higher end contained moistened peat and sheet moss mixture; the lower end contained water and a cork bark shelter. All hatchlings remained on the elevated moss area, often digging under moss for seclusion, and then entered the water during the dark evening hours. They continued their seclusion under the bark and seldom left the water (Fig. 2).

calling procedure was repeated, in a single motion, the young caiman propelled itself headfirst out of the egg. The hatchling was covered with a thin clear mucus, like that selected because it had a small crack in one end of the shell, with a clear substance containing blood vessels protruding. The egg contained a live, alert animal thought to be 1-3 weeks premature. The animal measured 180 mm and was fully developed except for a small amount of scale area around the yolk sack attachment area. The young caiman, still in the lower half of the egg, was placed in a small covered container with moist paper towel to retard moisture loss. It lived for 25 hours, during which time it remained alert and defensive but made no effort to free itself from the egg sack. The animal was preserved (CVG - A. 38089).

Although incubation had gone well beyond the expected time, it was decided to let the remaining eggs run their full course. Beginning 1 May, 112 days after oviposition, the eggs were uncovered daily and a grunt call was made along with a gentle movement of the eggs to simulate the actions of the adult female caiman (Medem, 1972). The peat moss covering was sprayed with water each time to replace any moisture loss and maintain the desired humidity level. On 3 May, after 114 days of incubation, as the eggs were moved, a crack developed in one. Because the crack neither extended nor widened and no return call came from the egg, it was covered again and left for the night. The next morning (14 hours later) the cracked egg looked the same. However, after the movement of the egg and

TABLE 1. Weight and Length Measurement for Six Hatchling *Paleosuchus trigonatus*, on 9 May, 1979

	Length (mm)		Weight (g)
	Snout-Vent	Tail	
1.	112.0	110.0	45.5
2.	111.0	110.0	46.2
3.	111.0	96.0	46.5
4.	110.0	112.0	43.5
5.	110.0	110.0	44.0
6.	109.0	112.0	47.5

The adult female caiman is known to aid in the cracking of the shell if the hatchlings cannot get out on their own (Medem, 1971). In the present case, the hatchlings readily cracked the eggs themselves. Actually, at the point of hatching, the hard, brittle outer shell seemed to be visibly weakened with the hairline cracks and fell away easily from the thick inner membrane as the young emerged. Of the six hatchlings, one developed an abdominal problem and died two weeks after birth. The animal was preserved (CVG - A. 38131). The remaining five were alert and healthy in appearance and were offered a first food of crickets (dusted with vitamins) after 14 days. When these were readily accepted, live gold fish and live juvenile mice were added to the diet and kept available to the caiman at all times. As of 19 October, 1979, all five are doing well and growing rapidly.

ACKNOWLEDGMENTS

I would like to thank Edward Maruska, Kraig Adler, Leslie Garrick, and Richard Davis for reviewing this manuscript, and those others who gave helpful comments. The two dead embryos (CVG - A.38089, CVG - A. 38131) are in the Cincinnati Zoo's preserved collection.

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REPRODUCTION OF THE BALL PYTHON, *PYTHON REGIUS* IN CAPTIVITY

Nothing is known concerning the reproduction of the Ball python *(Python regius)* in the wild and information on breeding this species in captivity is scant. Logan (1973) reported successful hatching of several clutches of ball python eggs incubated artificially at about 80°F (27°C). We are not aware, however, of any published accounts of hatchings from eggs that were tended to by the parent. There is a single, curious report of a ball python that was said to have given birth to 11 young (Anonymous, 1941).

Recently we had the opportunity to observe two instances of reproduction of *P. regius* in captivity in which both females were allowed to remain with the eggs.

MATERIALS AND METHODS

The first pair of ball pythons was quite small: nine days before the eggs were laid on 10 June, 1978, the female (VM76-02RG) weighed 980 g, the male was 911 g. The second pair was much larger, 11 days before oviposition the female (EB77-04RG) weighed 2,010 g, the male was 1,615 g.

On 10 June 1978, female VM76-02RG was transferred to a 60 X 30 X 30 cm aquarium tank, the bottom of which was covered by a 2 cm layer of packed down, damp peat moss. This in turn was covered with a 3 cm layer of damp sphagnum moss. An angulated slab of weathered driftwood was placed in one side of the tank to serve as a hiding place and nesting site. Two incandescent light fixtures were mounted on the pegboard cover at the opposite end of the tank. The light bulbs were used to regulate temperatures within the tank. One of the bulbs was red and was left on almost continuously. The other, a white bulb, was turned on only during the day. Relative humidity was kept at over 90 percent at all times by periodic misting.

Temperatures among the eggs within the body coil of the female, within the nesting site of the substratum and of the air within the tank, were measured with appropriate thermistor probes and a 12-channel YSI Model 44-TD Thermistemp Telethermometer as described previously (Van Mierop and Barnard, 1976). A piece of dark cloth was suspended from the tank cover to shade the air thermistor probe from the light bulbs. The aquarium was placed on a layer of insulating material.

Female EB77-04RG was placed in an aquarium measuring 90 X 38 X 30 cm on 15 March, 1979. Interior arrangements were similar to those described above.

OBSERVATIONS

Data on Female VM76-02RG prior to 10 June, 1978 are fragmentary. Room temperature was about 24°C. An incandescent light bulb mounted in the cage was usually but not always turned on during the day. No matings were observed. The female refused to feed after March 1978 and there was a gradual change in temperament. The ordinarily timid and inoffensive animal became irritable, struck at being disturbed, actually biting on several occasions. There was an increasing tendency to bask under the lights and to turn the mid and rear portions of the body sideways or upside-down while basking. This behavior continued after transfer to the aquarium tank.

Late in the morning of 19 June, 1978, four white eggs were laid. Three of these adhered to each other, the fourth was separate. Two of the eggs could be measured (Table 1), the other two appeared to be of about the same size. After egg laying was completed the female coiled tightly around the eggs. Ambient temperature at oviposition was 29.5°C. During the first 18 days of brooding, the ambient temperature was allowed to fluctuate between a mean low in early morning of 27.6°C (lowest 26.2°C) and a mean high in late afternoon of 32.5°C (highest 33.2°C). Corresponding mean nesting site and coil temperatures were respectively: low 28.1°C and 28.5°C, high 32.1°C and 31.6°C. Lowest measured temperatures at these sites were 27.0°C and 28.0°C, highest temperatures were 32.7°C and 32.3°C. The body temperature of the female therefore followed the fluctuations of the ambient temperature rather closely (Fig. 1). From day 19 on, the morning temperature was kept somewhat higher. The red light was turned on at night, and at times during the day, the white

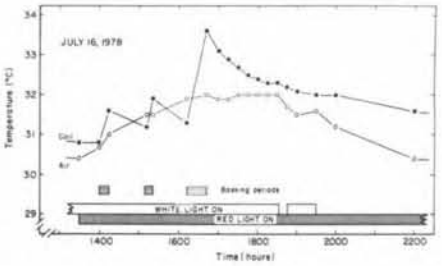


Figure 1: Ambient and coil temperatures measured over a four day period during brooding of a female ball python, *Python regius*.

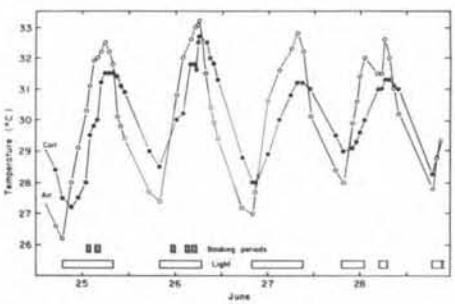


Figure 2: Effect of basking on coil temperature of a brooding female ball python.

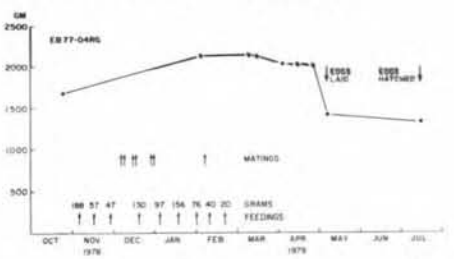


Figure 3: Weight of female ball python before and during gravid period, after oviposition (estimated) and after eggs had hatched.

one only during the day. This arrangement resulted in a mean morning low ambient and coil temperature of 30.2°C (lowest 29.2°C), mean late afternoon high temperatures of the air and the coil were 32.4°C and 31.6°C (highest 34 and 33°C). Mean coil temperature for the entire incubation period was 30.6°C.

The female left the eggs nearly every day for short periods, usually in early afternoon and sometimes more than once, to bask under the incandescent lights. Longest observed basking period was about 50 minutes. When disturbed the animal would immediately return to the eggs. After such a basking period the coil temperature increased by as much as 2°C, but under the existing nesting conditions it would return to slightly above ambient within a few hours (Fig. 2).

The female continued to be very protective of her eggs and struck at the glass when disturbed. A small freshly killed rat was refused on 21 June, three others offered on 3, 14 and 23 July were readily taken. The female shed outside the nesting site on 13 July. No excreta of any type were produced during the entire incubation period. About one week after oviposition, two of the eggs began to collapse and subsequently the shells turned yellowish-brown. Since there was no evidence of putre-

faction these eggs were not removed.

The two remaining eggs began to hatch on 21 August after an incubation period (between oviposition and the appearance of slits in the eggs) of 63 days. Both young had left the shell two days later and exhibited typical ball python behavior. One shed 11 days after hatching, the other two days later. Live, newborn rats were taken after the first shed and by one year of age on a diet of rats, the young had increased their weight six-fold (Table 1).

The two collapsed eggs contained a firm mass which resembled hard boiled egg white. There was no evidence of decay nor was there any trace of an embryo in either egg. Several earwigs *(Forficula auricularia)* had tunneled into the interior of the eggs and had deposited their own eggs. In addition there were numerous tiny olichaetes and entomobryid springtails. pH of the substratum was about 6 as tested with a reagent strip.

The second pair mated several times between 5-30 December, 1978. The male was removed 3 January, 1979, and reintroduced to the female a month later. Two further matings were observed on 6 and 7 February. Ambient temperature at these times varied between 23° C in the morning and 28-30° C in the afternoon. The animals were permanently separated on 10 February. The female accepted her last meal, a small mouse, on 20 February.

Body weight of the female increased from 1675 g on 24 October, 1978, to 2131 g on 4 February, 1979. Thereafter there was a slight weight loss to 2010 g on 26 April (Fig. 3). Temperature within the nesting site after transfer to the aquarium tank of 15 March fluctuated between 26-27° C in the morning to 29-30° C in the afternoon. The behavior of this female (irritability, basking, unusual body positions) was as described for female VM76-02RG. On 15 March, a marked enlargement of the midbody was noted which persisted for about a day. At the same time the distal one-third of the body had become more slender than before, *i.e.* the previously diffuse enlargement of the entire rear portion of the animal had shifted proximally and had become more localized. After about 24 hours the bulge disappeared and the rear part of the body resumed its "full" appearance as before.

Between 0800 and 1100 hr on 7 May, 1979, seven eggs were laid. One of these fell outside the coil and was removed. It was weighed and measured (Table 1) and after candling, which demonstrated a vascular system already in an advanced state of development, put in a glass container on a substratum of damp peat and sphagnum moss. The container in turn was placed in the aquarium tank in an area where the temperature was similar to that measured within the coil of the female. Behavior of the female during brooding was as described above except that she refused to feed throughout the incubation period. Temperature within the coil (lowest 28.5° C, highest 32.5° C) varied with that within the nesting site (lowest 28° C, highest 33° C). Mean coil temperature over the entire incubation period was 30.1° C, slightly lower than in the case of VM76-02RG. Humidity again was kept very high.

On 9 July the eggs no longer adhered to each other and the female was unable to coil around the scattered eggs. All were removed, candled, weighed, measured and placed in an incubator at 30.5° C. All were fertile and stained deep brown where they had rested on the peat substratum. The pH of the substratum as measured with a Radiometer Model BMS 3 Mk 2 blood gas and acid-base analyzer was 4.9. No organisms were seen.

On 13 July, the eggs, including the one incubated separately, began to hatch and three days later all young had left the shell. The young snakes shed between 28-30 July.

Table 1. Measurements (cm) and weights (g) of females, eggs and young of *Python regius*.

Female #	VM76-02RG	EB77-04RG
Weight of ♀ before oviposition	980	2010
Number of eggs	4	7
Total weight of eggs (est.)	320	595
Weight of ♀ after oviposition (est.)	660	1415
Weight of ♀ after eggs hatched	—	1342
Egg length, after oviposition	6.5	7.8*
Egg width, after oviposition	3.8	4.3*
Egg weight, after oviposition	—	84*
Egg length, before hatching	8.2*	7.2
Egg width, before hatching	4.1*	4.8
Egg weight, before hatching	86*	101
Hatchlings, length	38	43
Hatchlings, weight	56	67
Juveniles, length at one year	75	—
Juveniles, weight at one year	359	—

* Single egg, all other measurements and weights of eggs and young are mean values.

DISCUSSION

Some features of the reproductive cycle of *P. regius* are similar to those of *P. molurus*, the python species which has been studied most often and in the greatest detail. As in *P. molurus* and most, if not all other pythonid snakes (Benedict, 1932; Lederer, 1944, 1956; Ross, 1973; Ross and Larman, 1977; Sclater, 1862; Stemmler-Morath, 1956; Valenciennes, 1841; Van Mierop and Barnard, 1976, 1978; Walsh, 1977), the female ball python stops feeding some weeks after mating and coils around the eggs until they hatch. Unlike *P. molurus*, however, the ball python female will leave the eggs for brief periods to bask or, at least in some cases, to feed.

The statement has been made repeatedly, as for example by Logan (1973) for *P. regius*, that female pythonid snakes gain weight when gravid. Since no food is taken such a weight gain could only be explained on the basis of fluid retention. Female EB77-04RG was weighed several times when gravid. This showed that the animal actually lost weight (Fig. 3). Our observations with gravid *P. molurus* also have demonstrated that the "weight gain" is an illusion created by the fact that the rear portion of the body becomes larger while at the same time the anterior part of the animal becomes thinner. In other words, there is a redistribution of body mass, rather than a true weight gain.

The peculiar and pronounced local enlargement at midbody which lasts for about 24-36 hours and which occurs some 50 days prior to oviposition, we have also seen in *P. molurus*. The explanation for this phenomenon could be that ovulation occurs at that time and that the eggs migrate anteriorly, crowding together, in order to enter the oviducts.

We have found no evidence that the ball python becomes temporarily endothermic. Pitman (1973) stated that the "brooding female African *Python regius* able physiologically thermoregulate body temperature maintain heat above eggs lower critical temperature (33° C) and some 5 degrees higher than ambient temperature, to aid incubation", and "no evidence available — ability *P. sebae* thermoregulate body heat by conspicuous musculature contraction as do *P. regius* and Asian *P. molurus*". Pitman does not elaborate or give his source. According to Logan (1973), *P. regius* twitches when incubating. We have not found any evidence that the female ball python is able to regulate body temperature and produce heat endogenously by means of contractions of the body as has thus far been proven only for *P. molurus* (Hutchison, Dowling and Vinegar, 1966; Vinegar, Hutchison and Dowling, 1970; Van Mierop and Barnard, 1976, 1978). The behavior of the female as observed in this study however does suggest that this species, if given the opportunity to do so, may be able to maintain a more or less constant incubation temperature by behavioral means, i.e. by selection of nesting site and by basking, as has been observed by Cogger and Holmes (1960) for the carpet python *(Morelia spilotes variegata)*.

The relatively very large size of the eggs of *P. regius* has been commented upon previously (Logan, 1973; Pitman, 1973). Unlike the eggs of *P. molurus* which lose weight during incubation, those of the ball python increase in size and weight as do the eggs of most other snakes.

The incubation periods of 63 and 67 days were considerably shorter than the 97 to 102

days reported by Logan (1973). This difference undoubtedly is related to the higher mean incubation temperatures of 30.6 and 30.1° C as compared to about 27° C in Logan's study.

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BOOK REVIEWS

Wever, E. G. 1978. **The Reptile Ear. Its Structure and Function.** Princeton Univ. Press. xii + 1024 pp. ill. ISBN 0-691-08196-4. $50.

This book reminds me in so many ways of Gordon Walls' *The Vertebrate Eye:* it is comprehensive; it is profusely illustrated; it is lucidly written; it has universal appeal; and it is bound to become a classic.

The text is divided into four parts. The Introduction describes the techniques used for studying the ear, an organ so constructed that extraordinary methods of dissection, fixation and sectioning are required. Prior to dissection, sensitivity was measured on the intact ear of the anesthetized animal as the sound pressure required to produce a standard cochlear potential of 0.1 μv. When these pressures are determined over a spectrum of sound frequencies, the plot is U-shaped and the bottom of this curve represents those frequencies to which that particular ear is most sensitive. Anyone who has worked with reptiles knows how frustratingly incomprehensible their reaction to sound stimuli can be. The above technique overcomes this problem and enables comparison of auditory capabilities among different species. The General Anatomy of the Reptilian Ear and Sound Transmission to the Cochlea and the Stimulation Process conclude the introductory part.

Part II, by far the longest, describes the ear in the various families of lizards; part III includes snakes, amphisbaenians, *Sphenodon*, turtles and crocodiles. Each segment is introduced with a list of the toal number of specimens dissected, measured and described for each species that the author was able to obtain. I was tempted to count the number of reptile families, species and specimens represented in this opus, but after the first listing (Iguanidae) of 47 species, 149 specimens, I decided simply to state that the numbers are impressive and that they obviously represent a lifetime of meticulous, devoted, labor. The anatomy of the outer (when present), middle, and inner ear is described in detail for each species, anomalous or unusual details are pointed out, the sensitivity curve is provided and whenever known, (unfortunately, not too often) the relationship between the ear structure and the ecology of the species.

Part IV is a brief concluding summation of the writer's interpretation of the probable evolutionary history of the ear: the vertebrate cochlea emerged independently out of the non-auditory labyrinth in three different vertebrate groups: fishes, amphibians and reptiles, while the ear of birds and mammals followed the pattern of the reptilian ear. However, among the reptiles, especially the lizards, diversification has occurred in a number of ways, especially in the means of restraint of the ciliary tufts of the hair cells.

No reptile is deaf. Even those without external ears can perceive aerial vibrations, most quite well. Considering that reptiles as a group are not renowned for their vocalizations, the role that the ear plays in their survival is still mostly conjectural; that indeed it must have an important function is convincingly documented in this fascinating monograph. A copy of this book belongs in the library of every herpetologist.

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Herpetological Explorations of the Great American West. Edited with an introduction by Kraig Adler. 1978. Arno Press, New York. A two volume facsimile reprint of 24 studies by fifteen authors. Pagination indeterminate (*ca.* 2¼ inches thick—both volumes). $75.00.

This two-volume facsimile publication of collected rare works on the herpetology of the western United States (and Mexico) is a valuable compilation for anyone interested in North American amphibians and reptiles. The geographical area treated in these two volumes spans from Arkansas to the Pacific coast, and from the Canadian border into Mexico. As in other volumes of this series by Arno Press, the lack of overall consecutive pagination causes difficulty in locating a specific paper—one must search for a title page to locate the desired work. Otherwise, the two volumes are tastefully bound, well-organized and easy to read.

Included in this collection are herpetological portions of seven works by Baird, Cooper and Hallowell devoted to explorations for a railroad route from the Mississippi River to the Pacific Ocean. I feel their inclusion is of tremendous value since they had previously created (for me) a bibliographic nightmare. The seven papers are fully referenced and organized, and should eliminate much of the confusion regarding these surveys and their dates of publication. Also included (in volume

two) is the complete 1865 work of Maximilian, Prinz zu Wied, on his explorations in North America. This study alone commands prices of over $100.00 from book dealers, and, when this is considered, the price of $75.00 for these two volumes seems quite reasonable. I consider these collected works a good buy and a useful addition to any herpetological library.

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A Guide to Field Identification: Amphibians of North America. By Hobart M. Smith. Illus. by Sy Barlow. 1978. Golden Press, New York. 160 pp. $4.95.

This book, written by one of America's most distinguished herpetologists, is not only a useful field guide to the salamanders and anurans of the United States and Canada, but is also a compact handbook of North American amphibians, of value to both amateurs and professionals.

Amphibians of North America begins with a general introduction to the amphibia, including sections on habits and habitats, collecting techniques, and an important paragraph on "Ethics for the Enthusiast." A chapter on the physical characteristics of the families of American amphibians follows, accompanied by generalized drawings indicating the important characters used in species identification.

Of special interest to amateur readers are chapters explaining basic taxonomy and the use of identification keys. The author also describes the "policies of the book," including his decision to de-emphasize the naming and description of subspecies. This is a significant deviation from other popular field guides on amphibians.

The "identification" section for each order of amphibian is preceded by a general discussion of the structure and life history of the animals. All points are clearly illustrated and labeled, allowing readers untrained in amphibian biology and physiology to comprehend the text. For example, the section on frogs and toads includes descriptions and illustrations of the "topography of an anuran," "typical anural life history," "kinds of vocal sacs," and "distinguishing the sexes." A key to tadpoles is offered, allowing identification to the genus level.

Illustrated keys are an integral part of the identification system used in this book. To be useful and accurate, keys must often refer to characters which are difficult for the untrained amateur to visualize and understand. Smith and Barlowe have at least partially overcome this problem with the use of diagrams numbered to correspond with statements in the keys.

Identification of a specimen could be accomplished by going through a series of keys. Thus, the description of each order includes a key to the families; where necessary this leads to a key to the genera, and the introductions to the larger genera include keys to the species. The author, however, realizes that most users of this book will first rely on the illustrations of the species to identify a specimen, thus the recommendation that the keys be used to "verify" a proposed identification.

The descriptions and illustrations of species are arranged as in other field guides in the Golden series, *i.e.* with the range map and text for a species on the left-hand page, and its illustration(s) on the facing page. This system is certainly more convenient than one which requires the user to flip through a book to check illustrations, text, and range map for a species, but it is not without its costs. It limits the space available for descriptive text—and may partially explain the need for de-emphasizing the descriptions of subspecies in this guide, which are often terse. Greater reliance must then be placed on range maps for determination of subspecies, which leads to one of the few problems in using this book. The maps are very small and do not show state or provincial boundaries. Ranges of subspecies are "color-coded" to the text description; some difficulty in interpreting the maps may be encountered, particularly for forms with very limited ranges. A reader who is color-blind might also have some problem with the color-code system.

In general, the species descriptions are adequate, and Barlowe's illustrations are accurate and skillful. All species are shown in color, with color variations included where necessary. Diagrams are used to show morphological details useful in identification.

Following the species descriptions, Smith has included interesting and well-written chapters on "amphibian evolution, distribution, and anatomy," "reproduction" (including growth and longevity), "behavior" (amphibians do not hibernate, it seems—they instead "brumate"!), "enemies and self-defense" (including a rather depressing section on "Ecological Status" where Smith notes that "total eradication of amphibians is not likely, but their diversity will be greatly diminished. There appears to be no practical means of preventing this outcome.").

There is no bibliography, but the section entitled "Other Sources of Information" lists addresses for selected museums having important herpetological divisions, and mentions a number of good, generalized texts and literature references dealing with amphibian identification and biology. There is also a useful cross-referenced index.

Many of the common and scientific names used in *Amphibians of North America* differ from "Standard Common and Current Scientific Names for North American Amphibians and Reptiles" (Collins, *et al.*, 1978), published by the Society for the Study of Amphibians and Reptiles in 1978. Smith was a co-author of that report. As mentioned previously, no common names were assigned to subspecies in this new field guide, and a few species names have been changed. Smith has "arbitrarily" restricted the name "frog" to the advanced anurans (true frogs and treefrogs), while all other anurans are considered "toads." It will be interesting to see if the herpetological community will accept this usage; there will almost certainly be some resistance to a few of the common names chosen by Smith. For example, he uses the name "Peeper Treefrog" for the species *Hyla crucifer*, rather than the established name "Spring Peeper." *Ambystoma talpoideum* is called the "Talpid Salamander" instead of the more familiar name "Mole Salamander" (perhaps to avoid confusion with the common name for the family to which this species belongs?).

The scientific names in this field guide are as current as possible, but in a few cases Smith has chosen to differ from Collins, *et al.* (1978). For example, the genus name *Spea* is adopted for several of the western Spadefoot Toads *(S. hammondi, S. intermontana, S. bombifrons); Spea* has been considered a subgenus of *Scaphiopus* by previous workers, and Collins, *et al.* (1978) retained *Scaphiopus* for all of the North American Pelobatids.

Smith has figured range maps for the problematical species *Hyla versicolor* and *Hyla chrysoscelis,* though the map for the latter species is described as "largely conjectural." The ranges depicted for these two species are mutually exclusive, although recent work has shown that *H. versicolor* and *H. chrysoscelis* may occur sympatrically in some areas (*i.e.* Jaslow and Vogt, 1977, and Johnson, 1977). In the present book, the latter species' name is spelled *"chrysocelis"*, in apparent error.

A Guide to Field Identification: the Amphibians of North America will inevitably be compared to the amphibian sections of previous American field guides, such as Stebbins (1966) and Conant (1975). This reviewer feels that the Smith/Barlowe guide should be considered a valuable companion volume to these previous works, and not a competitor. Smith and Barlowe have made a fine contribution to popular American herpetology with this new field guide, and it definitely deserves a place in the library of all persons interested in the amphibia of North America.

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Stebbins, R. 1966. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Co., Boston. xiv + 279 pp.

JAMES H. HARDING
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500 Lone Pine Road, Box 801
Bloomfield Hills, MI 48013 U.S.A.

AMS Publications

announces

TURTLES IN KANSAS

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Janalee P. Caldwell and Joseph T. Collins

This book presents complete and concise information on the fourteen kinds of turtles currently known to occur in Kansas. Each of these turtles is treated in an account which contains one or more color photographs, common and scientific name, and descriptions of its size and identifying characteristics, habitat, breeding habits, food preferences, predators, defense mechanisms, general range, species with which it might be confused, how to observe it in the wild, and a **detailed** map of its distribution in Kansas.

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NEWSNOTES

CORRECTION

The following are addenda to the last Legislative Alert column (**HR** 11(4):105):
Hyla andersonii is listed as Endangered *only* in Florida, not throughout its range as implied.
Gopherus agassizii is listed as Threatened *only* on the Beaver Dam Slope in Washington County, Utah, not throughout its range.
Chelonia mydas is listed as Endangered in Florida and the Pacific coast populations of Mexico and Threatened everywhere else (such as in Hawaii and the Trust Territories and Puerto Rico).
Lepidochelys olivacea is listed as Endangered only on the Pacific Coast of Mexico and Threatened everywhere else.
Alligator mississippiensis is listed as Endangered in Oklahoma, North Carolina, Arkansas, Alabama, Mississippi, and inland portions of Texas, Louisiana, Georgia, and South Carolina; Threatened in Florida, central Louisiana, and coastal portions of Texas, Georgia, and South Carolina; and Threatened by Similarity of Appearance in 12 parishes in coastal Louisiana.
Crocodylus porosus is *not* listed as Endangered in Papua New Guinea.

The author and editor regret any confusion caused. ●

HERPETOLOGICAL MONOGRAPH SERIES

The Herpetologists' League has instituted a new publication series — the **Herpetological Monograph Series** — that is intended to serve as an outlet for manuscripts that, owing to their length, are not suitable for publication in traditional scientific periodicals. Contributions should be of broad appeal to the herpetological and scientific communities, and should address topics of amphibian and/or reptilian biology at the organismal level. Although symposia proceedings are not excluded from consideration, preference will be given to monographic works. By establishing the Herpetological Monograph Series, the Herpetologists' League proposes to (1) produce publications of scientific merit and quality, (2) make such publications available at a reasonable cost to the herpetological community, and (3) utilize proceeds from sales of publications to subsidize subsequent monographs.

Persons desiring additional information about this new publication series are invited to address inquiries to the Managing Editor, Linda Trueb, at the Museum of Natural History, The University of Kansas, Lawrence, Kansas 66045, USA. ●

ANTI-HERP AD

30 Crystal Road
Levittown, PA 19057
December 4, 1980

Dear George:

I would like to bring to the attention of the SSAR membership a series of ads by the Nocona Boot Company of Nocona, Texas, that have been appearing in *Playboy* magazine for over a year that I know of. These may also have appeared in additional periodicals, but if so, I have no knowledge of them.

These ads depict the suggested beheading of a western diamondback rattlesnake by a Nocona-shod figure (page 62 of the September, 1979, and again on page 98 of the January, 1981, issues of *Playboy*), and the suggested "removal" of a Gila monster from a Nocona-booted figure with a pair of fence-cutting pliers (page 70 of the December, 1980, issue of same). These same ads may have appeared at other times as well. I don't get the opportunity to thoroughly scan each month's issue of *Playboy*, so can't say for certain. However, I have seen at least one other, similar, ad depicting a scorpion as the victim.

I am especially disturbed by these ads appearing in a periodical with a circulation and impact of the magnitude of *Playboy's*. That magazine wields a great deal of psychological influence, whether intentional or not, and hence, helps to mold many readers' attitudes about a great many subjects. These ads are especially insidious in such an influential source.

Not only is this type of advertising offensive, but it is totally unnecessary as well. In addition, it is counterproductive from the standpoint of the preservation of these animals and in the case of the Gila monster at least, an endangered and protected species is involved.

If other readers are as disgusted by these ads as I am, I urge them to write to each of the following and express their dissatisfaction and to try to bring an end to this ad campaign:

Mr. Enid Justin, President
Nocona Boot Company, Inc.
P.O. Box 599
Nocona, TX 76255
Mr. Dale Gordon, Sales Manager
Nocona Boot Company, Inc.
P.O. Box 599
Nocona, TX 76255
Mr. Russell Weller
Playboy Magazine
Playboy Building
919 North Michigan Avenue
Chicago, IL 60611

Hopefully, with enough SSAR members' support, we can force both *Playboy* and the people at Nocona to realize the destructive nature of these ads and to discontinue them at the earliest possible date.
Thank you very much.

Sincerely,
Joseph R. Dinardo

REPTILE HUSBANDRY SYMPOSIUM

Fifth Annual Reptile Symposium on Captive Propagation and Husbandry to be held Friday thru Sunday, June 12, 13 and 14th, 1981, at the Oklahoma City Zoo, Oklahoma. Papers are still being accepted by Dr. Martin J. Rosenberg, Case Western Reserve University, Biology Department, Cleveland, Ohio 44106. This year's Symposium co-ordinator is Thomas Huff, Director, Reptile Breeding Foundation, P.O. Box 1450, Picton, Ontario, Canada KOK 2TO. Information with regard to accommodations should be addressed to Darell Pickering, Oklahoma City Zoo, 2101 N.E. 50th, Oklahoma City, Oklahoma 73111.

RICHARD A. HAHN
Publicity Chairman,
5th Annual Reptile Symposium
Zoological Consortium, Inc.
13019 Catoctin Furnace Rd.
Thurmont, MD 21788 ●

HR REVIEWERS

The editorial staff wishes to thank the following persons for reviewing manuscripts over the past several months:

James P. Bacon, Joseph Bielitzki, R. Bruce Bury, Gary Carl, Charles Carpenter, Archie Carr, Roger Conant, Joseph Collins, William E. Duellman, Stan Dyrkacz, John Ferner, Gary Ferguson, James Gillingham, Gary Harwell, Larry Hunt, John Lynch, C. J. McCoy, James B. Murphy, George Nace, Hugh Quinn.

Their investments of time are much appreciated. ●

POSITION

COLLECTION MANAGER

The Division of Herpetology, Museum of Natural History, University of Kansas, anticipates a position for a full-time collection manager for a period of two years with the possibility of continued funding for a permanent position. The starting date can be from 1 July to 1 September 1981 with a starting annual salary of $18,000 plus fringe benefits. Candidates must have a Bachelor's Degree or Master's Degree in vertebrate zoology, demonstrated knowledge of systematic herpetology, and minimally two years curatorial experience in a herpetological collection in a museum, including supervision of other personnel. Duties will emphasize reorganization and taxonomic updating of collection, preparation of cross catalogues, preparation and curation of osteological and histological materials, and supervision of student employees. **This is not a research position.** Send curriculum vitae and names, addresses and telephone numbers of two references by 1 May 1981 to Dr. William E. Duellman, Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. An Equal Opportunity/Affirmative Action Employer. Applications are sought from all qualified people regardless of race, religion, color, sex, disability, veteran status, national origin, age, or ancestry.

CURRENT LITERATURE TRANSITION

Beginning with this issue, we have a new section editor for Current Literature, Joseph Dinardo. I would like to extend my sincerest thanks to Richard Worthington, past CL section editor, for the outstanding job he did in developing and maintaining this valuable part of *HR*. I doubt if it is possible for me, even as editor, to *fully* appreciate the arduous task of preparing all those citations for publication each issue.
GRP ●

ERRATA

HR 11(2):48, col. 2 — substitute Cohen, H. J. for Cohen, J. H.
HR 11(3):76, col. 1 Harold A. Dundee, not Howard.

BRACHYLOPHUS MOVIE

The Fiji Film Unit is currently producing a 13 minute film on "*Brachylophus vitiensis*, the Crested Iguana." This unique film contains the first-ever recorded film history of the Crested Iguana and spans a whole year of animal observation, from birth to behaviour in its natural environment on an off-shore island in the Fiji group. The film contains scenes of the animal in its natural environment and in captivity, and includes shots of feeding, (natural), territorial behaviour (natural) and egg hatching (captivity).

The hope is to have the film completed by March/April 1981. The producers can supply a 16mm Eastman colour print or a ¾" U-matic cassette with English commentary at a cost of U.S. $250.00, payable to the Ministry of Information, Suva, Fiji. If you are interested in purchasing a copy of this film please write to the Director of Film Production, Fiji Film Unit, Government Buildings, Suva, Fiji.

Southwestern Herpetologists' Society

The Southwestern Herpetologists' Society is open to anyone having an interest in the study and conservation of reptiles and amphibians.

The Society meets on the third Monday of each month at 7:30 p.m., at the Reseda Recreation Center, 18411 Victory Blvd., Reseda, CA.

Monthly newsletter
HERPETOLOGY, our journal in its 14th year.

Membership $8.00 annually.
Make checks payable to SWHS
Send to Southwestern Herpetologists Society
P. O. Box 7469
Van Nuys, California 91409 ●

INTERNATIONAL HERPETOLOGICAL CONGRESS

Oct 3rd - Oct 9th 1981

Organised by the Cotswold Wild Life Park and the Association for the Study of Reptilia and Amphibia. To be held in the large Lecture Theatre, Department of Zoology, University of Oxford.

Provisional Programme

Days 1-2 Captive husbandry and breeding (World Wide); Days 3-4 Conservation and Field Research in Europe; Days 5-6 General Herpetology (World Wide); Day 7 Visit to Cotswold Wild Life Park, Lunch, Discussion and Dispersal.

Offers of papers for the various sections of this congress are now requested. Papers read should be of no more than 30 minutes duration and manuscripts for publication should be limited to 5,000 words and not more than five figures or tables.

Suggested titles should be sent without delay to:
J. Coborn, Cotswold Wild Life Park, Burford, Oxon OX8 4JW, England. ●

CURRENT LITERATURE

As of March, 1978, approximately 87 researchers are scanning 450 journals. Titles are published four times per year. Searchers are encouraged to submit titles for inclusion at three month intervals to assure approximately equal listings in HR.

Anyone publishing in a journal that is not widely distributed is invited to submit a complete citation or send a reprint to insure that the reference is published in Current Literature. Complete citations to obscure references are also welcome. Senior author addresses that are submitted will be included. Addresses following citations are those of first authors unless otherwise noted. Citations should be sent to

Joseph Dinardo
Current Literature
16 Idelwild Road
Levittown, PA 19057

A

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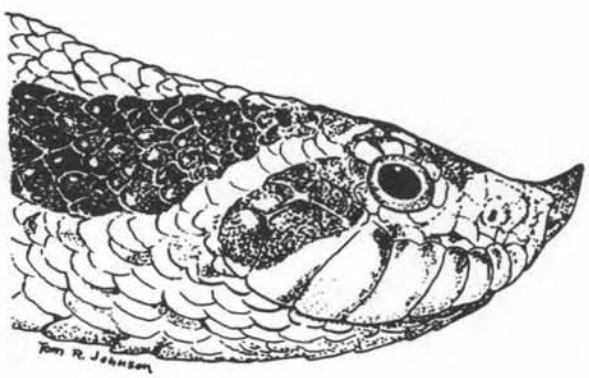
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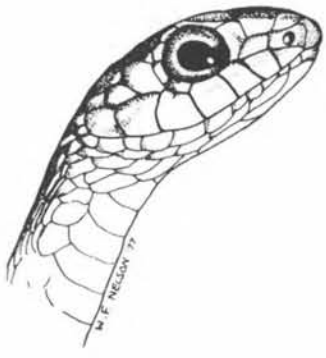


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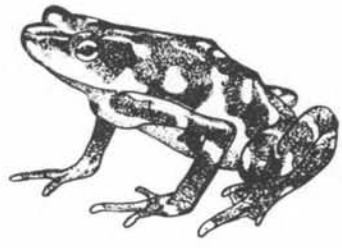
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